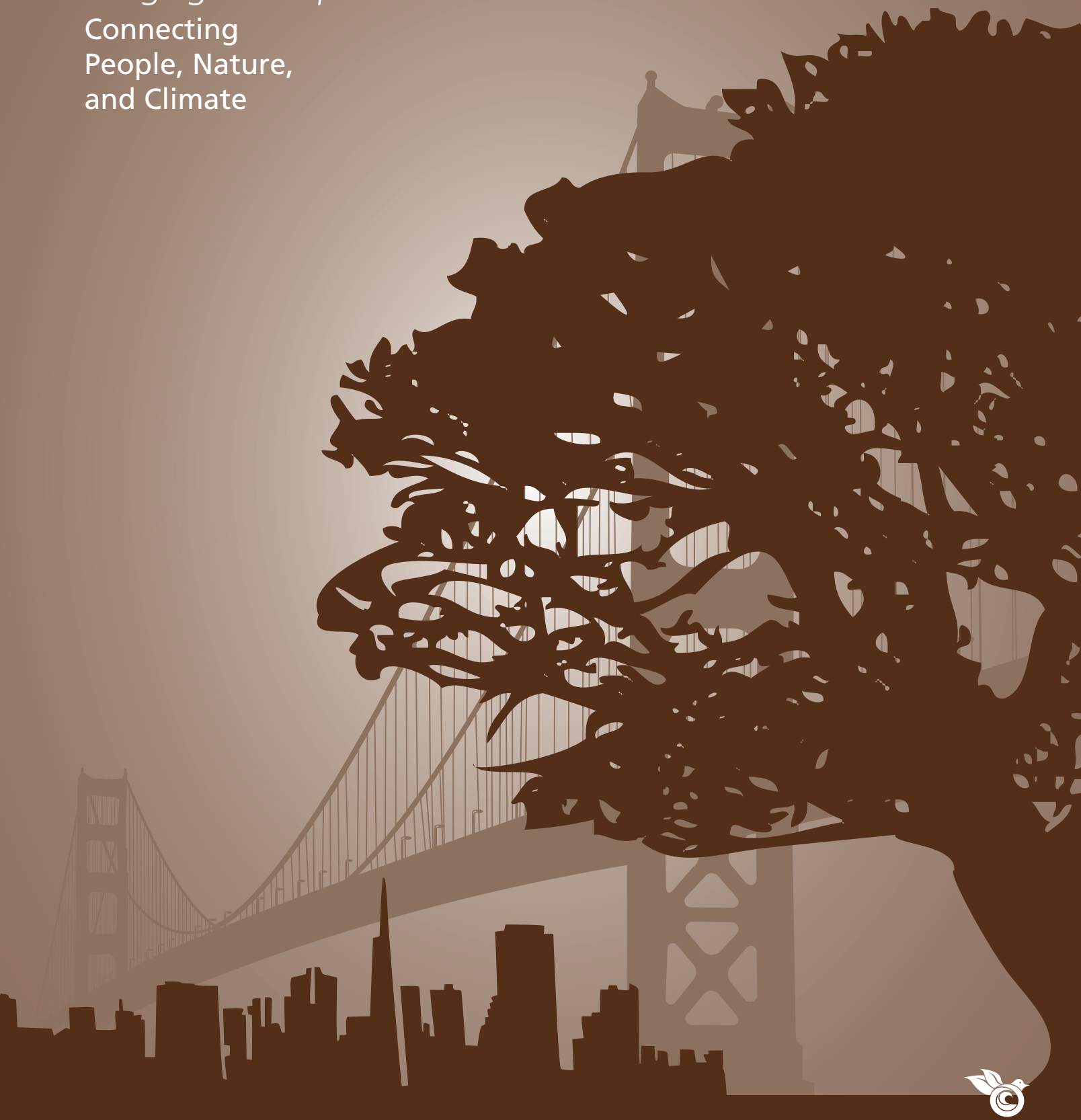
Abstracts

NACCB 2012

1st North America Congress for Conservation Biology

Bridging the Gap:

Connecting
People, Nature,
and Climate



Society for Conservation Biology North America Section

NACCB 2012

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Congress Abstracts

Ordered by surname of first author.
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Monday, July 16 9:45 Can Brain Size Help Predict Conservation Status Of Mammalian Species?

Abelson, Eric[*], *Stanford University*

As global anthropogenic pressure on wildlife mounts, conservationists are faced with finding salient characteristics that predict population decline in mammals. Confounding the ability to preserve mammalian species is the complexity of traits and behaviors that influence their ability to thrive in changing landscapes. While the brain is the seat of information processing, storage and the origination of behaviors, the importance of neural physiology to conservation is poorly understood. Encephalization (here defined as brain size corrected for body size and phylogeny) has been shown to be correlated with behavioral flexibility in birds as well as to predict the success of introduced mammals in novel habitats. However, the relationship between encephalization and conservation status has not been applied directly to understanding how mammals fare in a changing world. I specifically describe how encephalization in mammalian species from the Americas relate to current trends in endangerment and also examine the role that brain size has played in carnivore persistence over the last 40 million years. These results underscore the importance of incorporating encephalization into models predicting future faunal loss.

Wednesday, July 18 9:30 Climate Change Impacts On Vegetation In The San Francisco Bay Area: A New Modeling Approach And Implications For Conservation

Ackerly, David[*]

Climate change is expected to profoundly impact terrestrial vegetation. Understanding spatial variability of these impacts is critical to development of conservation strategies and projections of ecosystem services under future climates. We present a model of the projected responses of vegetation in the San Francisco Bay Area to 21st century climate change scenarios, using a novel application of multinomial logistic regression. The output of this method is a vector of the relative probability of occupancy by each of a set of vegetation types, for each pixel in the landscape. The overall vulnerability of vegetation to climate change can then be quantified as the change in modeled probabilities between the vectors modeled under present versus future climates. These changes capture the likelihood of long-term climate-driven vegetation change for each pixel, without relying on specific predictions of present and future vegetation types. Based on this model, we find that the vegetation patches with greatest vulnerability to climate change are those that lie close to the edge of the climate suitability envelopes for their respective vegetation types. In some cases, these climatically marginal populations occur on cool, north-facing slopes, challenging the idea that cool micro-environments will necessarily serve as in-situ refugia. For most of the projected vegetation transitions, the new vegetation type predicted to occupy a site already occurs within a short distance (< 5 km), so long-distance dispersal is not required. These results highlight the importance of fine-scale spatial heterogeneity to provide local propagule sources that will facilitate transitions among native vegetation types.

Monday, July 16 Connecting Conservation, Maps, And People At USAID: New Applications Of Geospatial Information Applied To Conservation And Development

Adeney, Marion[*]

Geospatial information and analyses are critical tools long used by conservation scientists to inform our work. These tools illuminate natural phenomena, changes resulting from interactions between people and nature, and benefits people receive from natural systems. The US Agency for International Development (USAID) is increasing both emphasis on the importance of nature conservation for development results and on the use of science, technology, and innovation to

inform development. As part of this effort, the USAID GeoCenter, launched in November 2011, is working to build capacity for geospatial analysis throughout the agency in areas from planning and strategy to evidence-based monitoring and evaluation of our programs. Here, we show the example of the Regional Development Mission in Asia, which is using applied geospatial analyses to inform mandatory assessments of the effectiveness of biodiversity and forestry programs and to aid in regional-scale strategic planning for climate change programming. We also discuss the advantages and challenges of applying these types of scientific tools in a large traditional development agency and discuss how the conservation community can best contribute to and benefit from this effort.

Monday, July 16 9:00 Changing Patterns In Emerging Diseases Of Wildlife Linked To Climate Change

Aguirre, Alonso*, *George Mason University*

Changing patterns in emerging infectious diseases of wildlife have been recently linked to climate change. These include changes in prevalence, abundance, hosts, geographic range, and wildlife host-pathogen interactions. We have observed movement of West Nile virus, avian malaria and avian pox and other arboviruses to higher ranges linked to warmer temperatures. Hantavirus in the Americas has been linked to changing drought and rain patterns. Possible effects, that are harder to predict, include invasions of new pathogens in a large number of wildlife hosts. In addition, this may also affect the overall dynamics of aquatic and terrestrial ecosystems, Specific research priorities to predict impacts of climate change on wildlife diseases include collection of baseline data on health parameters, as well as distribution, epidemiology and effects of pathogens and diseases in wildlife; studies separating the effects of different climate variables on the dynamics of pathogens and disease in animals and humans; and forecasting temporal and spatial effects of climate change on pathogen and host populations. It is important that scientific investigations benefit from transdisciplinarity through collaborations between ecologists, modelers, veterinarians, public health specialists and infectious disease biologists. We should focus on key host species and pathogens in selected ecosystems (aquatic and terrestrial), and should include epidemiological assessment, dynamic food-web modeling and experimental studies to develop adaptive strategies on new disease transmission patterns in wildlife affecting domestic animals and humans.

Monday, July 16 3:15 Life History Traits And Range Shifts Interact To Determine Species' Vulnerability To Climate Change

Akcakaya, H. Resit*, *Stony Brook University* , **Aiello-Lammens, Matthew** , **Stanton, Jessica** , **Ryu, Hae Yeong** , **Shoemaker, Kevin** , **Horning, Ned** , **Ersts, Peter** , **Pearson, Richard**

Assessing the vulnerability of species to climate change presents several challenges. Determining life history traits that make species vulnerable to extinction often leads to circularity in analysis when the data on extinction risk is based in part on these life history traits. Assessing the effect of range shifts in response to climate change often ignores life history and landscape-specific information; and the results lack relevance to extinction risk. To address these challenges, we developed a novel modeling approach, which links downscaled global climate model ensembles, ecological niche models (ENM), and generic life history models. We develop ENMs using a combination of dynamic climatic variables, and "static" variables such as land cover and hydrology. The results of ENMs are linked to generic life history models, which are standardized stochastic models with upper and lower bounds for each of a standard set of life history parameters. These life history models are sampled with a Latin hypercube design and each sampled model is linked with results of an ENM to form stochastic metapopulation models with dynamic spatial structure. Analysis of simulation results reveals

interacting effects of life history changes and range shifts on the vulnerability of species to climate change. This approach is demonstrated by using distributional and demographic data on 40 species of North American reptiles and amphibians to analyze their vulnerability to climate change.

Wednesday, July 18 10:15 Bridging The Gap: Walking The Talk

Albright, Whitney* , **Pairis, Amber** , **Choudhury, Arpita**

State fish and wildlife agencies in the U.S. are charged with managing fish, wildlife, plants, and habitats to protect ecological function and ecosystem services for generations to come. This job is made more challenging by climate change and its associated impacts as managers must now incorporate this stressor into conservation planning. Gaps in scientific knowledge, financial and political obstacles can all prevent climate change from being included in state-level planning processes and adaptation actions on the ground. In light of these obstacles, state fish and wildlife agencies look to collaborative partnerships for opportunities to leverage resources, and to ensure that the best available climate science is being used in planning and adaptation efforts. In order to assess existing adaptation planning, we surveyed fish and wildlife agencies in the U.S. and several partner groups to determine what climate change activities are currently taking place within their organizations, science gaps, and which partnerships have contributed to their adaptation actions. Survey responses demonstrate that a lack of communication and collaboration between the states, other partners, and the scientific community will be detrimental to safeguarding natural resources from climate change impacts. However, through innovative partnerships such as stakeholder working groups, LCCs, and more regional and local coordination, we can effectively overcome the science-management-policy gap.

Monday, July 16 Effect Of Farming Method On Arbuscular Mycorrhiza Formation In Two Coffee Growing Regions Of Costa Rica

Aldrich-Wolfe, Laura*, *Concordia College Biology Department* , **Schmaltz, Logan**, *Concordia College Biology Department* , **Mcglynn, Riley**, *Concordia College Biology Department*

Coffee (Coffea arabica) is one of many plant species that form mutualistic associations with arbuscular mycorrhizal fungi in which the plants exchange sugars from photosynthesis for enhanced uptake of phosphorus and other poorly mobile soil nutrients and protection from pathogens via fungal mycelia. While the benefits of traditional shade-grown and organic coffee farming methods have been well-characterized for a variety of animal species, the effects of different coffee farming methods on belowground communities are much less well-understood. In this study, we characterized farming methods in twelve coffee fields in two regions of Costa Rica, Monteverde de Santa Elena and San Vito de Coto Brus, based on use of herbicides, pesticides, and synthetic fertilizers; amount of shade; richness of shade species; depth of leaf litter; elevation; slope; and coffee cultivars. Coffee root samples taken from each field were cleared and stained, and percent root colonization by arbuscular mycorrhizal fungi was determined by microscopy. Coffee fields fell along a continuum from conventionally-farmed to organic, with several fields either receiving minimal applications of herbicides and pesticides or being recently transitioned from conventional to organic methods. Organic fields tended to be on much steeper slopes than conventional ones. Organic fields also had the highest root colonization by AM fungi, while conventional fields had the lowest. Our results suggest that organic coffee fields may benefit more strongly from associations with AM fungi than conventional fields. Perhaps more importantly, organic fields may have greater potential for the conservation of diversity in the arbuscular mycorrhizal fungi.

Monday, July 16 Cost-Benefit Analyses Of Mitigation Measures Aimed At Reducing Collisions With Large Ungulates In The USA And Canada; A Decision Support Tool

Ament, Robert*, *Center For Large Landscape Conservation* , **Huijser, Marcel**, *Western Transportation Institute - MSU* , **Duffield, John**, *University Of Montana, Department Of Mathematical Sciences* , **Clevenger, Anthony**, *WTI-MSU* , **Mcgowen, Pat**, *WTI-MSU*

Ungulate-vehicle collisions are numerous and have increased over the last decades in the United States and Canada. We calculated the costs associated with the average deer- (US$6,617), elk- (US$17,483) and moose-vehicle collision (US$30,760), including vehicle repair costs, human injuries and fatalities, towing, accident attendance and investigation, monetary value to hunters of the animal killed in the collision, and cost of disposal of the animal carcass. In addition, we reviewed the effectiveness and costs of a range of mitigation measures considered effective in reducing collisions with large ungulates and providing safe crossing opportunities for large mammals. We conducted cost-benefit analyses over a 75-year period to identify the threshold values (in 2007 US$) above which individual mitigation measures start generating benefits in excess of costs. These threshold values were translated into the number of deer-, elk-, or moose-vehicle collisions that need to occur per kilometer per year for a mitigation measure to start generating economic benefits in excess of costs. The model presented in this paper has been used as a decision support tool for wildlife mitigation measures along various road sections in the USA and Canada. We provide examples of how this tool shows that if certain thresholds are met mitigation measures may not only benefit human safety and nature conservation, but can also be a wise economic investment.

Tuesday, July 17 9:35 Why The Federal Sheep Experiment Station's Grazing Should Be Halted In Carnivore-Rich Connectivity Areas Linking The Yellowstone Area To Central Idaho

Ament, Robert*, *Center For Large Landscape Conservation* , **Callahan, Renee**, *Center For Large Landscape Conservation*

In 2008, the U.S. Sheep Experiment Station (USSES) in DuBois, Idaho undertook–for the first time ever–an analysis of the environmental effects of its sheep grazing operations. The Station, which was established in the 1910s, is situated along the Idaho-Montana border, where the “spine” of the landscape follows the Continental Divide along the crest of the Centennial Mountains. The Centennials represent a vital connection between the Greater Yellowstone Area and the Central Idaho Wildlands Complex, two of the few remaining large, relatively intact ecosystems in the U.S. The region is populated by large, native carnivores and ungulates, and there is overwhelming evidence of extensive grizzly bear use in the area. As a result, other federal agencies operating in the High Divide, including the USDA-Forest Service, Bureau of Land Management, National Park Service, and the Fish and Wildlife Service, have adopted conservation policies to protect connectivity, including phasing out existing domestic sheep grazing allotments on federal lands. Despite this fact–and despite the retirement of more than half a million acres of grazing allotments on nearby lands–the USSES has thus far refused to seriously consider any alternative other than “business as usual.” This presentation will discuss why the Station should join its sister agencies in promoting ecological connectivity in this region, particularly for carnivores, by ceasing all domestic grazing within the Centennial Mountains.

Tuesday, July 17 3:00 Recent Progress On Wildlife Corridor And Ecological Connectivity Policy In The United States, 2007 To Present.
Ament, Robert*, *Center For Large Landscape Conservation* , **Tabor, Gary**, *Center For Large Landscape Conservation* , **Callahan, Renee**, *Center For Large Landscape Conservation*
We summarize the increasing attention state and federal policy makers have given to maintaining ecological connectivity. It includes policy initiatives, memoranda, orders, plans, strategies and other administrative avenues of promoting the conservation of wildlife corridors. In addition to administrative efforts, it includes state and federal legislative efforts, both bills that were introduced and those that ultimately have passed. Some of these new policies focus on wildlife migration, others on large landscapes and yet others on private lands. Many of these efforts are wrapped within the context of adaptation strategies for climate change, others are in reaction to fragmentation brought on by human development such as energy exploration or busy highways, while others seek to create private land incentives or inform land use planning. Overall, there are over 20 noteworthy connectivity policy efforts described from 2007 through 2012. Seven are by states, one is a joint federal-state memorandum and fifteen are federal initiatives. Some policies are general in nature, while others have a high degree of specificity. In this presentation we will provide an assessment of what policies have been most successful, why they succeeded and how they can be used to implement conservation action.

Monday, July 16 10:00 N-Dimensional Pinball: Towards The Strategic Use Of Reserves And Management To Maintain Biodiversity Across The Whole Landscape
Anderson, Mark*, *The Nature Conservancy* , **Finton, Andy**
Conservationists are faced with the challenge of maintaining the long-term persistence of thousands of species using only a small portion of the landscape. Like the pinball challenge of keeping many balls indefinitely in play using only bumpers, flippers, and the space in between, various sized reserves can work in concert to maintain larger scale dynamics. In addition to the traditional role of providing refuge for rare species, reserves should be strategically placed to: 1) provide source habitat and create dispersal presser, 2) maintain ecological processes, 3) retain temporal continuity in the landscape, and 4) represent the spectrum of geophysical diversity. Further, reserves can be designed or situated to provide services beyond biodiversity conservation such as preventing floods or mitigating temperature extremes. Here, we examine the research that supports or refutes such uses of reserves in terrestrial systems, and we review management practices for non-reserve areas that are designed to amplify the effects of the reserves and maintain larger scale landscape characteristics.

Monday, July 16 8:45 Estimating The Resilience Of Terrestrial Habitats In The Northeastern United States And Canada
Anderson, Mark*, *The Nature Conservancy*
Resilience concerns the ability of a system to adapt to climate change by restraining damages or taking advantage of opportunities, while sustaining high levels of biodiversity and ecosystem function. We aimed to identify the most resilient examples of key geophysical settings (e.g. sand plain, granite mountain, limestone valley) in Northeastern North America to create a spatially explicit map of the set of places having with the largest capacity to adapt to climate change. The project had three parts: 1) identifying and mapping the geophysical settings, 2) developing a quantitative estimate of resilience for each setting based on landscape complexity and permeability, and 3) identifying key linkages that may be important in facilitating climate-induced regional movements. Our results identified 30 distinct geophysical settings and we developed an estimate of each setting's average resilience score. We next identified places that were above

the mean score for each setting within six eastern ecoregions. Lastly, we overlaid these places with sites identified as important by the Nature Conservancy based on current biodiversity which revealed that 53 percent of the Conservancy sites were potentially important for both current and future biodiversity.

Monday, July 16 9:00 California's Desert Flora: A Floristic Frontier On The Brink

Andre, James M.[*], *UC Riverside, Granite Mountains Desert Research Center*

The California desert flora, treated here as the region represented by the Jepson Desert Manual (2002), includes the Great Basin Province east of the Sierra Nevada and Mojave and Sonoran Deserts. This vast region contains nearly 40% of California's native plant diversity (2430 taxa), and represents one of the highest quality intact ecosystems left in North America. In the past 9 decades, 280 taxa have been added to the flora, and the rate of new species discovery has increased in the past 3 decades. By the end of this century, 150-230 native taxa are expected to be added to the flora, with the majority being newly described species that are also rare. In addition to numerous taxonomic discoveries, botanists continue to document significant range extensions and rare plant occurrences. Anthropogenic change is looming as the California deserts are being targeted for widespread renewable energy development (> than 2,000 sq. mi.) in the next five years. With approximately 10% of the flora undescribed and the documentation of rare species distributions incomplete, the consequences of rapid and large-scale habitat destruction that will alter ecosystem functions and profoundly increase the potential for extinctions. This presentation provides 1) an overview of recent plant discoveries and an assessment of our floristic knowledge, 2) the status of rare plants in the California deserts, and 3) a perspective of what we stand to lose with the impending industrialization of California's deserts.

Wednesday, July 18 12:30 Stakeholder Workshops On Aquatic Ecosystem Services Inform Conservation Planning In The Albemarle-Pamlico Basin

Angermeier, Paul[*], *US Geological Survey and Virginia Tech* , **Villamagna, Amy**, *University Of Maryland* , **Bennett, Elena** , **Mogollon, Beatriz**, *Virginia Tech* , **Frimpong, Emmanuel** , **Mahajan, Shauna**

Major environmental concerns in the Albemarle-Pamlico basin (APB) of VA & NC include urbanization, sea-level rise, estuary eutrophication, species imperilment, and rural poverty. We examined if casting these as gains/losses of aquatic ecosystem services (AES) could influence conservation planning by stakeholders. We assembled representatives of 27 groups working in the APB for 2 workshops to discuss 4 AES: water supply, water purification, nitrogen regulation, and wildlife-based recreation. Objectives of the 1st workshop (March 2011) were to 1) familiarize stakeholders with focal AES, 2) introduce scenario analysis as a planning tool, and 3) get stakeholders to help outline 4 plausible APB futures germane to their conservation efforts. The emerging scenarios represented contrasts in basin-wide vs. local environmental management and in environmental protection vs. conventional economic growth. We translated the scenarios into spatially explicit projections to facilitate comparison of AES delivery among scenarios and current conditions. Objectives of the 2nd workshop (April 2012) were to 1) present APB-wide analyses of focal AES, 2) compare current conditions with projected scenarios, and 3) discuss how AES analyses inform stakeholder conservation. Stakeholders found our AES perspectives and workshops useful. The workshops influenced conservation planning by providing a novel AES perspective, a neutral venue for engagement, and new opportunities for stakeholder collaboration.

Monday, July 16 An Assessment Of Plant Diversity Along Roadside Verges On The Baltic Island Gotland (Sweden): Measuring Plant Responses To Varying Nitrogen Levels

Apaydin, Muge*, *Department Of Plant Ecology And Evolution Evolutionary Biology Centre (EBC) Uppsala University*

Over the past century, human activity has substantially altered the global environment through changed land use, which has had a negative impact on the biodiversity. One major consequence of this is the nitrogen enrichment. This is a major threat to the plant diversity in terrestrial ecosystems because most plant species are adapted to nutrient-poor conditions and can only compete successfully on soils with low nitrogen levels. An increase in nitrogen will cause a drastic loss of biodiversity because of competitive exclusion. This study tests the validity of these claims by investigating the impact of human intervention on the plant diversity of roadside in Gotland, Sweden. Gotland's roadside flora is more species-rich than other regions and therefore of special concern. At the same time roadsides are mown regularly because of safety reasons, which enrich the level of nitrogen in the soil because the mulch is not collected. I expect that less competitive species will be eliminated from the system as the level of nitrogen increases. If empirically valid, these results indicate that current maintenance strategies are poor and insufficient. The paper also makes further recommendations for increasing the abundance of threatened grassland plant species by proposing alternative cost-efficient management and conservation methods.

Monday, July 16 The Role Of Bridge Species In The Transmission Of Highly Pathogenic Avian Influenza (HPAI) And Newcastle Disease (ND) Viruses In Jos

Apeverga, Tersoo*, *A. P Leventis Ornithological Research Institute (Aplori), Jos Nigeria*

Avian Influenza (AI) and Newcastle Disease (ND) are the two most important diseases of poultry and other birds. This is not only because of its ability to cause serious threat to the welfare of wild bird populations, but also its effects on agriculture and human health. However, not much is understood on the route of recurrent outbreaks of these diseases. Wild resident birds (bridge species) have been implicated with harbouring these viruses and capable of transmitting it to poultry. This study sort to understand the role of these bridge species in the transmission of AI and ND. A total of fifty eight (58) bridge species were caught using mist nets. All cloacal and tracheal samples collected tested negative for AI, but 53% showed positive result for ND. Although no positive case of AI was recorded, it was possible that infected birds died quickly after infection. The presence of ND virus is a great threat to wild birds and poultry farms, and could lead to great economic loss. This study suggests that poultry farms should be located away from streams and open waters to minimize contact with wild birds, and if possible they should be reared in bird-proof concealments.

Monday, July 16 3:45 Population Genetic Structure In Anadromous River Herring: Implications For Proposed Listing Under The US Endangered Species Act

Argo, Emily*, *University Of California* , **Schultz, Thomas**, *Duke University* , **Labbe, Ellen**, *University Of Southern Maine* , **Willis, Theodore**, *University Of Southern Maine* , **Limburg, Karin**, *State University Of New York* , **Gephard, Stephen**, *Connecticut Department Of Environmental Protection* , **Post, David**, *Yale University* , **Palkovacs, Eric**, *University Of California*

Alewife (Alosa pseudoharengus) and blueback herring (A. aestivalis), collectively referred to as river herring, are anadromous fishes native to the Atlantic Coast of North America. These species are an important component of coastal ecosystems and comprised one of the oldest fisheries in North America. However, steep population declines have led to widespread fisheries closures, designation as 'species of concern' and a current petition for

listing under the US Endangered Species Act (ESA). Despite conservation concerns, little is known about population genetic structure in these species. We collected alewife and blueback herring tissue samples from freshwater spawning runs from Maine to Florida and deployed 15 novel microsatellite loci to investigate population genetic structure within each species. Population genetic analyses reveal substructure within each species, with the groupings of genetically similar spawning runs relating to geographic location. Our results show greater overall differentiation among blueback herring spawning runs compared to alewife spawning runs. Our results provide important information for the designation of 'distinct population segments,' a critical component of the ESA evaluation process. In addition, our genetic data will be applied to answer questions regarding hybridization and the threats posed by bycatch in marine fisheries.

Tuesday, July 17 3:15 Nature's Protection From Storms And Sea Level Rise: InVEST Models And Applications

Arkema, Katie[*], *The Natural Capital Project, Stanford University* , **Verutes, Gregg** , **Guannel, Greg** , **Faries, Joe**, *Stanford University - The Natural Capital Project*

Understanding the role that nearshore habitats play in the protection of coastal communities is increasingly important in the face of a changing climate and growing development pressure. In the US, more than one-third of the population currently lives in the coastal zone. Conflicts between people, development and natural processes have led to worldwide pressure on many coastal systems. The InVEST Coastal Protection model quantifies the protective benefits that natural habitats provide against erosion in nearshore environments. Outputs can be used to better understand the relative contributions of different natural habitats in reducing nearshore wave energy levels and coastal erosion and to highlight the protective services they offer to coastal populations. In this talk, members of the Natural Capital Project will demonstrate examples of how we are applying this model throughout North America and in Belize to measure, map and value the protective role to people and property provided by natural habitats. We will show how this information is being used by coastal managers, planners, landowners and other stakeholders to inform coastal development strategies, permitting and climate adaptation planning.

Tuesday, July 17 9:00 Managing Novel Ecosystems In Urban Landscapes For Conservation And Restoration Of Biodiversity

Aronson, Myla[*], *Hofstra University*

Urban habitats are inherently novel ecosystems with drastically altered soils, climate, and resources from that of pre-urbanization habitats. These unique abiotic features, coupled with high levels of exotic species introductions, lead to novel plant and animal communities in cities that are not well understood. Although often perceived as concrete jungles, cities play a critical role for biodiversity conservation; estimates indicate cities harbor over 20% of the Earth's bird and 5% of plant species. Here I discuss the management and restoration of urban habitats to maintain this diversity. Management of urban natural habitats often focuses only on the eradication of exotic plant species. However, this management scheme may not be successful as cities are continually inundated by high propagule pressure of exotic species. It may be more efficient, instead, to manage remnant and restored habitats for retention of biodiversity, resistance to invasions, and ecological function. In particular, vacant lots and degraded parks offer opportunities to restore biodiversity and ecosystem function although there are many challenges to these restorations. As the majority of humanity now lives in urban areas, and urban land use is a growing portion of the Earth's land surface, there is a need to understand and manage novel ecosystems to maximize biodiversity and the human experience.

Monday, July 16 Exposure Patterns And Impacts Of Methylmercury On Bald Eagles In Maine
Atwood, Jonathan* , **Desorbo, Chris**, *Biodiversity Research Institute* , **Todd, Charles**, *Maine Department Of Inland Fisheries And Wildlife* , **Mierzykowski, Steven**, *U.S. Fish And Wildlife Service* , **Hanson, William**, *FPL Energy Maine Hydro* , **Gray, Rick**, *Biodiversity Research Institute* , **Welch, Linda**, *Maine Coastal Islands NWR* , **Evers, David**, *Biodiversity Research Institute*
Mercury (Hg) pollution is a growing concern in many regions of North America because elevated dietary exposure can adversely impact behavior and reproduction in wildlife. We sampled Bald Eagles over an eight-year period (2004-2011) in coastal, river, and lake habitats throughout Maine to evaluate differences in Hg risks among habitats and determine if eagle productivity may be influenced by Hg exposure. We found significant differences in Hg levels among eagles found in the 3 habitat types. Lake-dwelling birds showed higher Hg levels compared to river- and, especially, coastal-dwelling populations. Productivity (number of chicks per occupied nest) at nest sites located in lake habitats was negatively correlated with Hg levels found in nestling blood samples. A portion of Maine's freshwater-feeding Bald Eagle population exhibits some of the highest Hg concentrations reported in North America, and findings suggest Hg may be slowing the recovery of this regionally important breeding population. We discuss the policy and conservation implications of these findings.

Wednesday, July 18 8:30 How Did We Get Here? Establishment And Operational Status Of The LCC's
Austen, Douglas* , *USFWS*
In recognition of the challenges that we face as a conservation community and the emerging success of efforts that have addressed conservation at the large-scale, the Department of Interior, working with many partners, has built a network of 22 Landscape Conservation Cooperatives (LCC's). The LCC coverage now includes all U.S. states and territories and is increasingly working with conservation partners in Canada and Mexico. LCC's are public-private partnerships composed of states, tribes, federal agencies, non-governmental organizations, universities and others. To date, state natural resource or fish and wildlife agencies from all 50 states are involved in LCCs. LCC's recognize that our conservation challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation—holistic, collaborative, adaptive and grounded in science—to ensure the sustainability of North America's land, water, wildlife and cultural resources. The resulting system of LCC's works closely with the USGS Climate Science Centers (CSC) and the National Climate Change and Wildlife Science Center (NCCWSC) to identify, develop and transfer science to practitioners. Furthermore, the LCC's act as a forum for developing common large-scale conservation goals that emanates from individual partners missions but yet need to be addressed at a large scale in order to be successful. LCC's clearly respects the jurisdictional authorities of the various partners and, as such, seek to provide sound inform to inform good natural resource decision-making and facilitate collaborate conservation actions.

Wednesday, July 18 12:30 Impacts Of Border Tactical Infrastructure On Public And Private Lands In The Arizona-Sonora Border
Avila, Sergio* , *Sky Island Alliance*
The recent construction of border barriers and other tactical infrastructure to deter human and vehicle traffic across the border substantially impacts sensitive areas and wildlife populations. Due to the lack of environmental impact studies, construction of border infrastructure proceeded without input from public land managers or private landowners. This presentation summarizes results from mapping of border infrastructure along the Arizona-Sonora international border, and wildlife surveys in the sky islands. We mapped different

types of border wall and its impacts on public and private lands within a 200-mile section of border in southwestern U.S. and northwestern Mexico, resulting from photographic flights and field visits along the border. Remote camera surveys in northern Sonora and southern Arizona have resulted in 23 species of wild land mammals, including jaguar, ocelot, puma, black bear, coati and four species of skunks (Mephitidae). Additionally, we have compiled and mapped records of Neotropical felids on both sides of the border from the last decade. Sky Island Alliance seeks to build cooperative relationships with landowners in Sonora and public land managers in Arizona to facilitate scientific research, encourage large predator conservation and establish corridors connecting patches of continuous habitat throughout the binational region. The project's results supported the Federal certification of a private wildlife preserve in northern Sonora, 30 miles south of the border, expanding a network for northern jaguars and Sonoran ocelots.

Monday, July 16 Amphibian Diversity In A Fragmented Hotspot Of Biodiversity

Baczynski, Kat[*], *Bowling Green State University* , **Root, Karen**, *Bowling Green State University*

Amphibian numbers have declined drastically over recent years. Habitat loss and fragmentation resulting from urbanization and changing land uses are major factors leading to these declines. The primary goals of this study are to determine 1) amphibian presence, diversity, and relative abundance in northwest Ohio and 2) if presence, diversity, or relative abundance is affected by local habitat or landscape-level factors. Information about the locations of species and important landscape characteristics can be used to manage for amphibians more effectively and to identify which areas serve as suitable habitats and therefore warrant protection. In 2011, I monitored 14 sites using frog call surveys. I detected 9 of 10 species known to occur in this region. Habitat variables including percent canopy and ground cover were measured at each site. In contrast to other studies, preliminary results indicate that local anuran diversity did not vary with either local variables (canopy cover and ground cover) or landscape-level variables (diversity of surrounding cover types). This research should help us better understand the patterns of diversity, abundance, and habitat use of amphibians in this mixed land use matrix and the landscape factors that influence these patterns.

Tuesday, July 17 10:00 Marine Resource Management In Madagascar: Strategies To Endure A Crisis

Baker, Merrill[*], *UC Berkeley*

Much in line with the blue revolution occurring globally, Madagascar is in the process of quickly expanding its marine protected area (MPA) network. However, how to manage these new areas is yet to be decided. In early 2009 a political crisis exploded in Madagascar during which the incumbent president was overthrown. Although there has been much alarm within the international conservation community concerning the way in which this political crisis has increased pressure on Madagascar's unique terrestrial biodiversity, little is known about how the crisis has influenced resource use in the marine realm. Additionally, there is a gap in management theory concerning how different strategies fare (ecologically and socially) during a crisis such as the one in Madagascar. This paper aims to help close this gap by comparing several "state" and "community" managed MPAs in Madagascar in terms of incidence of marine resource use rule-breaking and how local fishers perceptions of access to and control over marine resources changed during the crisis. Understanding how local resource users respond to changing macro-political dynamics could help Madagascar, and possibly other nations in similar contexts, orient future MPA management strategies to better endure social upheaval.

Wednesday, July 18 11:15 Healthy Land, Healthy People? Spatial Relationships Among Measures Of Landscape Integrity And Human Community Health

Baldwin, Rob* , **Powell, Robert** , **Baldwin, Elizabeth** , **Trombulak, Steve** , **Lipscomb, Don**

Biological conservation exists in a social context. Landscape integrity indices have received widespread attention for conservation planning, and may be useful when coupled with measures of human community "health" that are mapped at similar resolution and extent. Our interdisciplinary group combined large extent (lower 48 United States) datasets [90m Human Footprint (HF), protected areas (PADUS), National Land Cover Change 2001-2006, median household income and poverty (US Census), obesity (CDC), and violent crime (FBI)]. Results indicate global (CONUS) correlations with regional variation. There were inverse relationships (% of county population obese and % of that and neighboring counties covered by protected lands of any protection level); positive relationships (HF, household income, crime, and % county converted to development '01-'06) suggesting that human land transformation may have a positive feedback loop with economic growth and crime; negative relationships (HF and coverage of GAP 2-4 but not GAP 1 protected areas at county and neighborhood scales), and regional relationships (geographically weighted regression revealed significant, opposite relationships by predominately rural vs. urban regions for obesity rates, mean HF; by contrast global result was weakly positive). Because large-extent spatial analysis of complex social and natural phenomena is likely to overlook important, correlated variables, we consider these results exploratory for generating hypotheses. The questions we ask are designed to show how interdisciplinary research may elucidate coupled aspects of human and landscape condition. There is an implementation gap in conservation, and understanding how human communities may or may not benefit from natural landscape integrity is important for, among other things, making the case for new protected areas.

Wednesday, July 18 12:00 Defining Core Concepts Of Information Across The Conservation Community: Can We Develop Consistent Approaches Or Is The Holy Grail Unattainable?

Ballard, Grant*, *PRBO Conservation Science* , **Dipietro, Deanne**, *Sonoma Ecology Center* , **Veloz, Sam** , **Gardali, Thomas**, *PRBO Conservation Science*

Countless projects generate geospatial data potentially relevant to improving conservation outcomes in the context of rapid environmental change. There are also many ways of accessing these products, which are generally highly technical in nature, and based on a rapidly evolving set of assumptions and analytical methods. Many of the most sophisticated models are currently only accessible by users with specialized statistical and computer programming skills. At the same time, more and more natural resource management activities justifiably are required to consider climate change adaptation, so people responsible for implementation risk wasting time sorting through a tangled web of climate-related data products, or making decisions based on less than the best possible information. Several ongoing California LCC projects tackle this challenge by utilizing informatics capacities developed across a spectrum of disciplines. I define what a decision support system is in the context of adaptive management, demonstrating a consistent conceptual framework across three case studies: (1) the California Climate Adaptation Commons (climate.calcommons.org) (2) the Environmental Change Network (www.prbo.org/ecn) and (3) the San Francisco Bay Sea-Level Rise Tool (www.prbo.org/sfbayslr). I will demonstrate key conservation decision support functions of each of these projects and highlight the synergies emerging by working collaboratively in the context of the LCC.

Wednesday, July 18 3:00 A Framework For Examining Public Participation In Scientific Research (PPSR) To Enhance Conservation Science, Education And Stewardship

Ballard, Heidi[*], *University Of California, Davis* , **Phillips, Tina**, *Lab Of Ornithology* , **Bonney, Rick**, *Cornell University*

Complementing recent discussions of the impacts of citizen science and other forms of participatory ecological monitoring on conservation and natural resource management (e.g. Danielsen et al. 2009), we describe here a framework for examining the outcomes of these programs on participants with respect to their scientific and environmental literacy and action. Researchers have just begun to investigate the educational impacts of intentional collaborations between volunteers and scientists to address real-world environmental problems [we term these Public Participation in Scientific Research (PPSR)]. We begin by drawing on a conceptual model that delineates three categories of PPSR differentiated by level of engagement and decision-making of participants: Contributory, Collaborative and Co-Created (Bonney et al. 2009). By integrating the goals of science education, conservation biology and environmental stewardship and action, we've developed a framework for comparing strengths of PPSR projects across fields as public participation becomes more intensive. Applying this framework to results of a national survey of 200 citizen science project coordinators reveals features and tradeoffs of each model that contribute to greater science learning, improved data collection, and/or deeper engagement with policy and advocacy.

Monday, July 16 ROBIN: The Role Of Biodiversity In Climate Change Mitigation In Latin America

Balvanera, Patricia[*], *Centro De Investigaciones En Ecosistemas, Universidad Nacional Autónoma De México* , **Equihua, Miguel**, *Instituto De Ecología A.C.* , **García-Alanis, Nashieli**, *Comisión Nacional Para El Uso Y Conocimiento De La Biodiversidad* , **Gerritsen, Peter**, *Centro Universitario De La Costa Sur,Universidad De Guadalajara* , **Kolb, Melanie**, *Comisión Nacional Para El Uso Y Conocimiento De La Biodiversidad* , **Lazos, Elena**, *Instituto De Investigaciones Sociales, Universidad Nacional Autónoma De México* , **Maass, Manuel**, *Centro De Investigaciones En Ecosistemas, Universidad Nacional Autónoma De México* , **Perez-Maqueo, Octavio**, *Instituto De Ecologia A.C.* , **Martinez-Meyer, Enrique**, *Instituto De Biología, Universidad Nacional Autónoma De México* , **Mora, Franz** , **Schmidt, Michael**, *Comisión Nacional Para El Uso Y Conocimiento De La Biodiversidad* , **Parr, Terry**, *Centre For Ecology & Hydrology, Natural Environment Research Council*

Tropical forest ecosystems are hotspots for biodiversity and provide one of the biggest stores of terrestrial carbon making their role in climate change mitigation programs increasingly important (e.g. REDD, REDD+). As of now, we do not know how much biodiversity or what components of biodiversity are needed to sustain the ecosystem processes needed for climate change mitigation. A new European/FP7 project on "The Role Of Biodiversity In Climate Change Mitigation in Latin America" (ROBIN) aims to inform the implementation of REDD+ by identifying options for using biodiversity and ecosystems for climate change mitigation in multi-functional forest landscapes, taking into account trade-offs with other ecosystem services at local and regional scales. ROBIN will quantify the role of biodiversity in terrestrial ecosystems of Latin America in mitigating climate change, as well as evaluate the associated socio-ecological consequences. ROBIN will engage local and regional stakeholders in the discussion around the selection of biophysical and socio-economic indicators, defining mitigation options, developing future scenarios and in the testing of decision support tools. ROBIN will work across 15 sites in 6 countries using a combination of field data, remote sensing and models. The Mexican consortium has shown for tropical dry and wet forests that there is a large variance in species diversity, species composition, carbon stock and uptake within ecosystem types, as a result of different biophysical conditions, management

histories and matrix configurations. Similarly variable sets of tradeoffs between biodiversity, carbon and services such as fuelwood, availability of non-timber forest products, pasture, and agricultural food production have been found.

Wednesday, July 18 9:50 Policy Design For Sustainability In Mexico: Incorporating The Ecosystem Services Perspective

Balvanera, Patricia*, *Centro De Investigaciones En Ecosistemas, Universidad Nacional Autónoma De México* , **Galan, Carla**, *Centro De Investigaciones En Ecosistemas, Universidad Nacional Autónoma De México* , **Castellarini, Fabiana**, *Instituto Multidisciplinario De Biología Vegetal, Conicet-Unc*

Satisfying the needs of this generation without jeopardizing those of the next one implies sustaining the flow of benefits from ecosystems to societies as well as the processes that underpin them. The ecosystem services perspective allows to integrate these two strategies and to identify what cross-sectoral policies are needed to do so. Here we present a document for federal, state and municipal decision makers in Mexico that draws lessons from an interdisciplinary project on ecosystem services at the country level. We build a simple conceptual framework to show the tight interconnections between the functioning of ecosystems and the satisfaction of societal needs. We develop a step wise approach to assess what components of the ecosystems and which sectors of society are at stake by focusing on the northwestern part of the country. We conclude by suggesting ideal approaches to planning.

Tuesday, July 17 4:15 Some Common Adaptation Strategies: How Effective Are They?

Barr, Brian*, *Geos Institute* , **Koopman, Marni**, *Geos Institute*

Climate models project considerably warmer temperatures, a more truncated precipitation season, greatly reduced snow pack, and increases in wildfire across the western United States by the late 21st century. Geos Institute has been working with communities and natural resource managers to brainstorm approaches for cohesively reducing the vulnerability of natural and human systems to these changing climate conditions. Identified threats and adaptation strategies varied substantially from region to region, though a few commonalities emerged. Common threats included (1) less water storage from declining snowpack and increasing likelihood of drought; (2) greater flood risk in developed areas; and (3) higher wildfire risk to residences in the wildland urban interface (WUI). Common strategies for addressing these threats included (1) build new dams and flood control structures; (2) manage vegetation and building materials in the WUI; (3) intensively thin forests and use biomass for energy production. These approaches to climate change adaptation are already being recommended in many areas, and implemented across many landscapes. Yet the jury is still out on the effectiveness of these strategies. They are associated with unintended impacts to natural systems that may outweigh their benefits. Some strategies may even conflict with climate change mitigation efforts. Finally, there are alternatives that may be both more effective and have positive impacts to natural systems.

Tuesday, July 17 4:00 Modeling Climate Change Species Impacts Within Southern California's Coachella Valley

Barrows, Cameron*

A key question for conservation strategies is whether otherwise protected species will survive the current climate change or will that change push them beyond their physiological limits? To address this question I constructed niche models to assess the climate change sensitivity of two endangered species that are among those receiving protection under the Coachella Valley's conservation strategy, the Coachella Valley fringe-toed lizard, Uma inornata, and the Peninsular bighorn sheep, Ovis canadensis. Simulated shifts in climate resulted in

predictable shifts in the extent of suitable habitat for both species. Suitable habitat for the bighorn sheep expanded up slope and westward, whereas habitat for the lizard shifted westward where temperatures are cooler and precipitation is as much as three times higher than in the eastern portions of their distribution. Unlike the sheep, fringe-toed lizards are tied to sand dune habitats; they cannot simply move to higher elevations to find a preferred climate envelope. However the conservation plan for the Coachella Valley explicitly encompasses the west-east temperature-rainfall gradient, as well as ecosystem processes that maintain the dune fields to provide greater certainty that the dune species would persist in the face of the levels of climate change that are expected here. Our modeling results support that outcome. One caveat to this prediction of survival will be the unpredictable severity and length of future droughts.

Monday, July 16 8:40 Shifting Distributions Of Desert Species In Response To Climate Change: Challenges For Both Determining Development Impacts And Preserve Design

Barrows, Cameron*

Concerns about current climate change are its cause, rapid rate of warming, unknown ultimate severity, and anthropogenic barriers and landscape fragmentation could impede species' redistributions. This uncertainty challenges efforts to identify and mitigate ecological impacts from landscape-scale land use changes, from undisturbed habitat to energy production, in the California deserts. Modeling distributions of species in response to climate change provides insights into the likely magnitude and direction of species' realignments. I used niche modeling to first describe species' current distribution, and then identify spatially explicit projections as to where and to what degree species distributions may shift as the desert climate becomes incrementally warmer. Scale is a critical attribute of these analyses; too fine a scale and the modeled are will not likely encompass the extent of the species niche capabilities; too coarse of a scale and local adaptations to local conditions could be lost. Within a region that spans the Mojave-Sonoran Desert interface, and with an up to 3°C increase in summer maximum temperatures, desert tortoises, Gopherus agassizii, suitable habitat area was reduced by 66%, with just 18% was within its current distribution. Data such as these will lead to informed decisions regarding landscape scale desert energy impacts as well as potential refugia where conservation efforts would have the greatest success.

Monday, July 16 Impact Of Shrub Encroachment On Herbaceous Community Diversity And Composition In Post-Agricultural Páramo

Bart, David* , **Matson, Emily**

Release from grazing pressure can lead to shrub encroachment in páramo grasslands. While shrub encroachment can decrease herbaceous-plant diversity in other systems, the impacts on recovering páramo are not known. We examined the impact of shrub encroachment on herbaceous-community diversity and composition in recovering páramo near Zuleta, Ecuador. We estimated cover of all species found in 40 25-m2 plots. We also measured total shrub cover, slope, elevation, aspect, topographic position, soil organic matter, soil moisture, bulk density, and pH. Linear regression of shrub cover against richness and Shannon index revealed no relationships. Non-Metric Multidimensional Scaling (NMS) revealed three axes in herbaceous species-space. Shrub cover, and to a lesser extent, elevation and soil moisture were negatively correlated with the most important axis. This axis was positively correlated with the following species: Dorobaea pimpinellifolia, Bidens andicola, Paspalum bonplandianum, Achyrocline alata, and Galium hypocarpium, and negatively correlated with Lachemilla andina, Cortaderia nitida, Geranium reptans, Jamesonia goudotii, and Stellaria serpyllifolia . These results suggest that while shrub

encroachment in recovering páramo has little effect on herbaceous-species richness or diversity, community composition shifts from disturbance-indicating erect herbs and short-statured graminoids to trailing prostrate herbs.

Monday, July 16 8:30 Using Patch Selection Models To Evaluate Effects Of Human-Wildlife Conflict Management On Wildlife Foraging Decisions

Baruch-Mordo, Sharon* , **Webb, Colleen** , **Breck, Stewart** , **Wilson, Kenneth**

Human-dominated landscapes offer spatially concentrated and reliable food resources that attract wildlife and lead to human-wildlife conflicts. Conflict management is often directed at humans (e.g., education) to reduce attractants or foraging benefits to wildlife, or at wildlife (e.g., hazing) to increase foraging costs, but strategies can be expensive and ineffective. A key driver of conflict is pursuit of food by wildlife, thus we used patch selection models (a dynamic, state-dependent modeling approach based on foraging theory) to assess how benefit reduction and cost increase affect wildlife foraging decisions. We applied the patch selection models to a system in which American black bears (Ursus americanus) forage in human-dominated patches and conflicts are common. We used survival as a fitness currency and body fat reserves as a state variable. We incrementally reduced availability of anthropogenic foods and increased energetic costs of movement in response to aversive management to search for thresholds resulting in avoidance of human-dominated patches. Benefit reduction ? 70% resulted in bears of almost all states avoiding human-dominated patches. Cost increases achieving similar results exceeded 1300% and are likely unrealistic to implement. Given modeling results and that control strategies targeting wildlife are unpopular with constituencies, we suggest allocating management resources to strategies that reduce availability of anthropogenic food.

Monday, July 16 Can genetic data confirm or refute historical records? The island invasion of the small Indian mongoose (Herpestes auropunctatus)

Barun, Arijana* , *USFW, Austin Ecological Services* , **Niemiller, Matthew L.** , *Yale University* , **Fitzpatrick, Benjamin** , *University of Tennessee* , **Fordyce, James**, *University of Tennessee* , **Simberloff, Daniel**, *University of Tennessee*

Many studies aimed at reconstructing the invasion history of a species rely, in part, on inferences based on patterns of genetic variation. These inferences warrant careful interpretation, however. Particularly, given the time scale of most invasions, the typical demography of invasive species in their invaded range, and the available molecular tools, the underlying assumptions of population genetic models are likely to be severely violated. Given this fact, we examined the potential of population genetic data for reconstructing the history of serial introductions of the small Indian mongoose, Herpestes auropunctatus. We used simulations to test the power of existing microsatellite data for testing the credibility of historical introduction records. Although our results are generally consistent with most historical records for H. auropunctatus, the existing data have low power to reject alternative historical hypotheses. Simulations of a wide range of founder population sizes show broadly overlapping results, making rather different historical scenarios of introductions difficult to rule out with typical datasets. We advocate caution when applying molecular population genetics for inferring the history of invasive species, and suggest extensive simulations as a tool for evaluating, in advance, the value of the approach for addressing important research questions.

Tuesday, July 17 12:00 Following The Food: Incorporating Spatial And Temporal Resource Availability In Species Distribution Models

Bean, William[*], *UC Berkeley* , **Stafford, Robert**, *California Department Of Fish & Game* , **Butterfield, Scott**, *The Nature Conservancy California Field Office* , **Brashares, Justin**, *UC Berkeley*

Static populations are a basic assumption of distribution models, but populations are often not at equilibrium at scales relevant to conservation biologists and managers. Incorporating relevant ecological data at meaningful ecological scales has been of primary interest to species distribution modellers for many years. In this study, we used distribution data collected over the course of a decade for the endangered giant kangaroo rat (Dipodomys ingens) in Carrizo Plain National Monument, California, to create a distribution model that incorporated both spatial and temporal variability of resource availability. Specifically, we estimated aboveground primary productivity from the normalized difference vegetation index (NDVI) using the Moderate Resolution Imaging Spectroradiometer (MODIS) platform. We then used generalized linear models to predict giant kangaroo rat occupancy based on primary productivity and a suite of spatially explicit environmental co-variates. Models that incorporated primary productivity performed best at predicting giant kangaroo rat distribution both within and among years. We therefore recommend the incorporation of remotely sensed covariates as an important tool in creating more meaningful species distribution models.

Monday, July 16 9:30 Missing Climate Change Effects In Analysis Under The National Environmental Policy Act

Bear, Dinah[*]

Implementation of the procedural requirements of the National Environmental Policy Act (NEPA) and realization of the policy goals and purposes underlying the Act are becoming increasingly untenable without recognition of climate effects on the affected environment. Far too much analyses of impacts of proposed actions and alternatives assume a stable baseline. Federal agencies are ignoring or giving short shrift to the changing affected environment. The Council on Environmental Quality's draft guidance on "Consideration of the Effects of Climate Change and Greenhouse Gas Emissions" under NEPA did include some discussion regarding assessment of the need to determine the effects of climate change on a proposed action, but it has not been finalized (CEQ, 2010). Meanwhile, the federal courts, while providing strong direction regarding the effects of proposed actions on climate change, have, to date, declined to hold agencies accountable for an assessment of the changing climate on the affected environment in light of proposed actions. CEQ, in its role as overseer of NEPA, and the scientific community need to provide leadership on this issue.

Wednesday, July 18 9:30 Conservation Work With Communities: Addressing Resource Extraction In Central Appalachia And The Solomon Islands

Beaty, Braven[*], *The Nature Conservancy* , **Kreps, Brad**, *The Nature Conservancy*

Conservation of ecological resources is paramount to the continued well-being of mankind. Natural systems provide the necessities of life for all humans, whether they live in subsistence communities or fully developed economies. The Nature Conservancy (TNC) has been working to minimize environmental impacts and restore natural systems in landscapes utilized for resource extraction for over 20 years. A powerful tool for achieving sustainable and acceptable outcomes is conservation planning that begins with full stakeholder representation. By allowing community members; residential, business and government; to participate in the process of setting priorities and developing solutions, environmental concerns can be incorporated into actions

collectively agreeable and defensible within the social setting. However, these efforts are not always successful. TNC has worked with communities in Central Appalachia and the Solomon Islands, and the government of Colombia, to address the resource extraction environmental impacts. Our experience suggests that successful outcomes depend on a committed 'champion' of the planning and implementation efforts. The Solomon Islands work highlights the importance of local community representative involvement in areas that are data poor to provide necessary information on valued resources and locations of sensitive ecological systems. Selection of mitigation priorities also is critically dependent on stakeholder involvement and provides the underpinnings for several planning tools used by TNC. I will compare working with communities in a developed and westernized setting with one that is much more closely connected to the local environment in a more subsistence oriented culture.

Wednesday, July 18 11:30 New Modeling Tools For Forecasting Cetacean Abundance And Distribution

Becker, Elizabeth[*], *NOAA, Southwest Fisheries Science Center* , **Foley, David**, *NOAA-NMFS-SWFSC-ERD* , **Forney, Karin**, *NOAA, Southwest Fisheries Science Center* , **Barlow, Jay** , **Redfern, Jessica**, *NOAA-Southwest Fisheries Science Center* , **Gentemann, Chelle**, *Remote Sensing Systems*

Species-environment models are increasingly recognized as valuable tools for assessing pelagic species distributions and developing mitigation measures; however, model predictions are generally based on past observations rather than current or projected ocean conditions. We present and evaluate methods for near real-time and forecast models of cetacean distribution based on remotely sensed and modeled oceanographic data. Recent advancements in processing satellite-derived data now allow short-term forecasts based on single-day snapshots of oceanic conditions. Ocean circulation models allow medium-range forecast predictions of oceanic variables, including sea surface temperature (SST), chlorophyll, and mixed layer depth. We developed habitat models for three cetacean species using survey data collected in the California Current Ecosystem from 1991 to 2005. We then incorporated remotely sensed and modeled SST forecasts as input variables to predict species' relative abundance in 2008. Forecast ability was assessed by the models' ranked predictions across eight biogeographic strata, as well as visual inspection of predicted and observed distributions. For all three species, the near real-time and forecast models provided enhanced ability to predict distribution patterns compared to predictions based on five-year averages. Cetacean-habitat models that allow forecasting of cetacean abundance can greatly enhance short-term decision-making and advanced conservation planning.

Monday, July 16 Inbreeding Avoidance Influences The Viability Of Small Populations Of African Wild Dogs

Becker, Penny[*], *Smithsonian Conservation Biology Institute, Smithsonian Institution; Wa Department Of Fish And Wildlife* , **Miller, Philip**, *Conservation Breeding Specialist Group (Species Survival Commission/International Union For Conservation Of Nature)* , **Szykman Gunther, Micaela**, *Humboldt State University* , **Somers, Michael**, *University Of Pretoria* , **Wildt, David**, *Smithsonian Conservation Biology Institute, Smithsonian Institution* , **Maldonado, Jesus**, *Smithsonian Conservation Biology Institute*

The conservation of many fragmented and small populations of endangered African wild dogs (Lycaon pictus) relies on understanding the natural processes affecting genetic diversity, demographics, and future viability. We used extensive behavioural, life-history, and genetic data from reintroduced African wild dogs in South Africa to (1) test for inbreeding avoidance via mate selection and (2) model the potential consequences of avoidance on population

persistence. Results suggested that wild dogs avoided mating with kin. Inbreeding was rare in natal packs, after reproductive vacancies, and between sibling cohorts (observed on 0.8%, 12.5%, and 3.8% of occasions, respectively). Only one of the six (16.7%) breeding pairs confirmed as third-order (or closer) kin consisted of animals that were familiar with each other, while no other paired individuals had any prior association. Computer-simulated populations allowed to experience inbreeding had only a 1.6% probability of extinction within 100 years, whereas all populations avoiding incestuous matings became extinct due to the absence of unrelated mates. Populations that avoided mating with first-order relatives became extinct after 63 years compared with persistence of 37 and 19 years for those also prevented from second-order and third-order matings, respectively. Although stronger inbreeding avoidance maintains significantly more genetic variation, our results demonstrate the potentially severe demographic impacts of reduced numbers of suitable mates on the future viability of small, isolated wild dog populations. The rapid rate of population decline suggests that extinction may occur before inbreeding depression is observed.

Monday, July 16 3:00 Temporally Shifting Determinants Of Distribution And Abundance Of American Pikas, And Behavioral Plasticity "Softening" Ecological-Niche Boundaries

Beever, Erik[*], *U.S. Geological Survey* , **Dobrowski, Solomon**, *Department Of Forest Management* , **Hall, Embere**, *Program In Ecology, Wyoming Cooperative Fish And Wildlife Research Unit* , **Loosen, Annie**, *Conservation Science Center, Teton Science Schools*

Montane ecosystems have been suggested by both paleontological and contemporary research to often be systems of relatively rapid faunal change, compared to many valley-bottom counterparts. In addition to often experiencing greater magnitudes of contemporary change in climatic parameters than species in other ecosystems, mountain-dwelling wildlife must also accommodate often-greater intra-annual swings in temperature and wind speeds, poorly developed soils, and generally harsher conditions. In the hydrographic Great Basin, pace of American-pika losses (defined as upslope retraction of minimum elevation of occupancy, and rate of site-wide extirpations) as well as determinants of extirpation differed dramatically from the latter 20th century to the period during 1999-2008. We present new results of ecoregional-level analyses of pikas (Ochotona princeps Richardson) that illustrate how biologically relevant derived hydrological variables can be important predictors of abundance. We also present new results from the Great Basin and Northern Rocky Mountains that illustrate how behavioral plasticity can, in at least some cases, 'soften' the boundaries of species' bioclimatic niches. Emerging efforts may contribute greatly to broad-scale, mechanism-based investigations to inform management and conservation of diverse montane wildlife and the ecosystem components with which they interact.

Monday, July 16 9:00 Using Enduring Features To Design Landscape Linkages For A Changing Climate

Beier, Paul[*], *Northern Arizona School Of Forestry* , **Brost, Brian** , **Jenness, Jeff**

Improving connectivity among protected areas is frequently proposed as a climate-smart conservation strategy. To design corridors for a changing climate, some scientists chain together highly uncertain models (namely models of emissions, air-ocean circulation, and biotic response) to produce corridors that are mapped too coarsely to support conservation decisions. Instead, we advocate designing for diversity and interspersion of "land facets" – landscape units with uniform topographic and soil attributes. This coarse-filter approach would conserve the arenas of biological activity, rather than the temporary occupants of those arenas. Our approach produces linkages with 6-12 partially overlapping corridors.

In each linkage one corridor optimizes connectivity for high interspersion of land facets; this corridor is intended to accommodate rapid, short-distance range shifts, interactions between species, and ecological processes. Each of the 5-11 other corridors optimizes connectivity for one facet type, and is intended to facilitate movement of species associated with that facet, today and in the future. We illustrate this new approach for 3 topographically diverse regions in Arizona. In these landscapes, our land facet linkage design provided connectivity for focal species similar to that provided by a focal species design. The land-facet approach is not biased toward data-rich areas, and can be applied where no maps of land cover exist.

Monday, July 16 4:15 Historical Ecology To Inform Conservation Planning On Southern California Coastal Streams: A Case Study From The Santa Clara River

Beller, Erin*, *San Francisco Estuary Institute* , **Grossinger, Robin**, *San Francisco Estuary Institute* , **Parker, Sophie**, *The Nature Conservancy* , **Verdone, Lily**, *The Nature Conservancy* , **Salomon, Micha** , **Brand, Peter**

The lower Santa Clara River has been subject to intensive modification for over 200 years, including dramatic reductions in riparian habitat. Current conservation efforts along the river require a spatially and temporally extensive understanding of the patterns and processes expressed by the system under more natural conditions as a foundation for place-based restoration and management decisions. However, regular hydrogeomorphic and ecological monitoring postdates major regional changes, providing only limited data. To address this data gap, we integrated hundreds of historical cartographic, textual, and visual accounts to create a comprehensive dataset describing hydrologic, geomorphic, and riparian characteristics prior to the substantial modifications of the 1800s. Our research reveals the historical diversity and heterogeneity of riparian communities on the river, including the presence of discontinuous nodes of forested wetlands linked to local variations in water availability. These findings are providing a framework for the development of regional conservation strategies along the river, as well as guidance on specific ecological palettes that may be appropriate at a local level. They also enrich our understanding of the relationship between ecology and physical processes on the river, past and present. This understanding is helping develop site-appropriate restoration targets, creating effective restoration projects that yield resilient ecosystems.

Wednesday, July 18 11:15 Large-Scale Movements And High-Use Areas Of Western Pacific Leatherback Turtles, Dermochelys coriacea

Benson, Scott*, *NOAA-NMFS-SWFSC* , **Eguchi, Tomoharu**, *NOAA-NMFS-SWFSC* , **Foley, David**, *NOAA-NMFS-SWFSC-ERD* , **Forney, Karin**, *NOAA, Southwest Fisheries Science Center* , **Bailey, Helen**, *University Of Maryland* , **Dutton, Peter**

The western Pacific leatherback turtle (Dermochelys coriacea), one of three genetically distinct stocks in the Indo-Pacific region, has declined markedly during past decades. This metapopulation nests year-round at beaches of several western Pacific island nations and has been documented through genetic analysis and telemetry studies to occur in multiple regions of the Pacific Ocean. To provide a large-scale perspective of their movements, high-use areas, and habitat associations, we report and synthesize results of 126 satellite telemetry deployments conducted on leatherbacks at western Pacific nesting beaches and at one eastern Pacific foraging ground during 2000–2007. A Bayesian switching state-space model was applied to raw Argos-acquired surface locations to estimate daily positions and behavioral mode (either transiting or area-restricted search) for each turtle. Leatherbacks that nested during boreal summer moved into Large Marine Ecosystems (LMEs) of the temperate North Pacific Ocean or into tropical waters of the South China Sea. Turtles that nested

during boreal winter moved into temperate and tropical LMEs of the southern hemisphere. Area-restricted search occurred in temperate and tropical waters at diverse pelagic and coastal regions exhibiting a wide range of oceanographic features, including mesoscale eddies, coastal retention areas, current boundaries, or stationary fronts, all of which are known mechanisms for aggregating leatherback prey.

Monday, July 16 11:00 What Is The Contribution Of Climate Change In The Arctic To Muskoxen Persistence?

Berger, Joel[*], *University Of Montana* , **Johnson, Marci**, *National Park Service* , **Lawler, Jim**, *National Park Service* , **Shults, Brad**, *National Park Service*

The Arctic is warming at more than twice the rate as elsewhere. Populations at the edge of their range often confront conditions that differ from those in the center – to the extent that their persistence might be more challenged if bioclimatic factors rule. An indisputable polar-adapted species are muskoxen whose modern terminus is western Arctic Alaska. Our comparative 4-year field studies of 2 populations (around Cape Krusenstern and Bering Land Bridge) whose demographic trajectories differ build upon 4 decades of monitoring by state and federal agencies. To test hypotheses about sources of population variation we are contrasting vital rates and life-histories using inferences about nutrition (as inferred through individual juvenile growth rates), physiological stress, and other metrics. Methods have been non-invasive (remote sensing, photo-imaging, population censuses, and ground observation) and invasive (158 captures and telemetry). Preliminary analyses suggest few strong inter-population differences in body mass, pregnancy, individual body growth or adult female survival; this lack of variation implies nutrition is not currently limiting one population more than the other. Annual variation in juvenile body sizes at both sites however suggests a regional weather signal, but the extent to which current warming is impacting muskoxen is less clear. Stochastic events and species interactions may play increasingly relevant roles in these populations' persistence.

Wednesday, July 18 3:15 Science Interrupted: Constructions Of Scientific Narratives In Community-Based Conservation

Bernacchi, Leigh[*], *Texas A&M University* , **Ragland, Chara**, *Texas A&M University* , **Peterson, Tarla Rai**, *Texas A&M University*

Scientists occupy a position of power in the public understanding of ecosystems and conservation, and members of the lay public use the results of scientific research to enhance the legitimacy of their own goals. This process may contribute to conflict among local community members and constrains the application of scientific research to conservation policy. To develop and implement public participation processes that contribute to more effective conservation policy, conservation biologists must become more aware of how the lay public interprets and uses their science. To contribute to this knowledge base, we studied community involvement in conservation efforts surrounding the federally endangered Whooping Crane (Grus americana) in coastal Texas. Our research is based on interviews, surveys, scientific publications, reports and public meetings with respect to managing the multi-use land around Aransas National Wildlife Refuge. After a formal categorical analysis of qualitative social science data, we developed a theoretical basis for understanding the phenomenon of "keystone scientist," and how their research was appropriated by members of the local community. Then we described each of the scientific constructions of the ecosystem, their related public interpretations and the political responses and policy outcomes. We use the analysis to identify principles to guide scientists in constructing scientific narratives that are more politically responsive.

Monday, July 16 Birds, Bees And Exotic Plants: Implications For Urban Restoration

Berthelsen, Martha*, *San Francisco State University* , **Lebuhn, Gretchen**, *San Francisco State University*

Ecological restoration in urban areas offers both unique challenges and benefits not found in more natural areas, yet little systematic investigation has been conducted to characterize successful reestablishment of habitat and ecosystem function of these sites. In particular, restoration of riparian areas in urban settings has the potential to create habitat for wildlife and establish corridors to connect larger parcels of habitat, and serve as natural parks to reconnect human residents with their local ecosystems. Both bird and bee populations have been used as measures of restoration success, and bee communities also serve as a proxy for pollination function. This study quantifies the richness and abundance of bees and birds at 20 restored and unrestored urban riparian sites. We hypothesize that restored sites with more complex vegetation structure, higher proportions of native vs. non-native plant species, and proximity to other natural areas will harbor greater diversity and abundance of bees and birds. Preliminary analysis using one-way ANOVA shows no significant difference in bird species richness or abundance between 3 types of sites -- unrestored, restored but not maintained, and restored with periodic maintenance. Multiple regression may tease out some of the site characteristics that best explain these data. These relationships will inform future restoration work, by providing specific targets for revegetation in terms of plant species composition and maintenance.

Tuesday, July 17 4:30 Tigers, Carbon And Water: Mapping Ecosystem Services To Guide Land Use Planning In Sumatra, Indonesia

Bhagabati, Nirmal*, *World Wildlife Fund*

We assessed implications for ecosystem services and wildlife habitat under two alternative scenarios of development in central Sumatra: a “green” Vision based on environmentally sustainable land use, and a business-as-usual future based on land use plans proposed by the Indonesian government. We used InVEST, a spatial modeling tool, to map carbon stock, hydrological services and tiger habitat in central Sumatra in 2008, and to model expected changes in their distribution and levels under the two scenarios. We overlaid habitat and ecosystem service layers to target areas where programs and policy mechanisms (such as payments for watershed services and forest carbon projects) could protect critical habitat for wildlife, maintain environmental benefits, and potentially bring in revenue. In aggregate, the Vision would yield higher levels of habitat and services relative to the government plan, with as much as a five-fold improvement in some services in the Vision. However, there is considerable variation in the distribution of services and their expected change across the landscape. For instance, there is overlap between high quality tiger habitat and high soil carbon stocks in the eastern peatlands, while along the mountainous west, forested slopes contain tiger habitat and substantially reduce erosion into waterways. Opportunities exist to implement a menu of policy mechanisms across the landscape such that improvements to both wildlife conservation and human welfare could be realized. Additional work is needed to assess feasibility and socioeconomic appropriateness before programs are implemented. These analyses are being provided to government officials to inform land use planning.

Monday, July 16 Environmental And Anthropogenic Influences On Large Herbivores In The Serengeti: A Comparison Of Four Community Measures

Bhotika, Smriti*

Influences of habitat characteristics on aggregate community measures (species richness, total abundance, total biomass, and cumulative basal metabolic rate) for large herbivores are compared in this study of Serengeti National Park and

neighboring protected areas. Aerial censuses estimate densities of twelve species across the landscape for nine surveys. Influences of seventeen habitat characteristics on each community measure were assessed using spatial regression models. Total abundance, total biomass, and total basal metabolic rate were strongly cross-correlated in each survey. There were similarities, as well as differences, in the spatial pattern of species richness compared to the other metrics; species richness, however, was often greater at lower values of the other measures. The community appears vulnerable to effects of humans in surrounding areas: the measures tend to be depressed near edges of the park adjacent to human activity. Roads within the protected areas do not negatively affect the species. Resources most strongly influencing community distributions are plant nutrients and NDVI. Fire does not markedly affect community distributions at a landscape level. Efforts to manage for species richness would involve emphasizing habitat characteristics different from those that would maximize total abundance, biomass, or metabolic rate. Management practices might strive to identify mechanisms responsible for negative effects emanating from nearby human populations.

Monday, July 16 11:30 Doing Solar Right: Moving Renewables Away From Public Lands And Into The Built Environment

Blaeloch, Janine[*], *Western Lands Project*

The eternal dichotomy of our public lands is the choice between use and conservation. Despite ostensible progress in our knowledge and attitudes, these lands continue to be seen by those in power as an endless and expendable resource and/or a dumping ground for large-scale uses. Today this tradition plays out in a massive push for utility-scale renewable energy development on public desert lands managed by the Bureau of Land Management. In opening the door wide to industrial renewables, the agency is not managing for multiple uses, but for single-use, utterly transformative, and permanent industrialization. Fortunately, sound alternatives exist to shift us away from this damaging policy. The EPA has identified 15 million acres of degraded, even contaminated land throughout the country that could be suitable for solar energy development. Moreover, distributed generation on rooftops, parking lots, highway medians, and everywhere in the built environment could better serve our needs as energy consumers and ratepayers, create jobs, and drastically lessen the environmental impact of our energy habit. It is possible to effect a dramatic shift in policy that spares desert ecosystems and creates an efficient, minimally damaging renewables infrastructure.

Monday, July 16 Smelling Danger: Behavioral And Phenotypic Responses Of Tadpoles To Chemical Cues From Parasites And Predators

Boland, Clara[*] , **Preston, Daniel**, *University Of Colorado* , **Hoverman, Jason**, *University Of Colorado* , **Johnson, Pieter**, *University Of Colorado*

Animals in nature are exposed to a wide variety of natural enemies, including predators and parasites. However, variability in how animals respond to the threat of different enemies remains poorly known and could have important consequences for ecological communities. We examined how Pacific chorus frog tadpoles (Pseudacris regilla) respond to chemical cues of two natural enemies that can cause sublethal injuries or mortality: trematode parasites (Ribeiroia ondatrae) and dragonfly larvae (Anax junius). Our experiment allowed us to examine behavioral and morphological responses of chorus frogs to chemical cues from: 1.) parasites alone, 2.) parasites actively infecting host tadpoles, 3.) predators feeding on tadpoles, and 4.) control treatments lacking chemical cues of enemies. Consistent with previous research, tadpoles responded to predator cues by reducing activity levels, although this effect was reduced later in development. Contrary to our expectations, tadpoles did not show altered levels of activity when exposed to trematode parasite cues alone or

to cues of parasites infecting host tadpoles. We also did not detect morphological responses of tadpoles to enemy cues. Future work will aim to examine responses of amphibians to predators and parasites within a more complex natural environment. Our results demonstrate how the threat of parasitism and predation can evoke different responses despite having similarly strong consequences for individuals.

Tuesday, July 17 4:15 Conservation Of Sagebrush Steppe And The Variable Nature Of Parasitism With Elevation Of The Sagebrush Defoliator

Bolshakova, Virginia* , **Evans, Edward**, *Utah State University*

Sagebrush-steppe ecosystems have been increasingly adversely affected following European introduction of agriculture including grazing. Reduced understory floral diversity from grazing may exacerbate the effects of naturally occurring episodic outbreaks of the sagebrush defoliator (Aroga websteri; Lepidoptera). Outbreaks may be naturally curtailed by parasitism of the moth, and the parasitoids as adults may depend on floral resources. We examined patterns of abundance of the defoliator, its parasitoids, and flowering understory plants along an elevational gradient throughout a 14,000 acre wildlife management area dominated by sagebrush-steppe. Native parasitoid species differed strongly in abundance across elevation, with greatest overall parasitism co-occurring with greatest parasitoid species richness. Associated floral richness also increased strongly with elevation and was correlated with rates of parasitism by two major parasitoid species. Field experiments indicated that species of pupal parasitoids respond differently to cues associated with their insect host and with floral resources. While the presence of all parasitoids together led to greatest parasitism, conflict and competition between heterospecifics may be reduced substantially by differential use of resources along the elevation gradient. Solid understanding of the interplay between defoliator, parasitoids, and floral resources may assist managers in providing high quality habitat to buffer the effects of defoliator irruptions.

Wednesday, July 18 11:15 A Century Of Bird And Butterfly Extinctions In A Large Urban Park

Bonebrake, Timothy* , *University Of California, Riverside* , **Cooper, Daniel**, *Cooper Ecological Monitoring, Inc.*

Few long-term examples exist of wildlife population trends in urban environments despite recent recognition of the importance of biodiversity in city centers. Founded in 1896, Griffith Park's over 1700 hectares represents the largest municipal park in California and places it in the top ten largest in the United States. Fortunately, we have excellent biological records from the early part of the 20th century in Griffith Park due to high interest from local naturalists. In the decades that followed, Los Angeles developed into a megacity surrounding the park, which today is surrounded by three freeways and miles of urbanization. We combined thorough examination of Griffith Park historical records with field surveys from 2008-2011 to determine the extent of urbanization impacts on the resident bird and butterfly communities. Out of a historical community of at least 55 butterfly species, conservatively, 10 appear to have become locally extinct (18%). Of the 11 historically known resident shrubland-dependent bird species in Griffith Park, 3 have been lost (27%). Despite these biodiversity losses, conservation opportunities abound; though 'critically imperiled' throughout its range, the butterfly Lycaena arota nubila was discovered in the park in 2010. Griffith Park is not unique and many parks around the world are becoming more and more urbanized. This study demonstrates that the conservation value of some urban parks is potentially high, unrecognized and underappreciated.

Monday, July 16 Investigation Of Fungal Root Colonizers Of Native Plants Growing In Dense Patches Of The Invasive Vincetoxicum rossicum As Well As Non-Invaded Sites

Bongard, Cindy* , **Fulthorpe, Roberta**

Fungal communities forming associations with plant roots have generally been described as ranging from symbiotic to parasitic. Disruptions to these associations consequently can have significant impacts on native plant communities. We examined how invasion by Vincetoxicum rossicum, a plant native to Europe, can alter both the arbuscular mycorrhizal fungi, as well as the general fungal communities associating with native plant roots in both field and forest sites in Southern Ontario. In two different sites in the Greater Toronto Area, we took advantage of invasion by V. rossicum and neighbouring uninvaded sites to investigate the fungal communities associating with local plant roots, including goldenrod goldenrod Solidago spp., wild red raspberry Rubus idaeus, Canada anemone Anemone canadensis, meadow rue Thalictrum dioicum, and wild ginger Asarum canadense. Fungi colonizing roots were characterized with terminal restriction length polymorphism analysis (T-RFLP) analysis of amplified total fungal and AMF ribosomal fragments. We saw a significant effect of the presence of this invader on the diversity of general fungal phylotypes colonizing native plant roots. In native plants at sites invaded by V. rossicum, richness of endophytic fungi increased, suggesting an increase in pathogenic or commensal fungi. The introduced vine also caused the composition of the general and AM fungal community in native roots to shift in both sites. These results suggest that invaders such as V. rossicum may be able to influence the composition of soil fungi available to natives, possibly via mechanisms such as increased carbon provision or antibiosis attributable to unique root exudates. Alteration of the soil fungal community by plant invasion can enable and promote successful invasion and subsequently disrupt complex native ecosystems.

Monday, July 16 11:30 Acoustic Monitoring Of Rare And Elusive Seabirds As Scalable Tool For Measuring Conservation Outcomes

Borker, Abraham*, *University Of California - Santa Cruz* , **McKown, Matthew**, *University Of California - Santa Cruz* , **Tershy, Bernie**, *UCSC* , **Croll, Donald**, *UC Santa Cruz*

Seabirds are the most threatened marine group with 28% of extant seabird species at risk of extinction and 49 species critically endangered or endangered. Because most seabirds breed in fragile, inaccessible and isolated locations, often returning to concealed nest sites only at night, managers and researchers face considerable financial and logistical challenges when measuring seabird populations and the success of conservation actions. Acoustic monitoring is a developing, cost-effective tool to document the presence, distribution and relative abundance of rare/elusive seabirds in these remote and sensitive locations. We investigated the relationship of seabird acoustic activity to their relative abundance, the efficacy of acoustic monitoring to measure the presence of rare species, and compared acoustic monitoring with traditional methods, using traditional and acoustic monitoring datasets from over 25 seabird islands and 10 species. To make such an approach scalable, we developed low-cost acoustic sensors based on a smartphone platform that can telemeter data and operate autonomously for field deployments. We tested these sensors at a globally important seabird colony (SE Farallon Isl., CA) and detected all three focal species over 3mths with 99% uptime. We find automated acoustic sampling and detection is a powerful cost effective tool to improve the power and scope of seabird monitoring activities, particularly for the world's threatened and elusive seabirds.

Monday, July 16 3:45 Climate Change Monitoring For Better Management In The South Bay Salt Pond Restoration Project

Bourgeois, John*, *California Coastal Conservancy* , **Valoppi, Laura**, *U.S. Geological Survey*

The South Bay Salt Pond Restoration Project (www.southbayrestoration.org) is the largest tidal wetland restoration project on the West Coast. When complete, the project will restore 15,100 acres of former industrial salt ponds to a rich mosaic of tidal wetlands and other habitats. San Francisco Bay has lost an estimated 85 percent of its historic wetlands due to fill or other alterations. This dramatic decline in tidal marsh habitats has caused populations of marsh-dependent fish and wildlife to dwindle. It has also decreased water quality and increased local flood risks. Restoration of the South Bay salt ponds provides an opportunity to begin to reverse these trends, by improving the health of San Francisco Bay for years to come. However, the urbanized setting of San Francisco Bay provides unique challenges and opportunities for estuarine restoration. We have identified long-term alternatives for the Project, each representing a continuum toward different end-states: one end at 50% of the existing ponds converted to managed ponds for waterbirds and 50% restored to salt marsh habitat, and the other end of the continuum at 10% of the former salt ponds converted to managed ponds and 90% restored to marsh habitat. The final mixture of managed ponds to salt marsh habitat will depend upon the outcome of the Adaptive Management Plan, which is being implemented over the next 50 years and will allow for lessons learned from earlier phases to be incorporated into subsequent stages as management plans and designs of future actions are updated. Phase 1 of the project began in 2008 with the goal of working towards the 50:50 scenario. For example, 53 water systems were installed throughout several ponds with the aim of slowly adding water back into the salt pond system and lowering the salinity before reintroducing the water into the bay. In addition, a large monitoring effort has begun to look at what bird species are regularly using the salt ponds in order to determine habitat use and needs. Finally, Phase 1 actions have been very targeted to provide immediate ecosystem services as well as to address key uncertainties (e.g., mercury contamination) surrounding the SBSP project, and are intended to help inform future phases. Phase 1 projects are expected to be completed by 2013, and planning for Phase 2 began in 2011. Challenges that have arisen during the project include: 1. Because the salt ponds have existed in San Francisco Bay for some time (i.e., 100-150 years), new suites of species have adapted to the high salinity and utilize the salt pond habitat. In addition, in some high salinity ponds they have observed a disproportionate number of certain avian species. Thus, restoration strategies were required to incorporate both habitats (i.e., salt ponds and tidal wetlands) rather than simply restoring all habitats to tidal wetlands. 2. During the gold rush, South San Francisco Bay had one of the largest mercury mines, which led to dormant and isolated mercury contamination in the salt ponds. Restoration efforts such as restoring tidal action or permanent flooding could cause the mercury to be mobilized. 3. Restoration of tidal wetlands will lead to new habitats that invasive species (e.g., non-native [and hybrid] Spartina) may colonize. In addition to several of the challenges currently faced by the SBSP Restoration Project, sea level rise is predicted to impact sediment supply and accretion. Thus a main goal of restoration efforts is to act with a sense of urgency (i.e., building marshes back up as soon as possible), thereby increasing ecosystem resilience and keeping up with likely sea level rise. All of these challenges are being addressed through directed studies by teams of researchers as part of the adaptive management strategy.

Tuesday, July 17 10:10 The Challenge Of Seabird Restoration In A Warming World

Bradley, Russell*, *PRBO Conservation Science* , **Warzybok, Pete**, *PRBO Conservation Science* , **McChesney, Gerard**, *USFWS* , **Jahncke, Jaime**

While artificial nesting habitat can be crucial to

effective seabird restoration, increased temperatures from climate change can cause serious negative impacts. Cassin's Auklet (Ptychoramphus aleuticus) is a small cavity nesting seabird whose population on Southeast Farallon Island, California, has declined dramatically since the early 1970s. Auklets show high site fidelity to nesting boxes that allow monitoring of individuals without disturbing natural habitat. We assessed increases in island air temperature over the last 4 decades and explored the utility of mitigation measures to reduce temperatures in auklet nesting boxes, compared to uncovered boxes and natural burrow sites. Since 2009 we have used temperature loggers to assess differences between the following 3 treatment groups: natural burrows (occupied), treated boxes covered with a wooden shade (occupied), and untreated boxes (unoccupied). Ground temperatures from control loggers were greater than those from standard weather box measurements. Simple wood shades effectively reduced temperatures of treated nest boxes – sometimes by well over 25% - relative to controls. Treated boxes had higher temperatures than natural burrow habitat, but were generally cooler than ambient temperature. Nest boxes provide essential artificial habitat for restoration and research, and while new long lasting designs should be pursued to manage for climate change effects, simple mitigation efforts can have significant results.

Monday, July 16 12:00 Effects Of Wetland Management On Carrying Capacity Of Duck And Shorebird Benthivores In A Coastal Estuary
Brand, L. Arriana*, *U.S. Geological Survey, Western Ecological Research Center* , **Takekawa, John** , **Buffington, Kevin** , **Shinn, Joel** , **Spring, Sarah E.**, *U.S. Geological Survey, Western Ecological Research Center* , **Miles, A. Keith**, *U. S. Geological Survey, Western Ecological Research Center*
With loss of natural wetlands, managed wetlands have increasingly supported energetic requirements for wintering shorebirds and waterfowl. Despite substantial research effort in freshwater systems, less is known about benthic invertebrate prey for shorebirds and diving ducks that depend on managed coastal estuaries, such as south San Francisco Bay managed ponds that comprise the largest wetland restoration effort on the Pacific Coast of North America. We assessed energy requirements for 8 shorebird and 4 diving duck species during the winters of 2007-2010 in 4 types of managed ponds – seasonal and circulation ponds each in two salinity classes – based on bird abundance, days in season, and allometric equations. We estimated energy available to birds on the basis of preferred prey abundance, biomass, energetic content, and accessibility, then applied a daily ration model to estimate bird use-days supported on available prey energy. An average peak of 45,000 diving ducks and 108,000 shorebirds used the study area at high tide through winter, with greatest shorebird abundances in seasonal ponds and greatest diving duck abundances in circulation ponds. Prey content and bird-use days varied by pond type, with mesohaline circulation ponds providing the greatest energy per unit area for both shorebirds and diving ducks. Overall the study area supported 79% of diving duck and 33% of shorebird use-days during winter. Our results suggest that alteration of pond management could substantially enhance energy available for waterbirds.

Monday, July 16 Effects Of Dune Restoration Treatmentss On Bee Communities Of The Coastal Sand Dunes Of Fort Ord, California
Brennan, Joan*, *San Francisco State University* , **Lebuhn, Gretchen**, *San Francisco State University* , **Thorp, Robbin**, *UC Davis Dept. Of Entomology*
This study investigates the effect of dune restoration treatments on bee communities of the coastal sand dunes in and around Fort Ord, California. The effect of dune restoration on pollinators has received little scientific attention, however wild bees are often the most important pollinators in an ecosystem making them a suitable

group with which to evaluate restoration measures. There is also strong evidence that wild bee populations are declining, and with them pollination networks. If restorations are not managed for bee population health, failure of bee-pollinated restoration plantings could occur. Pan traps were used to collect bees at 18 sites. Nine sites had received restoration treatments and nine sites were untreated. Preliminary data indicate greater bee abundance and species richness in treated sites. We hypothesize this is because these sites have increased vegetation structure, more varied floral resources, and a higher proportion of native vs. non-native plants. This data will inform future restoration decisions regarding both restoration plantings and the health of restored ecosystems.

Tuesday, July 17 11:15 Landscape Biodiversity Planning System: An Approach For Planning, Designing, And Measuring Biodiversity In The Built Environment

Brown, Isaac*, *AECOM Design And Planning*

The landscape biodiversity planning system is a design and planning tool that helps land owners, managers, and municipalities systematically plan and measure landscapes for biodiversity benefits. The system emphasizes bio-physical attributes of landscapes and can help guide habitat preservation, restoration, and enhancement in urban or rural settings including urban forests, private and public realm landscapes, and open space. This approach has been a powerful addition in AECOM's land planning projects when there is a need to demonstrate a measurable impact or improvement to site ecology. The system has been applied in urban environments including community master planning efforts in Singapore and Portland, Oregon, USA. Other applications are currently in progress. The system includes a Landscape Biodiversity Index (LBI) that measures performance of up to 10 landscape biodiversity attributes. Attributes include structural and pattern characteristics of landscapes such as priority species, habitat quality, and connectivity. Attribute importance weighting, performance indicators, and scoring criteria are defined by the planning team and calibrated for each project context. Calibration is based on empirical data on habitat requirements of target species, local ecosystem characteristics, or other built or natural landscape characteristics. Measurement is performed using a combination of Excel-based calculations, GIS, and/or by-hand measurements.

Wednesday, July 18 3:00 Practicing What We Preach: Measuring The Impact Of Capacity Building In Adaptive Management

Brown, Marcia*, *Foundations Of Success* , **Christen, Kate**, *Smithsonian Conservation Biology Institute*

Do we know whether our efforts to conserve biodiversity are working? To what extent are we trying to measure the effectiveness of our work? Are our efforts to train conservation professionals to be able to measure the effectiveness of their work paying off? The Conservation Measures Partnership (CMP) conducted a survey of conservation organizations and donors to assess whether and how much they are applying a basic "plan-do-check-adapt" cycle of adaptive management and found that while organizations value adaptive management, few conservation projects are applying it. The Smithsonian-Mason Global Conservation Studies Program, Foundations of Success (FOS), and the University of Maryland are working to build capacity in adaptive management (AM) through graduate-level courses based on the CMP Open Standards for the Practice of Conservation. We share results from evaluations of the effectiveness of two of these courses, which are part of our effort to apply AM principles specifically to capacity-building. We surveyed participants one to four years after completing these courses and found that the courses gave them practical skills that they value and are using. However, high level management of conservation organizations where former students are working is not yet providing the support needed to fully apply

AM. CMP needs to convince upper level management of the value of investing in adaptive management.

Tuesday, July 17 8:50 A Survey Of Land Managers Using Non-Native Plants In Restoration
Brusati, Elizabeth*, *California Invasive Plant Council* , **Johnson, Doug**, *California Invasive Plant Council*
Controlling invasive non-native plant species can be a major aspect of land managers' stewardship activities. However, land managers' relationship with these plants is typically more complex than simply removing them. Though their ultimate goal is to establish resilient native habitat, some land managers see a place for non-native plants in certain circumstances. This talk will present the results of interviews with experienced land managers regarding the circumstances in which non-native plants are used, how land managers decide to use them, and their assessment of the pros and cons of doing so. Land managers use non-native plants most frequently for temporary erosion control on bare soil to create conditions favorable to later establishment of native species. Severely degraded lands, such as former mine sites, may be revegetated with non-native species (although this practice can introduce a new invasive species). Land managers surveyed accept the presence of non-native plant species and use some form of risk assessment to set priorities for removal. Some land managers leave non-native plant species known to support particular wildlife species. None of the managers surveyed have planted non-native species as a long-term beneficial ecological component of the stewarded area. We will describe broader questions brought up by these discussions, such as the definition of "how local is local" and the need to reconsider methods in the face of climate change.

Monday, July 16 CalWeedMapper: A New Online Tool For Setting Regional Management Priorities For Invasive Plants
Brusati, Elizabeth*, *California Invasive Plant Council* , **Johnson, Doug**, *California Invasive Plant Council* , **Morawitz, Dana**, *California Invasive Plant Council* , **Powell, Cynthia**, *California Invasive Plant Council* , **Schuetzenmeister, Falk**, *California Invasive Plant Council* , **Morosco, Tony**, *California Invasive Plant Council* , **Harmon, Suzanne**, *California Invasive Plant Council*
Land managers need to devise strategic management plans in order to address invasive plants effectively with limited funding. The California Invasive Plant Council (Cal-IPC) interviewed experts throughout California about the abundance, spread and current management of 204 invasive plant species. These expert knowledge data are linked to existing online databases and displayed in a new online mapping tool, CalWeedMapper. This website is designed to increase the effectiveness of invasive plant management by providing landscape scale maps that serve as the basis for setting regional priorities, tracking progress and justifying funding. Land managers can see management opportunities for their region divided into surveillance, eradication or containment targets. These reports are derived from maps of current distribution combined with projected suitable range for 2010 and 2050 climate conditions. In addition to providing recommendations for regional management opportunities, CalWeedMapper allows land managers to generate maps of individual species distribution and to explore and update USGS quadrangle data, through an update interface or by submitting occurrence information. We are working with stakeholder groups and agencies to apply CalWeedMapper to their invasive plant management. Check us out at calweedmapper.calflora.org!

Monday, July 16 Defining And Mapping Vegetation For Long-Term Management In The Carrizo Plain National Monument

Buck-Diaz, Jennifer* , **Stout, Deborah** , **Evens, Julie**, *California Native Plant Society*

The Carrizo Plain National Monument (CPNM) has been designated to reserve and maintain the largest undeveloped remnant of grassland ecosystem of the San Joaquin Valley, California. The California Native Plant Society Vegetation Program, in collaboration with the Bureau of Land Management and California Department of Fish and Game, have initiated a 5-year project to inventory, classify, analyze, and map vegetation characteristics in the CPNM. From 2008-2010, more than 1,000 field surveys were compiled and classified to the alliance and association levels. In addition, more than 1,000 reconnaissance surveys were collected to inform the mapping. The resulting classification denotes over 50 vegetation alliances, of which eight are newly described and not previously published in A Manual of California Vegetation, second edition. The floristic vegetation classification gives quantifiable methods to recognize and delineate vegetation patterns, allowing for the identification of rare, uncommon, or representative stands. A fine-scale vegetation map of 247,000 acres was produced using true-color aerial imagery to provide an accurate existing baseline of plant community information. This map will serve as a basis for climate-change analyses, wildlife habitat modeling, long-term monitoring, and adaptive management in the region.

Wednesday, July 18 11:00 Conservation Planning On The Cumberland Plateau: A Case Study Coupling Science And Policy

Burcher, Chris*, *University Of Tennessee Knoxville*

Bridging the gap between science and policy is a complex and difficult task. Historically, conservation and natural resource management have been reactive – responding to conservation needs once they arise. More recently proactive management strategies including structured decision making and adaptive management have become popular. Moreover, approaches that use science to inform management protocols, laws, and policies regarding conservation and natural resource management are encouraged by many state and federal agencies. Conservation Planning (CP) is used by the US Fish and Wildlife Service (USFWS) as one approach to protecting endangered species while permitting land development, mining, and otherwise lawful human activity. Here I present current work on the Cumberland Plateau of central Tennessee where four federally threatened or endangered species and 19 species of concern are potentially threatened by human population growth. The Cumberland project unites city and county municipalities, local, state, and federal agencies, local environmental groups, and citizens living in the area. Conservation Plans are similar to other multi-stakeholder efforts, are becoming more popular, and have potential to provide benefits to stakeholders. I will share a summary of the general CP approach, an overview of the Cumberlands project specifically, and illustrate common pitfalls and misconceptions about this approach to uniting science and policy.

Monday, July 16 Greater Sage-Grouse (Centrocercus urophasianus) Movement, Distribution And Crucial Habitat In A Southwestern Utah Fringe Population

Burnett, A. Cheyenne*, *Utah State University* , **Frey, S. Nicole**, *Utah State University*

Greater sage-grouse (sage-grouse; Centrocercus urophasianus) populations have been declining since the 1930s range-wide. The Bald Hills population in Utah is an isolated population at the southern edge of the species' range. This peripheral population may provide intra-species diversity and therefore be of increased conservation importance. Due to lack of research, basic information about this population's seasonal movements, distributions, and habitat preferences are unknown. This is of particular relevance

because of the high potential for wind energy development in the area. The objective of this study is to develop a habitat selection model to predict and map seasonal habitat use and population distribution using Maximum Entropy. We will use readily available habitat and anthropogenic covariates as predictors of sage-grouse presence. Sage-grouse locations collected in 2011 via VHF radio telemetry provide presence-data to create the model. Locations from 2012 will be used to validate the model. Initial telemetry data suggests elevation and proximity to water to be major predictors in our final model. Preliminary results indicate that this population is semi-migratory and their seasonal distributions differ from the Utah Division of Wildlife's Habitat Coverage maps. This inconsistency highlights the importance of this study. By constructing population-specific distribution models, we can prioritize conservation efforts and make informed management decisions.

Monday, July 16 Reintroduction Of California Condors To Central California:Temporary Resolution Of A Conservation Dilemma

Burnett, Joe[*], *Ventana Wildlife Society* , **Sorenson, Kelly**, *Ventana Wildlife Society* , **Risebrough, Robert**

Monterey County in coastal central California was the site of the first observations by Europeans of California Condors (Gymnogyps californianus) and of the first recorded nesting; it is also the type locality of the species. A reintroduction program began in 1997; through 2010 84 captive-reared condors were released to the wild. We recorded 16 nestings by nine pairs and recovered eggs or shell fragments from 12 nests; shell thinning averaged 34 %, attributed to the DDT compound DDE. To maximize productivity whenever possible wild eggs were replaced with zoo-laid eggs. Chicks from eight of nine zoo-laid eggs incubated in the wild successfully fledged. Three wild-laid eggs hatched successfully in the wild and three of the wild-laid eggs hatched after artificial incubation at elevated humidities. Egg breakage accounted for only two of the 10 failures. High water loss appeared to be a significant factor but could not account for deaths of two early embryos. Toxicity of an as yet unidentified contaminant is at this time the only plausible hypothesis; DDE contamination of the coastal environment, however, continues to decline. We adopted a modified approach in 2012 to document as fully as possible any failures in the wild as a necessary prerequisite for determining their causes and to maintain an adequate level of recruitment. During the current season wild-laid eggs will remain in the nest until failure is confirmed and exchanged with zoo-laid eggs whenever possible.

Monday, July 16 8:30 Symposium Introduction: What Are Resilient Natural Systems, How Do We Identify Them, And Once Identified How Do We Protect Them?

Burns, Catherine[*], *The Nature Conservancy*

Ecosystem resilience is the ability of an ecosystem to retain essential processes and maintain diversity in the face of disturbances like climate change. As the pace of environmental change picks up, identifying areas with high adaptive capacity will be increasingly important for effective long term conservation. Although the precise species composition in a given area will undoubtedly change in response to environmental changes, resilient systems will continue to sustain high levels of biodiversity and ecosystem function. This talk will introduce the concept of resilience, why it is critical for conservation biologists to understand, and will set the stage for the symposium's additional speakers, who are developing the framework and the tools to guide efforts at identifying the most resilient natural systems. This talk will feature resilience concepts and their application to terrestrial, freshwater and coastal marine ecosystems. We will describe emerging techniques used to identify areas that will have high conservation value under future climate conditions, introduce real-world examples of how

to achieve long-term conservation success once resilient sites have been identified, and explore conservation strategies when the "players" (i.e. species, communities) are changing rapidly and traditional approaches are not sufficient.

Tuesday, July 17 10:00 A Framework For Monitoring The Cumulative Effects Of Human Footprint On Biodiversity

Burton, Cole[*], *Alberta Biodiversity Monitoring Institute* , **Huggard, David**, *Alberta Biodiversity Monitoring Institute* , **Schieck, Jim**, *Alberta Biodiversity Monitoring Institute* , **Solymos, Peter**, *Alberta Biodiversity Monitoring Institute* , **Bayne, Erin**, *Department Of Biological Sciences* , **Boutin, Stan**, *Department Of Biological Sciences*

Effective ecosystem monitoring is required to understand and mitigate ecological impacts of resource development. Yet most monitoring efforts are narrowly focused and inadequately consider the cumulative effects of multiple, interacting stressors. Monitoring also often lacks explicit links to regional planning and adaptive management. We describe a large scale, cumulative effects monitoring framework being implemented in Alberta, Canada, through the Alberta Biodiversity Monitoring Institute. The framework explicitly uses monitoring to generate and test model-based hypotheses about drivers of ecological change. More than 2,000 species and landscape elements are monitored across the 660,000 km2 province, using long-term systematic sites in combination with targeted sampling of gradients in human footprint. Spatially explicit models are constructed relating species abundance to footprint and other landscape attributes. Model predictions are designed to be tested with data from subsequent monitoring cycles, providing a means of learning about the system and guiding adaptive management. Additional benefits of the framework include standardized data on status and trend for a wide variety of biodiversity elements, model projections for regional planning and assessing alternative scenarios, and the identification of knowledge gaps for focusing additional research. We illustrate key features of the framework with a case study developed from the first decade of monitoring.

Tuesday, July 17 9:30 Climate Change/Land Use Change Scenarios For Assessing Threats To Ecosystem Services On California Rangelands

Byrd, Kristin[*], *U.S. Geological Survey* , **Soulard, Chistopher**, *US Geological Survey* , **Flint, Lorraine**, *U.S. Geological Survey* , **Casey, Frank**, *USGS* , **Alvarez, Pelayo**, *Defenders Of Wildlife* , **Sleeter, Benjamin**, *U.S. Geological Survey* , **Sohl, Terry**, *U.S. Geological Survey*

There are over 11 million acres of grasslands in the California Central Valley and the interior Coast Range, most of which are privately owned and managed as rangelands for livestock production. These ranches provide habitat for 75 threatened and endangered species, and generate multiple ecosystem services. As part of the California Landscape Conservation Cooperative, we developed three spatially explicit alternative future scenarios for the Central Valley and oak woodland regions of California that accounted for possible climate change and land use change. Narratives of future changes to California rangelands were developed with input from the ranching community and local experts through a partnership with the Defenders of Wildlife. Modeling of alternative scenarios produced maps of plausible future distributions of development, cropland, hay/pasture, and multiple vegetation classes integrated with plausible changes to climate and hydrological variables. We used model results to identify where suitable grazing area may be threatened. We also calculated potential changes in water recharge and runoff rates, carbon sequestration rates, and wildlife habitat area with rangeland conversion to development and intensive agriculture. Based on these analyses, the relative economic costs and benefits associated with change in rangeland ecosystem services were calculated for each scenario.

Monday, July 16 How Bad Would 50% Conversion Of Natural Habitat Be? A Bird's Eye View

Camargo, Rafael* , **Currie, David**, *University Of Ottawa*

Species–area relationships suggest that species richness should decline monotonically as natural habitat is converted to human-dominated land cover. However, Desrochers et al. (2011) found that avian species richness in 100 km2 quadrats in Southern Ontario has a peaked relationship with the proportion of natural land cover. They suggested that ?50% of natural landscapes can be converted to human-dominated cover before avian richness declines. But, are desirable species lost, replaced by "weedy" ones? Can one predict which individual bird species suffer if natural land cover is reduced to 50% of the original forest? We assessed 202 bird species in Desrocher's quadrats (n=991). For each species, we regressed the probability of occurrence as a function of natural land cover. We found that most species (145/202) have higher probability of occurrence at 50% natural cover than at 100%. Twenty-four bird species have their probability of occurrence reduced by >80%. Surprisingly, these were not systematically forest-interior bird species. Rather, the most seriously affected species were ones at the southern limit of their ranges. They are common in the boreal forest further north. Species at northern range limits typically had higher probability of occurrence at 50% natural land cover. At least for birds, humans apparently can share the landscape without unduly harming diversity. Ranges shifting northward due to climatic warm interact differently with land cover on their retreating and advancing edges.

Wednesday, July 18 11:00 Wine With That Burger? Trends In California Rangeland Conversion 1984-2008

Cameron, Dick*, *The Nature Conservancy* , **Marty, Jaymee**, *The Nature Conservancy* , **Holland, Robert**

Rangelands occur in habitats throughout the world that are highly threatened with low levels of conservation management. In California, rangeland habitats have high biodiversity value, provide significant habitat connectivity and form the foundation for a number of ecosystem services. Using aerial photos and a time series of spatial data tracking land use conversion, we mapped rangeland conversion between 1984 and 2008 across a 13 M ha area, covering 36 counties. In total, over 195,000 hectares of rangeland were converted during this time period. Surprisingly, agricultural intensification accounted for 40% of the conversion with vines, trellised olives and orchards leading the way. To assess the options for future conservation management of rangelands, we quantified the level of protection due to permanent protection in fee or with an easement, as well as through voluntary enrollment in the Williamson Act. Only 19% of the remaining rangeland is protected by fee or easement ownership. Another 43% the rangeland is enrolled in Williamson Act, while 37% has no protection status at all and is thus most vulnerable to being converted. Given the increasing availability of time series GIS data and the extent of rangelands in western North America, we propose that this method can be used to develop new strategies to effect protection at much larger scales, especially for regions with soil types suitable for agricultural intensification.

Wednesday, July 18 3:30 Population Structuring And Potential Loss Of Genetic Diversity In Neotropical Cougars (Puma concolor)

Caragiulo, Anthony* , *Fordham University* , **Dias-Freedman, Isaebla**, *American Museum Of Natural History* , **Rabinowitz, Salisa**, *American Museum Of Natural History* , **Clark, Alan**, *Fordham University*

Cougars (Puma concolor) were extirpated from much of their native range and are considered "near threatened" in Argentina, Brazil, Colombia, and Peru by the IUCN. Most cougars reside in the Neotropics; however, little is known about these populations as most studies focus on North American populations. Detailed information

regarding cougar populations is difficult to obtain via traditional methods (e.g., camera trapping, blood sampling) due to their elusive behavior and the cost of such techniques. This study uses mitochondrial DNA extracted from non-invasively collected scat samples to examine the genetic diversity of Neotropic cougars. Four mitochondrial gene regions (16S rRNA, 12S rRNA, ATP-synthase 6, and cytochrome oxidase b) were sequenced to examine if distinct haplotypes delineated cougar populations and whether populations were connected via shared haplotypes. We identified 236 individuals (96 males, 104 females, 36 unknown sex) and found evidence of population structuring, with distinct haplotypes in South and Central America. Additionally, mitochondrial nucleotide diversity in these gene regions is low, indicating a potential loss of genetic diversity. Also, amplification success was lower for scat samples compared to blood samples obtained from North America, but sequence quality was identical. This research is the first project examining the population genetic structure of cougars across their Neotropic range and will help prioritize cougar management plans.

Tuesday, July 17 11:15 What's Out There? An Overview And Analysis Of Available Tools For Tools For Climate Change Vulnerability Assessment And Adaptation Planning

Carr, Sarah* , **Rozum, John**, *NatureServe/NOAA Coastal Svc Center* , **Crist, Patrick**, *NatureServe*

Processes and approaches for assessing and reducing the vulnerability of coastal ecosystems and infrastructure to climate change are emerging, including multi-sectoral approaches that incorporate both ecosystem health and social well-being. Many coastal natural resource managers and communities have begun to plan for the impacts of climate change on their local ecosystems and infrastructure and are finding that processes and approaches require the use of geospatial analyses and tools to model and visualize the impacts of a changing climate on ecosystems and human infrastructure, explore the effects of potential management decisions, and conduct effective public engagement. The variety of tools and lack of information on them make it difficult for practitioners to select tools most suited to their needs and capacities. The Coastal-Marine Ecosystem-Based Management Tools Network is currently analyzing available tools for climate change vulnerability assessments and adaptation planning. This work includes determining climate change vulnerability assessment and adaptation planning needs that tools can address, identifying tools that address these needs, selecting a set of key tools, and determining gaps in available tool coverate. This presentation will provide an overview of available tools, their capabilities, requirements (e.g. technical expertise, training, and data needed to use them), and limitations. Subsequent presentations in the symposium will cover a subset of these tools in greater depth, including describing case studies of how the tools have been used in the field.

Monday, July 16 Species As A Unit To Bridge The Gap Between Taxonomists And Conservationists

Carrera Zamanillo, Maria Isabel*, *Universidad Nacional Autonoma De Mexico*

Global concern over species decline has become a central issue in international political debates. Current estimates of the total number of species on earth range from 3 to 30 million; however the scientific community has formally named and described only roughly 2 million species. The crisis is urgent: Species extinction is occurring at up to 1000 times higher rates than the previous five massive extinctions, but many species are not listed as threatened because there is no available information on them. How can we protect what we don´t know? To confront this threatening reality, the scientific community is developing indicators to quantify and monitor changes in biodiversity. But the irreducible complexity of biodiversity makes defining a single objective measure extremely difficult; different measures serve different

purposes. Species is recognized as the most common unit for measuring biodiversity. However, while in taxonomy species are considered hypothesis for identifying natural entities, in conservation biology species lists are taken as facts and form the foundation for funding and policy decisions. As currently practiced species lists don't necessarily reflect true biodiversity knowledge. Understanding these differences and designing epistemic frames based on shared goals is tremendously important for defining the scope and utility of interdisciplinary work. Since the loss of species transcends traditional disciplinary boundaries, interdisciplinary research may bridge the gap between specialists to forge better more workable research objectives. Taxonomists and conservationists need to work together to design specific units for the purposes of conservation. Documenting trends in biodiversity is more than an intellectual activity, it also depends on communication, exchange, and negotiation between experts.

Monday, July 16 11:45 Comparing Genetic Structure Of American Pika Populations At Different Elevations: How Does The Spatial Scale Of Gene Flow Vary Among Landscapes?
Castillo, Jessica* , **Epps, Clinton**, *Oregon State University*
American pikas (Ochotona princeps) have been proposed as an indicator species for climate change. Some populations in the relatively low elevation Great Basin appear to have gone extinct within the last century, while pikas in other parts of the species' range appear to be thriving. Due to their reliance on specialized habitats, their distribution is naturally fragmented at local and regional scales. Understanding the spatial scales at which dispersal and gene flow occur among habitat patches, and comparing among different ecosystems, is critical to evaluating the vulnerability of pikas to climate change. We investigated gene flow among habitat patches and genetic diversity within four study sites representing three major geographic regions: Crater Lake National Park in the Cascade Range, Grand Teton National Park (GRTE) in the Northern Rocky Mountains, and Hart Mountain (HM) and Sheldon (SH) National Wildlife Refuges in the Great Basin. Genetic diversity was greatest in the highest elevation site, GRTE, and lowest in the lower elevation sites, SH and HM. In each site, genetic structure increased strongly with distance between habitat patches. However, isolation by distance was stronger in the two Great Basin sites, suggesting lower patch connectivity at lower elevations. This study is the first to compare local genetic structure for pikas across ecosystems, and will clarify how patch connectivity will change if climate change affects habitat distribution.

Tuesday, July 17 9:00 Energy Development And Songbirds: Patterns And Mechanisms
Chalfoun, Anna* , *University Of Wyoming* , **Gilbert, Michelle**, *PRBO Conservation Science* , **Hethcoat, Matthew**, *University Of Wyoming*
Inevitable impacts of energy development activities include conversion and fragmentation of wildlife habitat as well as alteration of remaining patches. Understanding how and why wildlife populations are impacted by such changes is critical for wildlife conservation in the face of a rapidly expanding energy development industry. We examined the abundance of breeding sagebrush songbirds, many of which are displaying substantial range-wide declines, with respect to the density of natural gas wells in the Jonah and Pinedale Anticline fields in western Wyoming, USA. Increased well density was associated with significant decreases in Brewer's, sage, and vesper sparrow but not sage thrasher abundance. From a mechanistic standpoint, nestling masses for most species did not vary with energy development intensity, suggesting little evidence for changes in food availability. However, daily nest survival rates for all three sagebrush-obligate species decreased with well density and proximity to the nearest well pad. Current work is focused on why nest predation rates increased

with energy development. We are identifying nest predator species with infrared cameras and comparing predator abundance and diversity across energy development treatments. Understanding the mechanisms underlying energy development effects for songbirds and other species will greatly aid management prescriptions geared towards mitigating impacts of energy development to already declining species.

Tuesday, July 17 4:30 A Step In The Right Direction? Using Step Selection Models Of Large Carnivores To Support Corridor Design.

Chetkiewicz, Cheryl[*], *WCS Canada* , **Boyce, Mark**, *University Of Alberta*

Corridor designs are typically based on patterns of structural connectedness, often neglecting behavioural processes of resource selection and movement. We collected GPS data on cougars and grizzly bears in two fragmented landscapes in the Canadian Rocky Mountains where developments threaten to create barriers to movement. We used step selection functions (SSF) to quantify how cougar and grizzly bear pathways were influenced by the landscape. Cougars selected habitats closer to paved roads and forest cover for movement and avoided crossing paved roads during non-winter season. Grizzly bears selected habitats closer to paved roads and shrubs when moving during berry season. Grizzly bears and cougars moved faster when near paved roads during the berry and winter seasons, respectively. Conversely, cougars in Canmore and grizzly bears in both landscapes moved slower near forest and shrubs during the winter and berry seasons, respectively. We then simulated movement pathways based on the SSF models to examine how our models differed or supported current corridor designs in both landscapes. Taken together, the simulations and movement guidelines provide additional tools for managers faced with designing and managing corridors for large mammals.

Tuesday, July 17 9:45 Bridge This Gap: Teaching Professionals And Graduate Students Together In Conservation Training Courses At SCBI-Front Royal, VA

Christen, Kate[*], *Smithsonian Conservation Biology Institute* , **Brown, Marcia**, *Foundations Of Success*

Marrying graduate and professional training in short immersion courses requires close attention to enhancing, never compromising, learning experiences for students AND researchers/practitioners. What are the best teaching approaches for mixed groups presenting different practical experience levels, and how best to meet university accreditation needs--exams, lots of theory, papers--without compromising the experiential learning emphasis vital for practice-oriented in-service training? CNRS and SCB Education Committee seek positive graduate/professional training examples for the conservation community's expanding lifelong-learning portfolio. Here, lessons from an early source of this mixed training: Smithsonian-Mason's 4 years of co-scheduled graduate/professional courses, including Adaptive Management, co-taught with FOS. Two courses feel like one to participants, yet co-running entails negotiating new logistical layers. We focus on results and outcome data from course reports, evaluations, and interviews to assess opportunities and pitfalls for mixed trainings. Despite red tape, positives abound; grad credits for time-starved professionals still earning degrees; young grad students' close exposure to practitioners who are fellow learners; and professionals' close exposure to skills/perspectives of the newest conservation generations. One success indicator: our % increase in enrolled grad students, even as professional participant numbers also hold steady or increase.

Monday, July 16 Breeding Success And Conservation Of Sandbar-Nesting Birds Along The Mekong River In Cambodia

Claassen, Andrea* , **Cuthbert, Francesca**, *University Of Minnesota*

Birds are useful indicators of environmental change and ecological integrity. Species that nest on river sandbars are especially sensitive to habitat change, nest predation, and disturbance. In Southeast Asia, populations of riverine sandbar-nesting birds are declining, presumably due to anthropomorphic effects of egg harvesting by local people, domestic animal predation, intensification of land use activities, and upstream hydropower development. We investigated factors affecting reproductive success of sandbar-nesting birds along the Mekong River in Cambodia. In 2010-2011 we monitored nests of River Tern Sterna aurantia, River Lapwing Vanellus duvaucellii, Great Thick-knee Esacus recurvirostris, Small Pratincole Glareola lactea, and Little Ringed Plover Charadrius dubius and implemented a nest protection program focused on River Terns. Nest survival was influenced by species, nest initiation date, nest age, and nest protection, but was not influenced by environmental covariates. Results suggest that egg harvesting by people and predation by animals may currently be the most important causes of low nest survival rates of sandbar-nesting bird species along the Mekong River. Therefore, implementing site-specific nest protection may boost reproductive success rates in the short-term. However, given the rapid pace of large-scale development in the Mekong region, a longer-term conservation strategy will be necessary for sustaining sandbar-nesting bird populations in the future.

Wednesday, July 18 11:40 The Challenge Of Return On Investment In Conservation: Performance Measures As Key Criteria In Defining Success

Cleaves, David*, *U.S. Forest Service*

Collaborative conservation programs and activities will be increasingly scrutinized for effectiveness and efficiency as governments and the private sector concentrate on economic recovery and debt reduction. Conservation will have to compete more rigorously as investments with other uses of public and private capital. Being able to articulate, quantify, and realize returns on investment will be a necessary skill for any collaborative conservation enterprise. Some of the most important challenges for making conservation programs competitive are (1) framing conservation results as returns on investment, (2) distinguishing among inputs, outputs, outcomes, and impacts in an investment "value chain", (3) estimating the true costs of conservation practices, including defining the benefits and costs of collaboration, and (4) establishing performance measures through which to transform inputs into results across the multiple partners. Performance measures for conservation programs need to be measurable, sensitive to the program components, and meaningful to jointly derived conservation objectives and strategic intent. These measures must also influence the behavior of the individuals and organizations who must work together to make the conservation investment successful. Some examples will be drawn from the US Forest Service experience in using a "Balanced Scorecard" approach to incorporating climate change considerations into sustainable forest management programs and practices. The FS Climate Change Scorecard is comprised of performance measures across four dimensions: (1) organizational capacity; (2) partnerships, engagement and education; (3) adaptation; and (4) mitigation and sustainable consumption, and is completed annually by 155 National Forests and 20 National Grasslands. Some of the lessons being learned can be applied to collaborative conservation enterprises at the landscape scale.

Tuesday, July 17 3:45 Evolution Of California's San Francisco Bay-Delta In A Century Of Global Climate Change

Cloern, James*

Conservation planning requires quantitative visions of how ecosystems and the species they support will evolve in response to climate change. New model-based projections provide these visions for the San Francisco Bay-Delta system in two contrasting scenarios of global warming. Every aspect considered in the models changes substantially through the 21st century, including hydrology, sea level, habitat quality for at-risk native fishes, and frequency of extreme hydroclimatic events. These future visions provide a basis for designing strategies for adaptation to climate change and other forces of environmental change into the future. These strategies should be based on consideration of projections that: continued biological changes are inevitable; surprises are likely; environmental conditions will extend beyond the range of historical observations; rare climatic events in today's climate will become the future?s norm; conflicts over resource allocation will grow; and the need for adaptation will depend on the highly uncertain rate of global warming. Flexibility and adaptability will be keys to success in designing biological conservation plans as the rate of environmental change continues to accelerates.

Tuesday, July 17 3:00 Moving From Trade-Offs To Synergies: An Integrated Approach To Addressing Climate Change

Cohen, Ellie*, *PRBO Conservation Science* , **Seavy, Nat** , **Ballard, Grant**, *PRBO Conservation Science*

Decisions are commonly framed in terms of trade-offs resulting in investments in one set of actions at the expense of others. This approach is often invoked in the context of protecting natural versus human communities or responding to climate change through mitigation versus adaptation. We propose a framework based on synergies to address the growing challenges of climate change and extreme events. Integrated strategies incorporating the needs of both natural and human communities as well as mitigation and adaptation are required. Using examples from California, we demonstrate how this is possible by 1) engaging stakeholders in science-based planning, decision-support tool development, and implementation, 2) generating data-driven models to find win-win solutions, and 3) monitoring regularly to ensure that goals and processes are reevaluated and updated. Case studies from PRBO Conservation Science's (www.prbo.org) collaborations with multiple public and private partners are highlighted including the San Francisco Bay Sea Level Rise Tool to help prioritize tidal wetland restoration (www.prbo.org/sfbayslr), Sacramento Valley rice-growing practices to benefit birds and agriculture while avoiding maladaptation, and climate-smart restoration and prescriptive grazing on working lands to reduce drought impacts, sequester carbon and support biodiversity. We share how nature-based approaches can address both mitigation and adaptation for improved ecological and economic outcomes.

Tuesday, July 17 11:45 Good Practices And Socio-Economic Considerations In The Use Of Marxan For Conservation And Land/Water Use Planning

Coleman, Heather*

Marxan spatial planning software (hosted by the University of Queensland) supports systematic resource use planning, particularly in the creation of a reserve network. Using Marxan, planners can identify an efficient system of conservation sites that represents a suite of biodiversity targets for a minimal socioeconomic "cost". However, the most substantial challenges of solving a minimum set problem tend to include setting targets, determining appropriate cost values, and working with stakeholders to understand the role and outputs of the decision support tool. This presentation will concentrate on how the cost layer is defined and applied, as this significantly

influences the efficiency and implementability of a reserve network. The most common type of cost in Marxan analyses has been the area of planning units in a reserve; however, new techniques to consider include the use of surrogates, opportunity cost, existing human impact measurements, planned actions such as acquisition and stewardship, multiple cost surfaces (run separately), and conducting separate analyses with biodiversity and socio-economic features as respective targets and costs.

Monday, July 16 10:00 White-Nose Syndrome: Managing A Fungal Pathogen Of Hibernating Bats
Coleman, Jeremy*

White-nose syndrome (WNS) has caused unprecedented mortality in hibernating bats in eastern North America since its discovery in 2007. As of January 2012, the disease, WNS, and/or the causative fungus, Geomyces destructans, has been detected in 19 states and 4 provinces. The rapid spread and devastating impacts of WNS have presented wildlife and natural resource managers with considerable biological and social challenges, exacerbated by the many unanswered questions surrounding the etiology of the disease. Field signs of WNS include day-flying bats in winter, resulting in increased human-bat interactions. Relatively few tools have become available for managers to combat WNS and conserve vulnerable bat species. Federal (and state) listing under the ESA provides legal authority for government agencies to manage bats, but of the six species confirmed with WNS, only the Indiana bat (Myotis sodalis) is listed federally. Some state agencies have begun efforts to list certain hibernating bat species, and the US Fish and Wildlife Service is currently reviewing three species for potential listing. A coordinated effort is required to manage WNS and conserve North American bats. The National Plan for Assisting States, Federal Agencies and Tribes in Managing White-Nose Syndrome in Bats, finalized in May 2011, provides the framework for a coordinated national response, and presents a model for responding to similar disease outbreaks in the future.

Tuesday, July 17 10:15 Data Basin: Interactive Mapping Platform For Decision Support And Science-Based Learning
Comendant, Tosha*, *Conservation Biology Institute* , **Strittholt, James**, *Conservation Biology Institute* , **Ward, Brendan**, *Conservation Biology Institute* , **Bachelet, Dominique**, *Conservation Biology Institute*

As the pace of global environmental change increases, there is a need to find solutions to complex challenges related to climate change, agriculture, water, energy, and biodiversity. Scientific information is indispensable to solving these challenges. However, many social and technical barriers impede the flow of scientific knowledge between those who collect and analyze data and those who use data to inform decision-making, whether in resource management, public policy, or their daily lives. In response to this challenge, Conservation Biology Institute built Data Basin (www.databasin.org), an open-access, web-based data hosting, visualization, and collaboration platform. Data Basin is not a traditional website or data portal – it combines the latest web mapping technology with social networking functionality, resulting in an innovative tool for mapping, discussing, and interpreting spatial data. The Data Basin platform is accessible to users of varied technical levels and provides a mechanism to create social learning networks. The core of Data Basin is free and provides mapping tools to create customizable maps, group workspaces for collaboration, access to thousands of biological, physical, and socio-economic geospatial datasets, and drawing/analysis/commenting tools. Data Basin has over 3,300 users who have created more than 530 maps, over 180 collections of datasets and/or maps, and more than 160 groups to support in taxonomy, specific topics or geographies, conferences, and online learning initiatives. Using web-based mapping, Data Basin is breaking down

institutional and topical barriers in conservation science and practice.

Monday, July 16 10:10 Industrial Scale Power Plants Pose Landscape Level Threats To Mojave Desert Tortoises

Connor, Michael*, *Western Watersheds Project*

The desert tortoise (Agassiz's land tortoise, Gopherus agassizii) occurs in a variety of Mojave desert communities in California, Nevada, Utah, and Arizona, most commonly on gently sloping terrain with friable soils where there is abundant inter-shrub space for growth of herbaceous plants. The Mojave population was listed as threatened in 1990 prompted by severe declines in monitored populations. Recognized threats include habitat loss, degradation and fragmentation, urbanization, development, disease, drought, fire, subsidized predation, livestock grazing, highways, and military and off-highway vehicle activities. Critical habitat was designated in 1994, and recovery plans issued in 1994 and 2011. The extant conservation strategy is to reduce threats within large blocks of public land while maintaining connectivity between conserved areas to allow for gene flow and resiliency. Neither the critical habitat designation nor subsequent agency planning efforts envisioned the development of massive renewable energy projects in desert tortoise habitat on public lands. Developers of industrial scale solar projects share the desert tortoise's preference for gently sloping bajadas and large contiguous expanses of desert. Because recovery strategies for the desert tortoise rest entirely on the appropriate management of public lands the siting of large-scale solar energy plants on public lands inevitably conflicts with desert tortoise conservation.

Monday, July 16 11:45 Correlated Environmental Variation And The False Classification Of Extinction Risk

Connors, Brendan*, *School Of Resource And Environmental Management*

Estimating trends in abundance is the foundation upon which many conservation decisions are made. For example, extinction risk is often classified based on the magnitude of declines in abundance. However, variation in abundance can arise from observation error (i.e., the differences between observed abundance and true abundance) and environmental noise (i.e., stochastic variation in the environment that influences the true abundance of individuals), which can be further exaggerated by positive temporal correlation. When this stochastic variation in abundance is high, estimating the true underlying trend in abundance can be difficult and our understanding how correlated environmental noise influences the probability of falsely classifying a population as at risk of extinction is not well understood. I show that the probability of falsely classifying a population as at risk of extinction is sensitive to the magnitude of environmental noise and its degree of correlation. Using state-space models I estimated the magnitude of correlated environmental variation across 614 time series of animal abundance and show that as many as 90% of the time series I examined would be expected to be falsely classified as at risk of extinction more than 10% of the time. These findings highlight the need to consider the influence of correlated environmental noise in the false classification of extinction risk.

Monday, July 16 Development Of Radio Transmitter Attachment Protocols For The Pygmy Hippopotamus (Choeropsis liberiensis)

Conway, April* , **Hernandez, Sonia** , **Carroll, John**

The pygmy hippopotamus (Choeropsis liberiensis) is an endangered species endemic to the Upper Guinea Forests of West Africa. There are many challenges to studying pygmy hippos in the field;

they are solitary, nocturnal and in situ ecological data is scarce. The objective of this study was to develop and test methods for radio transmitter placement for pygmy hippos in Sierra Leone. To determine the best attachment method for the radio transmitter, 4 designs were tested in a captive setting, including hock, harness, and 2 collar variations. A tubular collar attachment was determined to be the best option as it provided longest life and had the least likelihood for injury. For in situ radio collar placement, 2 trapping periods using pit traps were conducted in 2011 (235 and 360 trap nights respectively). Pygmy hippos were not captured during this period; however, sign was frequently observed near the traps with 4 near-captures. Modifications to the pit traps were made, and results from this study may improve the success rate of future capture attempts. If researchers are successful in using radio telemetry to track this rare mammal, a greater ecological understanding will allow decision makers to prioritize conservation plans in the region.

Monday, July 16 11:15 Local Attitudes Toward Pygmy Hippopotamus Conservation On Tiwai Island, Sierra Leone

Conway, April* , **Hernandez, Sonia** , **Carroll, John** , **Larson, Lincoln**, *University Of Georgia*

Research suggests that effective endangered species conservation programs should adopt a community-based approach that considers the beliefs, attitudes, and needs of people living in and around protected areas. Local stakeholders' perspectives are especially important in rural regions of developing countries, where residents often depend directly on natural resources for daily subsistence. This study focused on one such region along the Moa River in Sierra Leone - an area home to the endangered pygmy hippopotamus (Choeropsis liberiensis). In 2010 and 2011, researchers visited 27 villages and surveyed 522 people living near the prime hippo habitat on or around Tiwai Island Wildlife Sanctuary. Surveys addressed topics including pygmy hippo encounters, local knowledge of hippo behavior, hippo-human interactions, and perceived benefits of hippo conservation. Overall, only 22% of respondents acknowledged any benefits related to hippo conservation. About 52% of respondents who had experienced focused education programs within the past six months reported some hippo-related benefits. In villages without education and outreach, this number dropped to 11%. Results suggest that educational programs focused on conservation benefits in local communities have the potential to increase support for pygmy hippo protection. Data also validate the importance of endangered species management that accounts for local stakeholders' attitudes toward and involvement in conservation activities.

Monday, July 16 Pubic Attitudes Toward Invasive Species Management At Great Sand Dunes National Park, Colorado

Conway, April* , **Sharp, Ryan**, *Eastern Kentucky University* , **Larson, Lincoln**, *University Of Georgia* , **Brownlee, Matthew**, *Clemson University*

Substantial research has explored ecological aspects of species invasions, but few studies have accounted for the social dimensions of invasive alien species (IAS) management. The absence of data regarding public attitudes toward invasive species is a particular concern in national parks, where stakeholder input is a critical component of land management decisions. To address the need for research examining public perceptions of IAS, this 2011 pilot study focused on visitors to Great Sand Dunes National Park, CO. Data were collected via onsite visitor contacts and follow-up web-based surveys (n = 72). Although 70.2% of visitors reported that they had seen or heard of "invasive species" in the past year, less than half (47.2%) of respondents were able to correctly define the term and even fewer (46.3%) were aware of the specific impacts of IAS in national parks. Analyses showed that on-site control of IAS was viewed as the most acceptable (compared to both eradicating invasives

or leaving ecosystems untouched) and least controversial management option. Logistic regression models indicated that adaptive eco-centric environmental attitude orientations and high education levels were the best predictors of support for IAS control. Results highlight the importance of visitor education programs that influence public awareness of and attitudes toward IAS management in parks and protected areas.

Tuesday, July 17 9:30 Energy Development And Sage Grouse In The West: Forging A New Paradigm For Landscape Conservation
Copeland, Holly* , *The Nature Conservancy* , **Naugle, David**, *University Of Montana* , **Pocewicz, Amy**, *The Nature Conservancy*
An ever-increasing human footprint is transforming landscapes in the Intermountain West. Conflict results from the high spatial overlap between world-class energy and wildlife resources. Nowhere is this conflict more apparent than in the West where fragmentation from development is the primary reason sage-grouse are designated as a candidate species under the federal Endangered Species Act. The possibility for a 2015 ESA listing has catapulted the sage-grouse into the limelight, forging new and unusual partnerships to avert a listing. Wyoming has taken bold actions to reduce fragmentation through policy changes and conservation easements that limit development inside high abundance core areas. We simulated future development and built models to measure the efficacy of these actions at protecting sage-grouse. Findings indicate that the core-area policy is effective at reducing impacts, and supplementing policy with conservation easements further abates anticipated losses. Our results provide unbiased estimates of the impacts of future fragmentation on sage-grouse and the potential contribution of the State's core area policy and private conservation easements at varying levels of funding. Decision-makers can use our science to guide the placement of future conservation work, so that federal and state agencies can work together with land trusts to support enough conservation in the right places to maintain a large and functioning sage-grouse population.

Tuesday, July 17 8:30 Have You Heard Of The Ohlone Tiger Beetle? How Knowledge Affects Recreationists' Stated Behaviors And Attitude Toward An Endangered Species.
Cornelisse, Tara* , **Duane, Tim**, *University Of California Santa Cruz, Environmental Studies Department*
The endangered Ohlone tiger beetle (Cicindela ohlone) occurs on public lands open to recreation. Recreation is the second leading cause of the decline of threatened species on public lands. Paradoxically, C.ohlone utilizes trails and disturbed areas for breeding and foraging. From 2001 to 2005 recreation was considered solely detrimental, as C.ohlone were occasionally crushed on trails. Trails were closed, creating a conflict between recreationists and C.ohlone conservation. After observations that vital bare ground habitat was dissappearing, the trails were reopened, albeit with little management to avoid beetle mortality. With a past conflict, recognition of recreation's positive effect on C.ohlone habitat, and a need for management, this is an ideal system to test how recreationists' knowledge affects their attitudes toward the species and their behavior in protected habitat. Knowledge of ecological issues has been shown to provide the distal basis through which more proximal mediators, such as attitudes, values, incentives, and social consequences change behavior. To test how recreationists' knowledge of C.ohlone affects attitudes towards the beetle and willingness to comply with proposed management strategies, I conducted 300 in-person surveys of the recreation community. Half of the participants were provided with information on the Ohlone tiger beetle and the effect of recreation prior to taking the survey; half of the participants were provided with no information. We found that the majority of recreationists rated C.ohlone conservation as important; yet, chose very

important significantly more if they had heard of C.ohlone prior to the survey. In turn, recreationists who rated C.ohlone conservation as very important were more likely to state compliance with both slowing down and dismounting their bike in beetle habitat. Participants with both prior and new (provided at the time of the survey) knowledge recognized the positive effect of recreation on C.ohlone significantly more, and negative effect significantly less, than those with no knowledge. Participants with no prior or new knowledge were more likely to state that recreation has no effect on C.ohlone and less likely to state compliance with slowing down or dismounting their bike. Thus, education both increases the value recreationists place on C.ohlone conservation and provides them with a correct understanding of the recreational impact on the beetle. This awareness can lead to increased compliance with management strategies, such as slowing down in beetle habitat. This result is particularly important because, in a related study, we found that slow cycling is significantly less disruptive to C.ohlone behavior than cycling at high speeds.

Monday, July 16 Measuring Amphibian Gene Flow Across Species, Scale And Sampling Scheme In A Managed Forest

Coster, Stephanie[*], *University Of New Hampshire* , **Kovach, Adrienne** , **Babbitt, Kimberly**, *University Of New Hampshire*

In the face of anthropogenic landscape change, understanding the factors affecting dispersal and gene flow is essential for conservation management. Landscape genetics provides a mechanism to examine how landscape features affect gene flow in natural populations. The relationship between environmental variables and genetic distance can vary with species, spatial scale and sampling scheme. To investigate these effects we used a least cost path analysis and partial Mantel tests to identify environmental factors that influenced gene flow in two pond-breeding amphibian species in a managed forest. We compared a larger spatial extent with coarse-grain sampling to a smaller spatial extent with fine-grain sampling. We found increased power at the finer spatial scale and evidence for species-specific responses; the more mobile wood frog (Lithobates sylvatica), displayed higher connectivity than the less mobile spotted salamander (Ambystoma maculatum). Open water and roads were barriers to gene flow for salamanders, while isolation by distance drove genetic patterns in wood frogs. Forestry had minimal effect on gene flow in either species. This study highlighted that species with similar habitat requirements and life cycles can have differing dispersal patterns and responses to landscape structure. It also revealed the importance of scale and sampling scheme in identifying landscape features that affect gene flow.

Monday, July 16 Weekend Bias In Citizen Science Data Reporting: Implications For Bird Phenology Studies

Courter, Jason[*] , **Johnson, Ron**, *Clemson University* , **Kaiser, Evan**, *Clemson University* , **Stuyck, Claire**, *Clemson University* , **Lang, Brian**, *Clemson University*

Studies of bird phenology are important to understand the effects of climate change on wildlife species and, in many cases, first arrival dates are reported through broad networks of citizen volunteers. Potential benefits are enormous (e.g., understanding ecological processes at broad spatial and temporal scales) if known biases of citizen data reporting are identified and properly addressed. One potential source of bias in bird migration studies is the tendency for “first” arrivals to be reported on weekends. We investigated weekend bias for five common migratory species in North America and assessed whether this bias affected mean first arrival dates reported using data from the North American Bird Phenology (1880-1969; N = 25,555) and recent citizen science databases (1997-2010; N = 63,149). Overall, weekend bias in first arrival reports occurred in all

species, although percentage of weekend observations decreased from 33.7% to 32% from historical to recent time periods. When comparing first arrivals reported on weekend and weekdays, small but significant differences were noted in mean arrival dates calculated (approximately 0.5 days) for four of five species. Our results indicate that weekend bias in citizen data reporting is decreasing over time and that accounting for 'day of week' in models examining phenology shifts could help make conclusions more robust.

Monday, July 16 Distribution, Habitat Requirements, And Conservation Status Of The Hellgrammites (Insecta: Megaloptera: Corydalidae) Of California

Cover, Matthew[*], *California State University-Stanislaus* , **Fleenor, Adam**, *California State University- Stanislaus*

The Corydalidae is one of two families of Megaloptera, a small order of holometabolous insects (~330 extant species worldwide). Corydalids have long-lived (1-5 year), fully aquatic larvae, commonly known as hellgrammites, and short-lived (~1 week) adults. The objective of this study was to determine the geographic and habitat factors affecting the distribution of species in California. It was motivated by unsuccessful surveys for several populations that existed prior to 1970, as well as anecdotal evidence that several species are intolerant of water quality and habitat degradation. We compiled locality information from published records, museum specimens, and new field collections, and examined habitat associations using GIS. Of the 11 species known from California, only 3 are commonly collected and widely distributed: Neohermes filicornis and N. californicus are found exclusively in temporary streams throughout the foothills of the Coast Range and Sierra Nevada, respectively, while Orohermes crepusculus is found in high-elevation perennial streams of the Klamath Mountains and Sierra Nevada. The other 8 species, 3 of which have not been collected for 40 years or more, are only known from 5-20 localities each. Because collection activity has increased in recent decades, especially with regards to aquatic life stages, there is strong evidence that land use changes have caused local extirpations in several species.

Wednesday, July 18 4:30 Applying PPSR To Invasive Species Research: New Perspectives In Conservation That Result From Taking An Interdisciplinary Approach

Crall, Alycia[*], *University Of Wisconsin-Madison*

PPSR programs have widespread application to invasive species science where educating the public and increasing collaboration among multiple stakeholders could prevent new introductions and control existing ones. Through development and evaluation of a national invasive species citizen science program, we found that many volunteer programs collect data and are willing to contribute these data to public databases. Although resources for education and monitoring are readily available, groups generally lack tools to manage and analyze data. Potential users of these data also retain concerns over data quality. Therefore, we compare the ability of citizen scientists to effectively carry out an invasive plant species monitoring protocol after one day of training relative to professionals. Using the results from this study, we provide specific recommendations for future trainings and protocol implementation to improve data quality. We also examine how the training program worked to change attitudes, improve understanding of the scientific process, and increase knowledge. Our results suggest that citizen science has the ability to empower participants to think scientifically, but that alternative survey instruments are needed, calibrated appropriately to the pre-existing attitudes and levels of knowledge in these relatively sophisticated target groups. We examine how this interdisciplinary approach has provided new insights for tackling this important conservation issue.

Monday, July 16 11:15 Context Matters: Intrapopulation Niche Partitioning Among California Sea Lions In The Gulf Of California
Crawford, Tara* , **Gerber, Leah**, *Ecology, Evolution And Environmental Sciences, SoLS, ASU* , **Kurle, Carolyn**, *University Of California San Diego*
Many generalist populations contain subsets of individuals that specialize in different resources and habitats. To better understand the drivers of intrapopulation niche partitioning in generalist predators, we compared the number of distinct foraging strategy groups among adult female California sea lions (Zalophus californianus) at three breeding colonies in different parts of the Gulf of California - Isla Granito (n=52), Los Islotes (n=83), and San Jorge (n=81) - using stable isotope analysis (?13C and ?15N) of fur collected from their suckling pups. We hypothesized that colonies with higher intraspecific competition will exhibit greater niche partitioning. Using a hierarchical cluster analysis, we identified six distinct foraging groups at Isla Granito (assignment accuracy=95.5% based on discriminant function analysis), which is a declining colony that is supported by low prey diversity. Los Islotes and San Jorge, which are both increasing in abundance and have access to more diverse prey bases, contain two distinct foraging groups each (accuracy of assignment=96.3% and 98.1%, respectively). The preliminary results presented here support our hypothesis. This initial analysis suggests that female sea lions in the GoC partition foraging resources over relatively small spatial scales; however, the degree of partitioning at each colony varies across the species' range. Characterizing this heterogeneity may facilitate conservation planning.

Monday, July 16 9:50 Prioritizing Conservation Actions In A Fragmented Metapopulation Of Desert Bighorn Sheep
Creech, Tyler* , *Oregon State University* , **Epps, Clinton**, *Oregon State University* , **Wehausen, John**, *White Mountain Research Station* , **Monello, Ryan**, *National Park Service*
Desert bighorn sheep in the Mojave Desert have small, naturally fragmented populations, and connectivity among habitat patches is critical for metapopulation persistence and maintaining genetic diversity. Connectivity among bighorn populations has been greatly compromised by highways and urbanization, and proposed renewable energy development may further fragment the landscape. Thus, to prioritize conservation actions, there is a pressing need to clarify the relative importance of specific habitat patches and dispersal corridors. We used genetic-based models of gene flow and movement to parameterize network models that describe two important ecological processes: gene flow among patches (genetic connectivity) and potential for recolonization of empty patches following extinctions (demographic connectivity). We applied these network models to identify the most effective locations for management actions such as corridor habitat protection, wildlife crossing structures, population reintroductions, and addition of permanent water sources. Additionally, we explored how patch persistence based on an empirical extinction model affected source/sink properties within networks. We found that rankings of habitat patch or corridor importance are strongly influenced by choice of network model, suggesting that conservation actions must explicitly address demographic connectivity and genetic connectivity as separate processes.

Monday, July 16 3:20 Climate Vulnerability Assessment And Adaptation In The Mojave/Central Basin Ecotone
Crist, Patrick* , *NatureServe* , **Tague, Joe**, *Bureau Of Land Management* , **Comer, Pat**, *NatureServe* , **Bow, Jacquie**, *NatureServe* , **Varley, Ian**, *NatureServe*
This project tested multiple aspects of the Yale Framework in the ecotone between the Central Great Basin and Mojave Desert Ecoregions. Working with the Nevada Bureau of Land Management (BLM) we integrated assessment

results from two BLM Rapid Ecoregional Assessments (REAs) with core recommendations from the Yale Framework. This work integrated climate vulnerability assessment with traditional cumulative effects assessment and developed land management strategies and adaptation alternatives for Nevada BLM. We used a scenario-based approach to assess needs for management changes based on modeled changes in extent and condition of numerous ecological systems, landscape species, and rare and imperiled species. Assessments began with the baseline condition and then modeled changes from potential development through 2025 and then integrated climate changes at 2025 and 2060. Assessments included changes to range forage, changes in biodiversity climate envelopes and refugia, and changes to ecosystem processes such as fire as well as invasive species pressures. The outputs are being used to enhance the effectiveness of policy decisions related to biodiversity preservation and climate change adaptation while meeting BLM's mandate for sustainable multiple-use of public land, including expanded development of traditional and renewable energy sources.

Tuesday, July 17 12:00 A Toolkit Approach To Integrated Climate Vulnerability Assessment And Adaptation Planning

Crist, Patrick[*], *NatureServe*

In conjunction with the US Fish and Wildlife Service, we developed a framework for integrating climate change effects into a scenario-based cumulative effects assessment and adaptation alternatives planning. We conducted two pilot projects to test and refine the process with one coastal project in Virginia and an inland project in Oregon/Nevada. These pilots integrated sea level rise and urban expansion in the coastal example and temperature change with fire and weed dynamics and renewable energy infrastructure development in the inland example. Our framework puts a target jurisdiction (in this case National Wildlife Refuges but the process will work for any location with sufficient data) in the context of a support landscape to fully incorporate offsite influences. The process also anticipates cooperative assessment and planning across the landscape. We employed a toolkit approach that utilized a number of modeling and decision support tools to conduct the large variety of analytical needs and facilitate cross-sector, cross-ecosystem processes. Toolkits followed a workflow from source data inputs, through analyses, to decision support product outputs. In each pilot we assessed a current conditions scenario and then integrated forecast land use changes with climate change for multiple future scenarios through 2100. While the pilot projects were for National Wildlife Refuges, the process will work for any location with sufficient data.

Wednesday, July 18 3:30 Human-Derived Risk Influences Choice Of Resting Sites In Grizzly Bears (Ursus arctos)

Cristescu, Bogdan[*], *University Of Alberta* , **Boyce, Mark**, *University Of Alberta* , **Stenhouse, Gordon**, *Foothills Research Institute*

Understanding how animals perceive human-derived risk can contribute to human-wildlife conflict prevention and inform conservation. We predict that areas where animals choose to rest should minimize risk of predators - which for large carnivores typically equate to humans - and hypothesize that human activity leads to behavioural trade-offs between habitat security and forage. To test this hypothesis and to identify key habitat for resting, we investigated choice of resting sites by GPS radiocollared adult grizzly bears (n = 10) sampled from a low density (4.79 bears/1,000 km2) threatened population in a multi-use landscape in Alberta, Canada. We compared security and food habitat features at resting and random locations while accounting for land use, season and time of day. In protected areas bears rested at night-time in areas where key plant foods were present, and resting sites had high horizontal cover during the summer peak in human

recreation. On reclaimed coal mines bears rested in areas with high horizontal cover and far from trails, with resting also occurring nocturnally. On public lands with high human use, bears rested at day-time and in areas with high horizontal cover, close to habitat edges. These spatial and temporal patterns of choice suggest that bears perceive human-related risk differentially by land designation, season and time of day. Although grizzly bears are presently not hunted in Alberta, choice of resting sites is possibly influenced by the ghost of predation past.

Tuesday, July 17 3:15 Global Patterns Of Fragmentation And Connectivity Of Mammalian Carnivore Habitat

Crooks, Kevin[*], *Colorado State University* , **Burdett, Christopher**, *Colorado State University* , **Theobald, David**, *Colorado State University* , **Rondinini, Carlo**, *Sapienza Universit di Roma* , **Boitani, Luigi**, *Sapienza Universit di Roma*

Although mammalian carnivores are vulnerable to habitat fragmentation and require landscape connectivity, their global patterns of fragmentation and connectivity have not been examined. We use recently developed high-resolution habitat-suitability models to conduct comparative analyses and to identify global hotspots of fragmentation and connectivity for the world's terrestrial carnivores. Species with less fragmentation (i.e., more interior high-quality habitat) had larger geographic ranges, a greater proportion of habitat within their range, greater habitat connectivity, and a lower risk of extinction. Species with higher connectivity (i.e., less habitat isolation) also had a greater proportion of high-quality habitat, but had smaller, not larger, ranges, likely reflecting shorter distances between habitat patches for species with restricted distributions; such species were also more threatened, as would be expected given the negative relationship between range size and extinction risk. Fragmentation and connectivity did not differ among Carnivora families, and body mass was associated with connectivity but not fragmentation. On average, only 54.3% of a species geographic range was comprised of high-quality habitat, and, more troubling, only 5.2% of the range was comprised of such habitat within protected areas. Identification of global hotspots of fragmentation and connectivity will help guide strategic priorities for carnivore conservation.

Monday, July 16 Ungulate Responses To Multi-Use Pathway Construction And Use In A National Park Transportation Corridor

Crooks, Kevin[*], *Colorado State University* , **Hardy, Amanda**

We conducted a Before-After-Control-Impact assessment of ungulate responses to multi-use pathway construction and use in a Grand Teton National Park, USA, transportation corridor. We measured elk (Cervus elaphus) and pronghorn antelope (Antilocapra americana) activities before (2007) and during (2008) pathway construction and two years after the pathway opened to public use (2009, 2010) in a treatment area with the pathway and an adjacent control area without it. If ungulates avoided pathway activities, we predicted, in the treatment compared to the control: 1) standardized counts of ungulates seen from the road would decline; 2) ungulates would shift away from the road; and 3) the probability of ungulates responding behaviorally would increase. Contrary to predictions, the number of elk seen did not decrease, the distance of elk from the road did not increase, and the probability of elk behaviorally responding was lower in the treatment relative to the control during and after pathway installation. Annual trends of number of pronghorn seen or their behavioral responsiveness did not differ in the treatment and control, but pronghorn shifted away from the road after construction in the treatment compared to the control during peak seasonal visitation, supporting the prediction that pronghorn avoided pathway activities. Overall, pathway activities did not appear to consistently alter ungulate distribution and behavior in the transportation corridor.

Monday, July 16 9:00 Climate Change Adaptation Planning And Action In Practice: Lessons From Across North America

Cross, Molly S.[*], *Wildlife Conservation Society* , **Rowland, Erika L.**, *Wildlife Conservation Society*

To build capacity for addressing the challenge of climate change to achieving conservation goals, there is a need for practical models for integrating climate change into site- and target-specific decision-making. We describe and evaluate one such model from our efforts to work with partners to conduct adaptation planning and implement priority actions for selected conservation targets at four landscapes across North America—the Greater Yellowstone Ecosystem, Arctic Alaska, the Adirondack State Park and Ontario's northern boreal forest. We compare adaptation options and issues across these diverse landscapes, highlighting, for example, to what extent variation across these sites in the rate and immediacy of climate changes affects how we frame conservation goals. Local political, economic, and ecological contexts at these landscapes also shape the types of conservation and management tools that can be applied in an effort to achieve adaptation goals. For some landscapes and conservation targets, an assessment of climate change impacts reinforces the need for conservation actions that are already underway, whereas in other situations more significant modifications of current conservation strategies may be necessary. Together, these landscapes represent a cross-section of issues that allow us to gain a better understanding of what climate change means for the conservation of biodiversity and ecosystems.

Tuesday, July 17 11:15 Population Structure And Intergeneric Hybridization In Harbour Porpoises In Coastal British Columbia

Crossman, Carla[*], *Department Of Zoology, University Of British Columbia* , **Taylor, Eric**, *University Of British Columbia* , **Barrett-Lennard, Lance**, *Vancouver Aquarium*

The population structure of the harbour porpoise (Phocoena phocoena) has been studied extensively over much of its range, but little information exists for Canadian waters, in particular for northeastern Pacific Ocean populations off British Columbia (BC), furthermore, the waters surrounding southern Vancouver Island, BC, are the only known location, worldwide, where hybridization between harbour porpoises and Dall's porpoises (Phocoenoides dalli) has been documented, but no empirical estimates of its extent exist. Using tissue collected from stranded porpoises, we sequenced the D-Loop region of the mtDNA and assayed variation at nine microsatellite loci to further resolve population structure in harbour porpoises and to assess the extent and patterns of hybridization with Dall's porpoise. While mtDNA variation did not reveal any clear patterns, microsatellite DNA data suggest the existence of a single genetic population of harbour porpoise in BC. Further, we found both first generation and backcrossed hybrids between these species. Our results suggest that while hybridization and introgression appear to be limited to the southern Strait of Georgia, their levels may be much higher than previously thought. Our data have provided novel insights about hybridization and demographic connectivity of harbour porpoise with the context of a genetic monitoring program in British Columbia.

Wednesday, July 18 9:45 Land Use Values In The Periphery Of A Protected Area In Northeastern Madagascar: Perspectives From Conservation Practitioners And Local Residents

Cullman, Georgina[*], *Columbia University*

Many conservation projects have broadened their implementation strategies to work with nearby communities to achieve diverse objectives. Such projects may propose interventions to change community resource use in the name of sustainability or poverty reduction. Yet in doing so, conservation projects often frame the relationship between local people and their natural environment as solely economic, neglecting to take

into account the complex relationships local peoples have with their surroundings. The Makira Protected Area (PA) in northeastern Madagascar reflects this trend towards inclusion: long-term park management incorporates surrounding communities as co-governors. The conservation project associated with the PA aims to reduce community resource use and encourage livelihood activities perceived as sustainable. My research explores the diverse, economic and noneconomic values that local people and conservation practitioners ascribe to land use in the periphery of this protected area. The three communities included in the study varied with respect to ease of access, dominant livelihood strategies, and settlement patterns. Within communities, variation existed due to residents' social status, age, and the length of time in the community. If economics were the most important aspect of community relations with the forest, community members' responses would predominantly reflect economic values and would not vary significantly regardless of community or individual characteristics. Instead, values were found to be highly variable. Through qualitative and quantitative analyses, I show not only what economic framings of collaborative conservation practice overlook, but also make recommendations for policy.

Monday, July 16 Development Of A Novel Detection Method For The Amphibian Killing Fungus

Cypher, Alysha*

Cypher, A.D*. K.J. Hart. M.E. Clay. A.C. Keth, PhD. D.M. Smith, PhD. 2012. Clarion University of Pennsylvania, Clarion, PA 16214. The amphibian killing fungus, Batrachochytrium dendrobatidis (Bd), has been observed to decimate amphibian populations around the world. In the face of this emerging pathogen, amphibian husbandry is now necessary to prevent many species from going extinct. In such facilities, periodic testing must be conducted to make sure captive populations remain free of this pathogen. Currently, testing for this pathogen is conducted using Real Time Polymerase Chain Reaction (RT-PCR), an expensive, timely, and often inaccurate test. With extirpation of many species occurring just months after infection, a faster, less expensive, and more efficient method is crucial for better management of this pathogen. If a monoclonal antibody can be isolated that binds to Bd, then it could be used to create a rapid, inexpensive, and efficient field assay similar to an ELISA (enzyme-linked immunsorbent assay). Potential antibodies have been harvested from the spleen of mice designed to produce immune responses to pathogens like Bd. Fluorescent antibody staining showed that antibodies produced by the mouse were significantly binding to Bd. These antibodies are currently being screened to determine specificity to Bd. If successful this field test could allow amphibian care facilities to test their captive populations more often and better protect them from Bd infection. It would also have application in field research and monitoring of wild populations and could yield results within 2 hours. This field assay would have tremendous conservation and wildlife management applications particularly in tropical regions where amphibian species are extirpated from regions within a matter of months.

Wednesday, July 18 11:20 Participatory Tools For Mapping Human Uses Of The Ocean

D'Iorio, Mimi*, *NOAA MPA Center* , **Hayden, Nicholas**, *NOAA MPA Center* , **Wahle, Charles**

Understanding human uses of the ocean is an essential component of successful coastal and marine spatial planning. In recent years, NOAA's Marine Protected Areas Center has pioneered a participatory mapping process to enable the gathering of ocean uses data through input and expertise of ocean stakeholders and the application of modern geospatial tools. These participatory methods utilize contemporary GIS tools and have been applied in various regions throughout the mainland US and Hawaii to provide important spatial data for marine resource planning and

management. Through facilitated mapping workshops, ocean experts and stakeholders assist in mapping current and emerging use patterns for a wide range of ocean and coastal uses and provide insights on historical trends and potential use conflicts. While the workshops serve primarily as a venue to collect spatial information on use patterns, they also provide a unique opportunity for stakeholders to engage with each other, discuss existing management issues and provide valuable knowledge and community insights that can help improve the planning process. This participatory approach can also increase community confidence in the spatial data used for policy and planning. The data gathered from the workshops are processed and compiled into various forms, both in hard copy and online as maps, spatial data and interactive online tools to serve decision making and resource planning needs.

Wednesday, July 18 9:10 The Challenge Of Conservation In An Era Of Declining Resources And A Changing Public: How Do LCC's Address Our Conservation Mission?

Daley, Jad[*], *The Trust For Public Lands*

The DOI Landscape Conservation Cooperatives are being established at a challenging juncture for conservation. Federal funding for conservation, restoration, private lands stewardship, and public land management is generally flat or declining. State and local funding, which has been a lynchpin in recent decades, is also under pressure from declining budgets and increasing reluctance to pursue local ballot measures. Public attitudes toward conservation remain positive, but polling often shows that conservation is not a top tier issue in driving voter preference for statewide or national elections. Despite these constraints, landscape-scale conservation has thrived in recent years. Historic landscape-scale successes have been achieved in large landscapes like the Northern Sierra, Crown of the Continent, and Northern Forest of New England. At a smaller scale, but of equal importance for ecological protection, landscapes such as New Jersey's Barnegat Bay have seen sweeping conservation. The key to these successes has been leverage. Coordinated conservation planning and goal setting has fed into alignment of federal, state, local, and private funding for on the ground conservation. The Landscape Conservation Cooperatives are very well designed to advance this successful model by promoting collaborative planning, providing new tools and data for landscape-scale assessment, and catalyzing conservation partnerships through networking. This session will examine successful landscape conservation models, and provide examples of how the Landscape Conservation Cooperatives can facilitate these and other similar efforts into the future.

Tuesday, July 17 8:45 Are Caribbean MPAs Making Progress Toward Their Objectives?

Dalton, Tracey[*], *University Of Rhode Island* , **Pollnac, Richard**, *University Of Rhode Island* , **Forrester, Graham**, *University Of Rhode Island*

Marine protected areas (MPAs) have been established around the world to achieve a variety of social and ecological objectives (e.g., conserve fish stocks, protect sensitive habitats, encourage non-extractive uses, promote research). Enhanced understanding of whether or not MPAs are meeting their objectives can improve existing policies, encourage accountability, and justify resource allocation. Few empirical studies have evaluated whether MPAs are meeting their objectives, and most of these focus on individual MPAs, examine only social or ecological objectives (not both), and rely on assessments by management staff. Using social and ecological data from a rapid assessment of thirty-two MPAs and their associated communities in the wider Caribbean, this study investigates whether or not MPAs are making progress toward their stated objectives, and explores how different factors influence this progress. Legislation, implementation documents, and management plans were used to identify stated objectives for

each MPA. Interviews, community surveys, document analysis, and coral surveys were used to assess MPA progress toward these objectives. Findings indicate that some MPAs are making progress while others are not, and a variety of MPA design and governance factors influence this progress. Results can be used to inform on-going efforts to help MPAs meet their social and ecological objectives.

Tuesday, July 17 9:30 Children Recognize Exotic Endangered Species Over Local Endangered Species Even In The Biodiversity Hotspot Of Coastal Southern California

Danoff-Burg, James*, *San Diego Zoo Global* , **Keith, Robin**, *San Diego Zoo Global* , **Lacombe, Corrin**, *San Diego Zoo Global* , **Reinbold, Megan**, *San Diego Zoo Global* , **Young, Samantha**, *San Diego Zoo Institute For Conservation Research*

Engendering support for conservation projects is often focused on educating people about endangered species. However, the majority of conservation messaging is focused on a few large, charismatic exotic species such as polar bears and pandas. While useful, this approach may distance people from the biodiversity in their own backyard. This may be particularly troubling in areas that are biodiversity hotspots, such as the California Floristic Province which contains over 50 IUCN listed species. We characterized the ability of school children in Southern California to name local versus exotic endangered species. When asked to name endangered species generally, almost no children named even a single local endangered species and even when prompted to name a local species, exceptionally few were able to name even one. We also analyzed for gender differences and by socio-economic status. We conclude that this important issue can be best addressed directly by local conservation organizations, and in particular by zoos and nature centers. Knowledge of local species is an essential first step building public support for local conservation projects.

Tuesday, July 17 9:05 Deep Divergence In Predatory Behavior Between Humans And Natural Predators; Insights Into Ecosystem-Based Harvest Management From The Natural World

Darimont, Chris*, *Geography Department, University Of Victoria* , **Fox, Caroline**, *Biology Dep'T. University Of Victoria* , **Reimchen, Thomas**, *Biology Department. University Of Victoria*

Although Ecosystem-Based Harvest Management (EBHM) attempts to prioritize ecological function over maximization of long-term yield, few data have offered empirical guidance to defend or implement this goal. This is because formal comparisons into how fundamental elements of predatory behavior might differ between humans (i.e. hunters and fishers) and other predators have been exceptionally rare. Our objectives were to test the hypotheses that humans: i) select similar individuals within prey populations; and ii) exploit prey at similar rates. Patterns we identified from a review of over a thousand studies in terrestrial, marine and aquatic systems offered support to refute both hypotheses. Specifically, we found that these two groups target fundamentally different age classes within prey populations; modern human predators target primarily larger reproductive age classes, whereas natural predators select primarily the juveniles within populations. Moreover, we found that humans on average exploit prey at considerably higher rates than other predators. This deep divergence in predatory behavior has important ecological, evolutionary and conservation implications. Among them, and should restoration of predator-prey systems be a goal, managers can direct hunters and fishers to mimic the predatory behavior exhibited more broadly in the natural world. Such policy would be consistent with the core philosophical goals of EBHM.

Monday, July 16 Applied Biodiversity Science Hub: Online Platform Connecting Conservation Theory To Practice By Fostering Local-Regional Bridging And Collaboration

Daut, Elizabeth*, *Texas A&M University* , **Gomez-Ruiz, Emma**, *Texas A&M University* , **Hurst, Zach**, *Texas A&M University*

Successful biodiversity conservation requires an efficient and trusted platform to foster effective communication, collaboration, and exchange of knowledge among disparate disciplines and conservation actors. On-line technologies provide the ideal medium. Copious on-line resources link specialized nodes, but fail to bridge the broader conservation community and create a centralized and comprehensive hub. Our objectives were to determine what on-line features are needed for a conservation hub, and the feasibility of creating a pilot resource for the Applied Biodiversity Sciences program, an interdisciplinary graduate program at Texas A&M University with the explicit goal of bridging conservation research and practice. We administered a questionnaire to members to learn key online resources commonly used as part of the program. We identified essential attributes for a centralized on-line resource including: efficient access to information and data, active interdisciplinary exchange, high impact education and leadership development, social networking and a platform for broader impacts. We compared our essential features to existing N. A. conservation and science websites and found that no website contained all key elements, but that many contained some. In conclusion, an on-line resource is needed to link existing conservation websites into a cohesive whole and to provide critical features to facilitate cross-discipline communication, collaboration and knowledge dissemination.

Tuesday, July 17 11:45 Ecological Roles And Conservation Challenges Of Burrowing Mammals In The World's Grasslands

Davidson, Ana* , **Detling, James** , **Brown, James**, *Department Of Biology, University Of New Mexico*

The world's grasslands are shaped in part by a key functional group of social, burrowing, herbivorous mammals. Examples include prairie dogs of North America (NA) (Cynomys spp.), ground squirrels (Sciuridae spp.) of NA, Eurasia, and Africa, and marmots (Marmota spp.) of NA and Eurasia, plains vizcachas (Lagostomus maximus), Patagonian maras (Dolichotis patagonum) and degus (Octodon degus) of South America, pikas (Ochotona spp.) of Asia, ice rats (Otomys sloggetti) and springhares (Pedetes capensis) of Africa, and burrowing bettongs (Bettongia lesueur) and southern hairy-nosed wombats (Lasiorhinus latifrons) of Australia. Through herbivory and ecosystem engineering they create unique and important habitat for many species, thereby increasing biodiversity and habitat heterogeneity across the landscape. They also help maintain the presence of grasslands and are key prey for many species. Yet, these burrowing mammals are facing myriad threats, which have resulted in dramatic declines in populations of the best-studied species and cascading declines in dependent species and grassland habitat. To prevent such declines, grasslands need to be managed to enable the co-existence of burrowing mammals with human activities. Here, we highlight the important and often under-recognized ecological roles of these burrowing mammals, their threats, and future directions needed for conservation and management.

Monday, July 16 Increasing The Number Of Women Academics In Conservation Biology: Lessons Learned From NSF ADVANCE At Iowa State University

Debinski, Diane*, *Iowa State University* , **Bowen, Bonnie**, *Iowa State University*

Conservation biology, like many fields of science and math, still has fewer women than men in most academic programs, especially at the highest ranks. In a recent survey of tropical biologists, the percentage of full professors was higher for men than for women in all age groups. Many

conservation biologists have the added challenge of balancing family and career in the context of field research, which can involve extensive travel. The National Science Foundation's ADVANCE Institutional Transformation program is designed to catalyze efforts to improve the recruitment, retention, and advancement of women faculty in science, technology, engineering and mathematics (STEM). At Iowa State University, the ISU ADVANCE Program has enhanced awareness of the role that departmental climate can have on faculty success. Departments have changed the time of departmental events to accommodate child care and school schedules; increased transparency in assignment of teaching responsibilities; and changed governance documents to clarify protocols for advancement to full professor. At the college and university levels, we have sponsored workshops to discuss best practices in recruitment, retention, and advancement. Since the program began in 2006, the number of women full professors, the number of women department chairs, and the number of women administrators have increased.

Tuesday, July 17 11:05 Foraging Ecology Of The Appalachian Coyote (Canis latrans) Using Stable Isotope Analyses: Implications For Effective Conservation And Management Plans

Dehart, Pieter[*], *Virginia Military Institute*

The coyote (Canis latrans) has increased in population throughout the east coast of North America, especially in the recent decade. As a consequence of this range expansion, human-coyote interactions have increased, directly through preying on livestock and indirectly through resource competition with local hunters (primarily deer). Effective management of these interactions has been hampered by a significant lack of knowledge of the basic foraging ecology of the coyote. To investigate the specific trophic role of the coyote in this ecosystem, we examined the carbon and nitrogen isotopic signature from the hairs of wild coyotes and potential prey (livestock, domesticated pets, and wild mammals) throughout Appalachia in forest, agricultural, and urban habitats. We found that, in forest and urban habitats, coyotes displayed significantly enriched mean ?15N (~8.5‰) and ?13C (~-22.5‰), consistent with a diet composed primarily of small wild mammals, while agricultural regions yielded dietary signatures reflective of opportunistically-obtained livestock. This new evidence suggests that while some coyotes may be occasionally utilizing select livestock as primary prey, they display greater foraging dependence on available wild species, particularly smaller prey in forested habitats. This finding suggests that this coyote predation strategy be considered in both effective management plans and in conservation plans for the natural recovery of both endangered competitors and prey.

Monday, July 16 4:00 Foundation And Application Of Water Management Frameworks To Restore Summer Streamflow In Coastal California Watersheds

Deitch, Matthew[*], *Center For Ecosystem Management And Restoration*

Concern over the negative effects of human water demand on aquatic ecosystems has made water management a critical issue in coastal California. Native species such as steelhead trout and coho salmon have declined substantially in recent decades, alongside increasing human demand for water during the summer dry season. While hydrologic data help to illustrate how and the extent to which humans may adversely affect streamflow, they also help to indicate the means through which water management challenges in coastal California can be met with thoughtful planning. Analyses show that, in many coastal watersheds, there is sufficient water to meet environmental needs as well as needs for farmers and domestic water users. However, many technical and legal challenges arise in efforts to sustainably manage water resources in this region. In addition to describing the rationale for the

capability to balance human and ecosystem water needs, I also describe two programs currently operating in coastal California that seek to help farmers and domestic water users obtain water at times to minimize ecological impacts, and in doing so, restore streamflow in summer months for juvenile steelhead trout and coho salmon: the California Coastal Stewardship Project and the Russian River Coho Partnership.

Monday, July 16 Diversity Of Arbuscular Mycorrhizal Fungi In Native Prairie, Agricultural And Prairie Restoration Sites In Northwestern Minnesota

Del Vecchio, Kristi[*], *Concordia College Biology Department* , **Hartmann, Eliza**, *Concordia College Biology Department* , **Nelson, Philip**, *Concordia College Biology Department* , **Aldrich-Wolfe, Laura**, *Concordia College Biology Department*

Predicting the capacity for different land uses to maintain diversity of belowground organisms requires an understanding of how changes in land use affect these belowground communities. Few studies have been conducted to examine how conversion of prairie to agriculture alters the community of arbuscular mycorrhizal (AM) fungi, despite the importance of these fungi for plant host establishment, and even fewer studies have documented how this community changes in response to prairie restoration. To gain an understanding of the differences in AM fungal community across land uses, we have initiated a long-term study comparing community composition of AM fungi in native prairie, current and abandoned agricultural sites, and recently restored prairie in northwestern Minnesota. In addition to differing in plant composition and diversity, these sites also show considerable variation in nutrient availability and prevalence of grass species. Results of our first season sampling soil nutrient availability and species richness of plants and AM fungal spores suggest that sites with an agricultural legacy exhibit reduced richness of AM fungal spores relative to native prairie. We found that AM fungal spore richness was positively correlated with grass species richness and negatively correlated with available phosphorus. Based on this year's work, we predict that sites with the greatest species diversity of native grasses and lowest phosphorus availability should support the highest richness of AM fungi. The relatively high concentrations of phosphorus and low diversity of native grasses in many prairie restorations may limit their ability to maintain diverse AM fungal communities.

Monday, July 16 Re-Introduction Of Red-Legged Frogs (Rana draytonii) To Historical Locations In Southern California

Delaney, Kathleen[*] , **Riley, Seth**

Historical data suggests that red-legged frogs were in all of the major streams throughout Santa Monica Mountains National Recreation Area (SMMNRA) near Los Angeles, CA. Today there is only one population of red-legged frogs within the park boundary. This population is the southernmost population in the United States, with 50 adults that successfully reproduce annually. Red-legged frogs in SMMNRA are genetically distinct from other populations in Ventura and Los Angeles Counties, therefore it will be important to populate streams with local individuals - half egg masses or tadpoles - to maintain genetic uniqueness. We have developed habitat suitability protocols that are specific to southern California red-legged frogs, and have conducted focused surveys in the Santa Monica Mountains for suitable habitat to re-introduce red-legged frogs. We will present preliminary results of the habitat suitability surveys and discuss our proposed methods for re-introduction. The population of red-legged frogs in SMMNRA is critically small and isolated, and there is great concern about its long-term persistence. A population of successfully breeding adults in additional streams will instantly result in a population size increase for Santa Monica Mountain red-legged frogs.

Monday, July 16 3:40 Rapid Assessment Of The Yale Framework And Adaptation Blueprint For The Pacific Coastal Rainforest

DellaSala, Dominick*, *Geos Institute* , **von Wehrden, Henrik**, *Leuphana University, Centre For Methods, Institute Of Ecology* , **Koopman, Marni**, *Geos Institute* , **Brandt, Patric**, *Leuphana University Lüneburg, Centre For Methods, Institute Of Ecology* , **Leonard, Jessica**, *Geos Institute* , **Goldstein, Michael**, *Alaska Coastal Rainforest Center* , **Dillman, Karen**, *Us Forest Service, Tongass National Forest* , **Jovan, Sarah**, *Forest Inventory And Analysis Program USDA Forest Service*

The Yale Framework is a collaborative project of nationally recognized scientists and policy experts intended to provide application tools for "climate-smart" assessments. We applied elements of the framework to Pacific Coastal rainforests because this region contains 35% of world's temperate rainforests, northern locales will experience rapid increases in temperature, and the project involves broad collaboration among researchers and managers. We developed a blueprint for adaptation using framework elements by: (1) comparing baseline to future climate scenarios; (2) identifying key processes and species distributions likely to shift in response to climate change; and (3) identifying relatively stable climatic areas that might function as refugia. We used the framework's emphasis on levels of biological organization stepping down from region to rainforest zones to landscape elements to focal species (conifers, epiphytic lichens, spotted owl, deer) to microsite. We mapped current rainforest assemblages using Maxent models and regional climate datasets, comparing them to future potential distributions using downscaled models. We located potential microrefugia expected to retain the same dominant vegetation through late-century based on multiple-model agreement (Hadley, CISRO, MIROC) in an MC1 functional vegetation model. Then we compared our results to reserve designs to determine robustness of conservation strategies in the face of climate change and increasing land uses.

Monday, July 16 The Population Genetics Of An Important Invasive Species In The Prairies Of The Great Plains; Kentucky Bluegrass (Poa pratensis)

Dennhardt, Lauren*, *NDSU* , **Travers, Steven**

Kentucky bluegrass (Poa pratensis) is an invasive species from Eurasia introduced during early European settlement of North America. Kentucky bluegrass (KBG) has been studied extensively as an economic crop, but has had little attention from the ecological community despite its destructive potential as an invasive species. Recent studies indicate that KBG is aggressively invading and altering the character of prairie communities in North Dakota. In order to conserve plant biodiversity loss due to invasion, a greater understanding behind the mechanisms of invasion is necessary. A few reviews have begun to describe plant introduction and naturalization, but more genetic data from a variety of invasive events is needed to broaden our knowledge. While most invasive species have low genetic diversity and a limited number of introduction events, KBG may be an exception to this trend which could further complicate management. We are studying the genetic diversity and ploidy of these populations using 15 microsatellite markers with the goals of elucidating 1) the evolutionary history of its invasion, 2) its diversity compared to other invasive species, and 3) its population structure in native tallgrass prairie communities. Our results have implications for management and policy decisions regarding native prairie and may provide a tool for understanding and controlling this species.

Monday, July 16 Response Of Large Mammalian Predators To Riparian Corridor Restoration In The Sacramento River National Wildlife Refuge

Derugin, Vasilissa* , **Lebuhn, Gretchen**, *San Francisco State University* , **Silveira, Joseph** , **Connor, Edward**, *San Francisco State University* , **Golet, Gregory**, *The Nature Conservancy*

Growing awareness of the ecological implications of habitat fragmentation has sparked efforts to restore connectivity between isolated habitat

patches. For this purpose, habitat conservation initiatives increasingly focus on the restoration of "corridors," parcels of land that promote the connectivity necessary for organisms' movement. Most studies of organisms' responses to corridor restoration focus on species at the lower trophic levels. Top predators (often, keystone species) have received less attention. Riparian corridor restoration in the Sacramento River National Wildlife Refuge provides an opportune setting to investigate the use of corridors by large mammalian predators. In Colusa, Glenn, and Tehama Counties, we are investigating mammalian predator use of 17 riparian corridor units that vary in age since restoration. The effects of habitat patch size are also being assessed. We use remote cameras to collect data on predator species richness and detection frequency. We hypothesize that predator species richness and detection frequency will be higher in larger habitat patches, and that they will be positively correlated with restoration age. Preliminary data analysis suggests that restoration age, indeed, may affect predator species richness. Our study will help guide restoration strategies by indicating how time and landscape context affect predators' return to restored locations.

Monday, July 16 4:00 Monitoring Coastal And Marine Resources Of National Parks In The Face Of Climate Change

Dethloff, Gail[*], *NPCA*

National parks, as protected areas, can be a tool of climate change adaptation. NPCA included climate change metrics in natural resource assessments at 60 parks over the past decade, including 22 coastal and marine parks. Insufficient data on climate change impacts were reported for three of these 22 parks. However, the majority of the parks with information were reporting relatively generic future impacts (rising sea level, increased precipitation, rising temperatures) based on model predictions rather than data collected as part of a monitoring program. Also during the past decade, the National Park Service (NPS) Inventory and Monitoring (I&M) Program began establishing long-term monitoring protocols in parks around selected natural resource indicators, or 'vital signs'. The selection of these indicators was based on conceptual models that identified key agents of change. Climate change was not considered a driver in all parks, and selected indicators for which monitoring protocols were built reflect this. For monitoring to fill the gap and provide needed empirical data on climate change impacts in the 84 coastal and ocean parks in the US national park system, NPS needs to enhance its monitoring programs to gather baseline information and explicitly address climate change in monitoring and management decisions.

Tuesday, July 17 12:00 Regional-Scale Models Of Non-Native Plant Phenology And Invasion To Support Conservation On Military And Adjacent Lands In The Sonoran Desert

Dickson, Brett[*], *Nau/Conservation Science Partners* , **Olsson, Aaryn**, *Northern Arizona University* , **Wang, Ophelia**, *Northern Arizona Unviersity* , **Sesnie, Steven**, *US Fish And Wildlife Service* , **Zachmann, Luke**, *Northern Arizona Unviersity* , **Bradley, Bethany**, *University Of Massachusetts* , **Rundall, Jill** , **Sisk, Thomas**, *Northern Arizona University*

In the Sonoran Desert of the southwestern U.S., interactions between plant invasion and increases in fire frequency and magnitude are a growing concern on DoD and neighboring lands, particularly in the face of ongoing climate change. Our research seeks to integrate empirically based models of non-native plant invasion with landscape models of fire risk and sensitive wildlife habitat in a decision-support package that informs management and conservation of native communities across 103,000 km2 of southern Arizona. Here we present modeling results for two of five target non-native invasive plants, Sahara mustard (SM) and Mediterranean grass (MG). We established 239 field plots and detected SM and MG at 103 and 135

plots, respectively. We acquired 12 years of satellite imagery and used trajectory-based time series analyses to derive multiple phenometrics and spatially weighted ensemble models to predict species-specific occurrence at local and regional scales . SM was more detectable than MG (Cohen's Kappa >0.6 and <0.4, respectively) suggesting priority effects and mapping potential are greatest for SM. Variable importance differed by species locally and regionally, although results for each species indicated that multispectral indices can complement other phenometrics in mapping invasive species. Our results suggest that a remote sensing and phenology-based statistical modeling approach can aid in predicting invasive plant distributions across extensive and heterogeneous areas.

Monday, July 16 9:15 "Survey Says?" There's A Gap Between The Science And Practice Of Climate Change Adaptation.

Doran, Patrick[*], *The Nature Conservancy* , **Petersen, Brian**, *Michigan State University, Kellogg Biological Station* , **Hall, Kimberly**, *The Nature Conservancy* , **Kahl, Katherine**, *The Nature Conservancy*

A brief review of the literature would seem to indicate that we are well on our way to adapting to climate change – we know the climate science, the impacts to our ecosystems and the strategies to abate those impacts. But to what degree is this true? Here we report results from an on-line survey of over 500 natural resource managers in North America's Great Lakes region designed to assess their perceptions on climate change and adaptation. Results conclusively show that climate change adaptation is not well understood and that many managers cannot distinguish between adaptation and mitigation. Despite this, over 80% say that climate impacts affect their work and over 60% discuss climate impacts regularly. And perhaps most importantly, while over 75% of respondents are taking climate change impacts into consideration in their current or future work, only 20% feel they have the necessary tools and knowledge to address climate change impacts. These results show that despite a scientific consensus that suggests climate change is happening and that we should implement adaptation actions accordingly, natural resource managers remain uncertain about what adaptation means and which actions represent appropriate adaptation actions.

Wednesday, July 18 11:45 Prioritizing Agricultural Conservation Practice Locations For Maximum Watershed Improvement

Doran, Patrick[*], *The Nature Conservancy* , **Legge, John**, *The Nature Conservancy* , **Herbert, Matthew**, *The Nature Conservancy* , **Asher, Jeremian**, *Michigan State University Institute Of Water Research* , **O'Neil, Glenn**, *Michigan State University Institute Of Water Research* , **Mysorekar, Sagar**, *The Nature Conservancy* , **Sowa, Scott**, *The Nature Conservancy* , **Hall, Kimberly**, *The Nature Conservancy*

Like many ecologically-significant rivers Midwestern U.S, Michigan's Paw Paw River is heavily impacted by agriculture via reduced infiltration/groundwater recharge and high sediment loads. Implementing cost-effective conservation practices to abate these impacts is difficult because we rarely know where practices will be most effective or the potential benefits of implementing a given practice. To address these gaps, we identify and prioritize the most effective locations for investing in conservation practices. Additionally, we estimate the anticipated change in groundwater recharge attributable to implementation of various practices. Finally, we test the usefulness of our approach using four scenarios for implementation of six conservation practices. Estimates of groundwater recharge under these scenarios were compared to recharge under simulated "historic" placement scenarios based on data for applied conservation practices in the same watershed. Collectively across the six practices, the prioritized scenarios provide an

increase in groundwater recharge of between 23% and 36% over the historic scenario. Results for sediment reduction were more variable, but prioritized scenarios suggest a doubling of benefit can be obtained by focusing on agricultural lands predicted to contribute the highest sediment volumes. Prioritized areas and the groundwater recharge tool are now informing implementation of conservation practices in the Paw Paw River watershed.

Wednesday, July 18 4:30 When Conservation Doesn't Wait For Politics: Implementing The Draft Solano Habitat Conservation Plan

Doubledee, Rebecca[*], *LSA Associates* , **Foreman, Steve**, *LSA Associates*

Habitat Conservation Plans (HCPs) are authorized by Congress under section 10(a) of the Federal Endangered Species Act. This section allows issuance of incidental take permits upon approval of a conservation plan developed by permit applicants. Development of a multi-species HCP is a complex and time consuming process. Six multi-species HCPs in Northern California have been stuck in the planning phase for many years. The Solano HCP is a large complex plan (14 applicants and 37 species) that was initiated in 1999. A large factor creating delays is lack of commitment and limited staff resources from the plan applicants (mostly local government agencies) and staff turnover at the Federal and State Wildlife Agencies. The first draft Solano HCP was released in 2002. Subsequent drafts were released in 2005, 2007 and 2009. Since 2002, local, State, and Federal Agencies have used the draft conservation measures to develop mitigation for individual development projects, incorporated the draft conservation strategy into general plan updates and used the draft reserve design to establish mitigation banks. Approximately 4,500 acres of vernal pool and coastal marsh habitat has been preserved or is in the process of being preserved within the HCP plan area. The key to implementing the draft Solano HCP is a conservation strategy based on the best available science and a unique implementation structure. The Solano HCP is proof that conservation can move forward despite government gridlock.

Monday, July 16 Analysis Of San Francisco Bay Environmental Conditions As They Relate To Organismal Abundance

Dournaee, Mary[*], *SFSU Romberg Tiburon Center For Environmental Studies & UIS Computer Science Department* , **Garfield, Toby**, *Romberg Tiburon Center And Sfsu Department Of Geosciences* , **Cohen, Sarah**, *Romberg Tiburon Center And Sfsu Department Of Biology*

The purpose of this study is to analyze trends in environmental conditions around the San Francisco Bay and to determine whether these environmental factors have significant impact on organismal growth. Since many invasive species have entered the bay, learning which environmental conditions are unfavorable for these species could aid in conservation efforts. This study analyzes temperature, salinity, and ocean current data for six field sites at different locations in the central area of the San Francisco Bay over the month of July, 2010. This environmental data is then compared to organismal growth on recruitment devices consisting of two 6”x12” PVC plates and one mesh wrap with two Tuffy kitchen scrub pads enclosed at each field site. Settled organisms include native and invasive crustaceans, bryozoans, polychaetes, nudibranchs, and tunicates. Protected field sites on the east side of SF Bay that experienced maximum currents between 20-30 cm/s and average temperatures of 18.2-18.4 °C demonstrated the most overall organismal growth. Regarding the relationship between salinity variation and organismal growth, further study addressing tidal considerations is necessary.

Wednesday, July 18 9:00 Shad In The Classroom: Connecting Students And Teachers To American Shad Restoration

Dowland, Melissa*, *NC Museum Of Natural Sciences*

Melissa Dowland, North Carolina Museum of Natural Sciences, Raleigh, NC, melissa.dowland@ncdenr.gov The natural world stimulates student and teacher curiosity in unique ways and helps generate an understanding of conservation. For over 30 years, the North Carolina Museum of Natural Sciences has provided hands-on, experiential programs to connect students, teachers, and the public with the natural environment. Since 2009-10, the Museum has spear-headed the Shad in the Classroom program in conjunction with the US Fish & Wildlife Service and the NC Wildlife Resources Commission. The main focus is the raising of American Shad from eggs to releasable fry in classrooms, ideally culminating in a field trip to release the fry in local rivers. The program targets grades 5 through 12 where students are the caretakers of their 'shad babies' – monitoring water quality, observing behavior and growth, and participating in classroom activities to increase their understanding of American Shad and river ecology. Additional aspects of the program extend beyond the classroom walls. Teachers in the program are required to attend a training session where they receive all necessary materials, hear from experts on American Shad biology and management, and build connections with other participants. Grant funds are available to provide support for student field trips to release fry in their natal rivers, providing students and teachers with concrete connections between 'their' fish and the river basin. Most teachers participate in an overnight canoe-camping experience on the Roanoke River and explore the bottomland hardwood forest ecosystem, traditional American Shad spawning habitat. Through this combination of experiences, students and teachers make connections between a historically important anadromous fish species and North Carolina's river basins, participate in an ongoing restoration project, and are exposed to careers in conservation and biology.

Tuesday, July 17 11:45 Where The Whales Are: Using Habitat Modeling To Inform Marine Spatial Planning In Cordell Bank And Gulf Of The Farallones National Marine Sanctuary

Dransfield, Andrea*, *San Francisco State University* , **Hines, Ellen** , **Jahncke, Jaime**

The extent to which humpback whales (Megaptera novaeangliae) select distinct habitats in the North Pacific has not yet been determined and should be considered a top priority in the context of marine spatial planning to ensure minimum conflict between human uses and wildlife conservation. The purpose of this study was to identify predictable locations of humpback whale aggregations within sanctuary waters in central California. We used data collected during Applied California Current Ecosystem Studies (ACCESS) cruises conducted by PRBO Conservation Science, Cordell Bank and Gulf of the Farallones National Marine Sanctuaries from 2004 to 2010. We estimated whale encounter rates at 3-km bin intervals. We overlaid whale distributions on prey (krill), hydrography (CTD) and bathymetry (depth) layers using a Geographic Information System to extract covariate data at appropriate time and spatial scales. We used statistical model techniques to determine habitat associations and to develop predictive models to identify preferred whale habitats. We found that humpback whales select particular locations for use, and that these habitats change depending on ocean conditions. Our results highlight the potential use that spatial analysis on marine wildlife may have to inform marine spatial planning and ensure the conservation of important threatened species.

Wednesday, July 18 11:30 Measuring Management: Using Qualitative And Quantitative Tools To Optimize Shorebird Habitat At Cabo Rojo Wildlife Refuge, Puerto Rico

Drew, Ashton*, *North Carolina State University* , **Alexander, Louise**, *NC State University*

The Cabo Rojo National Wildlife Refuge, located on the southwest coast of Puerto Rico, supports a salt flats ecosystem considered one of the most important stopover habitats in the Caribbean. Refuge managers wish to actively manage the hydrology of the salt flats in order to maximize accessible (depth), quality (salinity) habitat for foraging shorebirds. To help the refuge achieve this goal, we used the Open Standards for the Practice of Conservation, a qualitative framework rooted in adaptive management, to guide expert elicitations during two workshops to identify specific conservation targets, threats to those targets, and management strategies to alleviate threats. We also defined explicit links between planned management activities and expected outcomes as well as indicators to measure the effectiveness of those strategies. Using a statistical software program called Elicitator, we quantified expert knowledge about expected ecological responses to management strategies and incorporated that information within statistical models providing assessments of how migratory shorebirds respond to variable conditions at Cabo Rojo. These methods allow for a transparent process and follow adaptive management principles. We discuss the advantages of our approach in light of the refuge's goals and share how these tools inform the decision process.

Monday, July 16 12:45 Hierarchical Landscape Models For Endemic Unionid Mussels: Building Strategic Habitat Conservation Tools For Mussel Recovery

Drew, Ashton*, *North Carolina State University* , **Kwak, Tom**, *USGS NC Cooperative Fish And Wildlife Research Unit* , **Cope, Greg** , **Augspurger, Tom**, *USFWS Raleigh Field Office*

The Southeastern US supports high diversity of freshwater mussels; however, many of these species are in decline due to land use change, conflicting water resource demands, pollution, and other factors. Furthermore, changing temperature and precipitation patterns attributed to climate change are altering the aquatic landscape such that habitat suitable in the present may not be suitable in the future. We are developing a model to support USFWS mussel population recovery and habitat management efforts within an adaptive management framework. The model characterizes stream reach habitat suitability and probability of occupancy in a manner that supports prioritizing among the following decisions: do nothing, protect an existing population, restore habitat, translocate individuals, or release captive bred individuals. We use conservation planning and statistical modeling tools, including the Open Standards for the Practice of Conservation, Elicitator, and Bayesian belief networks to move from modeling qualitative information to modeling quantitative information. Ongoing mussel occupancy sampling efforts enables model validation and updating. We will present model construction and validation methods, which include several cycles of knowledge elicitation, model development, and model review. In addition, we will highlight how this pilot project has been designed to facilitate support of conservation decisions for other Southeastern freshwater taxa.

Monday, July 16 A Structured Approach To Designing Protection Areas For The Antillean Manatee In Puerto Rico.

Drew, Ashton*, *North Carolina State University* , **Alexander, Louise**, *NC State University*

Antillean manatees (Trichechus manatus manatus) occurring in Puerto Rico are listed as an endangered species. Although little was known about the Puerto Rican manatee when listed in 1986, the US Fish and Wildlife Service and the Puerto Rico Department of Natural and Environmental Resources have implemented various recovery activities focused on

environmental education-regulatory efforts, habitat mapping, and monitoring. These efforts have provided important new data and insights regarding the manatee population. The U.S. Fish and Wildlife Service wished to capture this information in an updated recovery plan and in the design of manatee protected areas. We used the Open Standards for the Practice of Conservation, a qualitative framework rooted in adaptive management, to elicit expert knowledge to identify conservation objectives, key habitat characteristics, develop an understanding of project context, and formally state hypotheses of how protected areas and conservation strategies will reduce threats. We found these methods well suited for organizing diverse knowledge resources into a coherent management vision with associated actions and helpful in the development of consistent and transparent processes to capture available knowledge, identify uncertainties, and facilitate the learning process central to adaptive management. We discuss the advantages of this method in light of agency objectives and remaining knowledge gaps regarding the species and causes of its decline.

Monday, July 16 Vertebrate Biodiversity In Agricultural Landscapes: Predicting Impacts Of Alternative Row Crop Production Strategies

Drew, Ashton[*], *North Carolina State University* , **Alexander, Louise**, *NC State University* , **Collazo, Jaime**, *USGS NC Cooperative Fish And Wildlife Research Unit*

Many vertebrate species inhabit agricultural landscapes, but increasing demand for food, fiber, and biofuel threatens these communities. To better understand and communicate the sustainability of alternative agricultural practices, we piloted a tool to inform commercial row crop producers (corn, cotton, wheat, and soy) of the relative expected impacts of their operational decisions on terrestrial vertebrate biodiversity. Our models locally fine-tune landscape-scale predictions of species presence (from Southeastern Gap Analysis Program [GAP] data) based on how individual producers manage their agricultural lands. Through a series of workshop and individual elicitations, regional producers and wildlife biologists identified (1) operational decisions (e.g. tillage, pest management, or field border management practices) at the field and field border level that could impact wildlife, (2) the probability of positive, negative, or neutral impacts to vertebrate shelter and forage resources under alternative decisions, and (3) the primary forage and shelter resources of each GAP species. Species impacts are modeled as an indirect response to changes in the probability of provisioning preferred resources. The final biodiversity score is reported both as total richness and as a relative index reflecting the proportion of species positively, negatively, or neutrally impacted. Producers can compare impacts of similar actions in different fields or alternative actions in a single field.

Monday, July 16 Landscape-Level Associations Among Waterbird Diversity And Characteristics Of Seasonal Winter Wetlands In A Large Conservation Hotspot

Dronova, Iryna[*], *University Of California Berkeley*

Poyang Lake, the largest freshwater lake-wetland system in PR China located in the middle Yangtze River basin, provides critical habitat for large numbers of wintering waterbirds from the East Asian Flyway. Hydrological regulations, uncertain climate effects and residential development impose serious threats to this ecological environment. While several research efforts address spatio-temporal patterns of habitat selection by individual species in this area, general relationships among waterbird diversity and seasonal wetland characteristics driven by annual flood cycle are not well understood. Limited field access and large wetland size create challenges for in situ surveys and suggest the need for cost-effective geospatial indicators of landscape –level diversity variation. Using Poyang Lake waterbird survey data from Dec 2006 and a matching remote

sensing image (Landsat TM, 30m pixel) we constructed generalized linear models to examine the statistical relationships among several avian diversity indices and land cover characteristics of the neighborhoods around small permanent winter sub-lakes within the matrix of seasonal marshland. Multiple candidate predictor variables including area, shape and spectral characteristics of the dominant land cover types were extracted from the satellite image via object-based image analysis (OBIA). From the pool of >100 tested variables, several features were consistently significantly associated with both species-based and guild-based diversity indices. Our results provide insight into the relative importance of remotely sensed indicators in explaining landscape-level diversity patterns that could be tested further following more comprehensive waterbird censuses.

Monday, July 16 3:30 Identifying And Incorporating Climate Change Indicators Into A National Marine Sanctuary Monitoring Plan
Duncan, Benet*, *NOAA Gulf Of The Farallones National Marine Sanctuary* , **Higgason, Kelley**, *Gulf Of The Farallones National Marine Sanctuary* , **Suchanek, Tom** , **Stachowicz, Jay**, *University Of California, Davis* , **Cayan, Dan**, *Scripps Institution Of Oceanography/USGS*
Impacts of global climate change have been observed on a regional scale along the north-central California coast. To better monitor and address these impacts, work is underway at the Gulf of the Farallones National Marine Sanctuary (GFNMS) to identify environmental and biological/ecological climate change indicators for the region stretching from Bodega Head south to Año Nuevo. Climate change indicators are measurable variables that can be used to determine the presence and impacts of climate change in a region. Indicators are selected following a rigorous process that incorporates an extensive literature review, workshops with regional experts, numerical modeling, and data analysis. In future stages of the project, the final set of climate change indicators will be incorporated into a comprehensive monitoring plan for the GFNMS with significant input from a regional working group of scientific experts. This first of its kind effort within the National Marine Sanctuary system will utilize a science-based approach to determine how to most effectively track climate-induced changes in the study region over time, and to allow for impacts to be more quickly and successfully identified and mitigated.

Wednesday, July 18 9:45 Open-Ocean Marine Conservation Policy Processes: The Alphabet In The Pelagic Soup
Dunn, Daniel*, *Duke University* , **Halpin, Pat**
CBD EBSAs, FAO VMEs, IMO PSSAs, ISA APEIs, UNESCO WHSs, RFMOs, CMS, COPs and SBSTTAs, EEZs and ABNJ, DOALOS, UNICPOLOS and the BBNJ working group… oh, oh, and don't forget your UNGA "Regular Process"! The alphabet soup of international policy processes related to pelagic conservation in the open ocean is a confusing stew of competencies and borderless boundaries. However, if we are to make greater progress in conserving the open ocean, this is a meal we must eat. While areas beyond national jurisdiction make up 64% of the ocean, only 1.1% of that area is under some level of protection (compared to 7.2% of territorial seas). To even begin to attempt to reach the 10-30% targets for protection adopted by a variety of conventions, organizations and governments, we need to understand the international policy processes affecting the open-ocean and make our research more accessible and relevant to those policy makers. Here we present the international policy context for pelagic conservation and work being done by the Global Ocean Biodiversity Initiative (GOBI) to inform those processes. In particular, we will highlight opportunities presented by ongoing intergovernmental workshops convened by the Secretariat to the Convention on Biological Diversity to identify Ecologically or Biologically

Significant Areas in need of protection, and recent academic workshops on related topics.

Tuesday, July 17 3:00 Beavers Link Tree Heterozygosity To Arthropod Community Diversity

Durben, Rachel* , **Walker, Faith**, *Northern Arizona University* , **Shuster, Stephen**, *Northern Arizona University* , **Whitham, Thomas**, *Northern Arizona University*

We examined the hypothesis that tree genetic diversity and arthropod community diversity will covary when revealed by beaver herbivory. Although genetic diversity within stands of trees is known to have community-level consequences, it is unknown whether such effects are present at an even finer scale, i.e. whether genetic variation of individual trees impacts associated communities. Our study contrasted arthropod community diversity and microsatellite marker-derived measures of genetic diversity (individual multilocus heterozygosity) of cottonwood (Populus fremontii) trees that had been felled by beavers and were resprouting, relative to adjacent standing, unfelled trees. Three patterns emerged. 1. Arthropod community diversity was significantly positively correlated with the heterozygosity of felled trees, but not of unfelled trees. 2. This result was not due to population substructure, genetic relatedness of the trees, or hybridization. 3. The underlying mechanism appears to be greater tree productivity with increasing heterozygosity. We suggest that high stress to trees as a consequence of felling drives the heterozygosity-productivity correlation, which is attractive to arthropods. This result links the genetic diversity of individual trees to community diversity, supporting the hypothesis that interactions among foundation species do have community-level effects. Our work suggests that foundation species' genetic diversity may benefit dependent communities in non-obvious ways, providing additional incentives for promotion and conservation of genetic diversity in management and restoration efforts.

Monday, July 16 4:30 Levee Setback Assessment Of The Lower Santa Clara River, Ventura County, California: Implications For Flood Risk Management And Ecological Benefit

Dusterhoff, Scott*, *Stillwater Sciences* , **Campbell, Chris**, *cbec, Inc.* , **Brand, Peter**

Over the past 60 years, a network of levees has been constructed along the lower Santa Clara River in Ventura County, CA. The network includes both public and private levees designed to protect portions of the natural floodplain from inundation and erosion during commonly occurring flood events. By constraining floodwaters locally and preventing floodplain inundation, the levees act to increase flooding potential downstream and can have a negative impact on channel and floodplain geomorphic and ecological processes. In an effort to understand benefits associated with setting back levees, a hydrodynamic model was developed for the California Coastal Conservancy that examines the impact of targeted levee setbacks on flow hydraulics and floodplain inundation during high flow conditions. The modeling analysis included examining levee setback on selected floodplain parcels under current flood flows and potential future flows that account for expected climate change effects. The modeling showed: 1) the effects of setting back levees on local hydraulics were localized primarily due to limited floodplain storage capacity and downstream hydraulic controls; and 2) that setting back levees on the largest floodplain parcels with the lowest average ground elevation had the greatest benefit. Moving forward, the model can be used as a management tool to assess the flood risk management and geomorphic/ecological benefits associated with other proposed channel/floodplain modifications.

Tuesday, July 17 12:15 Effects Of Weather On Juvenile Survival Vary By Stage: A Test Of The Parental Care Hypothesis

Dybala, Kristen* , **Gardali, Thomas**, *PRBO Conservation Science* , **Eadie, John M.**, *University Of California, Davis*

Variation in juvenile survival can have significant impacts on population growth rates, so understanding the population-level effects of environmental change requires understanding the effects on juvenile survival. However, the sensitivity of juvenile survival to environmental conditions may change as juveniles grow and develop. Although the youngest juveniles appear quite vulnerable to variation in environmental conditions, parental care may buffer their survival from these effects, while newly-independent juveniles often lack the skills to cope with poor conditions and may actually be more sensitive to environmental conditions. We tested this parental care hypothesis by examining the effects of prior winter weather (related to food availability), density, fledge date, and body mass on the survival of dependent and independent juvenile Song Sparrows (Melospiza melodia) between 1980 and 2010. Weather had the strongest effect on survival, accounting for 56% of the annual variation in survival around an overall declining trend, yet only affected the survival of independent juveniles. These results support the hypothesis that parental care can buffer the survival of dependent fledglings from annual variation in environmental conditions, and that the survival of independent juveniles is a major driver of annual variation in juvenile survival.

Tuesday, July 17 9:15 Ocean Conditions And The Diet Of Brandt's Cormorant (Phalacrocorax penicillatus) At Southeast Farallon Island

Elliott, Meredith L.*, *PRBO Conservation Science* , **Acosta, Sara**, *PRBO Conservation Science* , **Schmidt, Annie**, *University Of California, Davis* , **Bradley, Russell**, *PRBO Conservation Science* , **Warzybok, Pete**, *PRBO Conservation Science* , **Jahncke, Jaime**

Southeast Farallon Island in Central California hosts one of the largest colonies of Brandt's cormorants (Phalacrocorax penicillatus) on the west coast of North America. Reproductive success of this colony has varied through time, with low productivity years associated with poor ocean condition years (e.g., El Niño events). However, recent years of cold, productive ocean conditions have not resulted in improved productivity for the cormorants. Since 2008, a productive ocean year, this species has experienced anomalously low productivity. We analyzed diet information of Brandt's cormorant colonies on the Farallones and their relationships to this species' productivity, as well as how their diet relates to ocean conditions. This species consumed mostly northern anchovy (Engraulis mordax) before 2008, then switched to eating flatfish and rockfish species. There was a significant positive relationship between Brandt's cormorant productivity and the proportion of northern anchovy in their diet. When considering measures of ocean conditions, the North Pacific Gyre Oscillation (NPGO) for the winter prior to the cormorant breeding season is negatively related to the amount of anchovy in the cormorant diet. This diet analysis, in combination with studies of prey availability and ocean conditions, could help determine mechanisms behind changing fish populations, and provide information to assist in management and conservation of Brandt's cormorants and their prey in Central California.

Monday, July 16 3:20 Emergence And Stewardship Of The Anthropocene Biosphere

Ellis, Erle* , *Geography & Environmental Systems, Umbc*

Human populations and their use of land have transformed more than three quarters of the terrestrial biosphere into anthropogenic biomes (anthromes). Anthromes first emerged in prehistoric times and have been sustained for millennia in many regions through human use of fire, tillage, irrigation, and other ecosystem engineering strategies together with the harvest, transport, introduction and management of native,

domestic, and exotic plant and animal species. As a result, human reshaping of ecological pattern and process is now global, profound, and in most cases virtually irreversible, making it more than a challenge to conserve most species in native habitats. Yet, despite widespread losses of native species and even greater increases in exotics, the majority of native plant species appear to be sustaining viable populations in the shadow of their more abundant exotic competitors in the novel ecosystems that now cover nearly 40% of Earth's ice-free land. Recent trends in urbanization, agricultural intensification, and environmental awareness offer increasing opportunities to sustain biodiversity within the anthropogenic landscape mosaics created and sustained by human systems. Effective global stewardship of terrestrial biodiversity in the Anthropocene will require a new conservation paradigm based on multifunctional landscape management together with fundamental advances in observing, modeling, monitoring, and managing biodiversity in regional landscapes globally.

Tuesday, July 17 12:30 Bats And Wind Energy: State Of Knowledge And Research Priorities For USFWS And USGS

Ellison, Laura[*], *USGS* , **Cook, Megan**, *U.S. Fish And Wildlife Service* , **Szymanski, Jennifer**, *U.S. Fish And Wildlife Service*

Advancing renewable energy, including wind energy development, is an important step in reducing our nation's dependence on non-renewable sources of power. Since early in the development of wind energy production, concerns have arisen about the potential impacts of turbines to wildlife. Recent evidence shows that certain species of bats are particularly susceptible to mortality from wind turbines and are dying by the thousands across North America. This unanticipated problem for bats has moved to the forefront of conservation and management efforts directed toward this poorly understood group of mammals. U.S. Fish and Wildlife Service (USFWS) biologists are imminently facing regulatory decisions for wind energy projects with limited data about associated threats and options available to avoid, minimize, and mitigate impacts to bats. To address this, USFWS and U.S. Geological Survey scientists are working together to address research priorities to support decision-making concerning bats and wind energy facilities across the United States. These priorities include reliably predicting take of bats, linking pre-construction surveys with post-construction mortality, and understanding basic life history parameters as they relate to exposure to risk from wind turbines. Progress in this research will help us ensure that increasing renewable energy development does not come with unsustainable costs to our wildlife resources.

Monday, July 16 3:45 Projected Extinction Of Tidal Marsh Sparrows Following Sea-Level Rise: Can People Do Anything?

Elphick, Chris[*], *University Of Connecticut* , **Field, Chris**, *University Of Connecticut* , **Bayard, Trina**, *University Of Connecticut* , **Meiman, Sue**, *University Of Connecticut* , **Hill, Jason**, *Pennsylvania Cooperative Fish And Wildlife Research Unit* , **Gjerdrum, Carina**, *Canadian Wildlife Service* , **Rubega, Margaret**, *University Of Connecticut*

Climate change is predicted to affect a multitude of species, many of which could go extinct. Specialist species, especially those restricted to habitats that will diminish under climate change, are presumably most vulnerable. High latitude and high elevation species have received much attention, but species found in coastal habitats threatened by sea-level rise represent another class of organisms at especially high levels of risk. The saltmarsh sparrows Ammodramus caudacutus is a tidal marsh endemic bird, representative of this group of species. High tide flooding is the main cause of nest failure, and nesting habitat is limited to high marsh areas that are flooded during spring tides. Using nesting data from 35 tidal cycles (2002-09) we estimated the relationship between peak tide height and nest success to predict the tide height

at which reproductive failure is complete. Using predicted sea-level rise scenarios, we determined when this tide height will become the norm. The results suggest that saltmarsh sparrow reproductive success will approach zero by mid-century. Other tidal-marsh nesting birds will face a similar fate, albeit not quite so rapidly. Available management options to protect this suite of species will require major changes in the nature of coastal zone management in the northeastern US that include rethinking current approaches to marsh restoration, the protection of alternative coastal habitats, and whether some species simply cannot be saved.

Wednesday, July 18 4:45 Designing Surveillance For Unknown Invaders: Searching When You Don't Know What You Are Searching For

Epanchin-Niell, Rebecca[*], *Resources For The Future* , **Brockerhoff, Eckehard**, *Scion* , **Turner, James**, *AgResearch* , **Kean, John**

Cost-effective surveillance strategies are needed for efficient responses to biological invasions and must account for the trade-offs between surveillance effort and management costs. Designing optimal surveillance for specific, known invaders is challenging even when much is known about the target species. However, designing surveillance for unknown potential future invaders is even more difficult because invasion rates and processes, damages, the availability of control options, and control costs all are highly uncertain. Here we develop a framework for optimizing surveillance for a diverse group of unknown potential invaders in order to minimize the total expected costs of new invasions over time. We apply the framework to optimizing surveillance for future invasion by wood borers and bark beetles in New Zealand; these species have the potential to significantly impact New Zealand's plantation and urban forests. We show that optimal surveillance depends on invasion and economic characteristics and that surveillance efforts should be targeted based on risk, expected damages, and costs. However, we also discuss the difficulties of designing optimal programs in the face of such high uncertainty and strategies for addressing challenges. Finally, we discuss what can be said, and with how much certainty, about managing for something that is highly uncertain. Our approach and challenges are applicable to managing biological invasions world-wide, and reflect the difficulties of conservation management in an uncertain world more generally.

Monday, July 16 8:30 Understanding How Human Activities Trigger The Emergence Of Wildlife Zoonoses.

Epstein, Jonathan H.[*], *Ecohealth Alliance*

Globally, we are experiencing an unprecedented rate of infectious disease emergence. More than 50% of known human pathogens originate in animal populations, and of those classified as emerging, nearly 75% are zoonotic. In many cases, viral pathogens have entered into human populations from wildlife either directly (e.g HIV, ebolavirus) or via domestic animal hosts (e.g. Highly Pathogenic Avian Influenza, Nipah & Hendra virus), Nipah virus and SARS coronavirus provide two good examples of how viral spillover was precipitated by anthropogenic activities. In Malaysia, Nipah virus emerged in 1997-98 as a respiratory and neurological disease in pigs, however, it was the subsequent human infections with a 40% case fatality rate that led to the identification of this previously unknown pathogen. The natural reservoir of Nipah virus are frugivorous bats of the genus Pteropus, and current evidence supports the theory that Nipah virus co-evolved with its bat hosts over time. One of the critical factors that allowed Nipah virus to emerge was the intensification of pig farming in previously forested habitats that were utilized by bats, coupled with the planting of fruit orchards on the farms adjacent to the pig enclosures. In Bangladesh, Nipah virus moves directly from bats to people via contamination of date palm sap, a cultivated food resource also utilized by bats. In 2003, SARS

coronavirus emerged in southern China from bat reservoirs due to increased contact among bats, domestic animals, and people via the wildlife trade. Wildlife conservation and public health are not incompatible. Strategies for decreasing the risk of zoonotic disease emergence include developing a better understanding of wildlife ecology; creating buffers between wildlife habitat and urban or agricultural environments; and modifying current human activities to reduce contact among people, livestock and wildlife.

Monday, July 16 4:00 Climatic Influences On Multi-Year Occupancy Of The American Pika (O. princeps) In The Southern Rocky Mountains

Erb, Liesl P[*], *University Of Colorado At Boulder* , **Guralnick, Robert** , **Ray, Chris**, *University Of Colorado-Boulder*

As a cold-adapted, primarily montane mammal species, the American pika (Ochotona princeps) is presumed to depend on a narrow set of climatic conditions for survival. While much is known about the natural history of this species, its climatic tolerance is being tested throughout the species' range as the rate and severity of anthropogenic climate change heightens. Some populations have suffered recent extirpations, particularly in the hotter, more arid regions of the American pika's range, such as the Great Basin. Populations in regions such as the southern Rocky Mountains, have, on the whole, fared much better in the face of recent climatic change. Our 2008-2011 surveys of 69 historically occupied locations indicate that pikas still inhabit over 80% of these historic sites. Despite these relatively high occupancy rates, a notable pattern has emerged among the locations lacking pikas in the four focal survey years. Occupancy modeling of these data indicate that chronically dry sites were the most likely to lack pikas in 2008, while new extirpations in later survey years indicate that populations experiencing high summer temperatures are also vulnerable. These results suggest important interactive effects of precipitation and temperature for this and other study systems influenced by climatic change. As both these climatic metrics change, climatically-sensitive species such as the American pika must be closely monitored.

Monday, July 16 Assessing Predictive Ability Of Bioclimatic Envelope Models Using Data From The North Slope Of Alaska

Escovar, Tatiana[*] , **Pearson, Richard**

One of the most used modeling strategies to predict potential changes in species distribution is the species' bioclimatic envelope model. However, this strategy has been widely questioned due to its assumptions and uncertainties. Here, we evaluated the accuracy of this approach by comparing niche models against observed records. We built ecological niche models with shrub presence and abundance records across the North Slope of Alaska for the year 2000 and environmental data from 1960-1990 for the same region. Models were then predicted for 1931-1960. A measure of shrub change was obtained by comparing the 1960-1990 models against 1931-1960 projections. Changes were then compared to observed records of increase in shrub cover over the past 50 years in northern Alaska. Our results show no correlation between the predicted changes and the observed changes. We discuss the limitations of the models and the importance of spatial scale as a key factor of the predictive ability of specie's bioclimatic envelope models.

Wednesday, July 18 8:30 Biodiversity And Ecosystem Services In Changing Ethiopian Coffee Agroecosystems: Challenges & Opportunities

Eshete, Getachew[*], *University Of California, Santa Cruz* , **Zavaleta, Erika**, *Environmental Studies Dept.*

Deforestation and land use changes in tropical landscapes are key drivers of biodiversity and ecosystem services loss. Although most land use conversions are threats, some land uses such as shade-coffee agro-ecosystems may serve as refugia

for native biodiversity while supporting livelihoods. We studied (1) the relative roles of shade-coffee systems in the conservation of woody species diversity and (2) the impact of disturbance and fragmentation in remnant biodiverse forests in Ethiopia, the origin of Arabica coffee. Using an ecological study of 3 large government farms (GF), 39 small-holder coffee farms (SF), and 18 small and large forest fragments (FF), we analyzed patterns of species diversity and availability of locally important ecosystem goods and services (EGS). We found that 12% of the native woody flora exclusively occurs in coffee farms, while 59% and 26% of the regional native woody biodiversity is accommodated in SF and GF respectively. Woody species diversity in GF is lower than SF ($p<0.001$) and FF ($p<0.001$). Both coffee farms harbor diverse populations of birds, primates, insects, and small mammals. While some species highly valued for construction materials are abundant in FF, SF maintain the highest diversity of species providing EGS such as soil fertility, nitrogen fixation, bee forage, beehive hanging and shade. Hence, such non-forested landscapes can support significant biodiversity and vital ecosystem services in these rapidly changing landscapes.

Monday, July 16 Breeding Status And Diet Trends Of Two California Least Tern Colonies In The San Francisco Bay.

Euing, Susan H.[*], *U. S. Fish And Wildlife Service* , **Riensche, David**, *East Bay Regional Park District* , **Elliott, Meredith L.**, *PRBO Conservation Science*
SUSAN H. EUING, U.S. Fish and Wildlife Service, Alameda Point, P.O. Box 159, Alameda, CA 94501 USA, Susan_Euing@fws.gov DAVID L. RIENSCHE, East Bay Regional Park District, P.O. Box 5381, Oakland, CA 94605 USA, driensche@ebparks.org MEREDITH L. ELLIOTT, PRBO Conservation Science, 3820 Cypress Drive, #11, Petaluma, CA 94954 USA, melliott@prbo.org ABSTRACT: The two largest colonies of the California Least Tern (Sternula antillarum browni) in the San Francisco Bay area, Alameda Point and Hayward Regional Shoreline, are located 10 miles apart. The Alameda Point colony, on the former Naval Air Station, Alameda, has grown at an average rate of 9.2% per year since its discovery in 1976 and has a nesting density ranging from 1-153 nests per ha. Long-term breeding success at Alameda has averaged 0.86 fledglings per breeding pair. Breeding success increased through the 1980s, declined through the 1990s and the early 2000s, and increased again in the last five years. The Hayward colony, located on an island created from dredge materials in 2001 has been enhanced with additional substrate materials, social attraction devices, vegetation and predator management. Least Terns began appearing at this island in 2003, and successful breeding attempts have been observed since 2006. This colony has grown at an average rate of 51.5% per year and has a nesting density ranging from 33 – 333 nests per ha. Long-term breeding success has averaged 0.87 fledglings per breeding pair. The breeding bird assemblage at the Alameda Point colony site has three nesting species including the California Least Tern, whereas the Hayward colony has nine additional nesting waterbird species. Dropped fish have been collected from both colonies, and silversides (family Atherinopsidae) are the dominant prey. Alameda terns forage on a greater variety of species than the Hayward terns. Our regression results indicate the importance of Northern Anchovy (Engraulis mordax) to the breeding success of the Alameda colony. Seabirds can be used as indicators of change in the surrounding environment. Least tern diet data, collected by researchers from various breeding sites in central and southern California, tell us what is happening with the local marine and estuarine ecosystems in which this species forages and inhabits. Using similar techniques, PRBO Conservation Science has analyzed diet data from other seabirds (Brandt's cormorants, pelagic cormorants, pigeon guillemots, common murres, etc.), collected at various locations in northern and southern California. The diet data reflect the changing prey populations off California's coast,

and some results relate well to regional climate changes,such as the North Pacific Gyre Oscillation.

Wednesday, July 18 4:15 Public Participation In Scientific Research And The California Naturalist Program: Building The Nexus Between Learning And Action

Evans, Emily*, *University Of California, Davis* , **Ballard, Heidi**, *University Of California, Davis* , **Merenlender, Adina** , **Meredith, Anna**, *UC Berkeley*

Two types of conservation education and action programs, statewide Master Naturalist programs and citizen science projects, have been shown to increase volunteers' ecological knowledge, understanding of science and/or environment-related behaviors but have operated most often in isolation. We report on an integrated model designed to capitalize on the benefits of both types of programs for participants, and to recruit a trained population of volunteers to assist conservation organizations with their data collection needs. We have created and are testing an integrated model for regional networks of California Naturalists (California's statewide Master Naturalist program) and citizen science/PPSR projects, funded by NSF's Informal Science Education. At two pilot sites we are recruiting non-traditional participants to CA Naturalist trainings and linking these nodes with myriad PPSR projects in their region. To find out what participants are learning and how their conservation actions might be changing, we are tracking volunteers' progress through the trainings and regional PPSR programs through volunteer tracking tools, surveys and interviews with participants. We present our progress in creating this model and discuss preliminary results of who participates, how and why they are participating, and what they are gaining from participating in conservation science through this new integrated model

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Tuesday, July 17 8:45 Resilience Of Long-Term Invasions In California Grasslands: Should We Manage These As Novel Ecosystems Or Restore Historical Native Communities?

Eviner, Valerie*, *UC Davis, Department Plant Sciences*

Exotic grasses have dominated California's grasslands since the mid-1800's, with native communities only persisting in isolated areas. These invaded systems are highly resilient, and restoration of native grasslands often requires intensive and continuous management. There is considerable debate about which natives were historically dominant, and the relative importance of drought, overgrazing, and other factors in mediating the conversion from native- to exotic-dominance. There is evidence for factors that contribute to the resilience of the invaded state, including: climate shifts, pathogens, plant-soil feedbacks, small mammals, and N deposition. Understanding these mechanisms may improve restoration strategies, but if the native systems are no longer resilient under current environmental conditions, restoration attempts may further degrade these grasslands. This is particularly of concern due to a more recent wave of invaders that greatly decrease plant diversity and livestock production. Success of these new invaders has been attributed to diverse factors, including: increased atmospheric carbon dioxide, shifting seasonality of precipitation, alterations in grazing and fire regimes, and low prevalence of native and naturalized plants with a late-season phenology. These new invasions require us to reconsider our management practices and goals, based on balancing what we desire from these systems, and what is ecologically possible, particularly with a shifting environment.

Monday, July 16 Population Dynamics Of Aerial And Terrestrial Populations Of Phytophthora ramorum In A California Watershed Under Different Climatic Conditions

Eyre, Catherine*, *UC Berkeley*

We present one of the first analyses of the epidemiology of SOD (Sudden Oak Death) in California within a watershed based on temporally

and spatially replicated surveys of symptoms, viability of the pathogen from symptomatic leaves, and genetic analyses using polymorphic SSR markers. SOD symptoms on leaves of the transmissive host California bay laurel increased significantly from 15 to 39% in six survey plots between dry and wet conditions, while levels of identical symptoms caused by other foliar pathogen were highest (69%) in dry conditions, suggesting P. ramorum and other pathogens while occupying the same niche are favored by different climatic conditions. Although some foliar genotypes of P. ramorum were more abundant in wet than in dry conditions, a significant number of foliar genotypes were dominant and persistent through time. Soil and foliar populations were clearly genetically distinct but intermixing. We surmise that the genetic structure between substrates is not due to the presence of two distinct populations, but to the different ability of genotypes to adapt to the different substrates. There is evidence that in climatic conditions unfavorable to the pathogen genetic diversity increases, and in favorable conditions fewer genotypes are more widespread. We also show that foliar genotypes can spread further than soil genotypes in wet years, and that soil appears to be re-inoculated on a yearly basis.

Tuesday, July 17 10:00 A Double Helix Of Science And Policy? The Role Of Genetics In Endangered Species Decisions

Fallon, Sylvia*

One of the most contentious debates in species protection under the Endangered Species Act revolves around the taxonomic classification of various species, subspecies or distinct population segments. The use of genetics in resolving these designations has become commonplace, yet the type and amount of genetic data that is relied on varies by each policy decision potentially leading to inconsistent results regarding whether a species receives protection. As a scientist at an environmental advocacy organization, I monitor how the agencies in charge of administering the Endangered Species Act use genetics to guide their decisions. I then use a variety of approaches to ensure that the best available science is used to inform agency policy generally as well as specific policy decisions – from publishing scientific journal articles, to preparing technical public comments, to reaching out to others in the scientific community. In this presentation I will highlight each of these approaches with case studies including a recent proposed taxonomic revision of the gray wolf to illustrate how science can and does affect policy. Although academic scientists are often unaware of how to contribute to the science-policy interface, they are often well positioned to do so. I will end with a set of recommendations for scientists who are interested in bridging the divide.

Monday, July 16 10:00 An Integrated Hydromodification Management Framework To Protect Instream Communities

Federico, Felicia*, *UCLA La Kretz Center For California Conservation Science* , **Stein, Eric**, *Southern California Coastal Water Research Project* , **Booth, Derek**, *UC Santa Barbara* , **Bledsoe, Brian**, *Colorado State University* , **Bowles, Chris**, *cbec, Inc., Eco-Engineering* , **Berntsen, Eric**, *Ca State Water Resources Control Board* , **Gearheart, Greg**, *Ca State Water Resources Control Board*

Land use changes alter watershed hydrologic and geomorphic processes (hydromodification) often resulting in changes to stream morphology and, in turn, changes to instream biological communities. Regulation and management of hydromodification is in its infancy in California. The primary focus has been on morphological endpoints; implementation is through new and re-development only, on a project-by-project basis; and there is little monitoring data to support current stormwater control design requirements. This talk will summarize an integrated hydromodification management framework developed for the State of California that informs development of place-specific strategies to address contemporary and

legacy effects on instream structure and function. This framework incorporates technical recommendations related to assessment, modeling, development of management strategies and monitoring. Effective management of hydromodification will require coordinated approaches across programs at the watershed scale that address all aspects of runoff, sediment generation and storage, instream habitat, and floodplain management. This talk presents a synthesis of the most recent research to inform both short-term regulatory implementation as well as long-term policies. This is applicable throughout CA and nationwide.

Monday, July 16 Fine-Scale Genetic Structuring And Within-Stream Population Diversity In The Ozark Hellbender (Cryptobranchus alleganiensis bishopi)

Feist, Sheena[*], *Eggert Lab, University Of Missouri* , **Briggler, Jeffrey**, *Missouri Department Of Conservation* , **Koppelman, Jeffrey**, *Missouri Department Of Conservation* , **Eggert, Lori**

The Ozark hellbender (Cryptobranchus alleganiensis bishopi) was recently listed as an endangered species due to dramatic declines in population size. Because such declines may result in decreased genetic diversity which compromises the species ability to recover and persist, investigations into the genetic structuring of these populations are warranted. Previous studies identified clear genetic structuring across a broad geographic scale (i.e. between rivers). However, hellbenders are habitat specialists that exhibit extreme site fidelity and low vagility. This suggests that gene flow may be restricted among the discrete habitat patches that comprise a single river. Using 15 polymorphic microsatellite loci, we assessed the fine-scale genetic relationships between hellbenders occupying various river segments. Genetic distances were low (pairwise FST < 0.028), indicating little genetic differentiation exists amongst habitat patches. In addition, levels of diversity remain constant along the river's stretch as populations exhibit similarities in allelic richness and levels of observed heterozygosity (mean AR = 5.394, mean HO = 0.690). Such data provide new insight into the dispersal tendencies of hellbenders and suggest that gene flow and movement occur at a greater extent than that proposed by telemetry data alone.

Wednesday, July 18 3:00 Causal Mechanisms Of Protected Areas On Poverty

Ferraro, Paul[*], *Georgia State University* , **Hanauer, Merlin**, *Sonoma State University*

To estimate the effects on poverty from the establishment of protected areas, a study should incorporate pre-protection measures of poverty (or proxies for them) and explicitly control for the non-random nature in which protected areas are established. Few studies satisfy these criteria, and the few studies that satisfy them fail to answer the question of how protected areas affect poverty. Armed with this answer, decision-makers could better design protected area networks to foster the mechanisms that alleviate poverty and to discourage the mechanisms that exacerbate poverty. Unfortunately, identifying causal mechanisms is much more difficult than identifying average causal effects. To demonstrate how causal mechanisms of protected areas on poverty can be identified and quantified, we build on a rich data set from Costa Rica. Our analysis suggests that nearly half of the poverty reduction associated with the establishment of protected areas is attributable to tourism. Infrastructure development accounts for a relatively small proportion of the estimated poverty reduction. Ecosystem services from changes in forest cover account for no net effect on poverty, but may help to counteract the negative effects on the poor from restricted access to protected resources. The remaining estimated poverty reduction comes from unidentified mechanisms, which may include mechanisms other than the three we identified or pathways not captured by our mechanism proxies.

Monday, July 16 Community-Based Planning For Public Lands In The California Mother Lode

Fety, Lauren*, *Bureau Of Land Management*

If everyone is unhappy, the adage goes, planners are doing their job. In the Mother Lode, the Bureau of Land Management (BLM) is finalizing a collaborative, community-based plan. Planning for the 695-acre parcel involved: 14 months of public meetings, 230 participants, and hours of discussion among the stakeholders. The Kanaka Valley Management Plan is the Mother Lode Field Office's fifth collaborative, community-based plan. In the rapidly growing Sierra Nevada foothills, the BLM has pioneered collaborative, community-based planning methods since the 1990s. Since then, community-based planning has been used in areas with high public interest: multi-agency watersheds, noncontiguous public lands, and high use parcels. Involving people who are interested in, or live near, the planning area brings improved community buy-in and uses community expertise in an increasingly integrated landscape. During community-based planning, the BLM developed methods to promote flexibility, community involvement, education, effective use of technology, and public understanding of multiple-use landscapes. Collaborative, community-based planning is an effective way to approach conservation planning, especially when the planning areas are integrated in a neighborhood or otherwise have strong public interest. With rapid habitat fragmentation and loss and an uncertain future, working with communities for conservation and resource management is imperative.

Tuesday, July 17 10:05 Conservation Collaboration: Connecting Through Online Communities

Fiegener, Rob*, *Institute For Applied Ecology*

Online communications are an increasingly powerful way of connecting with colleagues and constituents, and have become a common deliverable in conservation grants. This speed talk will discuss creating and sustaining an effective virtual professional network. Examples will be presented from the Native Seed Network (nativeseednetwork.org) and Ecosystem Commons (ecosystemcommons.org). These sites represent an accessible and informal way to cultivate relationships and advance conservation goals. The sites offer public and private workspaces for sharing information and experiences among an audience of conservation professionals. Discussions, wikis, and document repositories are all available within a group context to facilitate organization of content and build partnerships. Groups may be regional or topical and can originate organically from community members to address emerging interests. Building a successful online community requires a sustained commitment and dedicated staff time, not a "build it and they will come" approach.

Wednesday, July 18 9:10 Revising State Wildlife Action Plans For Climate Change And Other Challenges

Figg, Dennis*, *Missouri Department Of Conservation*

The development of a comprehensive plan/strategy for every state in the nation was a monumental experiment in conservation planning. Although development of state plans was guided by training and support materials, the charge for the first round of state wildlife plans/strategies was to prepare what was most needed by each individual state. That was appropriate for the first round, and in many cases an important opportunity for state agencies to further define their role in conserving all plants, fish, wildlife and the habitats they depend upon. The next round of revisions will require that state agencies and conservation partners apply lessons learned so the level of engagement is higher than in the past. Our rapidly changing world is less and less fish and wildlife friendly every day. The products of conservation planning similarly developed, presented, and readily shared between and among states and with conservation partners, both public and private.

Even without concerns for climate change, these are desirable improvements. Considering the far reaching effect of climate change to all lands and waters, these are necessary changes to state action plans/strategies.

Tuesday, July 17 9:10 Anathema! Planting Non-Native Species For Butterfly Recovery On Washington Prairies

Fimbel, Cheryl*, *The Center For Natural Lands Management* , **Linders, Mary**, *Washington Department Of Fish And Wildlife*

Conservation partners are working to recover the Taylor's checkerspot butterfly (Euphydryas editha taylori) in Puget Lowland Prairies of western Washington. In 2007, a multidisciplinary team initiated a strategy to enhance habitat for reintroducing checkerspots in formerly occupied prairies. This approach emphasizes controlling invasive plants and re-planting important Taylor's checkerspot resources, emphasizing larval food plants. Partners strategically plant multiple species of Taylor's checkerspot food plants, including seeds and seedling plugs of the non-native narrowleaf plantain (Plantago lanceolata) into butterfly management units in semi-native prairie habitat. Although not native, concentrations of plantains are used for oviposition by Taylor's checkerspot females and support larval feeding. Plantains appear to provide an important food resource for pre-diapause larvae when many native host plants are senescing during drought conditions. Conservation practitioners should look beyond the traditional native / non-native dichotomy when planning management actions for rare species recovery; considering instead functional attributes and risks associated with essential resources.

Monday, July 16 12:15 Can California Condors Survive In A Polluted World? The Role Of Terrestrial And Marine Contamination On An Endangered Bird's Recovery

Finkelstein, Myra*, *University Of California* , **Kurle, Carolyn**, *University Of California San Diego* , **Aukema, Juliann, E.**, *Aukema Conservation Science* , **Doak, Daniel**, *University Of Wyoming Coop Research Unit* , **Bakker, Vickie**, *James Madison University* , **George, Daniel**, *National Park Service* , **Burnett, Joe**, *Ventana Wildlife Society* , **Brandt, Joseph**, *United States Fish And Wildlife Service* , **Bargu, Sibel**, *Department Of Oceanography And Coastal Sciences* , **Sandhaus, Estelle A.**, *Santa Barbara Zoo* , **Smith, Donald R.**, *University Of California*

Lead poisoning is recognized as a major factor limiting the recovery of California Condors (Gymnogyps californianus) and the principal source of lead exposure is considered lead-based ammunition. Assuming this major impediment to recovery is resolved, what is the future for condors? In looking beyond lead, trash ingestion and marine contamination may pose significant barriers to condor recovery; and the solution for these issues is less clear. Trash ingestion is cited as the most important mortality factor for condor nestlings and is responsible for 73% (8/11) of mortalities for condor chicks hatched in the wild. Exposure to marine contamination will likely increase as the growing condor population in coastal California is predicted to increase their reliance on beach cast marine mammals as a food source, and marine mammals are known to contain high levels of contaminants (mercury, PCBs, DDTs) that bioaccumulate. To investigate risk from marine contamination, we evaluated markers for foraging behavior (observational data, carbon and nitrogen stable isotope values) as well as mercury concentrations in condor blood (n=44). We found a significant association between mercury exposure and feeding behavior indicative of ingestion of and contamination from marine mammals. We conclude that California condor's struggle for survival is ongoing and our results highlight the challenges faced by many endangered species trying to recover in the polluted environment in which they live.

Wednesday, July 18 11:00 LC MAP: An LCC Approach To Integrated Data Management And Analysis

Finn, Sean*, *Great Northern Landscape Conservation Cooperative* , **Converse, Yvette**, *Great Northern Landscape Conservation Cooperative* , **Olliff, Tom**, *Great Northern Landscape Conservation Cooperative* , **Sojda, Rick**, *Great Northern Landscape Conservation Cooperative* , **Kern, Tim**, *USGS Fort Collins Science Center* , **Wilson, Lei Ann**, *USGS Fort Collins Science Center*

The path to effective collaboration over large geographic areas depends on successful transcendence of boundaries – political, jurisdictional, disciplinary, social, and technical. The Great Northern Landscape Conservation Cooperative (GNLCC) and partners are working to soften these boundaries while respecting the vision, mandates, and security concerns of the broad array of LCC partners. GNLCC has developed a state-of-the-art geospatial data discovery, management, and analysis tool which supports inter-organization collaboration and coordination: The Landscape Conservation Management and Analysis Portal (LC?MAP). LC?MAP combines modules built off DOIs open source developed ScienceBase, which provides efficient data search, catalog, and management tools, with the ArcGIS10 spatial data editing, analysis, and modeling environment to provide a powerful, fully functional project management and decision process portal. Interaction with the spatial data employs web services allowing dispersed, inter-organizational teams to access and analyze common datasets in near real-time and provides automated metadata and versioning functions to closely document project progress and product development. A robust security infrastructure is built in front of all components giving project managers fine-tune controls over accessibility and data publication. Design tradeoffs were biased toward reaching the widest possible audience while relying on established, stable platforms with in-place user support. This presentation will describe our theoretical approach to Portal development, provide real world examples of functionality from project inception to conservation decision, and discuss how LC MAP integrates with a suite of compatible digital conservation tools and services.

Tuesday, July 17 4:15 Fifteen Years Down The Road: Integrating Human And Natural Communities In California's Central Coast

Fischer, Christina*, *Santa Lucia Conservancy* , **Wilson, Christopher**, *Santa Lucia Conservancy* , **Hauser, Christopher**, *Santa Lucia Conservancy*

In the early 1990s, a development partnership purchased an historic 20,000 acre California cattle ranch to pursue a vision of creating a conservation-compatible community nested within a diverse coastal landscape of redwoods, hardwood forest, oak savanna, grasslands and coastal scrub. Fifteen years after entitlements, the community is at approximately 30% build-out and 90% of the land is in permanent protected status. The Santa Lucia Conservancy, an independent non-profit land trust, was established and fully endowed through the entitlement process to conduct ecological research, land stewardship and education activities and to ensure compliance monitoring and enforcement on protected lands. This unusual approach offers useful insights into the potential benefits and challenges to biodiversity conservation associated with private residential developments. In particular, our experiences highlight the importance of planning and managing for biodiversity as opposed to listed species, ensuring that land protection mechanisms and monitoring requirements are consistent with biodiversity goals, and that community residents are offered meaningful opportunities to understand and support efforts to protect ecological health.

Wednesday, July 18 8:30 Learning From The First Generation Of National Wildlife Refuge Comprehensive Conservation Plans

Fischman, Robert*, *Maurer School Of Law, Indiana University*

In 1997, Congress required all national wildlife refuges to produce comprehensive conservation plans (CCPs) designed to translate legal mandates and management goals into on-the-ground and in-the-water objectives. This paper reports preliminary results of an analysis of all US national wildlife refuge CCPs adopted between 2005 and 2011. The analysis focuses on the use of adaptive management in achieving biological objectives, the manner in which the plans respond to climate change, and how the plans define the role of the refuge within the larger landscape. The paper concludes with broader observations about how the refuge planning experience relates to trends in conservation planning generally.

Tuesday, July 17 4:15 Does Governance Matter? Understanding The Links Between Governance Regimes And Livelihood Outcomes In Tanzania's Managed Landscapes

Fisher, Brendan*, *World Wildlife Fund* , **Naidoo, Robin**, *World Wildlife Fund* , **Freeman, Olivia** , **Burgess, Neil**

Tanzania is home to some of the world's most captivating protected areas, and while places like the Serengeti and Ngorongoro Crater are world renowned, the country is replete with endemic species and important landscapes. On the flip side of this remarkable country for biodiversity is the unfortunate socio-economic conditions where more than 40% of the people live below the poverty line and over 30% are food insecure. This dynamic begs the question of whether conservation is positive or negative force in human welfare. Here we test this question by considering the livelihood effects of three types of natural resource management regimes in Tanzania – Joint Forestry Management; Community-Based Forestry Management and Wildlife management Areas. Each of these management regimes has different aspects of local community control and access to the natural resource use. We use the United State's Agency for International Development Demographic and Health Surveys (DHS) and quasi-experimental approaches to test how each of these different governance regimes affects the livelihoods and health of the associated communities. Using matching methods from the program evaluation literature we find that while no one governance regime shows categorical advantage of improving livelihoods over others, there are clear implications for conservation.

Tuesday, July 17 11:00 Do Private Conservation Activities Match Science-Based Conservation Priorities?

Fisher, Jon*

Background: Private land conservation is an essential strategy for biodiversity protection in the USA, where half of the federally listed species have at least 80% of their habitat on private lands. We investigated the match between private land protection conducted by the world's largest land trust (The Nature Conservancy) and the science driven identification of priority areas for conservation. This represents the first quantitative assessment of the influence of science on the land acquisitions of a conservation non-governmental organization (NGO). Methodology / Principal Finding: The lands acquired by The Nature Conservancy (TNC) were analyzed using GIS to determine to what extent they were in areas defined as priorities for conservation. The spatial analysis of TNC lands was broken up into land known to be acquired in the last five years, five to ten years ago, prior to ten years ago, and for land acquired anytime during the last sixty years (includes previous sets of data plus acquisitions lacking a date). For the entire history of TNC the proportion of TNC lands within the priority areas was 74%. Prior to 10 years ago it was 80%, 5-10 years ago it was 76%, and in the last five years it was 81%. Conservation easements were found to

have lower alignment with priority areas (64%) than outright fee simple acquisitions (86%). Conclusions / Significance: Overall the location of lands acquired was found to be well aligned with the priority areas. Since there was comparable alignment in lands acquired before and after formalized conservation planning had been implemented as a standard operating procedure, this analysis did not find evidence that defining priority areas has influenced land acquisition decisions.

Monday, July 16 Genetic Diversity Of The Northern Leopard Frog Across The 100th Meridian
Fisher, Justin*, *North Dakota State University* , **Purcell, Kevin**, *North Dakota State University* , **Stockwell, Craig**
In North America, the northern leopard frog (Lithobates pipiens) is considered a species with moderate to high risk of extinction in 26 out of 41 combined U.S. states and Canadian provinces. We surveyed 10 microsatellite loci to evaluate the genetic structure of 26 populations of the northern leopard frog throughout North Dakota contributing to the information gap for its genetic management. This region crosses the 100th Meridian and thus is ideal for evaluating this species because of the high spatial and temporal climatic variation. Heterozygosity values ranged from 0.71 to 0.88, with the highest levels of heterozygosity in eastern North Dakota with a longitudinal decline toward the more arid western region of North Dakota. We also found a longitudinal decline in allelic richness, ranging from 12.2 alleles in eastern populations and declining to 6.9 alleles in western populations. The spatial genetic diversity conformed to an isolation by distance model; and structuring programs revealed patterns of spatial genetic structure which roughly conforms to the spatial distribution of various ecoregions within North Dakota. These results should allow managers to delineate at risk populations and aid in the development of a genetic management plan for northern leopard frogs in the northern Great Plains.

Monday, July 16 9:15 Blurring The Lines: The Evolving Role Of Federal Land Management In Landscape-Scale Conservation
Fisher, Larry*, *University Of Arizona, School Of Natural Resources And The Environment*
The past decade has seen the emergence of an array of new approaches to public lands management that transcend traditional boundaries, both physical and institutional. Fueled by innovative program initiatives in water, species, forest, and ecosystem management, transportation planning, and energy development, and by the realities of constrained funding and limited agency capacity, federal agencies and their partners are exploring new models of collaboration, and new program and policy instruments that extend conservation beyond individual land management units to broader, landscape-scale conservation. The paper outlines some of the significant recent trans-boundary conservation efforts and discusses their longer-term implications for federal programs and policies.

Monday, July 16 11:20 Finance Strategies To Drive Climate Friendly Development
Fitzgerald, John*, *Society For Conservation Biology* , **Barrett, James**, *Applied Solutions*
To complement the way scientific findings on wildlife, ecosystem and human health are intended to drive environmental law as summarized in the introduction to this symposium, from an economic standpoint, the first-best response to the growing threat of climate change is to put a gradually increasing price on greenhouse gas emissions and to use the revenues to finance an investment platform to accelerate energy efficiency and renewable energy adoption. This strategy requires sufficient political will, which heretofore has been absent from most major greenhouse gas emitting

nations. Under the presumption that this will continue to be the case for the foreseeable future, a second-best solution will rely heavily on investment and, in the absence of a price on emissions, will need to be both more aggressive and more innovative in structuring finance. This discussion will highlight various strategies for financing clean and sustainable economic development in developed and developing nations.

Monday, July 16 8:30 Introduction To Symposium 13: The Progress We've Made, And The Next Four Years

Fitzgerald, John*, *Society For Conservation Biology*

Introduction to Symposium 13 – The Progress We've Made, and the Next Four Years - 30 min. In 2008, SCB's North America Section leaders and Policy Director worked with leaders of other societies and organizations and developed Recommendations for the Obama Administration and Congress. We presented these to the Obama Transition team and members of Congress. This symposium will review how SCB works with its partners to make progress on those recommendations. We'll discuss possible recommendations and strategies for achieving further progress. While speakers in this symposium will go into depth on other issues, such as proposed new regulations to improve the implementation of the Endangered Species Act, I will address other SCB priority issues briefly, such as Biological Security. I will also provide the policy context for some of our talks from -- Jim Barrett's talk on investment solutions to climate change and energy pollution, by summarizing the progress and delays so far in using and improving law in response to rapidly improving science by the Obama Administration and key states in regard to climate change and actions affecting it from oil sands development to the E.U.'s tariffs on air traffic pollution; to --Zoe Van Schyndel's presentation on Investment and Procurement -- including how SCB can help make sure that both government and corporate policy and practice keep up with increasingly powerful scientific findings.

Wednesday, July 18 8:50 Ensemble Hydrologic Modeling For The Next Century: Implications For San Francisco Bay Area Natural Resources

Flint, Lorraine*, *U.S. Geological Survey* , **Flint, Lorraine**, *U.S. Geological Survey* , **Weiss, Stuart**, *Creekside Center For Earth Observation* , **Loarie, Scott**, *Carnegie Institution For Science* , **Ackerly, David** , **Thorne, James**, *Information Center For The Environment, University Of California Davis* , **Micheli, Lisa**

Climate change scenarios for the next century have been developed for the San Francisco Bay Area. Using IPCC projections of future changes in climate, 23 models for 3 scenarios have been downscaled to 270-m for application to a regional water balance model (Basin Characterization Model; BCM) for 2000-2100. The BCM calculates water balance components including runoff, recharge, evapotranspiration, soil moisture, and streamflow based on climate, topography, soils and underlying geology, and the solar-driven energy balance and climatic water deficit. Precipitation projections for the next century vary between global climate models, but across all scenarios temperature forcings increase the variability of runoff, recharge, and stream discharge, and shift the seasonal timing of the hydrologic cycle. For both drier and wetter scenarios, warming amplifies climatic water deficit, a measure of drought stress on soils and vegetation. These hydroclimatic variables, analyzed at the watershed scale for the San Francisco Bay Area region, provide information and tools based on a consensus of the current state-of-the-art in climate science results.

Wednesday, July 18 12:00 Habitat-Based Models Of Cetacean Density And Distribution In The North Pacific

Forney, Karin*, *NOAA, Southwest Fisheries Science Center* , **Becker, Elizabeth**, *NOAA, Southwest Fisheries Science Center* , **Ferguson, Megan**, *NOAA-Alaska Fisheries Science Center* , **Foley, David**, *NOAA-NMFS-SWFSC-ERD* , **Barlow, Jay** , **Fiedler, Paul**, *NOAA-Southwest Fisheries Science Center* , **Redfern, Jessica**, *NOAA-Southwest Fisheries Science Center* , **Ballance, Lisa**, *NOAA-Southwest Fisheries Science Center*

The North Pacific Ocean includes diverse pelagic habitats spanning temperate and tropical waters. Studies of the abundance and distribution of cetaceans within these dynamic marine ecosystems have generally been patchy or conducted at coarse spatial and temporal scales, limiting their utility for pelagic conservation planning. Recent advances in habitat-based modeling of cetacean density offer a new tool for identifying and characterizing pelagic areas of importance to cetaceans. In this study, we present habitat-based models of cetacean density that were developed and validated for 22 cetacean species or species groups within the eastern tropical Pacific, California Current Ecosystem, and central North Pacific. Spatial predictions of cetacean densities (and temporal variance therein) were derived from data collected during 19 large-scale shipboard cetacean and ecosystem assessment surveys conducted during 1986–2008. Models were developed using generalized additive models with a variety of dynamic and static habitat-related predictor variables (e.g., bathymetric depth, distance to shore or isobaths, sea surface temperature (SST), variance in SST, salinity, chlorophyll, and mixed layer depth). The resulting spatial models provide finer-scale information on the distribution and density of cetaceans than previously available and indicate potential 'hotspots' of cetacean abundance or diversity.

Monday, July 16 11:00 Multi-Scaled Modeling Of The Shade Provided To The Klamath River By Vegetation And Geomorphology

Forney, William*, *US Geological Survey* , **Soulard, Chistopher**, *US Geological Survey* , **Chickadel, Christopher**, *Applied Physics Laboratory, University Of Washington*

The USGS River Ecosystems Models and Science project is studying approaches to characterize the thermal regulation of water and the dynamics of cold water refugia. High temperatures have physiological impacts on anadromous fish species. Factors affecting the presence, variability, and quality of thermal refugia are known, such as riverine and watershed processes, hyporheic flows, deep pools and bathymetric factors, thermal stratification of reservoirs, and other broader climatic considerations. This research develops a conceptual model and methodological techniques to quantify the change in solar insolation load to the Klamath River caused by riparian and floodplain vegetation, the morphology of the river, and the orientation and topographic characteristics of its watersheds. Using multiple scales of input data from digital elevation models and airborne LiDAR derivatives, different analysis methods yielded three different model results. Using non-parametric and geostatistical tests, the models are correlated significantly with thermal infrared imagery for ground truth information. With similar datasets, this approach and methods could be applied to any river in the United States– especially those listed as temperature impaired under Section 303(d) of the Clean Water Act—or international riverine systems. Considering the importance of thermal refugia for aquatic species, these techniques can help prioritize opportunities for riparian restoration, identify problematic reaches not likely to provide good habitat, and assess landscape connectivity and habitat mosaics for aquatic species' foraging and migration.

Monday, July 16 4:00 Conservation In The Anthropocene

Forrester, Tavis*, *University Of California, Davis*

We live in a time of unprecedented global human impact, and our influence is so pervasive that geologists are debating evidence for defining a new geologic era, the Anthropocene. The idea of the Anthropocene has triggered a debate about the direction of conservation. We hear that we are living at "the end of nature" and there is no place in the world undomesticated by humans. While humans have heavily affected the majority of the world, there are still areas that have relatively intact ecology, the "last of the wild". Protecting these places should still be a priority for conservation, even in the face of widespread change. We need to do this for scientific reasons so that ecosystem baselines are preserved and we can learn from the effects of global anthropogenic change on intact ecological communities. We need to do this for practical reasons so that goals for restoration projects have a basis in reality. We need to do this for public relations reasons, to engage society in conservation. And we need to do this for ethical reasons; we have a duty to future generations to provide them with the opportunity to observe the wonders of nature. While reserves are a viable conservation tool, especially in a world of rapid change, reserves alone are not adequate and an effective conservation strategy should include other elements. A broad based strategy should not preclude the use of preserves, and widespread change should not mean that we abandon the last of the wild.

Monday, July 16 The Importance Of Systematics To Conserving Biodiversity: A Case Study In Western North American Mimulus (Phrymaceae)

Fraga, Naomi*

Basic biodiversity research, including species discovery, is needed in areas with high levels of species diversity and endemism, such as western North America. Notably, it has been estimated that 5% of the flowering plant species in western North America are yet to be described (Ertter 2000). The genus Mimulus (Phrymaceae) has a high incidence of rarity and endemism, and is particularly diverse in western North America where more than 75% of the total number of species in the genus occur. At least 66 species of Mimulus are currently listed by U.S. government agencies and native plant societies as sensitive, rare, or endangered, making Mimulus a group of conservation concern. However, species delimitation and taxonomic relationships in Mimulus remain unclear, with 90 to 170 species recognized. In many recent regional treatments of the group, some previously recognized rare species with limited distributions have been lumped with more wide ranging species. Over the course of my work I have conducted extensive field research, photographing and collecting data from Mimulus populations primarily in California. As a result I have identified five undescribed species of Mimulus. Based on preliminary conservation assessments, four of the five undescribed species would be ranked as Nature Serve G1 (critically imperiled) or G2 (imperiled) species. An evaluation of species discovery and its implications for conservation will be presented, with insight from recent taxonomic studies in Mimulus.

Tuesday, July 17 11:30 The Yellowstone To Yukon Conservation Initiative (Y2Y): Restoring Connectivity For A Transboundary Grizzly Bear Population

Francis, Wendy*, *Yellowstone To Yukon Conservation Initiative*

Keeping the fabric of nature intact has become one of the significant challenges of the 21st century. Habitat loss and fragmentation caused by industrial exploration and development, transportation networks, and subdivision and sprawl are having the combined impacts of severing wildlife populations from each other and from needed habitats, increasing deadly conflicts between wild animals and people, and foreclosing opportunities for wildlife to move and adapt in response to

changing climatic conditions. The Yellowstone to Yukon Conservation Initiative (Y2Y) seeks to respond to these challenges by promoting a 2,200 mile network of large protected areas and functional connectivity between them. Using the example of collaborative efforts to restore connectivity for grizzly bears through the Cabinet-Purcell Mountain Corridor in western Montana, northern Idaho and southern British Columbia, this presentation will demonstrate how a long-term commitment to a shared conservation strategy by a network of over 60 organizations and agencies is creating the conditions in which biodiversity and human communities will be able to coexist through the coming changes. Emphasis will be placed on the newest implementation efforts and results including land purchases, forest restoration activities, wildlife conflict reduction programs and highway-wildlife mitigation efforts.

Wednesday, July 18 3:30 Re-Examining Society In Conservation Through Participant Experiences In PPSR

Fraser, John[*], *New Knowledge Organization*

Citizen science has been positioned as a central pillar in public participation in scientific research (PPSR) and a key strategy for promoting informal science education (Bonney et al, 2009). Central to citizen science are the practices of data collection, data organizing, coding, analysis, and the development of inferences from that work. While much of the literature surrounding citizen science has measured participant knowledge gains and increased participant understanding of science processes, little attention has been paid thus far to the affective or emotional dimensions of the experience, the motivations that lead participants to engage in a distributed research community, nor how participant's identities are related to that work. It has been assumed that citizen science projects provide continuous learning opportunities for all who engage with them, and that a continuum of learning exists that will lead citizen scientists along a hierarchical ladder of learning where they might emerge at the highest level as scientists developing their own questions, analyzing data, and presenting new knowledge back to the scientific community. These assumptions about a hierarchical learning continuum, however, may not represent the complexity of the outcomes adequately and may minimize the impact of social radiation of knowledge that results from citizen scientists' motivations for engagement in distributed research. This paper will use results from an external qualitative summative evaluation of participation in CamClickr, a major citizen science coding initiative established by the Cornell Lab of Ornithology, to challenge the theory that citizen scientists need or want to move up the science thinking hierarchy. It will challenge the idea that citizen scientists may not possess advanced skills as science thinkers and suggest that they may already possess the skills to develop and pursue hypotheses that will advance science knowledge, but may choose to participate in a more democratic role in the research conducted by others as an altruistic act that benefits those they consider within their scope of justice. They may also work altruistically on behalf of the biosphere and seek to advance the more general knowledge in science or help their colleagues in other fields of science to achieve science goals that cannot be attained in the lab alone. It will use these results to propose a new way of considering citizen scientists as part of a tiny activist public that works in a distributed model to bring attention and concern to issues facing society, actively promote science learning for others, and may advance the cause of science through personal interactions in ways that are substantially larger than might be possible through any other formal communication vector. The author will explore the implications of these findings on how authority and validity might be considered in distributed scientific research. The author will suggest that it may be important to reconsider the language, how hierarchy is defined in the scientific process, and how we might reconsider the value of volunteer expert technicians as participants in the scientific

enterprise. The author will conclude with how this new way of discussing Public Participation in Scientific Research may benefit science learning through rewarding task-based thinking about how to organize massive emerging datasets, and how these distributed processes may lead to new kinds of scientific knowledge about the biosphere that may be more congruent with an information rich society where conservation knowledge is aggregating rapidly across the globe.

Monday, July 16 3:15 Assessing MPA Network Performance In The Context Of A Changing Climate: A Test-Case Using California's MPAs
Freidenburg, Tess* , **Whiteman, Elizabeth**, *MPA Monitoring Enterprise, California Ocean Science Trust*
In California, a statewide network of MPAs is being implemented to, among other goals, protect ecosystem structure, function and integrity. Future evaluations of MPA network performance will occur in the context of a changing climate and associated changing oceanographic environment. The Monitoring Enterprise has developed a framework for MPA monitoring designed to efficiently 'take the pulse' of ocean ecosystems and support adaptive management. We have developed a recommend approach to most efficiently and effectively apply this framework to augment MPA monitoring to provide additional information. This information can be used to aid in the interpretation of MPA monitoring results as well as support the development of climate change-informed marine and coastal management and adaptation strategies.

Monday, July 16 12:15 Conserving Metapopulation Structure For Pacific Salmon May Counteract Forces Acting To Increase Synchrony
Fullerton, Aimee* , **Zabel, Rich**, *NOAA Fisheries*
Spatial segregation of populations across a variable landscape can confer species resilience by reducing the likelihood that all populations will experience the same disturbances. For ESA-listed Pacific salmon, this portfolio effect may be key to long-term persistence when faced with natural and anthropogenic change. We used a dynamic metapopulation model for Chinook salmon Oncorhynchus tshawytscha in the Snake River basin USA to evaluate how much of the annual spatial structure of co-variability in population abundance is driven by shared external processes (e.g, ocean conditions, climate, human activities) and internal processes as measured by population-specific growth rates and inter-population dispersal. We fitted model parameters using a 50-year-long dataset of spawner abundances. We found population dynamics to be largely driven by external processes, but models that also included local processes fit the data much better (? AIC >20). This suggests that watershed-specific conditions, homing fidelity, and population specialization may counteract broad scale factors that tend to increase synchrony across populations. With this model, we will investigate how metapopulation spatial structure could change under future scenarios of climate and fisheries management. This information will directly inform prioritization of population recovery and habitat restoration actions.

Monday, July 16 12:45 Avian Biodiversity Monitoring In California: The Benefits Of Automated Recorders And Community Level Occupancy Models
Furnas, Brett* , *California Department Of Fish And Game*
Climate change is projected to substantially disrupt the current distribution of bird species globally. Long-term, large-scale, multi-species monitoring could play a key role in informing conservation planners as they adapt to this challenge at the regional scale. In 2002 the California Department of Fish and Game began monitoring avian biodiversity in montane conifer and sagebrush habitats by surveying approximately 100 new

random plots each year across a 5.4 million hectare study area. The surveys provide an archival record of species present by using automated devices to record breeding bird song activity that experts later review. Repeat recordings at each plot at different times each morning over 3 consecutive days allow occupancy modeling of approximately 50 migratory and resident species. Modeling all species simultaneously in a community-level occupancy model increases the power to detect a population trend similarly affecting a guild or other group of species. Initial analysis of our first 9 years of data from middle elevation, montane conifer habitats suggests that species traits (body mass, foraging behavior, migratory versus resident) explain much of the variation in detection probability in a multi-species occupancy model. Additionally, based on our current level of sampling, we estimate we will have the statistical power to detect average annual group-level declines of under 1 percent for timeframes of at least 10 years.

Monday, July 16 8:30 There Is A Desert Ecosystem

Fusari, Margaret[*], *Retired Director UCSC Natural Reserves*

Desert ecosystems are defined by low and usually variable rainfall; hence low and variable primary productivity. Desert adapted species are specialized organisms; plants and animals that have evolved to succeed under those conditions. Deserts are not wastelands, empty, inhospitable, useless or products of the anthropogenic process called desertification. Deserts are wondrous ecosystems with values for human societies in terms of aesthetics, unique species and life history strategies, and products.

Tuesday, July 17 12:00 A Landscape Decision Support System (DSS) And Online Collaborative Laboratory (Collaboratory)

Gallo, John[*], *The Wilderness Society*

LandAdvisor is a customizeable framework and tool designed to help organizations decide where to conserve, how (i.e. acquisition, stewardship, etc.), and why. It uses a “return on investment” approach to blend the objectives of NatureServe Vista, Marxan with Zones, and CorridorDesigner in one integrated and flexible package. Specifically, a site valuation process combines with an algorithm for allocating a variety of land management options in “near-optimal” solution sets while considering not only contiguity and representation, but connectivity as well. The connectivity algorithm models the linkages between every pair of reserves to prioritize not only paths within a linkage, but also linkages within a landscape. To facilitate stakeholder engagement (which facilitates conservation implementation) LandAdvisor is build around an intuitive multi-criteria approach. Despite this, the principle of representation is still met using the novel “continuous benefit function” approach (with an option of using targets only) . The DSS is designed to update as new data, criteria, or values arise, thereby allowing adaptation to an increasingly dynamic world. It is now freely available as an ArcGIS toolbox. We are releasing LandAdvisor via The Landscape Collaborative (TLC) which utilizes Atlassian web-software and is designed for agile support, development and testing of such tools. Results from one of the three pilot studies in South Africa, Canada, and California will be presented.

Monday, July 16 Home Range Overlap And Resource Partitioning In Two Sympatric Wetland Birds

Gamboa, Maybellene[*], *University Of California, Berkeley* , **Hall, Laurie**, *University Of California, Berkeley* , **Cleveland, Clinton**, *University Of California, Berkeley* , **Beissinger, Steve**, *University Of California, Berkeley*

Characterizing habitat and resource requirements for threatened species is critical for developing management plans that ensure species persistence in the face of environmental change. The California

Black Rail (Laterallus jamaicensis coturniculus) is a small, threatened bird that co-occurs with the larger, more common Virginia Rail (Rallus limicola) in wetlands of the Sierra Foothills, California. Wetlands in this region are often fed by irrigation water. We tracked rails with radio telemetry during the breeding season to measure home range size and used stable isotope analysis of rail feathers and prey items to examine diet and resource partitioning. Fixed kernel density home ranges (95% KD) were significantly larger for Virginia Rails (0.41 + 0.06 ha, n = 7) than Black Rails (0.34 + 0.05 ha, n = 8), while core-use areas (50% KD) were not significantly different between species. Carbon and nitrogen stable isotope analyses suggest that a greater proportion of the Virginia Rail diet is composed of aquatic prey while Black Rails mainly consume terrestrial prey. Although these rails occupy similar habitat and have largely overlapping home ranges, differences in diet suggest rails avoid interspecific competition by resource partitioning allowing for simultaneous management of both species in the same wetland. As environmental change affects water availability in the state, the co-management of these species will help minimize management cost and effort.

Monday, July 16 Animal Diversity Of State Park "El Faro"

Gaona, Salvador*, *Universidad Autonoma Metropolitana* , **Silva-Torres, Beatriz**, *Universidad Autonoma Metropolitana* , **Santana, Edgar**, *Universidad Autonoma Metropolitana*

The State Park “El Faro” is a temperate forest, located in the south of the Sierra Nevada Mountains, Mexico. The Park has been subjected to intense timber exploitation to supply a neighboring paper factory. The objective of this conservation effort is to recover not only the forest mass from a quantitative point of view but also to insure the forest quality allowing for the recovery of environmental goods, services and processes. Preservation of the forest, and protection of the indigenous fauna are all issues which are addressed. One activity that has been done, is the knowledge of the fauna that is in the area for which an inventory of wildlife in the area. This paper shows the results obtained for the bird diversity in the Park. We observed and registered 20 families and 54 species of resident birds, and 28 families and 79 species of migratory birds, from 2009-10. Resident Birds Families: Accipitridae, Cathartidae, Columbidae, Corvidae, Emberizidae, Fringillidae, Hirundinidae, Mimidae, Paridae, Parulidae, Passeridae, Picidae, Ptilogonatidae, Remizidae, Strigidae, Thraupidae, Trochilidae, Troglodytidae, Turdidae, Tyrannidae. Migratory Birds Families: Accipitridae, Aegithalidae, Apodidae, Caprimulgidae, Cathartidae, Certhiidae, Columbidae, Corvidae, Cuculidae, Falconidae, Hirundinidae, Laniidae, Mimidae, Odontophoridae, Paridae, Parulidae, Picidae, Ptilogonatidae, Regulidae, Silviidae, Sittidae, Strigidae, Trochilidae, Troglodytidae, Trogonidae, Turdidae, Tyrannidae, Vireonidae.

Tuesday, July 17 3:45 Designing For Biodiversity: Enhancing Forest-Dependent Bird Conservation In A Tropical Agroecosystem By Modeling Functional Connectivity

Garbach, Kelly*, *University Of California Davis* , **Estrada Carmona, Natalia** , **Martinez-Salinas, Alejandra** , **Declerck, Fabrice**

Fragmentation of tropical landscapes often drives biodiversity loss in the tropics. Thus, conservation value of agricultural lands has received much recent attention. Studies in Mesoamerica have found that live fences and agroforests, which enhance tree species richness and structural complexity of habitat, provide support for birds that would otherwise be locally extirpated. Mist netting data collected at the CATIE center in Costa Rica suggest that complex agroforests and live fences can foster farm-to watershed-scale connectivity by linking forest patches bordering farms. However, two questions have fueled debate regarding conservation value of agricultural lands: (1) What is the optimal configuration of patches

and linear elements (e.g., agroforests and live fences) for forest-dependent species? (2) Do these configurations differ from those needed to support disturbance-tolerant species (e.g. birds that prefer open fields and plantation edges)? We modeled functional connectivity for 6 bird species with various levels of forest-dependence using Cicuitscape software. We calculated conductance values to describe ease of movement using 4 years of mist netting data collected in 6 land uses at CATIE; we evaluated 4 configurations of an agroecosystem. Increasing multistrata live fences enhanced functional connectivity for 5 of the 6 focal bird species, and live fences oriented perpendicular to forest patches had a strong positive influence.

Tuesday, July 17 9:30 Science In California's Marine Life Protection Act Initiative: User-Friendly And Rewarded

Garrison, Karen[*], *NRDC*

California's Marine Life Protection Act Initiative illustrates how compelling science can be if it's a dynamic, fully integrated element of decisionmaking. The MLPA required the state to revise its marine protected areas to create a science-based network of underwater refuges. In 2004, the state set up an initiative to carry out the MLPA. Stakeholders in four coastal regions designed alternative networks, and a Blue Ribbon Task Force (BRTF) drew on those designs to recommend a preferred option to the Fish & Game Commission. Science played a prominent role in the law, which set ecosystem protection goals and required that basic science guidelines be met. The Initiative integrated science into the process in key ways: (1) it provided spatial habitat info and a user-friendly design tool; (2) it convened a science advisory team that developed simple rules of thumb for designing MPAs and evaluated how well the designs met guidelines; (3) its iterative process allowed stakeholders to use evaluations to improve their proposals; and (4) the BRTF favored proposals that met science guidelines. Politics influenced the Commission's final decision, but the dynamic integration of science into the process fostered a "science immersion" course for participants and moved disparate proposals closer to meeting scientific guidelines—and closer to each other—than they otherwise would have been. As a result, the state now has significant new networks of biologically rich protected areas.

Tuesday, July 17 12:15 Conservation Biologists As Drivers Of Business Innovation: Our Essential Role Supporting The Sustainability Revolution

Gelbard, Jonathan[*]

Business is undergoing a remarkable transformation to more sustainable production, manufacturing and waste management practices. This emerging industrial 'revolution' is driven by both rising demand for 'green' products and the realization that 'sustainable' practices boost profits by improving efficiencies of resource and energy use, cutting costs, reducing risks, and boosting brand reputation and sales. Two factors currently hindering the success of sustainable business initiatives in remedying threats to biodiversity and ecosystem services are (1) a lack of scientific expertise on many corporate teams and (2) a need for more research to document whether practices claimed to be 'sustainable' are in fact achieving measurable ecological benefits. This need to improve integration of science into the design, execution and success monitoring of business practices is an extraordinary opportunity for conservation biologists, who offer companies the expertise needed to achieve key sustainability – and financial – goals. In turn, partnerships advancing sustainable business provide conservation biologists with new avenues of funding during a time of tightening government budgets. Here I describe two cases of sustainable land use-based business initiatives that would benefit from more active involvement by conservation biologists. I conclude by pointing to additional sectors that are ripe with opportunity

for getting science used to generate high-impact conservation results.

Monday, July 16 3:00 Securing Flood Protection And Habitat Connectivity For Wide-Ranging Species Through Agriculture Conservation In The Upper Pajaro River Floodplain
Gennet, Sasha*, *The Nature Conservancy* , **Klausmeyer, Kirk**, *The Nature Conservancy*
Using hyrdologic, ecological, and historical studies, TNC and partners developed a conservation plan for the Upper Pajaro River floodplain that is currently being implemented through land use planning processes and direct protection. This floodplain is a 9,000 ac. natural detention basin in the southern San Francisco Bay Area that reduces downstream flooding of high-value agricultural and urban lands by up to 30%. The basin is an ecologically diverse complex of wetlands, ponds, and riverine habitats embedded in a working landscape mosaic of agriculture and cattle ranching. The floodplain and riparian corridor also serve as a critical linkage for movement of wide-ranging terrestrial wildlife between the Santa Cruz, Gabilan, and Hamilton mountain ranges. The habitat linkage and flood abatement characteristics of this area are increasingly essential services for natural and human communities as climate changes.

Wednesday, July 18 8:30 We All Live Downstream: Engaging Teens In Aquatic Conservation At The Tennessee Aquarium
George, Anna*, *Tennessee Aquarium Conservation Institute* , **Rosenberg, Ashford**, *Tennessee Aquarium*
Research by The Ocean Project over the last decade indicates that youth between ages 12 and 25 are more educated on environmental issues and more likely to make positive conservation decisions than any other age group. In addition, parents turn to youth for advice on environmental decisions for the household. While the Tennessee Aquarium has been successful at reaching K-5 schoolchildren in our educational programming, we have recently started increased youth outreach in order to increase our impact on this influential demographic. New outreach programs and an Our Blue Planet speaker series specifically for regional high school students emphasize the connection between everyday choices and aquatic conservation. In addition to these traditional education programs, the Aquarium is also adding a residential summer camp for high school students, the Conservation Leadership in Action Week, led by aquatic scientists. During this week, campers will explore the southeastern conservation community and learn how to become an environmental leader. In addition to field trips to rivers, forests, and farms, campers will learn how to design and implement conservation projects for their own schools and neighborhoods. These students will then form the basis for a new Conservation Science Club that meets monthly at the Aquarium. By creating programs that meet the specific needs of teens and tweens, the Aquarium hopes to empower this growing generation of leaders for freshwater conservation.

Tuesday, July 17 9:45 Removing Lead From The California Condor Landscape Through Outreach
George, Daniel*, *National Park Service* , **Scherbinski, Scott**, *National Park Service* , **Brown, Leland**, *Institute For Wildlife Studies* , **Finkelstein, Myra**, *University Of California*
Release of captive-reared California condors has successfully established an adult breeding population in the wild. Research results from studies of the current population have established that limiting factors in the wild are anthropogenic. Paramount among these factors is mortality resulting from acute lead poisoning. Collaborative research between the National Park Service, the University of California Santa Cruz and other partners in Condor Recovery has established that ammunition is the principal source of lead

accumulated by endangered California condors while foraging in the wild. Additional work by several partner organizations to evaluate the severity and incidence of condor lead poisonings over time is currently underway. Recognizing the need to engage a broader community with research results, Pinnacles National Monument has integrated outreach into its condor restoration program. A diverse strategy of community events, presentations, and social media has been employed to encourage hunters to use non-lead ammunition. Efforts have succeeded through recognition and celebration of ranching and hunting practices that support working rural landscapes and continuation of the hunter conservation tradition. Although outreach efforts have lacked capacity to evaluate perspective changes on a regional scale, surveys performed by the Institute for Wildlife Studies at outreach workshops documented that 76% of attendees reported a positive impression of non-lead ammunition. Another 18% stated they would seek more information. Research and outreach continues in order to advance this dialog between endangered species managers and the broader community of landowners and sportsmen.

Monday, July 16 9:30 Canaries In The Coal Mines: Birds As Indicators Of Ecological, Domestic Animal, And Human Health

Gibbs, Samantha*

Canaries, members of the Serinus genus of finches, are small, brightly colored birds that are found predominantly in Africa and the Mediterranean Basin. Canaries were used in coal mines in the 19th and early 20th centuries as indicators for toxic gases that are lethal to humans. This concept can be applied on a much broader scale, by monitoring the health of free-ranging bird species to detect ecological, domestic animal, and human health threats. Birds are susceptible to many of the same diseases and toxins that impact domestic animal and human health; West Nile virus, avian influenza virus, DDT, and lead poisoning are examples. Birds can be found in natural, agricultural, and urban environments world-wide. Due to their abundance, visibility, and reliance on the landscape for resources, birds are often the first to reveal the mounting health threats present for all species.

Monday, July 16 Bridging The Gap Between Breeding Bird Survey And Local Bird Monitoring In California's Central Valley: The Need For Regional Bird Monitoring Programs

Gilbert, Michelle*, *PRBO Conservation Science* , **Seavy, Nat** , **Gardali, Thomas**, *PRBO Conservation Science* , **Hickey, Catherine** , **Golet, Gregory**, *The Nature Conservancy* , **Reynolds, Mark** , **Kelsey, Rodd**, *Audubon California*

Ensuring that conservation is cost effective will require accurate information about the return on investment. The Breeding Bird Survey program has provided fundamental information on continental trends in landbird abundance. At the same time, bird monitoring at habitat restoration sites has provided convincing evidence that these activities can increase the number of locally breeding birds. Ideally, the efficacy of multiple local habitat improvements should be evident in regional monitoring programs, such as the Breeding Bird Survey. Using data from California's Central Valley, we illustrate that limited coverage and fixed sampling locations make the Breeding Bird Survey inadequate for tracking Central Valley riparian bird populations at this scale. To address this need, we have designed and implemented a new regional monitoring program for riparian breeding landbirds in California's Central Valley. By collecting information at fixed legacy sites and at randomly selected sites that are reselected each year taking into account changes in the distribution of potential habitat, this program has been designed to make inferences at a regional scale between local projects and the nationwide Breeding Bird Survey program. As multiple partners work on individual projects to restore Central Valley riparian systems, our monitoring will provide a means of tracking the cumulative response of riparian birds.

Monday, July 16 11:45 Using United State Department Of Agriculture's (USDA) Farm Bill Easement Programs To Implement The Spirit Of Fortress Conservation In The Western U.S.

Gilgert, Wendell[*], *PRBO Conservation Science* , **Naugle, David**, *University Of Montana* , **Forkey, Alan**, *USDA NRCS* , **Griffiths, Tim**, *USDA NRCS*

In a global context, Fortress Conservation is an evolving and adaptive experiment in progress. Two examples of landscape scale wildlife conservation from Western United States and Canada will be presented as case studies in an attempt to illustrate how the concept of Fortress Conservation is evolving on the North American continent. The first example will showcase the use of the Wetland Reserve Program (WRP) in California's Sacramento Valley that clusters private landowner enrollments and that illustrates the potential to target wetland easements into high priority watersheds. Altogether, there are about 12,000 acres of restored wetlands along the Colusa Drain, that are subject to natural flooding, and that address the fish, wildlife and wetland restoration needs associated with linear riparian corridors, while contributing to floodwater attenuation and water quality improvements. As an element of the USDA Natural Resources Conservation Services (NRCS) Sage Grouse Initiative (SGI), the second case study will highlight the use of the Grassland Reserve Program (GRP) to secure high value wintering sagebrush habitat on private ranchlands in North-central Montana for a migratory sage-grouse population that nest and brood-rear in southern Saskatchewan. The protection of a 70+ mile corridor that consists of Canada's Grasslands National Park, the US Bureau of Land Management (BLM), Charles M. Russell National Wildlife Refuge, and a mosaic of private ranches, will be discussed.

Wednesday, July 18 9:15 The Invasive Potential Of Bioenergy Feedstocks: Ecological Risks And Policy Recommendations

Glaser, Aviva[*], *National Wildlife Federation*

The recent explosion in federal and state mandates and incentives for renewable energy has led to a greatly increased demand for cheap and plentiful biomass from a variety of plant sources. This rapid expansion of bioenergy production, along with the diversification of potential bioenergy feedstocks, is leading to the significant potential for biomass feedstocks to become ecologically-damaging invasives. A large number of non-native and genetically modified native species are currently being considered for use as potential biomass feedstocks, and many are already being cultivated. Examples of potentially invasive plants that are currently being cultivated as bioenergy feedstocks in test plots and/or commercial-scale plots across the country include giant reed (Arundo donax), napier grass (Pennisetum purpureum), and seeded giant miscanthus (Miscanthus x giganteus). Should these species escape and become established in nearby natural areas, the results could be potentially devastating for native ecosystems. Despite this, few safeguards exist in law to prevent the spread of invasive species through bioenergy cultivation, and current risk assessment methodologies alone may not be sufficient. Policy recommendations that could minimize or mitigate this risk include prohibiting the use of known invasive species as dedicated bioenergy feedstocks, assigning liability to feedstock producers for damages, and promoting the use of ecologically beneficial biomass feedstocks.

Monday, July 16 12:15 Acting To Save Plants From Climate Change: Benefits, Risks, And Tools For Management Success

Gluesenkamp, Dan[*], *The Calflora Database*

Californians have managed plant communities for ten millennia, employing simple tools to favor desirable plants and select against unwanted taxa. Contemporary natural resource management is more complicated, as we manage an expanding list of sensitive taxa and a growing diversity of unwanted species in a changing environment. Recently, conservationists have begun talking about ambitious new tools for adapting to climate

change: assisted migration, breeding neo-natives or selecting for change-tolerant traits, and aggressive management of invasive species. While scientists debate the risks and benefits of these interventions, individuals already are acting. How can we ensure that these actions lead to enhanced protection and not increased regret? This talk reviews climate change adaptation strategies available to managers, with brief evaluation of potential benefits and risks. We present examples (e.g. identifying climate change refugia, translocating species, hybridizing lineages) and the consequences for target species (e.g. Arctostaphylos franciscana, Cupressus lawsoniana, Sequoia sempervirens, Yucca brevifolia). We then outline resources, approaches, and tools available to support managers in effective action. Resources include recent research that can guide action and exciting technological tools for planning and tracking action. Finally, we review some fundamental principles derived from scientific and policy literature that can guide and improve this important work.

Monday, July 16 Impact Of Human Activities On Diversity Of Macroscopic Fungi In The State Park El Faro, Mexico

González-Ibarra, Minerva* , **Silva-Torres, Beatriz**, *Universidad Autonoma Metropolitana*

Macroscopic fungi represent a real alternative in the management of forests in Mexico as an economic and productive source for rural communities that inhabit the forested regions of the country. In Mexico, the mycological studies that include ecological analysis are relatively few, and ignore the potential of wild populations and their possibilities for sustainable use. Because of the fast and uncontrolled population growth, there are different problems in the state park “El Faro”, such as using the reservoir as a waste disposal site and obtaining wood through the illegal felling of trees, provoking not only the loss of different species that inhabit or depend of the tree stratum to live, but also of the “services” that trees provide us. In this study, we analysed the effect of the disturbance on the macroscopic fungi of the state park “El Faro”, a consequence of the uncontrolled population growth, using biodiversity as the main parameter to measure the direct and indirect effects of human activities in the forest. We used the Jaccard index to assess the similarity in species composition between two habitats with different degrees of disturbance. The most disturbed area has a considerable impact in the development of fungal fruiting bodies therefore affecting the richness and diversity.

Monday, July 16 Development Of Ecologically Complex Refuges For The Conservation Of Imperiled Freshwater Taxa

Goodchild, Shawn* , **Stockwell, Craig**

A standard conservation technique for protected species is to establish limited refuge populations in secure locations; however, this species-centric approach ignores historic biotic communities and thus may be insufficient to preserve the characteristics of the species important for long-term recovery. As a result of the absence of native conditions at these sites, processes such as contemporary evolution may change the population mediated by novel ecosystem dynamics. For instance, the Pahrump poolfish (Empetrichthys latos), a relict Goodeid extirpated from its native habitat, has been maintained in a series of artificial refuges since 1971. Severe genetic bottlenecks and ecological differences among the refuges have likely caused divergence among populations so that reintroduction potential may now vary among refuge populations. Further, taxa within communities have been altered by the presence of invasive species. For instance, where poolfish are extinct, Gambusia and Poecilia have invaded, further affecting ecosystem functions. We present a conceptual model using a community ecology approach to manage multi-species refuges in preserving robust populations of aquatic species suitable for reintroduction. This addresses

information gaps critical to the holistic and long-term maintenance of multiple endangered species.

Monday, July 16 11:00 Rio+20, CBD, Climate Agreements And International Trade And Finance
Gracey, Kyle*, *Global Footprint Network* , **Fitzgerald, John**, *Society For Conservation Biology*
North American conservation can in part be achieved through international cooperation in the various treaties that some or all North American countries are part of. These include the 2012 United Nations Conference on Sustainable Development (Rio+20), United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Each has made progress since its inception, and all face many challenges to their further implementation. We review progress made to date (particularly less than one month after Rio+20), discuss upcoming opportunities for the North American conservation biology community to contribute their scientific expertise to these negotiations, and discuss how conservation biology professionals can help foster stronger linkages across treaties and provide regional and local contributions, that, in aggregate, may facilitate greater action by North American nations that are party to these conventions. We will also review the roles that the international financial institutions can play supporting, hampering, and extending progress by these international agreements.

Wednesday, July 18 3:45 Learning From Deep Horizon: Connecting The Public, Researchers, And Decision Makers In Risk Assessment And Response To Oil Spills
Graham, Jim*, *Oregon State University* , **Kelly, Rose**, *U.S. Department Of Energy, National Energy Technology Laboratory*
The April 2010, blowout of the Deep Water Horizon oil well in the Gulf of Mexico (GOM) resulted in a massive mobilization of industry, academic, government, private organizations and individuals to assess, contain and remediate the spill. The implications of the spill included visible, direct impacts which included oil washing ashore, covering birds and other wildlife to indirect impacts from the economic loss resulting from the closure of fisheries, loss of tourism, and even the moratorium on deep offshore drilling in the GOM. Local groups helped provide data on the extent of the oil spill and wildlife mortality through the Internet. Researchers used data from a wide variety of sources to predict the potential extent and impacts of the spill and used the Internet to provide results to other researchers and the public. However, the time from when data were obtained to when results were available could be greatly improved by increased coordination between organizations. The Department of Energy's National Energy Technology Laboratory is funding the creation of an Energy Data Warehouse (EDW) that will provide a centralized website to exchange data between researchers, the public, and decision makers. As this system comes online, the public, and researchers, will be able to add information on the location of oil from spills and photographs of environmental impacts. This information will be made available to researchers to include in the analysis of the potential extent and impacts of spills. Research results can then be made available to decision makers and the public. The NETL EDW will join and complement a growing number of web-based systems connecting people with resources that seek to improve conservation of our natural resources.

Tuesday, July 17 9:10 Listing The Hawaiian Insular False Killer Whale As An Endangered Species Under The U.S. Endangered Species Act
Graham, Krista*
The Hawaiian insular false killer whale (Pseudorca crassidens) was proposed for listing as an endangered distinct population segment (DPS)

under the Endangered Species Act (ESA) on November 17, 2010. The population is estimated to be less than 170, down from an estimated 769. The insular DPS is considered to be genetically, ecologically and behaviorally distinct from the pelagic population, as well as from populations found elsewhere in the Pacific. Threats to the insular DPS are numerous and significant. The most severe threats are due to small population effects, such as decreased genetic diversity and inbreeding depression, and hooking, entanglement, or intentional harm by fishers. The insular DPS has a high probability of becoming functionally extinct within 75 years due to small-scale incremental impacts, such as decreased fecundity or survivorship due to direct or indirect effects of fisheries, or a possible single catastrophic event, such as a disease outbreak or oil spill. Due to the small population size and recent abundance decline of this DPS, coupled with habitat concerns and reproductive isolation, the NOAA Fisheries Service proposes to finalize the listing of this DPS as endangered in 2012.

Tuesday, July 17 10:00 Applied California Current Ecosystem Studies (ACCESS) Partnership: Bridging The Gap Between Monitoring, Education, And Management

Graiff, Kaitlin* , *Cordell Bank National Marine Sanctuary* , **Jahncke, Jaime** , **Roletto, Jan**, *Gulf Of The Farallones National Marine Sanctuary* , **Elliott, Meredith L.**, *PRBO Conservation Science* , **Robinette, Daniel**, *PRBO Conservation Science* , **Stock, Jennifer**, *Cordell Bank National Marine Sanctuary*

The Applied California Current Ecosystem Studies (ACCESS, www.accessoceans.org) is a partnership between PRBO Conservation Science, Cordell Bank National Marine Sanctuary, Gulf of the Farallones National Marine Sanctuary, and several academic institutions. ACCESS collects integrated data on ocean conditions, zooplankton (focusing on krill and copepods), seabirds, and marine mammals in northern and central California. The ecosystem goals of ACCESS are to support marine wildlife conservation and healthy marine ecosystems by conducting ocean research to inform resource managers, policy makers, and conservation partners. Ongoing surveys started in May 2004. Four to five cruises are conducted annually between April and October. Thirty-two cruises have been completed through 2011; data collected during these cruises have been shared with multiple partners to help achieve ecosystem goals. Data and expertise from ACCESS are being used to inform adaptive sanctuary management, for example, ACCESS data on whale abundance and distribution was provided to the United State's Coast Guard San Francisco Port Access Route Study and ACCESS data sets are currently being integrated into an Environmental Response Management Application (ERMA) for the greater Cordell Bank and the Gulf of the Farallones region. Educators from NOAA's Teacher at Sea program participate on ACCESS cruises to gain experience with ocean science and subsequently bring their experiences and knowledge to their classrooms.

Monday, July 16 Prioritization Framework For Restoring Environmental Flows Below Dams In California

Grantham, Ted* , *UC Davis* , **Moyle, Peter**, *University Of California*

There are thousands of dams in California, each one contributing to the degradation of aquatic ecosystems in some way. Most of these dams were built and are operated with little consideration for their effects on fish, although for 100 years the State of California has officially recognized the need to provide adequate flows for fish below dams under Fish and Game Code 5937 and the Public Trust Doctrine. Recent successful lawsuits for restoring flows in California rivers indicate that there is an opportunity for more widely implementing environmental flow protections. However, the great number of dams and unique biogeographic characteristics of each site suggest that a systematic approach for prioritizing dams is

required. Here, we present an evaluation framework for identifying dams in the State of California that have impaired downstream fish communities due to inadequate environmental flow releases. We use a tiered approach to (1) evaluate whether fish downstream of dams are in good condition, (2) assess the degree of hydrologic alteration to the natural flow regime, and (3) identify potential legal constraints for selecting the subset of dams for which environmental flow protections should be implemented. The recovery of environmental flows is vital for the conservation of native fish communities, yet it remains a daunting challenge given the large number and widespread distribution of dams. A systematic approach for prioritizing dams is essential for making progress towards the protection of environmental flows for freshwater ecosystem conservation.

Wednesday, July 18 4:15 Estimating Resistance To Gene Flow

Graves, Tabitha*, *Northern Arizona University* , **Beier, Paul**, *Northern Arizona School Of Forestry* , **Royle, J. Andy**, *Usgs Patuxent Wildlife Research Center*

Resistance reflects how difficult it is for genes to move across an area with certain attributes (e.g. a particular land cover, slope, and elevation) compared to an area with attributes that best support gene flow. Resistances are used in corridor design. Given a matrix of observed genetic distances between pairs of individuals in a landscape, several investigators have estimated resistance parameters by calculating ecological distance (as a least cost or circuit resistance distance) between the same pairs of individuals under several alternative sets of resistance parameters. They then used Mantel tests, partial Mantel tests, multiple regression of distance matrices, and related model selection techniques such as causal modeling to determine which set of resistance parameters produced a matrix of ecological distances most consistent with the genetic distance matrix. These approaches assume that genetic distances resulting from generations of mating, dispersal, and Mendelian inheritance are linearly related to ecological distance. Despite the recent popularity of these approaches, these assumptions have not been tested, these approaches do not yield confidence intervals, and the statistical bias and precision of the resulting estimates of resistance parameters have not been assessed. In this paper we provide a formal statistical approach for optimizing resistance parameters over the entire multivariate parameter space. We then demonstrate that, for a wide range of simulated scenarios, using Mantel correlations between genetic and ecological inter-individual distances results in biased and imprecise resistance parameter estimates. The surface of the Mantel r correlation can be very flat, leading to a wide range of parameter estimates with the same Mantel correlations, indicating that for a large range of scenarios, Mantel r correlations are inadequate approximations of this complex process. A new approach to estimating resistance values is needed so that corridors can be designed with valid resistance values and incorporate measures of uncertainty.

Monday, July 16 Landscape-Scale Models And Maps Of Fire Connectivity In The Sonoran Desert

Gray, Miranda*, *Northern Arizona University* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Olsson, Aaryn**, *Northern Arizona University*

Over recent decades in the Sonoran Desert of Arizona, increasing heterogeneity in the amount and location of precipitation has resulted in extreme inter-annual fluctuations in fine fuel accumulations. Coupled with ongoing climate change and invasion by non-native grasses and forbs, this pattern has contributed to more frequent and larger fires spread by contiguous beds of native and non-native plant biomass. Historically, fires in the Sonoran Desert were infrequent and of low intensity. However, the potential for rapid and dramatic change to the fire

regime threatens native communities that can take centuries to recover after fire. Appropriate fuel management in this region will require an improved understanding of the dominant drivers of fire under changing climatic and fuel conditions. As a step towards extending the scope of fire research and management in this region, our research focuses on predicting the relative contributions of fuel attributes (e.g., configuration and loading) and climatic variables to fire spread. We are integrating remotely sensed fuels data and fire behavior models within an ecologically based connectivity framework that identifies thresholds of fire spread and isolates those areas and climatic conditions that contribute most to these thresholds. This work builds on concepts and models that are accessible to multiple land managers and stakeholders in conservation.

Monday, July 16 Evaluating Feature-Based Connectivity Models Using Puma Occurrence Data In The Santa Cruz Mountains

Gray, Morgan* , **Wilmers, Chris**, *UC Santa Cruz* , **Merenlender, Adina**

In fragmented landscapes, habitat connectivity is essential to ensuring species persistence. Mathematical models – based on landscape features, expert opinion, or species occurrence data – are often constructed to predict landscape connectivity and are central to diverse conservation applications. Despite their widespread use, the predictions of connectivity model are not frequently evaluated with empirical data on movement patterns to confirm accuracy. We evaluated 4 landscape feature-based connectivity models using species occurrence data for Puma concolor in California's Santa Cruz Mountains. Each model was derived from a landscape feature related to the built environment: (1) distance to roads, (2) mean parcel size, (3) median patch size, and (4) a combined estimate based on models (1), (2), and (3). Our results showed that observed puma movement in the Santa Cruz Mountains was predicted as a general trend by all 4 models, with diminished accuracy at habitat quality extremes. Pumas used very low quality habitat less than predicted by the median patch size, mean parcel size, and combined models, and used very high quality habitat more than predicted by the distance to roads model. Identifying and constructing connectivity models with puma-specific indices of habitat use could improve our predictive ability and puma landscape planning.

Tuesday, July 17 4:30 The Use And Misuse Of Adaptation: Linking Community And Natural Resource Strategies

Gregg, Rachel* , **Hansen, Lara**, *EcoAdapt* , **Hoffman, Jennie** , **Mielbrecht, Eric**, *EcoAdapt*

The majority of climate change assessments focus on the potential impacts of climate change. Some efforts move a bit farther along to assess the implications and vulnerabilities of climate change for specific human community or natural resource concerns. A smaller group still endeavors to develop approaches to reduce these vulnerabilities. These efforts are called "adaptation." The majority of adaptation efforts limit their solutions to the individual species, location or sector of concern. This can result in solutions that ignore other confounding factors or have adverse implications for non-target species, locations or sectors. This problem is perhaps more apparent with climate change than other stressors given the scale of its impacts. Here is where our societal effort to address climate change could become more opportunity than uphill battle. Creating adaptation planning that thinks cross-sectorally could allow for more harmonious community and natural resource planning providing opportunities to support both in well thought out adaptation plans. There are already examples emerging where the challenge of cross-sectoral conflict is leading to cooperative planning.

Tuesday, July 17 11:00 Desperately Seeking Stable, 50-Year-Old Landscapes With Long, Wide Wildlife Corridors

Gregory, Andrew* , **Beier, Paul**, *Northern Arizona School Of Forestry*

Conservation corridors are the most promising intervention available to sustain plant and wildlife populations in light of anthropogenic land use and possible global climate change. However, we lack strong evidence that these interventions will work, because rather than assessing species' demographic persistence or gene flow attributable to corridors, most corridor research has documented species' presence and movement along relatively short (< 150 m) corridors in landscapes not dominated by human land uses. We have recently initiated a project to determine if conservation corridors work, and what conditions (such as width, severity of constrictions, or adjacent land uses) are associated with successful conservation corridors. Because conservation corridors are young, we will study landscapes with 'de facto' conservation corridors (i.e., corridors that exist as a quirk of how the landscape was developed). In each landscape (n > 50), we will collect DNA samples from focal species in patches connected by corridors, isolated patches, and sampling locations within intact habitat. A corridor will be deemed successful if genetic distances between connected patches are smaller than genetic distances between isolated patches and similar to that of sampling sites in intact habitat. Focal species will vary and may include any reptile, amphibian, mammal, flightless arthropod, or sedentary bird associated with the patches and corridors, but not the human-dominated matrix. In each landscape, the configuration of patches and corridors must have been stable for 20-50 years, so that genetic structure is likely reflective of landscape pattern. We ask you to suggest appropriate landscapes for this study at www.docorridorswork.org.

Monday, July 16 A Comparison Of Diel Nesting Behaviors Of The Western Snowy Plover (Charadrius nivosus nivosus) In The San Francisco Bay

Greuel, Bridget*, *CSU East Bay, San Francisco Bay Bird Observatory* , **Inouye, Caron**, *California State University, East Bay* , **Nilsen, Caitlin** , **Wildy, Erica**, *California State University, East Bay*

The Western Snowy Plover (Charadrius nivosus nivosus) has been extensively studied in regards to its habitat usage, population ecology, foraging ecology, and diurnal breeding behaviors. This information is limited to data obtained during daylight hours or with telemetry and very little is known about its specific nocturnal breeding behaviors, particularly in regards to the threatened Pacific Coast population. In this study, we examined 10 behaviors, including egg turning, time on nest, number of incubation bouts, and predator avoidance. We hypothesized that during the night, the length of individual incubation bouts will be longer, and the total number of bouts will be fewer; during the day total time and frequency off the nest will be greater; eggs will be turned with equal frequency during the day vs. the night. Because the Western Snowy Plover is a federally threatened species, a thorough understanding of its entire behavioral repertoire will better allow biologists to continuously reevaluate their methods and update recovery plans, taking all aspects of its behavioral ecology into account. This information will also be useful to document nocturnal behavior changes due to Global Climate Change (GCC). Since this species has a historically low nesting success, it is important to understand their nocturnal as well as diel behaviors, so that any changes due to factors such as GCC can be monitored.

Tuesday, July 17 9:30 The Tree Is Dead. Long Live The Tree. Do Monarch Butterflies Prefer Or Simply Use Eucalyptus For Overwintering Roosts?

Griffiths, Jessica*, *Cal Poly State University* , **Villablanca, Francis**, *Biological Sciences*

Western monarch butterflies migrate seasonally

from breeding habitats in the interior West to overwintering sites along the California coast. Within these sites, the majority of the overwintering population is typically found on a subset of the trees that are present. Thousands of butterflies can aggregate into massive, discrete, roosting clusters that form on the leaves and branches of selected trees. A species of tree that is used quite often is the blue gum eucalyptus. This species is often a numerical dominant at overwintering sites, therefore confounding interpretation of whether monarchs a) actually prefer this species or b) simply appear to prefer it because of this species' numerical dominance at overwintering sites. We tested whether monarch butterflies use different species of trees within overwintering sites preferentially (biased relative to abundance), or simply relative to abundance. We find that even though monarchs frequently use Eucalyptus, this is generally not the only tree species that is used (unless it is the only species present). Further, we find that at sites where alternate species are available, under some circumstances, the use of alternates is disproportionately high. We conclude that blue gum are likely utilized because they are present, but are not used in a greater proportion than would be predicted based on their relative abundance.

Monday, July 16 11:40 Restoring Scientific Integrity In Federal Decision Making: Inching Along With Miles To Go

Grifo, Francesca[*], *Union Of Concerned Scientists*

In the last administration, politicization of the science on which the Department of the Interior and other agencies that manage natural resources make their decisions, undermined their effectiveness and ability to carry our their missions. In addition, agencies allowed political appointees within and without these agencies to interfere with individual species decisions and promulgate policies that reduced the role of science in endangered species decision-making. Recovering from so many years of political interference has not been easy, but there are signs of hope. Some agencies such as the National Oceanic and Atmospheric Administration and the Department of the Interior are struggling to implement and expand their precedent setting scientific integrity policies. Others such as the Department of Agriculture have barely moved forward at all in their policies. If these new policies take hold, the next few years will bring a renewed commitment to transparent decision making, and a working environment mostly free of interference and intimidation. Insulating science-based decision making from political considerations will not happen over night and this presentation will provide an overview of points of progress and remaining challenges.

Wednesday, July 18 4:00 NPS Inventory and Monitoring: Effectively Monitoring Park Resources In An Era of Rapid Climate Change

Gross, John[*], *National Park Service*

The U.S. National Park Service Inventory & Monitoring Program (I&M) has implemented natural resource monitoring in about 300 parks to provide information on condition and trends. I use I&M experiences to evaluate recent assertions about the comparative effectiveness of 'targeted' monitoring as compared to 'surveillance' monitoring, particularly in the context of rapid climate change. Design of I&M began with questions of 'why' and 'for who', and monitoring was then established to evaluate condition and trends over the long term. Monitoring protocols were founded on explicit goals, objectives, and sampling designs, but the overall design and long-term nature emphasize tracking key indicators of system health rather than targeting the 'issue de jour'. Factors that profoundly influence the management outcomes of monitoring include relevance, time and expense for protocol development, complexity of sampling large and remote areas, the capacity of managers to use information, and data management and reporting.

Targeted monitoring and other short-term monitoring that may more appropriately be called research, are complimentary to long-term monitoring. But these other types of monitoring do not address the full complement of management needs and they have not delivered a outcomes necessary to increase long-term institutional capacity to collect, synthesize, and use monitoring data.

Monday, July 16 How Accurately Can We Determine The Ratio Of Human Population Growth To Extinction Of Species?
Grossman, Richard*
It is well known that the increasing number of people is the cause of the sixth mass extinction of non-human species. The average number of people that causes the extinction of one species is not known. To be able to estimate this number is an important step to bridging the gap between people and nature. This heuristic information can be of value for educational purposes, both to conservation scientists and to the lay public This ratio needs two only data: the annual increase in human population and the annual decrease in the number of species. Although human population data are fairly accurate, the number of species that are driven to extinction each year is much more difficult to estimate. Now there is information that makes it possible to approximate the loss of species. I conclude that it is possible to estimate the ratio of human population growth to species extinction with an error of about 4 1/2 orders of magnitude.

Monday, July 16 The Farallon Restoration Project: Island Ecosystem Recovery By Invasive House Mouse Removal
Grout, Dan*, *Island Conservation* , **McChesney, Gerard**, *USFWS* , **Bradley, Russell**, *PRBO Conservation Science*
Removal of invasive species from islands has become an increasingly successful and important tool for restoring island ecosystems. The Farallon National Wildlife Refuge, 28km west of San Francisco, is the site of a U.S. Fish and Wildlife Service proposal to restore seabirds and endemic species by removing invasive house mice (Mus musculus). The Farallon Islands harbor over 300,000 breeding seabirds, and is the largest seabird colony in the contiguous U.S. Yet non-native mice are having serious negative impacts on native island resources, threatening species like the rare Ashy Storm-Petrel (Oceanodroma homochroa). About 50% of the world population of this petrel species breeds on the Farallones, and their population has declined in recent decades. Recent mark-recapture studies indicate that mice infest the Farallones at plague-like densities of over 1272 mice/hectare, one of the highest densities reported for the species. A mouse eradication operation is proposed using techniques that will be uniquely tailored to the islands, and will be based on over ten years of research to fill important data gaps. Rodents have been successfully removed from 338 islands worldwide to date. Recent U.S. rodent removal efforts have been done on Anacapa and on USFWS Refuges in Alaska, Palmyra Atoll and Desecheo. The Farallon Restoration Project intends to permanently restore the Farallon ecosystem while minimizing non-target impacts by extensive consultation, research and careful planning.

Wednesday, July 18 9:30 Closing The Gap Between Planning And Doing: Making Conservation Planning More Relevant To On-The-Ground Interventions In The Nature Conservancy
Groves, Craig*, *The Nature Conservancy* , **Game, Edward**, *The Nature Conservancy* , **Hardesty, Jeff**, *The Nature Conservancy*
The Nature Conservancy (TNC) has been deeply engaged in systematic conservation planning (the "where" or spatial planning question) and strategic planning (the "how" question) for 20 years. For spatial planning (ecoregional assessments), a

recent analysis suggests the gap between planning and doing is relatively small and that we focus conservation efforts on places identified in these plans. On the strategic side, however, implementation of conservation plans is falling short and the gap between planning and doing is significant. We are implementing a number of major changes to close this gap: 1) greater emphasis on the development of strategies including articulation of theory of change and development of alternative strategies, 2) better identification of costs and benefits of alternative strategies including return-on-investment analyses, 3) mainstreaming of multi-objective planning that better incorporates ecosystem services and better connects social and ecological objectives, 4) a roadmap to conservation planning and adaptive management that is easier to understand for managers and project directors, and 5) improved understanding and transparency of the purpose, decisions, and decision makers for any major planning effort as well as a clear articulation of the ultimate outcomes for any major conservation project. Examples of each of these changes will be discussed.

Monday, July 16 12:30 Vernal Pool Ecosystems Of Baja California, México: A Story Of Loss And The Growing Effort To Conserve What Remains

Guilliams, Matt[*], *UC Berkeley* , **Mata, Sergio**, *Terra Peninsular* , **Delgadillo, Jose**, *Universidad Autónoma De Baja California*

Vernal pool ecosystems are ephemeral, rain-fed pools found in Mediterranean climates worldwide. These ecosystems are relatively well studied in the United States but poorly so in northwestern Baja California, where they might have been historically common. A large percentage of vernal pools in the United States have been destroyed during the conversion of native habitat to other land uses, e.g., to agriculture in the Central Valley of California. A similar loss of vernal pools might have occurred in Baja California as well, although little is currently known about the present and historical distribution of vernal pools in México. Here we present data from a long-term project to map and assess the vernal pools of Baja California. Aerial photographs have revealed regions with features consistent with the presence vernal pools prior to agricultural development, as well as many sites that presently support vernal pools. Based upon photointerpretation of aerial images in GIS and fieldwork, current and historical vernal pool areal extent has been quantified. Vernal pool loss in Baja CA is conservatively estimated at 91.5%. Given this estimate of loss and the rapid pace of development in northwestern Baja CA, a “triage approach” has resulted in conservation efforts focused on the Valle de Las Palmas region between Tijuana and Tecate, an area slated for massive development over the next decade. Current project goals include the formation of a bi-national vernal pool conservation team, development of education and outreach materials in Spanish, and continued fieldwork.

Tuesday, July 17 9:45 Life At The Boundary: Creating A Dynamic Environment For Scientists And Natural Resource Managers To Understand And Adapt To Climate Change

Gunther, Andrew[*], *Bay Area Ecosystems Climate Change Consortium* , **Cohen, Ellie**, *PRBO Conservation Science*

Despite the overwhelming agreement among climate scientists about the causes and implications of climate change, most resource managers and policymakers in the United States are not yet taking adaptive action. Given this slow response more scientists are seeking direct engagement to influence and policy and management. The Bay Area Ecosystems Climate Change Consortium (BAECCC) was formed in 2009 to bring together scientists, public and private resource managers, and decision-makers to collaboratively understand and reduce the negative impacts of climate change on Bay Area ecosystems and communities. BAECCC’s goal is to engage these stakeholders in conducting research and applying

key findings to enhance the conservation of ecosystem services for wildlife and people. Key features of BAECCC's approach include (1) creating an iterative process for exchange of information between the management and scientific communities, (2) encouraging novel alliances that result in the funding of useful science and convenient tools for the application of results; and (3) helping scientists and managers understand and eliminate institutional, historical, and procedural constraints to effective collaboration. BAECCC is testing its approach through the development and implementation of a strategic research initiative to clarify the impacts of climate change on ecosystem services and identify strategies for adaptation to reduce the severity of these impacts.

Monday, July 16 9:30 Conservation Portfolios: Management Strategies For An Uncertain Future

Haak, Amy* , **Williams, Jack**, *Trout Unlimited*

Wildlife managers and conservation partners are often faced with difficult decisions on how to allocate limited financial resources in a manner that maximizes benefits to the species of concern. The uncertainty of future conditions due to rapid environmental change brought on by global warming further complicates the prioritization process. Management strategies that increase biological diversity and promote varied approaches to population protection are more likely to succeed. We apply the concept of a diverse management portfolio to native trout conservation and the identification of priority habitats for restoration actions. The conservation portfolio of a species is quantified using the 3-R Framework: Representation (protecting/restoring diversity), Resilience (having sufficiently large populations and intact habitats to facilitate recovery from rapid environmental change), and Redundancy (saving enough different populations so that some can be lost without jeopardizing the species). Results of the portfolio analysis are used to identify those elements of diversity that are rare or threatened and are thus a high priority for restoration. The portfolio also identifies existing stronghold populations that contribute to resiliency and are a high priority for protection. Application of the concept is described in case studies of Yellowstone cutthroat trout Oncorhynchus clarkii bouvieri and Rio Grande cutthroat trout O. c. virginalis.

Wednesday, July 18 8:30 Wildlife Protection Or Wildlife Conservation? Can We Do Both? Can We Afford Not To?

Hadidian, John*, *The Humane Society Of The United States*

Contrasting visions of wild animals that pit the moral value of individuals against that of populations have been richly debated between what can be called traditional conservationists and, variously, animal rights, welfare or protection interests. At present there seems to be a détente occurring that allows both sides to see value in the thinking of the other, but perhaps without fully recognizing that it is one thing to resolve debates over concepts and another to try to solve tangible real world problems. The oncoming train named invasive species management may set this détente back. It is important to acknowledge that both populations and individuals are being managed in the real world and in real time, often controversially, and in addition to seeking ways of reframing concepts such ongoing realities must be engaged more directly. This means speaking concretely of improved policies and better practices. As it becomes ever more professionalized, the field of wildlife damage management may help here. Stepwise procedures that emulate Integrated Pest Management (IPM) best practices are increasingly being applied to vertebrates, resulting in improved welfare consequences. Practically, welfare assessment matrices are facilitating decisions concerning the consequences of specific methods of control. This talk takes a critical look at these and other recent developments in wildlife damage management that may, if not leading to better agreement, at least lead to better understanding.

Monday, July 16 Enhancing The Capacity For Climate Change Adaptation In Conservation Planning At The State Level

Hagell, Suzanne* , **Hull, Scott**, *Wisconsin Department Of Natural Resources* , **Reetz, Matthew**, *Univeristy Of Wisconsin Madison* , **Martin, Karl**, *Wisconsin Department Of Natural Resources* , **Meyer, Michael**, *Wisconsin Department Of Natural Resources* , **Ribic, Christine**, *Us Geological Survey Wisconsin Cooperative Wildlife Research Unit*

Natural Resource Management (NRM) agencies play a primary role in conservation and climate change adaptation within states because they have the ability to implement and enforce planned anticipatory action. However, this can only happen if NRM agencies have the adaptive capacity to identify and carry out informed decisions. Challenges to adaptive decision-making in NRM include working under multiple forms of uncertainty, limited resources, and insufficient planning horizons. Adaptive Management (AM) is commonly recommended in NRM to reduce uncertainty, but requires more capacity in terms of resources and time than is commonly available. An evaluation of alternatives to AM coupled with an assessment of the current adaptive capacity in NRM would be an important step towards providing real solutions for climate change adaptation. This project took advantage of an interagency, state-level partnership, the Wisconsin Initiative on Climate Change Impacts (WICCI, www.wicci.wisc.edu). As part of the Wildlife Working Group, we assessed adaptive capacity by conducting a survey to measure existing adaptive capacity and decision-making across agencies, focusing on information exchange and application. Secondly, we evaluated Structured Decision Making (SDM) as a tool for enhancing these components of capacity while solving an actual NRM problem. Our ultimate goal is to create infrastructure within Wisconsin that can support long-term, adaptive planning in light of the uncertainties and associated challenges imposed by climate change. We report on the process and challenges of climate change adaptation at the state level and illustrate the role that strategic, collaborative decision-making could play in the future of wildlife conservation and Natural Resource Management.

Tuesday, July 17 3:45 Wet, Flat, And Fragmented: Tailoring Adaptation Strategies To Fit Risks And Opportunities In The Great Lakes Region

Hall, Kimberly* , *The Nature Conservancy* , **Kahl, Katherine**, *The Nature Conservancy* , **Doran, Patrick**, *The Nature Conservancy*

One of the major challenges associated with developing and implementing responses to climate change is that the best strategies, and how to achieve them, vary with location. To move forward, we need to know how much the climate is changing in a given place, what is at risk, and who makes the decisions that influence species or system viability. I will describe ongoing work in the forest management sector, and work focused on protecting freshwater systems in agricultural landscapes, highlighting how conservation science is being used in the Great Lakes region (North America) to inform decisions related to promoting ecosystem-based adaptation strategies, and actions that increase greenhouse gas sequestration. Major challenges in this region include the potential for increased agricultural and urban impacts on water quality due to increases in intensities of peak storm events, and increases in flooding in or near drained agricultural landscapes. In addition, the region's flat topography suggests species need to move particularly long distances to "track" changes in temperature. Given that potential movement corridors include natural barriers like the Great Lakes, and many anthropogenic barriers (agriculture and urban land uses, and many barriers in aquatic systems), prioritizing "where to work" to promote connectivity has emerged as a key area for collaboration among researchers and practitioners.

Wednesday, July 18 8:30 Ecoinformatics Beyond National Jurisdiction: Status And Future Directions
Halpin, Pat*

The development of biological and environmental information to support ocean policy and management in areas beyond national jurisdiction (ABNJ) is a challenging task at present. Areas beyond national jurisdiction are often not only outside of national control but are also outside of individual national scientific data collection and monitoring programs. International consortiums of scientific data contributors are an essential mechanism to provide the necessary data and analysis in these ocean commons. The Global Ocean Biodiversity Initiative (GOBI) is an international partnership advancing the scientific basis for conserving biological diversity in the oceans. It aims to assist countries, as well as regional and global organizations to develop new data, tools, and methodologies to identify ecologically significant areas in the open ocean and deep sea. In parallel with GOBI, the Ocean Biogeographic Information System - OBIS (http://iobis.org) acts as the primary open-access data archive to house and supply data to individuals and institutions for use in areas within and beyond national jurisdiction. OBIS now provides more than 30 million geospatially referenced data records covering more than 125,000 marine species. This geospatial information is directly useful for the assessment of areas of Ecologically or Biologically Significant Areas (EBSAs), Vulnerable Marine Ecosystems (VMEs) and other important international ocean assessments now being conducted in these regions.

Wednesday, July 18 11:40 Recent And Future Climate Space Trends In The San Francisco Bay Area
Hamilton, Healy*

The diverse flora and fauna of the San Francisco Bay Area are adapted to the relatively cool, ocean-mediated climate patterns of its central coastal position in the California Mediterranean ecoregion. Understanding how these patterns may change as a result of anthropogenic climate disruption will contribute to climate adaptation efforts, land use planning and conservation strategies within the Bay Area. Evaluations of the rate and magnitude of future change in climate usually compare to a single baseline averaged over a 30-50 year time slice. This method of evaluating projected change factors does not incorporate the natural climatic variability to which Bay Area biodiversity is adapted. Using annual observations from the PRISM spatial climate dataset (Daly et al 2002), we create both means and standard deviations per pixel in monthly maximum and minimum temperatures and monthly total precipitation across an 80-year baseline, from 1900-1980. We present the geographic distribution of recent climate trends (1981-2010), and evaluate the locations of statistical departures from historical climatic variability. Direct weather station observations are compared to the PRISM interpolated spatial climate data as an evaluation measure. Climate space trends demonstrate that an increase in summer minimum temperatures are the most significant recent change relative to 1900-1980 baseline climates. To investigate the rate and magnitude of future departures from baseline climate space, we examine a multimodel ensemble of downscaled future climate parameters derived from the A2 emissions scenario for several future time slices. Analysis of climate space trends incorporating historical climatic variability provides a statistical and visual representation of both the most vulnerable and the most resistant fine scale patterns of climate change across Bay Area landscapes.

Tuesday, July 17 8:45 Messing With Water Policy And Fishes In California: An Independent Science-Based Approach
Hanak, Ellen*, *Public Policy Institute Of California* , **Moyle, Peter**, *University Of California*

California is boiling with conflicts over water,

especially those involving endangered fishes. To conduct science-based analyses of the problems, the Public Policy Institute of California and the Center for Watershed Sciences at UC Davis assembled teams of academics (representing economics, ecology, law, engineering, water policy, geology). Their reports, including 3 books, have garnered considerable attention. Some fish-oriented findings include: (1) Changing the way water is exported from the Sacramento-San Joaquin Delta is needed to protect fish. (2) The Delta ecosystem has undergone a regime shift from an estuarine to a more lake-like environment. (3) Major physical changes to the Delta are inevitable as sea level rises and levees collapse. (4) Large investments in habitat restoration are required. (5) Biologists are pessimistic about long-term survival of some native species. (6) Reoperation of many California dams to benefit fish is needed. The PPIC-UCD teams also recommend practical solutions to the problems, provided water culture can change from conflict to reconciliation. The success of this effort has been the result of creative leadership (Ellen Hanak, Jay Lund, Jeff Mount), intellectual independence, diverse expertise, collegiality, good graphics, and foundation funding.

Wednesday, July 18 3:20 Estimating The Impacts Of Bolivia's Protected Areas On Poverty

Hanauer, Merlin[*], *Sonoma State University* , **Canavire-Bacareza, Gustavo**, *Georgia State University*

Protected areas are a powerful policy tool for the preservation of ecosystems and their services. The rapid proliferation of protected areas in Bolivia over the past several decades has prompted interest in understanding their impacts on surrounding populations. Using rich biophysical and socioeconomic data from Bolivia we find that municipalities with at least 10% of their area occupied by a protected area established between 1992 and 2000 exhibited differentially greater levels of poverty reduction between 1992 and 2001, compared to similar municipalities unaffected by protected areas. We find that our results are robust to a number of econometric specifications, spillover analyses and a placebo study. Although our overarching results that Bolivia's protected areas were associated with poverty reduction are similar to the few previous studies that exist from other countries, our underlying results differ subtly, but significantly. Previous studies found that controlling for key observable covariates led to fundamentally antithetical results compared to naïve (uncontrolled) estimates. Conversely, our results indicate that naïve estimates lead to an over estimation of the poverty reducing impacts of protected areas. Our results expose the heterogeneity of protected area impacts across countries and, therefore, underscore the importance of country-level impact evaluations in order to build the global knowledge base regarding the socioeconomic impacts of protected areas.

Tuesday, July 17 9:50 Influence Of Current Speed, Substrate, And Plankton On The Distribution Of Suspension Feeders In Mo'Orea, French Polynesia

Hann, Courtney[*], *UC Berkeley*

Suspension feeders are sessile marine organisms dependent on plankton and organic particles transported by the water column for food. This study focused on the distribution of four suspension feeders (Dendropoma maxima, Spirobranchus giganteus, Heteractis magnifica, and Tridacna maxima) in Mo'orea, French Polynesia based on current, suspended particle abundance, and substrate type. The positive association found between current and suspended particle, or food, abundance suggests that a stronger current transports more organic particles to a set location than a weaker current. As a result, docks or resorts built over the water can inhibit water flow, thereby transferring less food to filter feeders in coral reef ecosystems. In addition, all four species studied showed substrate preference for specific coral species. This observation reiterates the importance

of protecting an entire coral reef ecosystem, versus a particular species. Since suspension feeders regulate primary production by consuming plankton, their distribution and abundance greatly affects marine food chains. Therefore, when designing coral reef conservation programs, it is important to consider potential hazards that may reduce current speed, and therefore obstruct suspension feeder growth.

Monday, July 16 3:00 Why Climate Change Should Be Part Of Monitoring
Hansen, Lara[*], *EcoAdapt* , **Score, Alex**, *EcoAdapt* , **Gregg, Rachel**
Today monitoring is a part of many conservation endeavors and is designed for a variety of goals. Monitoring is used as a part of management, regulation, design/designation and improving our understanding of basic ecological processes. In all of these cases explicitly developing parameters and approaches that consider the sensitivities and effects of climate change can lead to better outcomes for the original goal. Unfortunately very little monitoring that was not designed exclusively to assess the effects of climate change exists today and this can make many of our conservation endeavors more vulnerable to climate change. There is an emerging body of work attempting to provide guidance to improve monitoring, making it more climate savvy.

Monday, July 16 Restoration In An Arid Land Creek And Wetland Complex
Hare, Trevor[*], *Sky Island Alliance*
Cloverdale Ciénega was a vast desert marsh irrigated by a 10,000-acre watershed that is now in excellent condition. It was so large, in relation to its watershed size, that it was able to harvest the bulk of the runoff from a typical storm by super charging its alluvial storage. Down valley, wetland swales brought water to Cloverdale Creek, creating a perennial stream reach. This wetland complex has been degraded due to an old concrete dam, dozens of berms and a deep gully. The only perennial creek in the Peloncillo Mountains is now an arroyo and the ciénega is greatly reduced. The project goals were to restore a more natural hydrology to the watershed, restore riparian vegetation, and to protect and enhance the population of the Chiricahua leopard frog. After three years of careful planning we commenced work in spring 2010. We removed over 6000 cubic yards of dirt from levees and with 250 tons of boulders we constructed four diversions along the man-made gully. These structures were designed to allow storm flows to spread out over the entire width of the dried ciénega surface. Monitoring results and phase two and three planning will be discussed.

Tuesday, July 17 11:10 Arroyo, Rillito And Cienega Restoration In The Sky Islands
Hare, Trevor[*], *Sky Island Alliance*
Land managers and owners in the Sky Island region of Arizona, New Mexico and Sonora have asked for effective, and replicable restoration techniques for Arroyos, Rillitos and Cienegas. Restoration of these rare resources will have beneficial effects on both the ecosystem and the economic base in rural areas. How do we measure the benefits? And how do we effectively communicate our findings?

Monday, July 16 Are Payments For Ecosystem Services Enough In An Urbanizing Landscape?
Harris, Nyeema[*], *University Of California Berkeley*
Benefits people derive from the environment are conspicuous and continue to gain attention as the science of ecosystem services shifts from theory to implementation. Besides identifying “win-win” locations, where high ecosystem services and biological diversity overlap, a more useful question might be, “Can payments for ecosystem services compete with payments for alternative uses?” We illustrate this approach at a regional scale by using

the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) model to quantify carbon sequestration in the rapidly developing Upper Neuse River Basin near Raleigh, NC, USA. We used property tax values as a metric of opportunity cost and calculated a ratio between the monetary values associated with potential payments for carbon sequestration and those associated with opportunity costs. The "affordable" lands for purchase and preservation (ie, a ratio ? 1) varied with payments for carbon sequestration being higher than property costs on ~74% of wetlands compared to ~9% of urban lands. We also evaluated affordability on lands of high conservation value (ie, Significant Natural Heritage Areas) and found that ~44% and 73% of these lands were affordable when carbon was valued at $20/ton and $45/ton, respectively. If conservation areas correspond to areas of high economically-valued ecosystem services that are affordable, motivations for land conservation justifiably encompass benefits to nature and human welfare.

Wednesday, July 18 4:00 Coextinction: More Than Just A Theory?

Harris, Nyeema[*], *University Of California Berkeley* , **Colwell, Robert**, *University Of Connecticut* , **Dunn, Robert**, *North Carolina State University*

The accelerated loss of species to extinction remains a persistent and troubling phenomenon in conservation biology. As evidence continues to mount regarding the number of species known to have gone extinct, it becomes increasingly apparent that extinctions are rarely, if ever, an isolated events. Instead because these extinct species are hosts, are prey, are pollinators– their demise may lead to the demise of affiliated species. As a concept, coextinction in its simplest, binary form is straightforward. Two species can be linked by pure exploitation, in which one species benefits and the other is harmed; by mutualism, in which each partner bears a cost but each reaps a net benefit; or by commensalism, where one species benefits with negligible cost or benefit to the other. We review empirical examples that infer coextinction, but also highlight the complications of why such events are difficult to document and require statistical or network models for estimation. Host shifts represent a plausible alternative for affiliates, yet the ecological and evolutionary constraints and promoters are poorly understood. Coextinction risk and its management depend on host specificity, the evolutionary lability of affiliates, host and affiliate traits, and synergistic interactions with other threats, including habitat loss, climate change, and invasive species.

Monday, July 16 9:10 Improving Endangered Species Act Listing And Recovery, Consultation And Enforcement

Hartl, Brett[*], *Society For Conservation Biology*

The decision to protect a species under the Endangered Species Act (ESA), and the decision to remove the legal protections provided by the Act because a threatened or endangered species has "recovered," are the two most important policy decisions the U.S. Fish and Wildlife Service (FWS) makes to preserve biodiversity in the United States. While these policy decisions are required to be based solely on the best available science, they often lack consistency, transparency, and a clearly articulated scientific rationale. Thus, these decisions are susceptible to improper policy and political interference, often to the detriment of endangered species themselves. This presentation will explore the listing process under Section 4 of the ESA, recent efforts to reduce the backlog of candidate species waiting for listing, and new approaches designed to improve the listing process. In addition, we will explore ways of defining what it means for a species to be "recovered" under the ESA using objective criteria for assessing extinction risk and science-based thresholds for down-listing and delisting endangered species. Finally, this presentation will explain how an objective recovery standard will provide much needed guidance for interagency consultations required by Section 7 of the ESA, and

a better prioritization scheme for allocating resources to law enforcement efforts to protect the most endangered species within the United States.

Monday, July 16 The Round Goby (Neogobius melanostomus) And Native Benthic Fish In New York Tributary Streams Of Lake Ontario
Hassan, Zafri[*], *Cornell University* , **Sullivan, Patrick**, *Cornell University* , **Bain, Mark**, *Cornell University*
Round goby (Neogobius melanostomus), is a non-native benthic fish that has occupied the Great Lakes since early 1990's and caused economic and ecological threats. The population has now moved into the tributary system and can potentially out-compete other native benthic fish. We used kick-seine and electro-fishing methods to document the occurrence of round gobies and native benthic fish in a watershed of northwest of New York draining into Lake Ontario. There were 33 sites visited, 16 sites where both round goby and native benthic fish were present, 2 round goby only, 7 native benthic only and 8 where both were absent. We detected 7 native benthic fish (Etheosoma blennioides, E. caerulem, E. flabellare, E. olmstedi, E. exile, Percina caprodes and P. maculate) at sites where round gobies were present. Data were modeled using stream landscape position, distance from Lake Ontario, substrate types and stream size. Except substrate types, all variables significantly predicted the probability of presence-absence of round goby relative to native benthic fish in the area. At this time, while none of the native species is of conservation concern, the information from this study might be used to recommend steps for countering the round goby invasion.

Tuesday, July 17 11:45 Can Prescribed Burns Be Used To Control A C(4) Invasive Grass In A C(4) Grassland?
Havill, Scott[*], *Texas State University* , **Schwinning, Susan**, *Texas State University* , **Bach, Jp**, *Freeman Ranch Center* , **Lyons, Kelly**, *Trinity College* , **Williamson, Paula**, *Texas State University*
Invasive species control is most difficult when the invasive and native species have many physiological and morphological traits in common. Short of removing invasive species by hand, area-wide treatments such as prescribed burns carry the risk of insufficiently discriminating between the invasive and native species and inadvertently promoting the further spread of the invasive species by opening up competitor-free space. To decrease invasive species cover in the long term through fire or other techniques involving disturbance, native-invasive differences in mortality must be large enough to overwhelm the competitive advantage of the invasive species. We tested the hypothesis that the careful timing of prescribed burns can be used to manipulate the tiller proportions of the non-native C(4) grass KR bluestem (Bothriochloa ischaemum) and the native C(4) grass little bluestem (Schizachyrium scoparium). We burned individual grass patches six times between June 2011 and January 2012 inside a 46 cm diameter steel barrel centered on bunches of either KR bluestem or little bluestem. Live tillers were counted before and after each burn to ascertain whether the fire changed tiller proportions. To identify potential physiological and environmental correlates of fire effects on tiller proportions, we recorded the phenological stages of species just before the burn, water potential, pre-burn biomass, and fire temperatures. Fire significantly reduced KR tiller proportions from approximately 54% to between 11 and 30%. The least reduction in tiller proportion (30%) was observed after a September burn, when KR bluestem bunches were predominantly in a state of dormancy due to drought. The largest reduction in KR bluestem tiller proportions (11%) was observed only weeks thereafter, following an October burn, when bunches were burned in the early stages of vegetative growth. These results support our hypothesis that careful timing with respect to the phenological state of the invasive species and its recent drought history is an effective tool to maximize selectively negative effects on the

invader. This conclusion may transfer to other invasive grasses in other grassland systems, but the technique has to be reconciled with a policy of banning burns during and after drought periods.

Tuesday, July 17 9:15 Importance Of Multiple Faunal Distributions When Conserving Ephemeral Wetlands: Differing Invertebrate And Amphibian Community Responses

Hawley, Joanna*, *Clemson University* , **Baldwin, Rob** , **Pitt, Amber**, *Clemson University* , **Brown, Bryan**, *Virginia Tech*

Across North America ephemeral wetlands have become a conservation concern due to the many species they support and the landscape scales at which metacommunities operate. Most conservation-oriented studies focus on one taxonomic group (e.g., amphibians, waterfowl) and selected temporal or spatial extents. Our goal was to understand the effects of variables measured at within-pond, local, and current as well as historical landscape components, in influencing faunal distributions. We examined habitat components of 41 wetlands in relation to amphibian and macroinvertebrate communities. Our results demonstrated that while the distributions of amphibians and invertebrates are modestly related, the habitat preferences of macroinvertebrates are more general whereas amphibians are more restricted in their ability to successfully colonize and persist. We found an average of 4.5 amphibian species per wetland (±2.57, max=11, min=0) and an average of 20.5 benthic macroinvertebrate genera per wetland (±8.13, max=44, min=4). Linear models revealed that amphibian species richness was influenced by area, depth, distance to the nearest wetland, macroinvertebrate richness and percent of historical low-density development and cultivated area at a 250 m radius. Macroinvertebrate taxonomic richness was influenced by pH, dissolved oxygen, depth, conductivity, canopy cover, percent of historical cultivated, pasture and forested land at a 250 m radius. Our results support the importance of considering the responses of multiple faunal distributions in the context of current and historical land use in determining habitat drivers and conservation needs of a given system.

Tuesday, July 17 4:45 Nursery, Field, And High-Throughput Sequencing Studies Of Partial Host Resistance To An Introduced Forest Disease

Hayden, Katherine*, *UC Berkeley* , **Wright, Jessica**, *USDA-Forest Service, Pacific Southwest Research Station* , **Eyre, Catherine**, *UC Berkeley* , **Garbelotto, Matteo**, *University Of California*

The introduced pathogen *Phytophthora ramorum* has had a devastating impact on populations of tanoak (*Notholithocarpus densiflorus*) in California and Oregon, where it causes the disease sudden oak death. Tanoaks are important ecologically, and one of the few species that are both killed by *P. ramorum* and contribute to its spread. Here we report on progress to date on a multiyear, collaborative project, the goal of which is improve the understanding of the role resistance might play in the disease dynamics and management of tanoak populations. We show the relevance of laboratory studies to field outcomes, present results from simultaneous next-generation sequencing of host and pathogen transcriptomes, and discuss the potential for disease resistance in driving the management or evolution of the species in response to this considerable threat.

Tuesday, July 17 12:30 Breaking Through: Talking Science To Connect With Your Audience

Hayes, Rich*, *Union Of Concerned Scientists*

This interactive presentation is based on my book "A Scientist's Guide to Talking with the Media." Participants will learn how to craft and deliver effective messages for public consumption that are not only scientifically accurate, but make people care. We will view several video clips of scientists that will lead to a group discussion on best

practices. Attendees will learn advanced techniques that will increase their confidence and help them keep their cool during difficult encounters. Scientists will also have the opportunity to share their own public communication experiences for feedback. The talk is appropriate for scientists with limited media experience as well as those wishing to hone their skills.

Wednesday, July 18 11:00 Predicting Pacific Top Predator Habitat Using Global Climate Change Models

Hazen, Elliott[*], *NOAA Southwest Fisheries Science Center* , **Bograd, Steven**, *NOAA Southwest Fisheries Science Center*

Climate change scenarios have predicted an average rise from 1-6° C by 2100 which could effect the habitat and distribution of many marine species. The tagging of Pacific predators (TOPP) project has tagged 4300 animals resulting in 268,000 data-days and an expansive dataset for examining climate change effects. We used spatially explicit habitat models (e.g. generalized additive mixed models) to examine present-day distributions and foraging habitat of 23 top predator species in the Pacific from 2001-2009 as a function of fixed bathymetric variables, sea surface temperature, wind, Ekman pumping, mixed-layer depth, and chlorophyll-a. Consequently we used 1° and monthly resolution climate models from the Geophysical Fluid Dynamics Laboratory to predict potential habitat from bathymetry, SST, and chlorophyll-a under future scenarios. We found oceanographic changes, such as the northward migration of the transition zone that affected top predator biodiversity throughout the Pacific and highlighted potential changes in important conservation corridors. Increased frequency of El Niño / La Niña events and changes in timing and intensity of upwelling could further affect biodiversity and potential habitat in the north Pacific, particularly the critical habitat within the California current.

Monday, July 16 Habitat Complexity And Alternative Prey Alter The Strength Of Nonnative Fish Impacts On Pond-Breeding Amphibians

Hedman, Hayden[*] , **Preston, Daniel**, *University Of Colorado*

Understanding invasive species impacts is important for prioritizing conservation strategies, especially in wetland ecosystems in North America. Unfortunately, impacts of invasive species are often challenging to detect because they occur alongside other types of environmental change or their strength varies with characteristics of the invaded ecosystem. In the present study we examined how habitat complexity (aquatic plant density) and alternative prey availability (zooplankton density) alter the strength of invasive mosquitofish (Gambusia affinis) impacts on a native amphibian community. Within artificial pond mesocosms the survival of Pacific chorus frogs (Pseudacris regilla) was nearly 2x greater in treatments containing increased habitat complexity or alternative prey. Growth rates of chorus frogs also increased in the presence of elevated habitat complexity. Survival of California newts (Taricha torosa) was high across all treatments, although newts grew faster in the presence of alternative prey. Increased habitat complexity also indirectly increased zooplankton densities, presumably by providing refugia from fish. Current research is examining how impacts of nonnative mosquitofish in mesocosms 'scale-up' to real wetlands. Our results highlight how the environmental characteristics of invaded habitats can alter the strength of invasive species impacts, which should be considered in developing management strategies for wetland ecosystems.

Monday, July 16 11:15 Genetic Change Over The Past Century In The American Pika (Ochotona princeps)

Hekkala, Evon[*] , **Peacock, Mary**, *University Of Nevada*

The American pika (Ochotona princeps), often referred to as the “canary in the coal mine” for

observing changes in alpine systems, provides an ideal model for examining genetic changes in a high altitude species under ongoing climate change. Pika are very sensitive to temperature, and current evidence suggests that the species' elevational distribution has moved upward in the past century as warming occurs in the Great Basin, Sierra Nevada and elsewhere. Few studies to date have explicitly sought to utilize archival material to empirically estimate the impacts of climate change on genetic variation in natural populations over time. We are using genetic analyses of archival samples, datasets available from the recent past and contemporary samples from throughout the range of this species in western North America, to test the hypotheses that neutral genetic diversity has been lost in association with climate induced range contractions over the past century. Preliminary data from microsatellite markers for historic and contemporary pika populations in the Ruby Mountains in Nevada and Bodie in the Sierra Nevada indicate a loss of allelic diversity over the past century.

Wednesday, July 18 12:00 Using Fine-Scale Climate And Hydrology Data For Adaptive Conservation Planning In The San Francisco Bay Area

Heller, Nicole* , **Branciforte, Ryan** , **Weiss, Stuart**, *Creekside Center For Earth Observation*

In the spring of 2011, an ambitious land acquisition plan was released for the San Francisco Bay Area, the Conservation Lands Network (CLN). This conservation planning exercise selected priority conservation sites based on a vegetation cover analysis and specific species targets. The San Francisco Bay Area Terrestrial Climate Change Collaborative (TBC3) is working to explore the impacts of climate change on the suitability of the CLN, and to create a prioritization scheme for land acquisition and management within the network. Our analysis reflects projected climatic changes derived from a large ensemble of downscaled climate data and further processed through a regional water-balance Basin Characterization Model to project climate and hydrological variables at the 270-meter scale. We use this data to describe spatial and temporal aspects of current and future climate and examine implications for conservation priorities and management actions. In this talk, I describe our framework for measuring and categorizing vulnerability and resilience across the landscape and translating these categories into specific management options to develop a tool for spatially explicit adaptation planning. This work illustrates that an ambitious land acquisition plan, focused on areas of high climatic heterogeneity, is an effective way to deal with climatic changes, especially given uncertainty in future climate emerging from different global climate models.

Tuesday, July 17 4:15 The Other Side Of The Coin! Conservation Translocations Benefit Protected Fish, But May Impact Endemic Invertebrates

Henkanaththegedara, Sujan*, *North Dakota State University* , **Fisher, Justin**, *North Dakota State University* , **Mcewen, Daniel**, *Minnesota State University Moorhead* , **Stockwell, Craig** , **Parmenter, Steve**, *California Department Of Fish And Game*

Desert springs, which harbor diverse invertebrate assemblages, are often used as refuge habitats for protected fish species. However, this management strategy neglects the potential impact of fish on unique invertebrate communities. We conducted a mesocosm experiment to assess fish impacts on community structure of spring-dwelling invertebrates. We established invertebrate communities in large mesocosms by pumping water from a spring. Tanks were randomly assigned to one of three fish treatments representing allopatric and sympatric populations of invasive western mosquitofish and endangered Mohave tui chub or a fishless control treatment. Final populations of invertebrates and fish were sampled and counted after 67 days. Invertebrate community structures changed mainly due to

population declines and local extirpations of invertebrates, presumably due to fish predation. For instance, densities of Crustaceans and Chironomid larvae in fish treatments dropped compared to the fishless treatment. Notably, Cladocerans were extirpated in 80% of mosquitofish mesocosms, while Chironomid larvae were extirpated from 60% of tui chub mesocosms. Furthermore, a NMDS achieved a two-dimensional solution for invertebrate community assemblage with a strong disassociation of the majority of invertebrate taxa among the different fish treatments. Our results fulfill an information gap suggesting that native fish transplanted to fishless desert springs may also have negative impacts on spring-dwelling invertebrates.

Tuesday, July 17 9:00 Protecting The Sacramento-San Joaquin Estuary For Aquatic Resources: It's The Water And A Whole Lot More
Herbold, Bruce*, *USEPA*
In 1991 a mountain of data had been assembled on the estuary and there was an exploding need to protect its resources. Populations continued long-term declines and multiple diverse fish were added to the endangered species lists and the state's water quality control plan was disapproved by EPA. Workshops funded by EPA brought together scientists who, without opining on the level of protection, analyzed the data to identify a flow parameter that was ecologically important, measurable, and largely controllable. This unidimensional parameter, the location of the average daily salinity of 2, was adopted into new water quality standards by EPA and the State. Populations rebounded until 2000, when a wide diversity of fish showed sudden simultaneous declines and studies were begun on a full array of estuarine stressors. Published scientific papers, including explicit funded efforts to synthesize the various studies, were rapidly incorporated into Biological Opinions. In 2012 flow standards are again being addressed, but now in the context of how flow interacts with all the other factors that drive ecosystem processes. In addition, new modeling allows detailed study of the effects of flow on distributions and volumes of all habitats defined by salinity.

Tuesday, July 17 9:00 An Assessment Of Spatiotemporal Refugia For Wildlife During The Mountain Pine Beetle Epidemic
Heyward, Joslin*, *University Of Wyoming* , **Chalfoun, Anna**, *University Of Wyoming* , **Hayward, Greg**, *USDA Forest Service*
Lodgepole pine (Pinus contorta) forests of the Intermountain West are currently experiencing a widespread epidemic of the mountain pine beetle (Dendroctonus ponderosae), due in part to climate change. Major habitat changes will occur at a range of spatial scales as a result, with largely unknown implications for forest wildlife species. An important question is which alternative stand types may best support forest-dependent wildlife prior to mature lodgepole regeneration. Our specific study objective was to examine the relative abundance of focal avian and small mammal species and species diversity across a gradient of patch sizes of spruce-fir and previously logged (young) lodgepole stands within a matrix of beetle-killed lodgepole forest. During 2010-2011 we conducted diurnal rodent/avian point counts and small mammal live-trapping with PIT-tagging in each potential refugia type across a gradient of patch sizes. Species assemblages differed significantly between stand types and among patch sizes. Habitat specialists and semi-rare species were most abundant in the largest patches of spruce-fir. These stands also had the highest species richness and diversity. Spruce-fir stands had higher levels of coarse woody debris, a relatively closed canopy, and are more mesic which may favor species such as the brown creeper (Certhia americana), shrews (Genus Sorex), and uncommon species of voles, such as montane (Microtus montanus) and long-tailed (Microtis longicaudus) voles. Generalist species such as the deer mouse (Peromyscus maniculatus), and species that thrive in open canopy or drier environments,

were more abundant in young lodgepole stands. Previous efforts have focused on how species and assemblages change with phases of a beetle outbreak. Our results provide a foundation for managers evaluating management actions influencing the size and distribution of forest stands in post-bark beetle landscapes. Depending upon the specific habitat needs of species of concern, conserving structurally different stand types and a range of patch sizes will be important in maintaining wildlife populations and biodiversity.

Wednesday, July 18 11:30 Does Restoring Components Of Natural Flows Result In Rehabilitation Of Ecosystem Services?
Higgins, Jonathan*, *The Nature Conservancy*
Globally, many dams are now managed for environmental objectives in addition to their original purposes such as water supply, flood control, power generation, or navigation. The rationale for managing dams for flows to achieve environmental objectives is based on sound scientific and socioeconomic understanding of the importance of natural flow regimes to river ecosystem health and services. However, empirical evidence illustrating ecosystem health and services restoration as a result of environmental flow management has not been previously summarized. This presentation provides a summary of the types and degrees of environmental health and service benefits that have been documented in peer-reviewed journals and reports on impacts resulting from managing flows to restore natural aspects of: base flows; daily flow variability; high flow pulses, and; multiple flow attributes. Results include dramatic recoveries of many aspects of ecosystem health, and documented benefits to recreational, commercial and subsistence fisheries, flow-dependent agriculture, livestock, and vegetation uses. These results provide empirical evidence to draw from for developing project impact goals and objectives, informing monitoring and measures approaches, selecting project sites that have greater potential for success, and leveraging this activity more broadly through illustrating these benefits to people and nature.

Tuesday, July 17 9:15 Partitioning Amazonia: Broad-Scale Divisions In Amazonian Forests And Their Implications For Conservation Planning
Higgins, Mark*, *Carnegie Institution Department Of Global Ecology,* , **Ruokolainen, Kalle**, *Department Of Biology* , **Tuomisto, Hanna**, *Department Of Biology* , **Llerena, Nelly**, *Department Of Biology* , **Cardenas, Glenda** , **Phillips, Oliver**, *School Of Geography* , **Vasquez, Rodolfo**, *Center For Conservation And Sustainable Development* , **Rasanen, Matti**, *Department Of Geology*
Accurate maps of biodiversity and biomass distributions in Amazonian forests are critical for international conservation planning and carbon accounting. Despite over 50 years of study, however, our knowledge of broad-scale patterns in these forests remains in what John Terborgh has called the "stone age." Here we use a combination of satellite imagery and field inventory to demonstrate that Amazonian forests are divided into distinct large-area units on the basis of geological formations and their soil properties. We specifically identify a geological discontinuity of over 300km in western Amazonia corresponding to a 15-fold change in soil fertility and an almost total change in species composition. We further identify a second discontinuity of over 1500km in western Brazil that we believe represents the chemical and ecological boundary between western and central Amazonia. These findings point to more accurate and efficient means of mapping and planning in these vast and remote forests, and support the broad-scale mapping and planning initiatives of the WWF, Nature Conservancy, and others.

Tuesday, July 17 9:45 Landscape And Seascape Science, Planning And Action: A Comparison Across 19 Sites

Hilty, Jodi* , **Chester, Charles** , **Cross, Molly S.**, *Wildlife Conservation Society*

With growing evidence of actual and potential climate change impacts on biodiversity, what adaptation solutions has the conservation community put forth? It is widely recognized that the current system of protected areas is inadequate to protecting biodiversity from the threat of climate change. Yet rather than focusing on a narrow strategy of expanding the global coverage of formal protected areas, scientists and conservationists have instead argued for integrated large landscape. To what degree is this oft-cited solution possible? We reviewed nineteen global case studies from around the globe (including polar, equatorial, freshwater, marine, montane, and temperate systems) to assess how climate change is being incorporated into science, planning, and action. We found both similarities and differences in approaches, tools used, and challenges faced based on local ecological, political, and socio-economic circumstances. In regions experiencing high poverty, lack of science was likely to be a major stumbling block, and solutions tended to emphasize incorporate sustaining livelihoods. The critical impact of changes in water regimes was highlighted in the freshwater and marine systems, where adaptive management was emphasized. In montane systems, which are relatively more intact, working across political boundaries has met with mixed success, and multi-level stakeholder buy-in has been an important variable. In polar systems, human impacts are projected to increase with more access to the regions, and efforts are focused on finding refugia, places most likely to change most slowly. The case studies represent an ongoing set of experiments as to how best to conserve biodiversity during this time of rapid climate change.

Wednesday, July 18 9:30 Changing Conservation Values Of Small-Scale Fishers In Southeast Asia

Hines, Ellen*

The condition of mangroves, seagrass, and coral reef areas along the coast of Thailand has been degraded as a result of overfishing and destructive fishing methods. Increasing populations and increased development along the coast also cause degradation or destruction of these resources. Endangered marine species, such as coastal cetaceans, dugongs, and turtles can also be caught up in coastal degradation as their habitats are in turn damaged or they are incidentally caught in fishing nets. Our team performed interviews about the importance of endangered marine species and systems and their conservation along the eastern coast of the Gulf of Thailand between 2003 and 2012. Our respondents included 627 respondents between the ages of 13 and 80, from fishing villages in Rayong, Chanthaburi and Trat provinces. There were no significant differences in answers about conservation between different age groups in each year of interviews. However, the results show that the responses concerning the importance of conservation increased significantly from the earlier to the later years. Generally within each year, mangroves were considered the highest in conservation importance, marine endangered species below that, coral reefs next, and seagrass considered the least important marine system. Results are compared with similar interviews in Myanmar, Cambodia, Vietnam, western Thailand, Sri Lanka and India. We believe these results show that as direct resource users, small-scale fishers are increasingly aware of the need to conserve important resources affecting their livelihoods. These interviews document changing values and opinions and can point towards education needs and enforceable management solutions. There are three major ways that the outcome of these surveys will be linked to actual conservation practice: 1) surveys were conducted in close collaboration with scientists from the Thailand Department of Marine and Coastal Resources, who will use results for coastal management, 2) we work closely with village councils throughout Trat

province (where most of our respondents are from) and attend village council meetings to discuss our results, and 3)we give presentations to local schools and create educational materials and are preparing class exercises based on coastal conservation.

Tuesday, July 17 11:00 The Climate Adaptation Knowledge Exchange (CAKE): Your Online Adaptation Destination

Hoffman, Jennie* , **Hitt, Jessica**, *EcoAdapt* , **Gregg, Rachel** , **Hansen, Lara**, *EcoAdapt*

The Climate Adaptation Knowledge Exchange (CAKE) is a joint effort by EcoAdapt and Island Press to create an innovative community of practice on climate change adaptation. It is intended to foster the discipline of adaptation to climate change by facilitating the identification of important information and its accessibility; building a community via an interactive online platform; connecting practitioners to share knowledge and strategies; and networking with other relevant materials around the web. This presentation will showcase components of CAKE including a georeferenced database of case studies and adaptation-interested people and organizations, a virtual library, adaptation advice and information exchange, and links to tools and data. We will demonstrate searching by text, map, and keyword, as well as interlinkages among CAKE components. One challenge has been getting users to contribute their case studies to the site. While users often go through the quick process to recommend a document or tool they are far less likely to contribute a case study to the site. We also have struggled with the balance of staying relevant in an online forum by continually adding and updating content with the need to maintain the scientific integrity and reputation of the site. Technical challenges include difficulty with representing regional resources on the map; location is currently designated by a single point regardless of the size of the region covered.

Wednesday, July 18 9:15 The Role Of Recreational Anglers In The Conservation Of Imperiled Freshwater Fish

Hogan, Zeb* , *University Of Nevada - Reno*

While the number of recreational anglers has been growing in many countries, the overall impact of these anglers on freshwater fish biodiversity is unclear. Past research has shown that recreational anglers can significantly reduce fish stocks, eventually leading to fisheries collapse. Yet recreational anglers can also have a positive effect on the health of fish stocks, especially when anglers take an active role in management and conservation. To better understand the strengths and weaknesses of angler driven conservation measures, I examine case studies focusing on recreational fishing for large-bodied, imperiled freshwater fish. Although several of these species are considered threatened by IUCN, they remain popular with recreational anglers. I will discuss recreational angling in the context of imperiled fish status and long-term persistence. Which species are popular with anglers? Does recreational angling for large-bodied fish threaten their survival? What are some the direct and indirect impacts of recreational fishing? And importantly, where are the success stories? Can recreational fishing help protect vulnerable large-bodied fish? Case studies from Mongolia and Nevada (U.S.A.) highlight some of the benefits of engagement of recreational anglers in conservation where recreational angling (or funds from recreational anglers) is driving sustainable, science-based management.

Wednesday, July 18 12:00 Assessing Potential For Collaborative Reconciliation Of Conflicts From Contentious Wildlife Management In Southwestern Arizona Designated Wilderness

Hoglander, Cerissa* , **Nielsen, Erik**, *Northern Arizona University* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Rosenstock, Steve**, *Arizona Game And Fish Department*

The conflict over developed waters as a wildlife conservation management tool has persisted for

over twenty years, and is now being adjudicated in the United States Ninth Circuit Court of Appeals where wilderness advocates and management agencies are in contention over the reconstruction of developed waters for desert bighorn sheep management in the Kofa National Wildlife Refuge wilderness. This conflict exemplifies the ideological split between wilderness and wildlife management. The purpose of this study is to examine the potential for collaborative reconciliation of the dispute over developed waters in southwestern Arizona based on stakeholders' shared interests, interdependence, and willingness to collaborate. Through in-depth interviews with representatives from stakeholder agency and non-profit organizations, key dimensions of the conflict were identified including broader sociopolitical conflicts, differences in intrinsic environmental values, and scientific disagreement and uncertainty. Despite strong ideological divisions, areas of common ground were identified, including converging goals and an overall willingness to pursue a collaborative effort. Such a collaborative reconciliation process has a distinct potential for proceeding, however an underlying lack of trust and perception of management politicization amongst some stakeholders must be addressed through network-building activities as a precondition to ensure a greater chance of success.

Tuesday, July 17 10:00 A Conservation Information System For Bridging The Gap Between Conservation Funds Invested, Actions Taken And Outcomes Achieved

Holdsworth, Andy[*], *Minnesota Department Of Natural Resources* , **Holt, Peter**, *Minnesota Department Of Natural Resources* , **Austin, Clay**

The stakes for land and water conservation have never been greater. The challenges are unprecedented, and the expectations of funders and the public for significant conservation outcomes are high. With the citizens of Minnesota approving a 25 year constitutionally-dedicated funding source for habitat, clean water, and parks and trails, demand for transparency and accountability to results heightened. The Minnesota Department of Natural Resources (DNR) developed its first Outcomes Tracking System, a database-backed web application to track and report on its agency-wide conservation results. The system provides a streamlined way for agency staff to enter and store conservation data to a central repository allowing the agency to fulfill various reporting needs. The system connects on-the-ground conservation projects and programs and their funds to agency goals and objectives and uses predefined indicators and targets to track and report results. The Outcomes Tracking System currently delivers DNR's program and project funding and outcomes information to a legislatively-mandated database and website designed to help the public learn about and track the results of their conservation dollars. Together these systems serve as a valuable platform for connecting people to conservation work happening in their watersheds or counties as well as tracking and reporting the cumulative contribution of hundreds of multi-year projects towards large-scale, long-term conservation goals.

Monday, July 16 Identifying Conservation Priorities Using Spatial Analysis Tools For The National Wildlife Refuge System In Oregon

Houghten, Charles[*], *Us Fish And Wildlife Service - NWRS - PVS* , **Miewald, Tom** , **Cruz, Liz** , **O'Hara, Kevin**

The National Wildlife Refuge System, managed by the U.S. Fish and Wildlife Service (USFWS), is the world's premier system of public lands and waters set aside to conserve America's fish, wildlife and plants. The Pacific Region's Division of Refuge Planning is currently identifying habitats that are high priorities for meeting conservation goals and objectives identified by USFWS and our partners. This poster will highlight the use of spatially explicit decision support tools for developing Land Protection Plans (LPP) across geographies in Oregon, with a focus on the Willamette Valley.

Land Protection Plans are our primary tools for studying and evaluating conservation opportunities, including adding lands to the National Wildlife Refuge System. In the Willamette Valley Conservation Study Area, we are taking a collaborative approach to planning and analysis, by building off of existing research and conservation planning conducted by other organizations. The overall goal of our spatial conservation planning exercise is to provide decision support for the USFWS managers developing strategies to achieve conservation goals and objectives, such as a focusing on Federal trust species and rare and declining habitats. We used the Marxan conservation planning tool to optimize conservation alternatives across the study area, its use is featured on our poster.

Tuesday, July 17 8:45 Assessing The Ability Of Different Metrics To Identify Gradients In Landscape Integrity In The Southern Great Plains
Houts, Mike*

The negative impacts of habitat fragmentation due to land use conversion, roads, urban areas, and other features have been well documented. In recent years there have been several different approaches to assessing fragmentation at the regional scale, including the identification of intact blocks using human footprint metrics and the calculation of the Effective Mesh Size measuring the probability of random points occurring in the same landscape patch. In the southern Great Plains, where the grassland habitats are extremely fragmented by roads and croplands, it may not be as important to find huge unfragmented blocks as it is to identify the least fragmented regions and manage them as the "best of what's left". The goal of this research was to assess the ability of these two model types to identify relatively biologically intact and functioning habitats. This was accomplished by assessing the landscape integrity at a collection of stratified random locations using online map services with high resolution aerial photography. Regional biologists were provided with a URL addresses for an ArcExplorer project and an online survey to answer questions about the condition of over 100 sample locations delineated by 20 acre polygons. The modeled landscape integrity and Effective Mesh rankings were then compared against the rankings from the image assessment to determine the effectiveness of the methods to identify intact landscapes. While largely a qualitative assessment, the results proved adequate to assess the general applicability and performance of these methods of modeling the integrity and intactness of the landscape. In addition to the results providing information on how well each method identified a range of landscape conditions, this research also explores the feasibility and effectiveness of using online GIS Applications and high resolution imagery to conduct "remote field assessments".

Wednesday, July 18 8:50 Finding Common Ground For Climate Action: LCCs And The California Department Of Fish And Game
Hunting, Kevin*, *California Department Of Fish And Game*

Pursuing and maintaining collaborative partnerships is a mainstay of the California Department of Fish and Game's (DFG) core values and an intregal part of its climate adaptation planning efforts. Bringing together representatives from multiple agencies and organizations is vital to the creation of a collective vision for responding to the challenges associated with climate change and DFG is comitted to pursuing and maintaining partnerships that promote the leveraging of resources and expertise of multiple entities. Landscape Conservation Cooperatives (LCCs) in California are providing a mechanism to facilitate this kind of information sharing and conservation planning at a landscape scale, which is imperative for effectively responding to climate change impacts to fish, wildlife, and habitats across the state. The roles and responsibilities of LCCs across the country vary as do their relationships with state fish and wildlife agencies; however in California the

story is all success. LCCs throughout California are providing a platform for agencies and organizations to come together to identify actions that will help achieve shared goals, and to piece these actions together to form the large-scale collective response that climate change demands. DFG has taken an active role working with the U.S. Fish and Wildlife Service and others to support the development of LCCs in California, and together we are responding to one of the greatest conservation challenges of our time.

Wednesday, July 18 12:15 Considerations For Spatial Planning Of Pelagic Systems: Towards Ecosystem-Based Management

Hyrenbach, David[*], *Hawai'i Pacific University* , **Adams, Josh**, *US Geological Survey* , **Louzao, Maite**, *Juan De La Cierva Instituto Español De Oceanografia* , **Le Corre, Matthiew**, *Laboratoire Ecomar* , **Rieser, Alison**, *Department Of Geography*

Seabird conservation is advancing rapidly, spurred by technological developments (e.g.,biologging) and conceptual advances for determining where / when to make the most effective conservation investments (e.g., demographics). Yet, the worsening conservation status of oceanic birds and the predicted changes in the ocean's ability to support the food webs they depend upon require novel approaches. In particular, there is a need for conservation approaches capable of addressing the underlying physical and biological ocean heterogeneity in time and space, as well as the dynamic nature of life-history processes and human impacts. To this end, we outline five key principles guiding the development of spatially-explicit conservation targets, and illustrate their conceptual foundations and practical applications: (1) evaluating mismatches between management and ecological processes, (3) accommodating scale-dependent temporal and spatial variability, (3) preserving webs of ecological interactions, (4) acknowledging the heterogeneity of human activities, and (5) embracing place-based management. An improved dynamic understanding of critical habitats and human impacts is required to integrate seabird conservation needs into the developing marine spatial planning paradigm for territorial waters and the high-seas. Furthermore, it is our hope that the lessons derived from seabird conservation will inform similar measures for the spatial management of other pelagic species and their dynamic ecosystems.

Wednesday, July 18 10:00 Developing Regional Shorebird Conservation Through Practices On Private Lands

Iglecia, Monica[*], *Audubon California* , **Strum, Khara**, *PRBO Conservation Science* , **Sesser, Kristin**, *PRBO Conservation Science* , **Skalos, Dan**, *PRBO Conservation Science* , **Reiter, Matt**, *PRBO Conservation Science* , **Kelsey, Rodd**, *Audubon California* , **Hickey, Catherine**

Over 90% of natural wetland habitat has been lost in California's Sacramento Valley yet shorebirds use this region throughout their annual cycle. One reason for the abundance of shorebirds is rice production, which provides over 80% of available flooded habitat in winter and summer. Rice in the Sacramento Valley is used by 13 species of shorebirds and supports 42% of all wintering shorebirds and 64% of all breeding shorebirds in the Central Valley. Certain stages of rice production may limit available shallow water habitat for shorebirds during critical times. In collaboration with the rice industry and rice growers, we developed a suite of five innovative practices, compatible with rice production, to enhance the habitat value of rice fields for shorebirds throughout the year. We developed a 7-year research plan and began testing three of these practices in summer 2009. We compared shorebird response in rice fields with alternative management practices to rice fields with traditional management practices. Our research and our partnership with the rice growing community led to an opportunity to integrate the newly developed shorebird-friendly rice field management practices into a NRCS incentive

program. Our adaptive model of landscape scale conservation has helped further shorebird conservation in California's Central Valley and could be applied to other agricultural lands.

Monday, July 16 3:30 Moving And Rearing Short-Tailed Albatross Chicks: On The Road To Establishment Of A New Breeding Colony

Jacobs, Judy[*], *U.S. Fish And Wildlife Service* , **Deguchi, Tomohiro**, *Yamashina Institute For Ornithology* , **Ozaki, Kioaki**, *Yamashina Institute For Ornithology* , **Suryan, Robert**, *Oregon State University*

The short-tailed albatross (Phoebastria albatrus), listed as endangered under the U.S. Endangered Species Act and as a Special Bird for Protection in Japan, was nearly exterminated by hunting before the turn of the 20th century. Now protected, the breeding population has built to an estimated 500-550 pairs, nesting on two islands; Torishima, the main breeding site, is an active volcano, and the smaller site in the Senkaku Islands is inaccessible due to sovereignty disputes. The Short-Tailed Albatross (STAL) Recovery Team (with members from Australia, Japan, the U.S. and Canada) has indicated that additional STAL breeding colonies must be established in order to achieve recovery. We are attempting to facilitate new colony formation by translocating young STAL chicks and rearing them at a new protected colony site, in the hopes that they will return to breed at the new site when mature (5 to 10 years of age. Before working with the endangered birds, we undertook pilot attempts to rear chicks of the two other (more common)North Pacific albatross, Laysan (Phoebastria immutabilis) and black-footed (Phoebastria nigripes), in 2006-2007 respectively. Beginning in 2008, we have been moving endangered STAL chicks each year from Torishima to a prepared site on Mukojima, an island in the Bonin (Ogasawara) chain. 2012 is our 5th consecutive (and last) year of this project. In total, 70 STAL chicks have successfully fledged from Mukojima. The post-fledging movements (followed by satellite telemetry)of a sample of the Mukojima fledglings have been comparable to those of their Torishima counterparts. So far, we have seen 6 of the 10 STAL fledglings from the first cohort (2008) and one from 2009, return to Mukojima and "practice" courtship dancing. These observations, as well as visits from several parent-reared subadult STAL, provide encouraging signs that STAL will eventually establish a breeding colony on Mukojima. We hope that the techniques we have developed will be useful for others attempting to conserve surface-nesting seabirds by engaging in the long-term (but rewarding) process of translocation and chick-rearing.

Monday, July 16 9:15 Temporal Patterns In Zooplankton Abundance In Central California

Jahncke, Jaime[*] , **Elliott, Meredith L.**, *PRBO Conservation Science* , **Warzybok, Pete**, *PRBO Conservation Science* , **Bradley, Russell**, *PRBO Conservation Science*

Seabirds are samplers of the marine environment and past studies have examined diet to indicate relative abundances of certain marine wildlife. Diet information on the Cassin's auklet (Ptychoramphus aleuticus), a zooplanktivorous seabird breeding on the Farallon Islands in Central California and a California species of special concern, have been collected since 1971. In addition, since 2004, we have collected zooplankton community composition data during at-sea cruises conducted in the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries. We explored auklet diet and zooplankton sample time series and the relationships between them. This species consumed mostly euphausiids (family Euphausiidae) in most years, with other marine invertebrates (e.g., amphipods, decapods, copepods and mysids) and larval fish comprising a minor proportion of the diet. However, during 2005 and 2006, auklet diet consisted almost entirely of mysids. Zooplankton samples also showed a dramatic increase in mysid abundance. The auklets suffered near total reproductive failure

during this period. Euphausiids once again became the dominant prey in auklet diet starting in 2008 and productivity has rebounded. These links between auklet diet, auklet productivity, marine invertebrate abundances can be used to understand changes in the marine ecosystem and may also assist managers in important ocean conservation decisions.

Tuesday, July 17 11:15 Resistance To Science: Combating Agency Fear, Politics, And Inertia
Jasny, Michael*, *NRDC*
In bringing science to bear on management decisions, it is essential to understand why administrative agencies sometimes fail to act, even when presented with data that might otherwise seem compelling or determinative. Fear of litigation, interagency politics, entrenched legal positions, non-conservative evidentiary standards, and bureaucratic inertia all can affect the role of science in environmental decision-making. This paper explores agency resistance to science using, as a case study, the problem of underwater noise and its effects on marine biota: a complex, poorly understood issue with broad policy implications on which numerous biologists and bioacousticians have attempted to intervene. It considers why certain science-based interventions have succeeded in driving agency action, and others have failed, looking in particular at the effectiveness of different vehicles of engagement, including peer-reviewed publication, administrative comment, and public messaging. It also considers the importance of framing scientific ideas in terms that are relevant to agencies, by examining the emergence of the concept of “acoustic habitat” in characterizing the impacts of chronic noise on marine wildlife.

Monday, July 16 3:45 Status And Trend In American Pika Site Occupancy Patterns Across The Western US: Insights From Some Of The Nation's "Crown Jewel" National Park Units
Jeffress, Mackenzie*, *University Of Idaho*
American pika research has largely occurred as disparate efforts on unprotected lands in the western US. However, this charismatic species is important to many western national parks and monuments and concerns over its ability to persist in the face of accelerated climate change have brought the species to the attention of park resource managers. Furthermore, studying the species in these parks and protected areas provides an excellent opportunity to align study objectives and methods and to establish a broader regional scope of inference that can yield novel insights into habitat relationships and long-term population trends. A monitoring partnership was initiated in 2009 among four national park units and the National Park Service’s vital signs monitoring program. The group produced a monitoring protocol that provides robust probabilistic sampling designs and standardized field methods, facilitating both park- and regional-level analyses. With this approach, estimates of turnover and “growth rate” in site occupancy provide the framework for evaluating temporal trends. The protocol has since been adopted by other parks and agencies and was used in the “Pikas in Peril” research effort that expanded the partnership to include four additional “crown jewels”, including the flagship Yellowstone National Park. Occupancy surveys and genetic collections made during 2010-2011 at more than 1,100 sites are fueling regional modeling and a species vulnerability assessment.

Tuesday, July 17 3:45 Corridor Conservation In Southern California Under Climate Change: Understanding Wildlife Response To Burned Landscapes

Jennings, Megan* , **Lewison, Rebecca**, *San Diego State University* , **Crooks, Kevin**, *Colorado State University* , **Boydston, Erin**, *U.S. Geological Survey* , **Lyren, Lisa**, *U.S. Geological Survey* , **Vickers, Winston**, *University Of California, Davis* , **Boyce, Walter**, *University Of California, Davis*

Land conservation efforts are challenged by the nature of dynamic ecosystems and shifting climate regimes. In southern California, wildfires are prevalent landscape disturbances expected to become more frequent under climate change. Understanding how changes in this disturbance regime affect wildlife is critical to ensure landscape connectivity. We analyzed GPS tracking data on bobcats, coyotes, and mountain lions in southern California to understand how mammalian carnivores respond to burned landscapes. We compare home range sizes and movement patterns in burned and unburned habitats, conduct compositional analysis of habitat usage, and develop a preference index to evaluate individual responses. At the population level, we found no strong response to burned landscapes, but on an individual level, some animals exhibit an avoidance of habitats shortly after fire, a preference for burned habitats between five and ten years after burning, and no preference ten years and beyond a fire event. Individual movement patterns showed avoidance of burned edges contiguous to development features, e.g. roads or housing developments, suggesting potentially negative synergistic effects between fire disturbance and habitat fragmentation. In fire-prone environments, multiple corridor options and fuel management activities may be necessary to conserve connectivity. Linkages should also be evaluated in the context of how land use change coupled with climate change may affect connectivity.

Monday, July 16 9:30 Biodiversity, Ecology, And Conservation Of Microbiotic Soil Crusts In The California Deserts

Johansen, Jeffrey* , *John Carroll University*

Microbiotic soil crusts are surface aggregations consolidated by lichens, mosses, eukaryotic algae, cyanobacteria, and fungi. Microbiotic crusts of the California deserts differ from crusts of other North American deserts. In particular, lichen and moss diversity are low. However, algal diversity is significant, and based on initial studies of the biodiversity in these deserts, endemic species and even endemic genera are being discovered. Our studies thus far have been in Joshua Tree National Park, Mojave National Preserve, and Fort Irwin NTC. These crusts are characterized by clear dominance of cyanobacteria, very low abundance of moss cover, and patchy occurrence of dark-colored lichens. Microbiotic crusts serve several key ecological roles in desert soils, including protection from erosion, nitrogen fixation, contributions to organic matter, and biological interactions with vascular plants. Microbiotic soil crusts have been subject to a variety of anthropogenic disturbances, including grazing livestock, off-road vehicle use, construction, and mining. Recovery from disturbance is very slow, especially in arid areas in the hot deserts. In developing solar energy in California, examination of microbiotic crust development should be a part of our environmental assessments. Parts of the Mojave lack microbiotic crust development, either due to past disturbance or unfavorable conditions for development; and these areas are more suitable for energy development.

Monday, July 16 12:00 Legislative Delisting Of Wolves: Consequences Of Ignoring Obvious Political Lessons And What To Do About It

Johns, David* , *Society For Conservation Biology*

In 2011 the U.S. Congress delisted wolves in the Northern Rockies. House action was unsurprising because hostility to wolves and the Endangered Species Act dominated. But ESA-friendly Senators,

who had long and steadfastly refused to make species or geographic exceptions to the ESA, voted for delisting. They, along with the President who could have vetoed the bill, feared that Montana Senator Tester could lose his seat in 2012 if "management" of wolf populations was not returned to the states. Analysis of events leading up to the delisting and since show that most conservationists did not and do not recognize the cause of the legislative loss: they were out-organized by wolf opponents. Otherwise supportive political leaders thus felt they had more to fear from wolf opponents than from conservationists. Yet circumstances leading to delisting were not new. Conservationists ignored the extraordinarily obvious lesson exemplified by Roe v Wade: no controversial court decision is secure without ongoing work building political support for it; reliance on litigation alone without grassroots organizing is precarious at best. Most conservation NGOs have long abandoned grassroots organizing and the consequences are grim. The problem can be remedied; there is nothing magical or secret about organizing political support.

Tuesday, July 17 3:00 Natural Community Conservation Planning In California: A Tool For Adapting To Climate Change

Johnson, Brenda[*], *California Dept. Of Fish And Game*

Natural Community Conservation Planning (NCCP) is a State-sponsored collaborative endeavor in California that seeks to conserve species, natural communities, and ecological processes at an ecosystem level while accommodating appropriate and compatible economic land use. The law governing the NCCP program (NCCP Act of 2003) was intended to mediate climate change by connecting large habitat reserves across environmental gradients; however, the degree to which NCCPs can now provide the resilience necessary to conserve biological systems in perpetuity is uncertain. NCCP conservation strategies, spatial extent, landscape connectivity, and management typically are based on data assumed to be static rather than dynamic in space and time. The practice of NCCP can be improved, to provide both a functional stand-alone Climate Change Adaptation Strategy and to complement other conservation programs and initiatives. Opportunities currently exist for integration of multiple programs to improve resiliency and conservation of the State's biodiversity.

Wednesday, July 18 3:00 In Defense Of Monitoring

Johnson, Douglas H.[*], *USGS Northern Prairie Wildlife Research Center Fisheries, Wildlife, And Conservation Biology*

Monitoring involves checking something "at regular intervals in order to find out how it is progressing or developing" (Microsoft Word), or collecting measurements at a specified frequency of multiple time units (W. L. Thompson et al., 1998, Monitoring Vertebrate Populations, Academic Press). The key point is "at regular intervals" or "multiple time units," suggesting a continuing process. Most monitoring, in the strict sense of the word, is intended to persist for long periods of time, perhaps indefinitely or permanently. Some definitions, unfortunately, do not indicate the repetitive nature of monitoring and are basically synonymous with "observing." And recently the term "monitoring" has been adopted for the process of evaluating the effect of some management action or observing a system to understand how it operates. Worse, users of this definition have tagged monitoring, as defined originally, with the pejorative modifier "surveillance," and criticized monitoring not guided by a priori hypotheses and their corresponding models. I intend to demonstrate that monitoring, in the original sense of the term, indeed has considerable value. A continuous monitoring program is the only way to detect changes caused by unplanned activities, such as hurricanes, wildfires, oil spills, or, notably, climate change. It also can establish a protocol to evaluate the effects of planned activities, when and where needed.

Further, examples are plentiful of continuous monitoring programs that provided insight into systems far beyond the original intent of the program.

Monday, July 16 12:15 Beyond The Protected Core: Connecting People And Nature In The Crown Of The Continent

Johnson, Shawn[*], *Center For Natural Resources & Environmental Policy, The University Of Montana*

Iconic Glacier and Waterton National Parks stand at the heart of the 18 million acre Crown of the Continent ecosystem. This spine of glacier?carved mountains is the headwaters of three continental watersheds – the Columbia, the Missouri, and the Saskatchewan. The Crown of the Continent retains a full complement of native predators as well as large populations of moose, elk, bighorn sheep, pronghorn, and deer. The Crown of the Continent is also a dynamic human landscape, where a history and culture of farming, ranching, logging, mining, hunting, fishing, and exploring have both altered the land and engendered an indelible link between people and place. As natural and human impacts have become more noticeable and troublesome, there has been a growing number of community?based partnerships, sub?regional, and regional initiatives focused on the long?term conservation and stewardship of this remarkable landscape, especially those lands beyond the protected core. This case study presentation will examine the Roundtable on the Crown of the Continent, a new effort to link existing and emerging community-based and regional efforts through a network governance approach to landscape scale adaptive management in response to climate change and other landscape scale dynamics. It will explore the inherent tensions of operating at different scales and across jurisdictional boundaries, analyze what is working and what is not, and share lessons learned.

Wednesday, July 18 3:15 The Impact Of Energy Sprawl On Biodiversity And Ecosystem Services

Jones, Nathan[*], *Colorado State University* , **Pejchar, Liba**, *Colorado State University* , **Theobald, David**, *Colorado State University*

Energy production in the U.S. is in transition as demands for clean and domestic sources increase. Wind energy offers the benefit of reduced emissions, yet, like conventional sources such as oil and natural gas, both contribute to energy sprawl, or the loss and fragmentation of habitat due to development activities. To understand the relative nature and magnitude of energy sprawl, we used a diverse set of indicators to quantify the impacts of oil, gas, and wind development on biodiversity and ecosystem services in Colorado and Wyoming. Aerial imagery was supplemented with empirical data to estimate wildlife mortality, habitat loss, noise and light pollution, fragmentation, invasive species, water resources, and carbon storage. To quantify these impacts we digitized the land use footprint within 375 randomly selected 1-km diameter plots, stratified across energy types. In order to determine how landscape characteristics influence the magnitude of impacts, each of the above indicators was modeled with a suite of covariates, including land ownership, land cover, topography, elevation, housing density and median income. We found substantial differences in impacts between energy types, although the magnitude and direction of the differences varied among indicators. This novel technique and our specific findings can be used by developers, planners and policy-makers to design energy development that minimizes impacts to natural ecosystems while maximizing benefits to society.

Tuesday, July 17 8:30 Novel Ecosystems: Hope Or Hype?

Jordan, Marilyn[*]

Novel ecosystems—new, historically unprecedented combinations of species resulting from environmental change, human actions, and changing species composition—occupy 40% of the

terrestrial ice-free globe. Are novel ecosystems degraded and worthless, potentially valuable habitats to be conserved, or both? Answers require we better understand the benefits and deficiencies of novel ecosystems and implications for genetic and species diversity, trophic linkages and ecosystem function. For example, invasive plants typically cause decreases in ecosystem producer species diversity, biomass and nutrient uptake. These patterns hold true in both aquatic and terrestrial ecosystems, and among herbivores, detritivores and predators. Reduced plant species diversity results in a loss of specialist insects, and bottom-up reductions of energy available to higher trophic levels. Widespread "replacement" of specialist species by generalists is happening in many taxa as a result of disturbance and global change. This loss of functional diversity contributes to functional homogenization and likely loss of ecosystem resilience, stability and ecosystem services. Are we are losing the diverse genetic material needed for evolution and adaptation to change? How do we prioritize scarce resources and use a triage approach to management and restoration of novel ecosystems? What management strategies are needed to maximize the conservation value and ecosystem services provided by these altered ecosystems?

Tuesday, July 17 11:00 Recent Decline In Suitable Environmental Conditions For African Apes - An Attempt To Bridge The Gap Between Local Efforts And Global Perspectives

Junker, Jessica*, *Max Planck Institute Eva*

We predict distribution of suitable environmental conditions (SEC) for African apes across 23 range countries for the 1990s and 2000s, assess the relative importance of factors influencing SEC distribution and estimate rates of SEC loss, isolation and fragmentation over time. We extracted 15051 presence localities for eight great ape subspecies from the A.P.E.S. database and related these to environmental, climate and human impact factors combining MAXENT and logistic regression models. Proportional SEC loss over time was highest for Cross River gorillas (-61%), followed by eastern (-52%), western gorillas (-32%), bonobos (-29%), central (-17%) and western chimpanzees (-11%). Nigerian-Cameroon- and eastern chimpanzees did not seem to have experienced such dramatic SEC reductions. Except for the eastern gorilla, number of SEC patches did not change significantly over time, suggesting that SEC loss mainly led to a reduction in overall patch size. This study represents the currently best available estimate of continent wide African SEC distribution and its change over the past 20 years. It is also the first attempt to amalgamate data from numerous ape sites across the continent to bridge the gap between local efforts in the field and a global perspective on ape populations. Although the model has statistical limitations that do not allow for drawing inferences at the site-specific level, it has potential for wide applicability at the regional scale, including identifying priority conservation areas, mitigation efforts for resource extraction industry, potential wildlife corridors and future survey sites. With more data, we hope to further validate and improve the current model to predict distribution and change of great ape SEC for the future and provide a global decision-making tool for the effective allocation of future conservation and funding efforts.

Monday, July 16 11:45 Rio Grande Cutthroat Trout - Integrating Science, Policy And Communities To Identify Conservation Opportunities At A Landscape-Scale

Kandell, Stephen*, *Trout Unlimited* , **Haak, Amy**

Rio Grande cutthroat trout (RGCT) have declined across their range and now occupy slightly more than 10% of their historical stream habitat in the West. They have been eliminated from the Texas portions of their range as well as disjunct sub?basins at the southern extents of the Rio Grande and Pecos River basins in New Mexico. In 2008 the Fish and Wildlife Service found that RGCT warranted listing under the Endangered Species

Act but was precluded due to other priorities. Trout Unlimited has analyzed the within-species diversity of the remaining populations of RGCT. The results are quantified in a rangewide Conservation Portfolio that summarizes populations according to their representation of genetic, life history or geographic diversity. This information has been used to prioritize and direct a comprehensive conservation initiative. In partnership with sportsmen, ranchers, tribes and other interests, Trout Unlimited is leading a campaign to protect healthy rivers, especially the headwaters that provide clean water and critical habitat for fish; reconnect habitats within watersheds through flow improvement and barrier removal so fish can access spawning grounds, find refuge and repopulate areas in the face of increased threats related to a changing climate; restore degraded stream systems; and finally, sustain this work by empowering stewards from local communities.

Monday, July 16 3:40 The Shifting Sands Of Shifting Baselines

Kareiva, Peter*

A core concept in many management approaches and environmental regulations is the notion of historical conditions and baselines. In a world of climate change, invasive species, and dramatic human impacts, managing or regulating using these baselines is difficult. Using fisheries, coral reef, forest, and endangered species case studies we present an alternative to the historical baseline approach. We argue that more effective conservation can be accomplished if we abandon the historical baseline as the focus, and instead identify future outcomes for nature that may have little to do with the state of the world prior to European settlement. This does not mean baselines are unimportant—but their importance lies in what they teach us about ecology, not as management objectives.

Wednesday, July 18 12:00 Intensive Agriculture Erodes Beta-Diversity At Large Scales

Karp, Daniel*, *Stanford University*

Biodiversity is declining from land conversions of unprecedented scale, which replace diverse, low-intensity agriculture with vast expanses under homogeneous, intensive production. The most important determinant of diversity at these large scales is the degree to which local sites differ in their species compositions (beta diversity). While the consequences of land-use intensification for local (alpha) diversity are well-studied, the impacts on beta-diversity are almost entirely unknown. Using a 10-year dataset on Costa Rican birds, we find lower-intensity agricultural practices sustained beta-diversity across large scales on a par with native forest. In both forest and low-intensity agriculture, bird communities changed as vegetation structure turned over with distance. By contrast, we find that high-intensity agricultural practices homogenized vegetation structure across great distances, causing bird community turnover to decline by ~40% relative to the turnover in forest or lower-intensity agriculture. These results suggest that rapid rates of agricultural expansion and intensification threaten diversity not only locally, but also at larger spatial scales, and biotic homogenization may accelerate species loss beyond even current dire predictions. Because beta-diversity is sustained in low-intensity agriculture, however, our findings also point the way towards multi-functional agricultural systems that maintain productivity while simultaneously conserving biodiversity.

Monday, July 16 An Urban Lifestyle Means A Smaller Menu And More Competition For Some Western Pond Turtles

Karres, Nicole*, *Sonoma State University*

The focus of my research is how living in urban waterways may affect the diet and feeding ecology of E. marmorata. To describe the affect of urbanization on their diet and feeding ecology, I am comparing my results from an urban and a

suburban site with those from a similar study done in wildlands. My preliminary results indicate E. marmorata at both urban sites are apparently carnivorous, a departure from the omnivorous diet of those living in wildlands. In addition, the diet of E. marmorata in urban aquatic ecosystems is less diverse than that of E. marmorata living in wildlands. Specifically, in wildlands E. marmorata have eighteen food groups in their diet while those at a suburban site have seven groups and have one at an urban site. In wildlands crayfish comprise less than one percent of their diet, at the urban site, E. marmorata mostly eat crayfish, while at the suburban site they do not eat them. In addition, my tangential observations are interesting and may be worth investigating. For example, E. marmorata may be targeting vegetation filled with an animal food resource inside, a behavior not reported in wildlands. At the urban site, they may be competing with the North American river otter (Lontra canadensis) for food, something also not reported in wildlands. Lastly, increased human disturbance to maintain the urban waterway channel may be inhibiting foraging for a two of the four months they are actively feeding.

Tuesday, July 17 8:30 An Aquatic Resource Inventory For California

Kass, Jamie[*], *SFEI*

The concept of an Aquatic Resource Inventory is a spatial database of aquatic habitat features like wetlands, streams, and lakes that is maintained and updated through cooperation between local entities for the purposes of planners, ecologists, or any other parties interested in landscape ecology, conservation, or urban development. It consists of polygon and line features with data-rich attributes that can be used for broad- or fine-scale landscape analysis. The need to create and maintain a spatial database of aquatic resources at the local level stems from the lack of such a dataset that includes the high resolution and accuracy required by local entities. Further, federal datasets that offer similar data are not reliant on local stewardship and often go years without the updates needed for local planning. Lastly, federal datasets are created for use by field experts and therefore include attributes that are unfamiliar to local users and therefore difficult to decipher, often requiring relational tables to decode them. In order to create a straightforward state-wide dataset composed of locally-fed information, SFEI is partnering with mapping experts and scientists around the state to develop the methodology for a California Aquatic Resource Inventory (CARI). The impetus for CARI was the State Water Board Resolution 2008-0026, which called for development of a Wetland and Riparian Areas Protection Policy (WRAPP) under the Clean Water Act section 401 to protect all wetlands and waters of the State. The basemap that provides the foundation for CARI is the San Francisco Bay Area Aquatic Resource Inventory (BAARI), which was completed in 2011 and is soon to become available for public download. BAARI was digitized by SFEI directly from aerial photography using ancillary data including elevation, slope, topographic maps, spatial hydrologic model output, and federal streams and wetland datasets. BAARI has over 50 wetland and 5 linear stream classifications, and covers tidal and non-tidal aquatic features. SFEI's Riparian Area Mapping Tool (RAMT) generates functional riparian areas for BAARI from landscape data inputs. Lastly, BAARI was quality checked using an innovative technique incorporating expert input with automated processing. This talk will present the mapping methodology and quality control technique for BAARI, the tool design of RAMT, and the planning for CARI.

Tuesday, July 17 11:45 Describing The Heath Of Complex Ecosystems: The State Of San Francisco Bay 2011 Experience

Kelly, Judy[*], *San Francisco Estuary Partnership*

San Francisco Bay is vital to our region's economy and quality of life. One of the world's great nature harbors, it has played a defining role in the history of the Unities States and is the aesthetic,

economic, and ecological centerpiece of America's fourth largest metropolitan area. The ecological health of this estuary depends on the functioning of a complex array of oceanic, estuarine, fluvial, and terrestrial processes. Since the Bay is affected by the daily actions of local and regional decision-makers and the public, providing these groups information about the ecological health of the Bay is essential to informed decision making. To assess and communicate the health of the estuary, the San Francisco Estuary Partnership [one of 28 National Estuary Programs] assembled an interdisciplinary team of scientists to (1)define the attributes of a health estuary (water, physical habitats, ecological processes, and living resources), (2) select measureable indicators for each attribute, and (3) identify benchmarks against which to compare the measured values for each indicator. The State of San Francisco Bay 2011 report integrates a large amount of data into this assessment framework. Achieving this integration required judgments regarding what constitutes "health" and how to measure it, and how to set quantitative benchmarks for evaluation. Lessons learned from creating the State of Bay 2011 Report will help us to better refine and develop future communication tools and can also inform similar efforts in other complex natural systems.

Monday, July 16 Monitoring nitrogen deposition in Grand Canyon National Park: integrative approaches to understand ecosystem effects of nitrogen deposition

Kenkel, Julie* , **Johnson, Nancy** , *Northern Arizona University* , **Sesnie, Steven**, *US Fish And Wildlife Service* , **Hultine, Kevin**

A global concern for aquatic, terrestrial and atmospheric systems, nitrogen (N) inputs above historical levels alter ecosystem dynamics that maintain local nutrient cycling regimes. In Class 1 Wilderness areas like Grand Canyon National Park (GCNP), N pollution from anthropogenic sources threatens not only terrestrial ecosystems, but also air quality and visibility, hindering the expansive views of GCNP. Here we present results on terrestrial responses to anthropogenic N deposition and information to establish baseline quantifications of atmospheric N deposited in GCNP. We used passive air samplers, stable isotope analysis, and spectral analyses to determine depositional inputs of N in air, vegetation and soils. Samples from ten sites were collected over eight months to capture spatial and temporal patterns in areas of GCNP with projected low to high vehicular N deposition. Similar techniques were used on the Paria Plateau, northeast of GCNP and in close proximity to the Navajo Generating Station. Soil samples evaluated at a roadside gradient in GCNP show significantly different d15N signatures than soil samples collected from the Paria Plateau ($p=0.01$). Comparison of the sites will help determine new quantitative information about different sources and levels of N deposition in GCNP. This information enables the development of regulations that can target specific sources of N deposition, and supports efforts to maintain high air quality standards for the southwestern U.S.

Tuesday, July 17 9:55 Ghost Bustards: Major Causes Of High Adult Mortality Rate In Mongolian Populations Of Great Bustard

Kessler, Aimee* , **Natsagdorj, Tseveenmyadag**, *Institute Of Biology* , **Batbayar, Nyambayar**, *University Of Oklahoma* , **Batsuur', Dashnyam**, *Ornithology Lab* , **Smith, Andrew**, *Arizona State University*

Only 2000 individuals of the Asian subspecies of Great Bustard (Otis tarda dybowskii) are estimated to remain. Despite this low number and reports of continued decrease, data are lacking on factors influencing this decline. Over the past six years we have used Argos/GPS solar-powered PTTs to monitor 14 adult Great Bustards captured on their breeding grounds in northern Mongolia. By longitudinally tracking individual birds we have been able to investigate mortalities with the goal of elucidating factors limiting population growth. Ten mortalities have been recorded so far, occurring an

average of one year after monitoring on a bird was begun. By examining physical evidence at the site of last transmission and interviewing local people, we determined the cause of mortality for each bird. Causes of death thus include poaching, poisoning, and collision with power lines. Two deaths were determined to be due to natural causes. Poaching has caused 50-70% of recorded deaths. This high rate of mortality, coupled with Great Bustards' long maturation time and low reproductive rate, is likely a major driver of the decline of the Asian subspecies. All deaths occurred on varied stopovers across a 2000 km migratory path and on wintering grounds in China. Thus, conservation efforts across a broad swath of territory are urgently needed to slow declines of the small remnant populations of Asian subspecies of Great Bustard.

Tuesday, July 17 4:15 The Tradeoff Between Patch Size And Clustering In Designing Reserve Networks

Kitzes, Justin* , **Merenlender, Adina**

The probability of a species persisting in a patchy landscape can generally be increased by increasing patch sizes and by reducing the distances between patches. Selecting a network of reserves in a fragmented landscape requires a tradeoff between these two goals, as the set of the largest available patches is unlikely to also be the most clustered set of patches available. Here we investigate general patterns in the species and landscapes for which minimizing inter-patch distances or maximizing mean local patch area most increases survival rates. We construct stochastic metapopulation models for 10 g to 100 kg idealized terrestrial mammal species using allometric relationships from the literature and use these models to simulate population trajectories in patchy landscapes. An analysis of two-patch networks finds that each species has a characteristic range of distances, from 0.25 to 1.25 times a species' maximum dispersal distance, within which patch clustering may increase the probability of survival. In an empirical landscape in northern California, species near 1 to 10 kg in body size have the highest survival rates in a clustered network, while larger species have the highest survival rates in a network that maximizes mean local patch area. The results demonstrate that conservation planners must use caution in choosing a level of clustering for reserve networks, as clustering may improve the resilience of some species to global change while disadvantaging others.

Wednesday, July 18 10:00 Barriers And Incentives To Engagement In Public Policy And Science-Based Advocacy

Klain, Sarah* , *UBC* , **Tam, Jordan**, *UBC* , **Singh, Gerald**, *UBC* , **Martone, Rebecca**, *UBC* , **Sisk, Thomas**, *Northern Arizona University* , **Mach, Megan**, *UBC* , **Chan, Kai**

As ecosystem degradation increases, the gulf between environmental science and its application to policy and resource management has become more apparent. While some environmental managers and scientists increasingly recognize how conservation biology research is relevant to public policy, others contend that engagement in policy erodes scientific credibility, diminishing the objectivity of research. We seek to understand why conservation scientists, graduate students, practitioners and managers choose to engage or withhold from participating in public discourse, informing management practices, and developing environmental policy. Based on 500 responses from a questionnaire that we distributed at nine scientific conferences, our analysis explores factors hypothesized to affect the frequency of engagement, such as tenured status, perception of time restrictions for engagement and perception of adequate communication and policy engagement training. We also explore linkages between infrequent or no engagement in policy with past negative experiences informing public policy, perception of lack of support from peers and mentors and a normative belief that scientists should only report scientific results and leave

others to make decisions. Our results provide insights into strategies for overcoming knowledge exchange barriers at the science-policy interface to contribute toward the development of appropriate and effective environmental policy.

Monday, July 16 10:00 Landscape-Scale Indicators Of Biodiversity's Vulnerability To Climate Change

Klausmeyer, Kirk[*], *The Nature Conservancy* , **Shaw, Rebecca**, *Environmental Defense Fund* , **MacKenzie, Jason** , **Cameron, Dick**, *The Nature Conservancy*

Climate change will increase the vulnerability of species across the globe to population loss and extinction. In order to develop conservation strategies to facilitate adaptation to this change, managers must understand the vulnerability of the habitats and species they are trying to manage. We present an approach for distilling complex climate and landscape data into simple actions land managers can take now to help plants and animals adapt to a changing climate. The method is based on historical and future climate data and landscape attributes like topography, coastal proximity and habitat fragmentation that directly impact species' ability to adapt. We applied this method to California, USA to map the portions of the state where biodiversity managers should focus on minimizing current threats to biodiversity (9%), reducing constraints to adaptation (28%), reducing exposure to climatic changes (24%), and implementing all three (9%). In 18% of the state, estimated vulnerability is low so continuing current strategies and monitoring for changes is likely sufficient, while in 12% of the state, vulnerability is so high that biodiversity managers may have to reassess current conservation goals. In combination with species-specific vulnerability assessments or alone, mapping vulnerability based on landscape-scale indicators will allow managers to take an essential step toward implementing conservation strategies to help imperiled species adapt to climate change.

Monday, July 16 4:40 Yale Framework: Re-Evaluating Florida Ecological Conservation Priorities In The Face Of Sea Level Rise

Knight, Amy[*], *Florida Natural Areas Inventory* , **Oetting, Jon**, *Florida Natural Areas Inventory* , **O'Brien, Michael**, *Florida Natural Areas Inventory* , **Knight, Amy**, *Florida Natural Areas Inventory*

Florida's location and geography make the state especially vulnerable to sea level rise. Sea level is expected to rise 1-3 m by the end of this century in response to climate change, inundating 5-15% of the state. Hundreds of species and associated ecological communities will be affected, and scientists cannot predict with confidence how the biota will respond. "Protecting the ecological stage" is an adaptation objective recommended in the Yale Framework for Integrating Climate Change and Conservation Planning intended to protect current and future patterns of biodiversity. We evaluated habitat heterogeneity and available geophysical data to define and prioritize the ecological stage in areas of Florida likely to be affected by sea level rise. The resulting conservation value layer was further refined to consider connectivity, habitat fragmentation, and ecological integrity. The analysis results in a planning dataset that prioritizes coastal landscapes/ecological resources based on sea level rise adaptation potential and is being used to inform statewide conservation planning in Florida.

Monday, July 16 AmphibiaWeb: Tracking New Species Discovery In An Era Of Decline

Koo, Michelle[*], *Museum Of Vertebrate Zoology*

Since 2000, AmphibiaWeb (amphibiaweb.org) has served as an vital online resource for amphibian species, natural history and declines with accurate and current information for educators, researchers, and managers. Every species has a web page and steady progress is being made to produce species accounts accompanied by conservation status, photographs, audio recordings, videos, maps, and taxonomic references. Browse functions facilitate taxonomic, photographic, geographic, and other

searches. Unique services include a list (updated daily) of the number of valid amphibian species, mapping of type localities for recently described species, and ready access to the largest amphibian photo collection (nearly 25,000). Literature on amphibian declines is summarized monthly. On average, AmphibiaWeb receives 15,000–20,000 unique queries per day from visitors around the world. The mapping functions of AmphibiaWeb continue to evolve and currently integrate range maps from IUCN with mapped point locality data from scientific collections via HerpNet2. An iPhone app enables mobile searching and browsing of amphibian data, including locality-specific searches. A recent overhaul of AmphibiaWeb's taxonomy is based on the most stable phylogenetic hypotheses. Taxonomy is monitored by a subcommittee of amphibian specialists from multiple institutions and is updated as species are described and published revisions are evaluated. AmphibiaWeb is a community-contributed resource; volunteers, including herpetology students across the US, produce the vast majority of species accounts and photos. AmphibiaWeb continues to evolve and works to integrate new informatic resources such as VertNet and GBIF software tools to continue producing a vital resource for amphibian conservation.

Wednesday, July 18 4:00 Effects Of Landscape Covariates And Future Land Use Change On The Distribution Of Mammalian Carnivores On Former Fort Ord Army Base

Kowalski, Bartholomew[*], *CSUMB* , **Watson, Fred**, *CSUMB*

Mammalian carnivores experience various effects of anthropogenic disturbance near urban environments. Urban expansion and increased anthropogenic activity in preserved habitat areas may cause changes to current spatial distribution of those species. To predict the effects of future land use changes on the mammalian carnivores we modeled their current probability of occurrence across the former Fort Ord Army base as a function of urban proximity and road/trail density. We collected detection/nondetection data for coyotes, grey foxes, bobcats, raccoons, and skunks using scent stations. We incorporated the probability of detection into logistic regression models, and ranked the models using AIC for each species. Once we determined the best model and the coefficients of the predictive variables, using GIS we created a map of future species distribution given proposed landscape changes in the study area. Probability of occurrence varied across the species, with coyotes being least sensitive and bobcats being most sensitive. Grey foxes showed a preference toward inland areas with higher road/trail densities. Striped skunks were more likely to use areas with low road/trail densities, which was the opposite pattern from raccoons. Our results suggest that the distribution of coyotes will most likely not be affected much by future development, while those of bobcats and grey foxes will be adversely affected. Raccoons and grey foxes might benefit from an increase in road and trail density, while skunks might not. The results from our study suggest that future land use changes will most likely have a varied affect on the distribution of mammalian carnivores, and that careful consideration is needed to ensure those species' healthy populations.

Wednesday, July 18 11:00 California Climate Change And Landscape Connectivity

Kreitler, Jason[*] , **Schloss, Carrie**, *University Of Washington*

The Western Geographic Science Center assessed the geography of climate change in California to determine the potential impact of corridors to partially mitigate climate change effects by increasing landscape connectivity. The corridors identified from the California Essential Habitat Connectivity (CEHC) project were analyzed by their potential to expand the overlap of protected climate space between present and future climates. Data from a variety of general circulation models downscaled to ecologically relevant scales

(270m pixel resolution) were used to determine the climate stability of protected areas. Using winter minimum temperature, summer maximum temperature, and climatic water deficit, we calculated three dimensional convex hulls for individual protected areas to determine their stability with and without a CEHC-derived corridor. Due to the uneven rate and magnitude of climate change across California, certain protected areas will have increased exposure to climate change threats and may receive greater benefits from expanded connectivity, compared to climate refugia. Similarly, and due to scarce conservation resources, the prioritization of corridors based on climate change information can be used by policy makers to determine mitigation strategies to help reduce the negative effects of climate change.

Tuesday, July 17 3:15 Adoption And Implementation Of Conservation Design Standards In Local Land Use Regulations
Kretser, Heidi[*], *Wildlife Conservation Society* , **Reed, Sarah**, *Colorado State University* , **Hilty, Jodi** , **Theobald, David**, *Colorado State University*
Conservation development (CD) has emerged as a promising strategy to minimize the ecological impacts of low-density residential development, which is expanding rapidly throughout rural landscapes of the United States. CD protects or restores the ecological resources of a property, while clustering compatible housing development on the remainder of the site. We examined development codes in 4 northeastern states and 11 western states for ordinances that establish guidelines or create incentives for CD. Out of 715 northeastern towns, we found that 38 percent had at least one CD ordinance. Out of 414 western counties, we found that 32 percent had at least one regulation pertaining to CD. We reviewed the collected ordinances on the basis of their conservation objectives as well as for guidelines related to ecological site analysis, protected area design, ownership and management of the protected area, and developed area design. On average, CD ordinances were adopted earlier (1996 vs. 2002) and by more local jurisdictions (38% vs. 32%) in the northeast than in the west. In both regions, a density bonus was the most commonly employed incentive to encourage participation in the conservation design process, allowing a mean increase in development yield of 31% in the northeast and 71% in the west. We will present results of our review and make recommendations to improve land-use regulations and increase the use and effectiveness of CD for protecting wildlife habitat on private lands.

Monday, July 16 9:45 Modeling Connected Landscapes For A Changing Climate
Krosby, Meade[*], *University Of Washington*
Methods for incorporating climate change into connectivity conservation planning have risen rapidly in recent years. And yet, the vast majority can be divided into two categories: those that rely on models of species responses to future climates, and those that use no climate models at all. The former use highly specific but highly uncertain climate envelope models to identify corridors or areas of overlap between current and projected future species ranges. The latter seek to avoid any uncertainty around future conditions by modeling networks of geophysical settings, in order to preserve the ultimate drivers of biodiversity. The Washington Habitat Connectivity Working Group's effort to address climate change in their statewide and ecoregional connectivity needs assessments has sought a middle ground between these two extremes. The group has been developing novel methods for identifying connectivity networks intended to facilitate range migrations and provide climatic refugia for diverse taxa. These methods rely on a range of underlying models, including topography, current climate, and future climate. We will present recent results from the group's analyses, and discuss their role in the development of the Western Governors' Association's Crucial Habitat Assessment Tool.

Wednesday, July 18 12:45 Incorporating Pest Control By Birds Into Agricultural Landscapes: The Ecosystem Service Value Of Bird-Friendly Farm Management

Kyle, Keiller*, *Audubon California* , **Kelsey, Rodd**, *Audubon California*

Agricultural cropland is often considered a largely hostile landscape for wildlife; however, many bird species in the Central Valley of California and elsewhere not only use but often rely on farmland and crops for foraging and nesting. Audubon California, through its Bird Friendly Farming Initiative, is working to incorporate natural habitats and manage crops on farms to increase the abundance and diversity of birds in working landscapes. It is therefore important that we develop a better understanding of the potential benefits or costs to farmers of these practices. One service that birds provide that has not been fully explored is natural pest suppression by insectivores and raptors. With rapidly increasing regulations of chemical pesticides, especially in California, natural pest control options will be highly valued and useful. In this review of existing literature and studies we estimate the pest control benefit that insectivorous birds can provide to farmers and make the case that an increased abundance of birds on farms could result in a substantial reduction in chemical pesticide application. Bird-centric pest management is successfully being implemented on shade-grown coffee farms throughout the tropics, and we conclude that this avian ecosystem service is currently under-appreciated and underutilized in temperate farming practices.

Tuesday, July 17 9:45 Reducing Bycatch Of Overfished Species Using Risk Pools, Spatial Fishing Plans, And Innovative Technology

Labrum, Kate*, *The Nature Conservancy* , **Gleason, Mary**, *The Nature Conservancy* , **Merrifield, Matt**, *The Nature Conservancy* , **Bell, Michael**, *The Nature Conservancy* , **Rienecke, Steve**, *The Nature Conservancy* , **Wilson, Jono**, *Bren School / UCSB*

Off California's coast, a coalition of conservationists and fishermen are combining science and local knowledge to test new approaches for avoiding bycatch of overfished rockfish. The groundfish fishery on the U.S. West Coast is a multi-species fishery that has been dominated by bottom trawling for decades. The fishery was declared a disaster in 2000 due to depletion of vulnerable stocks of a handful of species, increasing regulations, and declining revenues and landings. Fishery closures were established to rebuild stocks and some fishermen have switched to more selective gear; however, catch of target species is still constrained by the need to avoid overfished stocks. As the fishery transitioned to an Individual Fishing Quota (IFQ) "catch shares" management system, we tested collective arrangements for combining quota of overfished species in "risk pools" and implementing local zoning of fishing effort in spatial fishing plans. We developed eCatch, a digital system to capture spatial information on bycatch in near-real time to support risk pool management and refinement of fishing plans over time. These efforts have significantly reduced bycatch of overfished species relative to the fleet at large in the first year, as well as promoting collaborative solutions for achieving both conservation and economic gains.

Tuesday, July 17 9:40 Creating Connections: Engaging Citizens Through Training To Identify Andean Bears While Promoting In-Situ Involvement And Scientific Sustainability

Lacombe, Corrin*, *San Diego Zoo Global* , **Van Horn, Russ**, *San Diego Zoo Global* , **Zug, Becky**, *University Of Wisconsin-Madison* , **Danoff-Burg, James**, *San Diego Zoo Global*

As conservation efforts increasingly rely on developing local collaborators and seek to maximize return on conservation efforts, we must create innovative opportunities to capitalize on interdisciplinary expertise and develop sustainable practices. Here, we share an example of how we were able to involve local participants who visited

the San Diego Zoo Institute for Conservation Research in a learning module experiment that answered a field-inspired research question: 'Can humans reliably identify individual Andean Bears using photographs?'. Results of this study are augmenting in-situ conservation research on Andean Bears in South America by increasing validity of data collected by local para-ecologists, while also ensuring their continued involvement in the project by enabling them to train others in this skill. Local involvement and capacity building contributes to the maintenance and long-term sustainability of field research projects, and the conservation efforts they support. This study is an example of how to creatively enhance the skills and engagement of local collaborators while generating awareness, collecting rigorous data, and efficiently addressing conservation challenges utilizing various disciplines and outlets

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Tuesday, July 17 12:30 Invest In Climate Change Planning: Advancements In Ecosystem Service Models For Informing Vulnerability Assessments And Adaptation Strategies

Langridge, Suzanne[*], *Natural Capital Project* , **Arkema, Katie**, *The Natural Capital Project, Stanford University* , **Guannel, Greg** , **Verutes, Gregg** , **Guerry, Anne**, *The Natural Capital Project, Stanford University*

National, regional and local governments and NGOs are beginning to develop strategies for responding and adapting to climate change. Yet, making informed decisions requires understanding how climate change will affect ecosystems and the services they provide to people. InVEST is a scenario assessment tool that can be used to ask how a variety of climate variables (e.g., sea surface temperature, sea level rise) and adaptation strategies (e.g., retreat, infrastructure investment, habitat restoration) will affect a wide range of benefits people get from nature (e.g., protection from coastal hazards, sustenance from the ocean and land, recreational and cultural fulfillment). By combing dynamic models of ecosystem function with economical and social valuation, InVEST produces biophysical, economic and human well-being metrics for use in a variety of decision contexts. In collaboration with local partners, we are using InVEST to assess climate change vulnerabilities and to evaluate alternative adaptation strategies in Monterey Bay, CA, Galveston Bay, TX and along the coast of the United States for the National Climate Assessment. We will give an overview of these 3 projects and describe how outputs from InVEST are informing climate change planning at multiple scales in regions with diverse habitats and policy questions. Through this synthesis, we will identify challenges we have faced in designing these tools, and share recent advancements in tool functionality and application.

Monday, July 16 Citizen-Based Monitoring Characterizes Relationships Between Water Quality And Benthic Macroinvertebrate Composition In A Western Sierra Stream

Lauder, Jeff[*], *Sierra Streams Institute* , **Durben, Rachel**, *Sierra Streams Institute* , **Hild, Joanne**, *Sierra Streams Institute*

Sierra Streams Institute has collected water quality and benthic macroinvertebrate (BMI) data for 11 years in Deer Creek, in the western Sierra Nevada foothills, to address the hypothesis that water quality and BMI composition are highly correlated. Through biannual sampling (N=17), we assessed changes in water quality and BMI composition, and correlations between them, in relation to various case studies, including an upgrade to nitrogen treatment from a Waste Water Treatment Plant (WWTP), and a restoration project on a reach of Little Deer Creek, a tributary of Deer Creek. Nitrate (NO3) decreased at all downstream sites after the WWTP upgrade by an average of 0.415 mg/L (± 0.18, p=0.03). At two sites downstream of the WWTP, the Scraper-Grazer (SC) Index increased significantly (R2=0.75, p=0.006; R2=0.75, p=0.005). On Little Deer Creek, the Shredder (SH) Index increased at the site immediately downstream of

the restoration (R2= 0.55, p= 0.001. Ordination showed significant correlation (r=0.88) between BMI composition and water quality across all sites, and demonstrated that conductivity (r2=0.93), water temperature (r2=0.88), pH (r2=0.91), site elevation (r2=0.94), and watershed area above the site (r2=0.84) were all highly correlated predictors. Results show the relationship between water quality and BMI indices, and validate the use of BMI indices to assess water quality and the use of water quality parameters to track BMI health.

Monday, July 16 9:00 Planning For Species Movements In A Changing Climate
Lawler, Joshua*, *University Of Washington*
In the past, many species moved great distances to track changing climates. Although today's biota will likely move in similar ways in response to projected future climatic changes, modern species will face many challenges that their predecessors did not. Not the least of these is that humans have altered and fragmented much of the Earth's surface, making long distance movements difficult for many species. Here, I present the results of two studies that demonstrate the potential magnitude of this problem. In short, these studies reveal key places on the landscape where management actions can facilitate species' movements. However, they also indicate that many species will be unable to keep pace with climate change. Although designating more protected areas and connecting them with protected corridors are often cited as the best adaptation strategies to address these climate-driven movements, alone, they will likely be insufficient. The magnitude of projected changes and the barriers to movement that species face will likely require changes in existing policies and the development of new policies to facilitate species' movements in a changing climate.

Tuesday, July 17 9:00 Opportunities And Challenges For National Parks To Serve As Freshwater Protected Areas
Lawrence, David* , **Olden, Julian**, *University Of Washington*
We assessed the representation of freshwater fish diversity provided by the National Park Service (NPS) and the potential for parks to serve as freshwater protected areas (FPAs) in the United States. Although most parks were not designed with freshwater conservation in mind, nearly two-thirds (62%) of native U.S. fishes reside in national parks. However, only 18% of the nation's highly imperiled fish species are represented within the NPS. The ability of parks to serve as protected areas depends on activities upstream from their boundaries and we found that a substantial part of these watersheds have some form of conservation status. Using a conservation planning approach that integrated fish representation provided by parks and their current and future ecological threats (e.g., climate change, dams, watershed impervious surface, invasive species) and management challenges (e.g., land stewardship beyond park boundaries), we identified 50 parks that could serve as core members of a nationally comprehensive FPA system. While the NPS has limitations as the potential basis for an FPA network, it provides considerable representation of freshwater fish diversity that should be taken into account during systematic conservation planning for freshwaters.

Monday, July 16 8:50 Assessing And Implementing Forest Planning Rules Under The National Forest Management Act
Lawrence, Niel*, *Natural Resources Defense Council* , **Noon, Barry**, *Colorado State University*
SCB has been involved almost since its inception with implementation of the National Forest Management Act, which mandates basic protections and periodic planning for 192 million acres of public lands. SCB's recommendations to the incoming Obama Administration highlighted the need to maintain viable populations of wildlife species, return to meaningful planning, restore environmental review, and better fund inventory and conservation efforts. We will review the

administration's performance on those fronts and score the responsiveness of its new planning regulations to SCB's several layers of input. We will also explore how the scientific community shaped interpretation and implementation of the Reagan-era regulations that until this year have undergirded all management planning for units of the national forest system. Finally, we will suggest how those lessons can guide SCB impact on the new regulations in the years ahead.

Tuesday, July 17 12:30 Estimating Local And Regional Population Sizes For An Endangered Minnow, Redside Dace (Clinostomus elongatus), In Canada

Lawrie, David[*], *Toronto And Region Conservation* , **Poos, Mark**, *Fisheries And Oceans Canada*

The Laurentian Great Lakes have undergone drastic declines in freshwater fishes, with 22 species having become extinct in the past century and many more currently at risk. One such species is the endangered minnow, the Redside Dace (Clinostomus elongatus), which is undergoing severe declines across its entire range. Depletion and mark–recapture surveys were used to quantify population estimates of redside dace at several spatial scales (pool, reach and catchment) across several Great Lakes tributaries in Canada. There was large variation in the local population estimates and the rate of occurrence of redside dace populations. In some cases, such as Gully Creek, a Lake Huron tributary, redside dace were widespread but had low abundances. In other cases, such as in the Don River, redside dace were highly localized but in relatively high abundance. Extrapolated population estimates at the catchment scale showed that three of the five study populations were below conservative estimates needed for long-term population viability. Differences in redside dace populations were driven by adjacent land-use (urbanization). Post-hoc analyses revealed strong negative associations between population estimates and impervious land-use. Immediate recovery actions that focus on eliminating chronic and episodic impacts of adjacent land-use including watercourse connectivity, will help to ensure redside dace long-term survival, remaining a species at risk of – rather than facing – extinction.

Tuesday, July 17 11:00 Assessing The Impact Of Aquatic Invasive Species On Hawai'ian Stream Food Webs Using Stable Isotopes

Layhee, Megan[*], *California State University Chico* , **Marchetti, Michael**, *St Mary'S College Of California*

Anthropogenic disturbance is restructuring ecosystems and changing interactions within ecological communities. In the Hawaiian Islands, one of the most significant forces of disturbance is the widespread presence of non-native species. In this study stable isotopes of carbon and nitrogen were used to examine trophic relationships and energy flow changes occurring in Hawaiian stream communities due to invasive species and biotic disturbance. On the island of Kaua'i, we sampled all members of the stream community, including primary producers and consumers, from four streams across varying levels of invasion and disturbance. ?13C, ?15N signatures, and trophic positions of stream members were calculated to determine differences in overall food web structure, changes to native consumer isotopic signatures, and differences in food web diversity and trophic redundancy. Comparison of streams with varying levels of invasion and disturbance indicate that 1) overall food web structure varied dramatically among locations, 2) native species were nearly absent in heavily invaded and disturbed streams while at the same time a suite of non-native consumers are replacing the trophic roles left by the natives, 3) isotopic signatures and trophic position of native consumers were not significantly different across streams, and 4) heavily invaded and disturbed streams had more trophic diversity and generally lower trophic redundancy. The results of our study suggest that conservation approaches for native aquatic biota need to address the significant trophic and

functional alterations that have occurred to the food webs.

Tuesday, July 17 9:30 Student Scientists: Researchers And Educators Team Teach To Advance Local Conservation

Leidner, Allison*, *NASA Earth Science Division* , **Wunderly, Ben**, *North Carolina Maritime Museum, Beaufort* , **Brin, Christine**, *North Carolina Maritime Museum, Beaufort* , **Gillikin, Paula**, *North Carolina National Estuarine Research Reserve - Rachel Carson*

Providing opportunities for primary and secondary school students to learn about local ecological research and experience field studies can be a powerful way to educate students about the scientific method and excite them about local conservation issues. However, developing such opportunities on the part of the researcher can be time consuming and requires connections to schools or community organizations that may take years to establish. Furthermore, many scientists may lack the skills and experience to explain their research to younger audiences. Partnering with local informal education organizations can help overcome these obstacles. Here, we describe how a collaboration between a researcher, a local natural and maritime history museum, and a public lands manager resulted in the development of a three day summer science course for middle and high school students in eastern North Carolina. This class focused on coastal conservation, with an emphasis on the crystal skipper, a locally endemic butterfly. Students were exposed to field techniques such as mark-recapture and vegetation sampling, and learned about local conservation issues. At the conclusion of the class, students made posters, fact sheets, and other materials to present to their local community and classmates for the upcoming school year. We discuss the challenges and opportunities for these types of partnerships, summarize lessons learned, provide suggestions for how others may replicate this experience, and describe situations where such collaborations might be the most successful for promoting conservation education.

Wednesday, July 18 11:00 Remote Detection Of Ephemeral Wetlands In The Atlantic Coastal Plain Of North America: Local Relief Models And High Throughput Computing

Leonard, Paul* , **Baldwin, Rob** , **Homyack, Jessica**, *Weyerhaeuser NR Company*

Ephemeral wetlands are ecologically important ecosystems throughout North America and occur frequently in the Atlantic coastal plain ecoregion. They are known to support 86 species recognized by the US Fish and Wildlife Service as threatened or endangered, and numerous others that are state protected. Consequently, ephemeral wetlands have become a national conservation priority yet are often cryptic and methods to detect them at the landscape scales necessary for resource management have been time consuming, cost ineffective, or coarse-filter. This study seeks to fill detection gaps, by implementing and expanding new remote sensing methods. We subjected high resolution LiDAR elevation data to relief models designed to elucidate fine-scale geomorphology, specifically small localized changes in concavity, as a location predictor. We conducted field verification (N=114) to measure model commission (15%) and approximate omission (5%) error rates. Fine grain size and large spatial extent can impose processing limits in landscape-level analysis. We executed high-throughput computing (HTC) on idle university GIS workstations (n=132) to achieve a 91x time savings over our 55,000 ha study area. Our results suggest local relief models successfully predict ephemeral wetland boundaries in the low-relief Atlantic Coastal Plain. Using HTC they can be efficiently replicated at larger extents. Many small wetlands are centers of biodiversity in forested landscapes and such analyses will provide information integral for landscape-scale management and conservation.

Monday, July 16 Municipal Vernal Pool Policy Development: Sustainability Science In Action
Levesque, Vanessa*, *University Of Maine*
Sustainability science typically stresses efforts that simultaneously promote social, economic and ecological well-being. Municipal government contributions to sustainability, however, are often are overlooked. Because local government actions have a direct effect on local sustainability conditions, the extent to which municipalities adopt sustainability as a meaningful concept and operationalize it in their policies and programs is significant. This case study assesses the efforts of two Maine municipalities that are developing vernal pool regulatory policy tailored to local ecological, economic and social conditions, in cooperation with state and federal regulators regulations. The institutional analysis and development (IAD) framework guides the assessment of the municipal vernal pool policy development process to illuminate the influence of interactions between the players, and the interplay of institutional, biophysical and social factors on the sustainability planning process. We assess the ability of this strategy to result in more cost-effective and socially-acceptable conservation. We highlight the ecological and economic challenges that arise and the strategies that are developed in a municipal-state-federal partnership to develop a locally-tailed vernal pool policy. This work will provide a guidepost and lessons for similar initiatives that aim to improve conservation success by incorporating economic and social needs into policy design.

Tuesday, July 17 4:30 Balancing Single Species Protection And Ecosystem Function: A Case Study From The San Diego Multiple Species Conservation Program
Lewison, Rebecca*, *Institute For Ecological Monitoring And Management*
Landscape-scale conservation planning is used as a tool to protect sensitive species and communities at broad scales. Multiple species conservation plans that meet the requirements of both the federal Habitat Conservation Plans (HCPs) and state Natural Community Conservation Plans (NCCPs) are being implemented in Southern California. These joint HCP/ NCCPs require protection of federal and state listed species as well as additional sensitive species and include goals for maintaining biodiversity, rare habitat types, and ecological processes. The requirement to monitor and manage for both covered species and ecosystem integrity is one of the fundamental challenges facing these regional conservation plans. Monitoring each covered species may be cost prohibitive and may not provide an accurate assessment of the health of the ecosystem as a whole. Conversely, monitoring ecosystem integrity poses significant challenges due to, among other factors, ambiguity around how to define and measure integrity. Here we look at the San Diego Multiple Species Program (MSCP), a plan that encompasses 582,000 acres and aims to protect 85 covered species as well as ecosystem integrity and function. While an easily solution to resolving the species:system balance is non-trivial, we discuss how monitoring programs can be developed that address the need for balance and how existing data can be used to evaluate system integrity. We also explore how diverse stakeholders are collaborating to face the challenge of integrating species and ecosystem monitoring and management in an effective and cost-efficient manner.

Wednesday, July 18 3:15 Are Allee Effects Important In Conservation Biology?
Lidicker, William*
Are Allee effects important in conservation biology? William Z. Lidicker, Jr., Museum of Vertebrate Zoology, University of California, Berkeley 94720-3160 The answer to the title question is “yes, very important,” but only if Allee effects continue to be defined by demographic criteria as originally intended. In recent decades, they have increasingly been defined in terms of individual (Darwinian) fitness. While this trend may

lead to improved mechanistic understanding of population dynamics, it makes it impractical to recognize and analyze the demographic impacts of cooperative (mutualistic) interactions that are at the core of the demographic effects of interest to conservation. Individual genetic fitness is not positively correlated with the intensity of positive interactions in populations, although group fitness might be. Demographically defined Allee effects are based on cooperative interactions which are increasingly appreciated as important. They in turn lead to destabilizing influences on population processes; these “anti-regulating” factors operate both to encourage growth at high densities and to encourage extinction at low densities (through the minimum threshold density phenomenon). Empirical evidence for the importance of such influences is rapidly increasing. Future research should identify life history traits and kinds of communities that are more likely to generate Allee effects, and hence improve our predictive skills. Anti-regulating analogs at the community level may lead to alternative steady states and failures in restoration efforts.

Monday, July 16 4:45 The Ecological Effects Of Bottom Trawling In Unconsolidated Sediments: A Collaborative Approach To Resolving Pressing Management Questions

Lindholm, James[*], *Institute For Applied Marine Ecology* , **Gleason, Mary**, *The Nature Conservancy* , **Kline, Donna**, *Institute For Applied Marine Ecology*

The fact that fishing with bottom trawls impacts the seafloor, and associated biological communities, is now axiomatic. Considerably less is known, however, about the nature of those impacts and patterns of recovery of the seafloor following such disturbance, particularly in the unconsolidated sediments of the continental shelf. Now a unique academic-NGO-government-fishing industry partnership on an experimental study off Central California is yielding important new insights into the impacts of trawling on micro-habitats, invertebrates, and fish. ROV video and still photographic imagery is being collected in study plots impacted by known levels of trawling effort and in control plots in which no trawling has occurred for many years. Data extracted from the imagery at 2-weeks, 6-months, and 1-year post-trawling show significant declines in micro-topographic complexity under both low- and high-intensity trawling treatments, but also suggest that considerable natural variation in the benthic community must be considered when evaluating the impacts of trawling. The goal of this collaborative study is to advance our understanding of the relative impacts of trawling to improve spatial management approaches in the interests of those who fish, those who love fish, and those who love to eat fish.

Tuesday, July 17 3:30 Climate Velocity And Implications For Adaptation

Loarie, Scott[*], *Carnegie Institution For Science*

The ranges of plants and animals are moving in response to recent changes in climate. As temperatures rise, ecosystems with ‘nowhere to go’, such as mountains, are considered to be more threatened. However, species survival may depend as much on keeping pace with moving climates as the climate’s ultimate persistence. Here we present a new index of the velocity of temperature change (km yr-1), derived from spatial gradients (°C km-1) and multimodel ensemble forecasts of rates of temperature increase (°C?yr-1) in the twenty-first century. This index represents the instantaneous local velocity along Earth’s surface needed to maintain constant temperatures, and has a global mean of 0.42?km?yr-1 (A1B emission scenario). Owing to topographic effects, the velocity of temperature change is lowest in mountainous biomes such as tropical and subtropical coniferous forests (0.08?km?yr-1), temperate coniferous forest, and montane grasslands. Velocities are highest in flooded grasslands (1.26?km?yr-1), mangroves and deserts. High velocities suggest that the climates of only 8% of global protected areas have residence times exceeding 100?years.

Small protected areas exacerbate the problem in Mediterranean-type and temperate coniferous forest biomes. Large protected areas may mitigate the problem in desert biomes. These results indicate management strategies for minimizing biodiversity loss from climate change. Montane landscapes may effectively shelter many species into the next century. Elsewhere, reduced emissions, a much expanded network of protected areas, or efforts to increase species movement may be necessary.

Wednesday, July 18 9:50 The Bay Area Bioatlas - A Baseline For Understanding Climate Change Impacts On Regional Biodiversity

Loarie, Scott* , **Kennedy, Morgan** , **Micheli, Lisa** , **Branciforte, Ryan** , **Gluesenkamp, Daniel** , **Weiss, Stuart**, *Creekside Center For Earth Observation*

With ongoing land-use and climate change altering the distribution of plants and animals, better data on where species persist and where are disappearing are urgently needed. The two most common sources of biogeographic data (museums occurrence data and range maps) each have shortcomings that limit their utility. Museum occurrence data lack information on where plants and animals are absent. Likewise, range maps are too coarse to discern for mapping occupancy at the scale of individual reserves. Biodiversity atlases represent a third, less common data-type. By combining comprehensive lists of species associated with particular units of land, atlases have neither of the shortcomings of museum occurrences and range maps. However, they exist for few areas and taxa because of the large amount of fieldwork required to generate them. We used new internet technology built off the iNaturalist.org citizen-science social network, the CalFlora.org online biogeographic database, and the Bay Area Open Space Council Conservation Lands Network to rapidly compile reserve-checklist data, range maps, and museum occurrence data from diverse sources into a single Atlas of vertebrates and vascular plant occupancy across Bay Area protected areas. By combining these various biogeographic data types into a single framework, the Bay Area BioAtlas overcomes the individual shortcomings of each data type. We use the BioAtlas to demonstrate (1) how these data are useful for modeling and projecting the roll of climate and land-use change on species distributions at regional scales and (2) how they serve as a powerful baseline for monitoring future changes.

Monday, July 16 Overlapping Public Policies For Private Forest Conservation

Locke, Christina* , *University Of Wisconsin--Madison*

Private lands are crucial for achieving landscape-scale conservation goals like ecosystem management and forest connectivity. Public policies for protecting private lands include regulations, incentive-based approaches, and acquisition of land. Policy assessment is especially critical in areas adjacent to conserved forests where development pressure tends to be high. Although multiple policies influence private land use and management, empirical studies rarely consider how polices overlap and interact. We focused on Wisconsin's Managed Forest Law tax incentive program and local zoning ordinances. We conducted 1. spatial analyses to quantify private forest protection in critical areas and 2. spatial and content analyses of zoning ordinances to determine if and how they prioritized forestry. The results of our neutral landscape model analysis indicated that tax program enrollments clustered near public and other conserved forests. However, approximately 253,600 ha (19.8%) of enrolled forests were located in townships lacking zoning ordinances, and the remaining townships' ordinances varied widely with respect to forest considerations. Although enrollment is voluntary, forest tax programs provide the unintended but important benefit of connectivity with public lands. However, enrollment in these programs is not permanent and effective forest conservation relies

on other policy approaches like zoning. Considering that all 50 states have forest tax programs, and that local land use ordinances vary widely, the combined effects of multiple policies on private forest conservation deserve greater attention.

Monday, July 16 10:15 Black Bear Population And Connectivity In The Sky Islands Of Mexico/United States

López, Carlos*, *Universidad Autonoma De Queretaro* , **Lara, Nalleli**, *Universidad Autonoma De Queretaro* , **Coronel, Heli**, *Naturalia A.C.* , **Gonzalez, Alejandro**, *Naturalia A.C.*

The Sky Island region is a mountainous region surrounded by grasslands, deserts and intermountain valleys, located between Mexico and the United States. Currently, the international border wall poses an immediate threat to the survival of black bears (Ursus americanus), considered an endangered species in Mexico. Our aim was to determine the conservation status of black bear in the Sierra San Luis sky island (Sonora-Arizona) as affected by the border fence. We determined population size through camera trap and radio-telemetry, and modeled population occupancy using PRESENCE. We documented a healthy bear population with more than 500 individuals. Surveys along the border failed to detect bears crossing it, but we identified linkages between the two countries important for future landscape planning. Increased vehicular traffic, migration and drug traffic have a negative effect on bear populations, exacerbated by an increase in anthropogenic activities resulting from the construction and maintenance of the border wall. We recommend modifications to the structure of the border wall, and to increase wildlife monitoring by the United States authorities to reduce the potential impact this structure has on black bear and other wildlife populations.

Tuesday, July 17 11:30 Terrestrial Wildlife Conservation And Renewable Energy Development In The Desert Southwest United States: A Review

Lovich, Jeffrey*, *U.S. Geological Survey* , **Ennen, Josh**, *Maryville College*

Renewable energy development is experiencing a renaissance particularly in the desert southwest United States where wind and solar energy potential is high. Large areas of public land are currently being permitted or evaluated for utility-scale renewable energy development (USRED). The same areas are characterized by high and unique biodiversity including threatened and endangered species like the desert tortoise. We review the peer-reviewed scientific literature for information on the known and potential effects of USRED and operation (USREDO) on terrestrial wildlife. In comparison with the large body of literature on the effects of wind energy facilities on birds and bats, very little is available to evaluate the effects of wind or solar facilities on terrestrial wildlife. Effects due to construction and eventual decommissioning of USRED facilities include direct mortality, environmental impacts of fugitive dust and dust-suppressants, destruction and modification of habitat including impacts of roads, and offsite impacts related to construction material acquisition, processing and transportation. Known and potential effects due to operation and maintenance of facilities include habitat fragmentation and barriers to gene flow, as well as effects due to noise, vibration, electromagnetic field generation, microclimate change, pollutant spills, water consumption, predator attraction, and increased fire risk. A general lack of before-after-control-impact studies hinders the ability to rigorously quantify the effects of USREDO on terrestrial wildlife. Basic information is also lacking on facility design effects, the efficacy of site selection criteria, and the cumulative effects of USREDO on regional wildlife populations. Insufficient data are currently available to adequately assess the impact of USREDO on terrestrial wildlife.

Monday, July 16 4:15 Integrating Climate-Smart Monitoring Into New Zealand's Long Term Marine Environmental Monitoring Programmes

Lundquist, Carolyn*, *National Institute Of Water And Atmospheric Research (NIWA) And Department Of Conservation* , **Hewitt, Judi**, *National Institute Of Water And Atmospheric Research (NIWA) And Department Of Conservation* , **Thrush, Simon**, *National Institute Of Water And Atmospheric Research (NIWA) And Department Of Conservation*

New Zealand's marine ecosystems are a global diversity hotspot due to their geographic isolation, physiographic complexity and complex circulation. Marine ecosystems are expected to respond to climate change, and increasing temperature and sea-level rise have already been documented. Additional predicted climatic changes include impacts associated with storm frequency, precipitation, and ocean acidification. However, the consequences of climate changes on New Zealand's marine biodiversity are uncertain due lack of baseline data on species distribution patterns and ecology, and lack of understanding of stress-responses, multiple stressors interactions and other complex dynamics. Regardless, environmental monitoring in New Zealand has been effective in determining long-term changes and linking these changes to climatic variables. Here we illustrate New Zealand examples that provide insight into ecological response to climate change. First, we discuss a coastal monitoring programme, designed to report on the overall health of a large harbour. The ecological indicators and sampling regime link trends in abundance of key indicator species to climatic changes, despite cyclic patterns in population dynamics, and provide clues for the potential for resilience in ecological response to climate change. A second programme follows the MarClim framework to determine baseline information and physical determinants of species' range distributions to predict (and monitor) range shifts of rocky intertidal species. Finally, we discuss proposed changes in New Zealand's monitoring of marine protected areas and New Zealand's Antarctic research to incorporate climate metrics into evaluation of long-term ecological integrity.

Monday, July 16 11:00 Population Management Reduces Social Stability In Feral Horses By Increasing Stallion Harassment Of Mares

Madosky, Jessa*, *Thomas University* , **Rubenstein, Daniel**, *Princeton University* , **Howard, Jerome**, *University Of New Orleans* , **Stuska, Sue**, *National Park Service*

Overabundant species are often managed on public lands in order to reduce their impact on ecosystems. Immunocontraception has been promoted as a management strategy in many species to reduce population growth without altering behavior. However, PZP immunocontraception has been shown to reduce social stability in feral horses. One potential driver of harem changes is stallion harassment. Mares may change harems in order to minimize their harassment costs. We tested if treated mares are harassed more by harem stallions and tested the relationship between harassment rate and harem change rate to determine if harassment drives harem changes. Higher stallion harassment was strongly correlated with higher harem changes and treated mares were harassed more than controls. There were no significant differences in harassment rates before and after harem changes. These results indicate that management via PZP results in higher harassment rates for treated mares and males treat contracepted females differently than control mares. Though the point of the contraception is to limit population growth, the social side effects of contraception may reduce reproductive success of individuals valuable to the population and reduce recruitment beyond desired levels thus complicating management and conservation efforts. Given that PZP is used in many species, this study indicates a need for deeper investigation into the social impact and side effects of managing species with immunocontraception.

Tuesday, July 17 11:20 Non-Invasive Sampling And Ex Situ Management Of Panthera uncia
Makkay, Amanda M.*, *Fordham University*
The ex situ population of snow leopards, (Panthera uncia), is experiencing a decline in fecundity. The genetic diversity, mean kinship values, of the captive P. uncia population is determined via models derived from studbook data. Literature suggests determined mean kinship values are not necessarily comparable to measures from molecular genetic data (Russello and Amato 2004). This proposal evaluates and compares the model based approach to empirically derived measures of genetic diversity of the Association of Zoos and Aquariums' (AZA) North American snow leopard population. Panthera's Global Felid Genetics Program, partnered with the American Museum of Natural History's Center for Conservation Genetics, has collected over 200 wild snow leopard fecal samples. The genetic information from these data has allowed for individuals and lineages to be sourced to their population of origin. Genetic diversity of the snow leopard population is measured through analysis of captive snow leopard fecal samples. Using a panel of published snow leopard microsatellite primers (Waits et al 2007) kinship patterns are identified for AZA snow leopards. The genetically most similar wild source populations for individuals within the captive population are also identified referencing Panthera's collection. This genetic diversity data provides insights into the recent declining success of captive breeding programs and for the varying degrees of success associated with husbandry efforts at AZA institutions. Other applications include studies on variation in life history characters among captive lineages, which may be influencing the success of population maintenance and the potential for reintroduction. This information is invaluable to reintroduction efforts, understanding both in-situ and ex-situ population differentiation, and local adaption.

Monday, July 16 4:15 Applying Adaptive Leadership To Climate Change Strategies: Lessons From A State Natural Resource Agency Initiative
Manolis, Jim* , **Wendt, Keith**, *Minnesota Department Of Natural Resources* , **Holdsworth, Andy**, *Minnesota Department Of Natural Resources* , **Pierce, Ann**, *Minnesota Department Of Natural Resources*
In 2009, the Minnesota Department of Natural Resources (MNDNR) identified climate change adaptation and mitigation strategies as top priorities. The agency established new programs, positions, and teams to integrate climate change strategies into management. Initial efforts focused on synthesizing and communicating scientific information. Now, adaptation projects are underway that aim to help conserve ecosystems in the face of climate change. Mitigation projects aim to reduce carbon emissions by 20% over five years. Overall, the initiative continues to make progress in the face many challenges. Budgets are tight, the political landscape is polarized, and staff are busy with many other priorities. Principles of "adaptive leadership" have been useful for overcoming these barriers and developing strategies for moving forward. Most notably, the principle of "combining strengths of multiple leaders" helped prioritize climate change as a conservation issue, and will be essential for full integration into conservation planning and site-level actions. "Cycling frequently through action and reflection" helped identify weak links in the initiative and strategies for overcoming them. Other useful principles have been "getting and maintaining attention," "strategic timing," and "nurturing productive conflict." These principles can be applied to any conservation challenge that requires changes in priorities, beliefs, or habits.

Monday, July 16 3:00 Critical Role Of Seasonal Tributaries For Native Fish And Aquatic Biota In The Sacramento River

Marchetti, Michael*, *St Mary'S College Of California* , **Bowen, Heather**, *California State University Chico* , **Benigno, Gina**, *California State University Chico*

Due to the Mediterranean climate of California, the Sacramento River has an abundance of small tributaries that contain water only during the winter/spring wet season. Over the past 9 years we examined the ecology of these tributaries in terms of native fishes and aquatic macroinvertebrates and will highlight the critical role this underappreciated habitat plays in the overall functioning of the entire riverine ecosystem. In this talk I discuss and summarize data from five individual studies examining ecological aspects of this habitat. In a study of juvenile Chinook growth in seasonal tributaries using otolith microstructure we find that fish grow bigger and faster on the abundant food and warmer temperatures in seasonal tributaries. In a four-year study on the spatial distribution and abundance of native fish larvae in tributaries of the upper Sacramento River we find that certain critical tributaries (Mud Creek) produce almost an order of magnitude more native fish larvae than near by permanent streams. In a study comparing the distribution and abundance of aquatic macroinvertebrates in a seasonal tributary with a nearby permanent stream we find the seasonal tributary contains unique taxa as well as higher drift densities and an ecologically distinct community. In a cross-watershed comparison of larval fish drift density we find that a seasonal tributary (Mud Creek) produces more larvae on a per volume basis than all other streams/rivers we examined. In a comparison of juvenile Chinook growth morphology between seasonal and permanent streams using geometric morphometrics we find that salmon growth is characteristically different in seasonal tributaries, possibly leading to a better and healthier fish morphology. Taken together, this extensive body of work highlights the critical importance of this habitat and strongly suggests the need for watershed-level conservation.

Monday, July 16 8:30 Confronting The Human Dimensions Of Environmental Degradation: Psychological Barriers And Opportunities

Markowitz, Ezra*, *University Of Oregon*

Inaction in the face of worsening environmental degradation is powerfully shaped by the interaction between aspects of our psychology and features of the environmental problems we face. Large scale, complex, and distally occurring phenomena—including global climate change—fail to engage our cognitive and affective alarm systems, which developed to be sensitive to immediate, rapid and salient changes in our environments. Converging evidence from the behavioral and brain sciences also suggests that our moral judgment system, which is a powerful motivator of prosocial action, is ill-equipped to recognize climate change and other environmental collective action problems as moral imperatives, depressing willingness to respond. Despite these challenges, research in psychology, communications and other fields provides insight into concrete strategies that can be used to meaningfully encourage public engagement with these issues. In this talk, I integrate recent empirical findings to highlight the challenges that environmental problems pose to our cognitive, affective, motivational and moral judgment systems (e.g., compassion towards victims of environmental catastrophes decreases as the number of individuals in need of aid increases). I then discuss strategies communicators might employ to directly confront public disengagement and increase positive responses to pressing conservation issues (e.g., reframing environmental issues as morally-significant public health problems).

Tuesday, July 17 10:00 Experimental Management Approaches In Novel Ecosystems, Including Learning To Love Them As They Are
Marris, Emma*, *Freelance Writer*
The phrase "novel ecosystems" allows us to see landscapes and waterscapes that would traditionally have been disdained as trashy or failures as sites ripe with promise and ideal for experimentation. One approach is to treat novel ecosystems as hands-off experiments that will, over time, demonstrate how new, self-willed ecosystems adapt in response to stressors including climate change. As Ariel Lugo has said, novel ecosystems are "the planet's response to what we have done to it," and there are lessons to be learned from them. On the other hand, novel ecosystems, because they are (by some definitions) impossible to restore to a historical state, also provide areas for strategies unmoored from historical baselines, including managed relocation of vulnerable populations in advance of climate change and rewilding to Pleistocene-like systems. Choosing among these and other strategies will depend on our conservation goals, which could range from familiar goals like extinction minimization, diversity maximization and provision of ecosystem services to artistic expression to preserving undirected natural selection to creating socially egalitarian spaces. Novel ecosystems are currently perhaps the most "wild" or unmanaged places on the planet; they are also the perfect places to try out new and forward-thinking goals and approaches. In novel ecosystems, we see glimmerings of future nature—loved, respected, dynamic and unfamiliar.

Tuesday, July 17 11:30 Citizen Science Drives Public Policy With The California Grunion, A Beach Spawning Fish
Martin, Karen*, *Pepperdine University*
Sandy beaches are essential spawning habitat for the California Grunion, Leuresthes tenuis, an endemic marine fish. Policies to conserve this species and its habitat have dramatically changed within the past decade. This case study describes a team of citizen scientist volunteers formed in San Diego in 2002 to monitor California Grunion as "Grunion Greeters." Working with scientists and over 150 organizations, this project extended throughout California and into Mexico. Over 4000 volunteers provided detailed data through community based habitat monitoring. This commitment engendered a new sense of stewardship for the entire sandy beach habitat. The result has been positive changes in beach management, and greater involvement of stakeholders in policy development. New beach management practices are in place throughout the habitat range of the grunion, thanks to the public participation in the scientific process, working with agencies including California Coastal Commission, National Marine Fisheries Service, California Department of Fish and Game, the US Navy, the Marines, California State Parks, and local counties and cities. The enjoyment of observing spawning runs is appreciated as a spectacular natural phenomenon, as well as a rich source of scientific data. California Grunion now inspire affection, conservation, and eco-tourism.

Monday, July 16 Yellowfin Tuna As An Indicator Of Ecosystem State In The Eastern Tropical Pacific
Martin, Summer*, *Scripps Institution Of Oceanography* , **Ballance, Lisa**, *NOAA-Southwest Fisheries Science Center*
Biodiversity is believed to be positively correlated with ecosystem resilience. Because biodiversity data can be challenging to collect, biodiversity indicators are valuable predictors of ecosystem state. This is particularly true for oceanic ecosystems. We explore the potential for using yellowfin tuna (Thunnus albacares) as an indicator of biodiversity by linking ecological characteristics of tuna (e.g. distribution and abundance) to diversity indices calculated from an existing dataset. These data were collected from NOAA Fisheries ships at sea during 10 years over a 19-year time span (1988-2006) in the oceanic eastern

tropical Pacific, an area of 21 million km2 that includes waters of 12 nations and the oceanic commons. We characterize diversity of cetaceans, seabirds, larval fishes, and flyingfishes and relate these to yellowfin tuna metrics. Because of the close ecological association of these tuna with dolphins in this region, our results have particular relevance to depleted populations of spotted and spinner dolphins (Stenella attenuata and S. longirostris, respectively), but more broadly, to ecosystem-based management of oceanic systems. These ecosystems present a complex set of management challenges. The living marine resources they include are often transboundary; enforcement of international agreements is difficult; and the ecosystem goods and services they provide are global. Yellowfin tuna is a commercially important species and tuna information is widely available through fisheries datasets, providing the potential to predict ecosystem state for this system into the future.

Tuesday, July 17 3:15 Breeding History Influences Long-Term Field Survival Of Experimental Introductions Of Jacquemontia reclinata

Maschinski, Joyce[*], *Fairchild Tropical Botanic Garden* , **Wright, Samuel**, *Fairchild Tropical Botanic Garden*

Building new populations of rare species presents an opportunity to create self-sustaining populations resilient to stochastic events, while testing ecological theory. Using progeny from controlled crosses (control, selfed, sibling, far neighbor, and between-site), we tested whether breeding history would influence long-term survival of US endangered Jacquemontia reclinata reintroduced within historic range in 2004 and 2005. By 2011, survival significantly increased with distance from pollen donor, was consistent across years of the study, and became most apparent after major stochastic events (hurricanes, drought, and exceptional cold). Mean second generation progeny did not differ significantly across treatments or sites, though magnitude of variation in recruitment differed across breeding treatments. Population viability models indicated that at least at one site, only populations founded with between-site crosses are sustainable. These studies confirm that using a single population source, especially for reintroductions of the smallest populations of this species may decrease the likelihood of population persistence and is not advisable. However prior to population mixing of any species, we advise using decision trees, reintroduction guidelines, and paying close attention to ecology, life history, habitat specialization, and dispersal mechanisms of target species to achieve sustainable genetically diverse reintroduced populations.

Monday, July 16 Restoring Floodplain Habitat Connectivity For Aquatic Species Recovery: An Integrated Modeling Framework

Matella, Mary[*], *UC Berkeley* , **Merenlender, Adina**

California's Central Valley was once a large dynamic river-floodplain ecosystem that flooded seasonally, but hydrological alterations designed to provide a stable water supply and to prevent flooding have severed hydraulic connections and led to habitat loss and significant declines in aquatic biodiversity. Recovering floodplain connectivity for ecosystem health requires an understanding of structural components related to the physical landscape, functionality of flow dynamics, and knowledge of species habitat requirements for movement, reproduction, and survival. To advance our understanding of floodplain habitat connectivity and benefits of habitat restoration alternatives, we provide a modeling framework to quantify the effects of restoration on hydrological habitat connectivity and illustrate this approach through case studies of restoration scenarios using historical and climate change scenario flows to restore fish floodplain habitat along segments of the Sacramento and San Joaquin Rivers. Case study results show that in addition to channel alterations, higher flows are

required to recover significant flooded habitat area, especially given reductions in flows expected under climate change. Our approach provides a template for developing multiple scenarios of restored floodplain connectivity that will help managers evaluate floodplain restoration projects in the context of flood management planning.

Wednesday, July 18 8:45 Using The Adopt-A-Fish Program To Get Stakeholders Hooked On Conservation

Mather, Martha*, *Kansas State University* , **Muth, Robert**, *Department Of Environmental Conservaiton* , **Frank, Holly**, *FERC*

Successful conservation requires peer-reviewed research, stakeholder involvement, an understanding of how human activities impact the ecosystem, and a link between natural systems and human values. Here, we show how two “Adopt-a Fish” programs have linked these four objectives. Our interactive “Adopt-a Herring” and “Adopt-A-Bass” projects communicated science and encouraged coastal residents to take a stake in ecological restoration. For example, in order to understand river herring spawning behavior, our ecological research tracked river herring via radiotelemetry in the Ipswich River, a coastal system in northeastern Massachusetts. Then participating stakeholder organizations adopted and named individual tagged fish and followed their movements. Research results were communicated to adopters through a project web page and end-of-the-season summary presentations. These tools cultivated a personal interest in river herring, stimulated discussion about river restoration, educated participants about the goals and methods of scientists, and initiated critical thinking about impediments to sustainability. In our related “Adopt-a-Bass” program, we undertook similar activities but targeted fishermen, rod-and-gun clubs, and outdoors clubs, thus connecting passion for fishing to conservation. The Adopt-A-Fish projects were successful participation-based outreach program that effectively drew attention to the restoration of anadromous fish and provided an opportunity for the public to become involved in real restoration research.. We hope other field biologists will use our methods for outreach to involve the public in scientific research.

Tuesday, July 17 11:30 Climate Change And California Golden Trout: Can Wilderness Areas Be Used As Refuges From Warming Temperatures?

Matthews, Kathleen*, *PSW Forest Service*

California golden trout (CGT), one of the few native high-elevation fishes in the Sierra Nevada, are imperiled due to exotic trout, genetic introgression, and degraded habitat, and now face further stress from climate warming. Their native habitat, primarily within the Golden Trout Wilderness (GTW), has reduced streamside vegetation, widened channels, and shallow depths from cattle grazing which all contribute to warm water temperatures. Climate change will further compromise streams because most climate warming scenarios predict increased water temperatures. One important management response to climate warming is to ensure that habitats are more resilient. I have initiated a study to determine the climate change resiliency of golden trout habitat by conducting a spatially explicit analysis of stream temperatures in GTW meadows. Preliminary data from 2008 to 2011 indicate that summer stream temperatures often reached 25oC, reportedly lethal for salmonids, although the specific tolerances of CGT are unknown. In the higher temperature areas, it is important to quickly begin restoring stream cooling features--depth, width, and vegetation, so CGT habitat can withstand future higher temperatures. Moreover, areas with coolest temperatures should be rested from cattle grazing to maintain their streamside features and resiliency. The spatially explicit temperature information from this study is crucial for managers to prioritize their restoration efforts. In the GTW there is an opportunity to increase resiliency of CGT habitat because it is a

federally designated Wilderness set aside by U.S. Congress to "to preserve its natural conditions…affected primarily by forces of nature". To provide more resilient habitats for aquatic species, Wilderness areas could be used as refuges, i.e., the freshwater version of marine preserves. In these preserves, managers could eliminate or minimize activities such as cattle grazing that are lowering the resiliency of freshwater habitats to increased warming.

Tuesday, July 17 8:35 A Meta-Analysis Of The Effect Of Good And Bad Environmental Actions On Stock Prices

Matzek, Virginia*, *Santa Clara University* , **Saunders, Martin**, *Santa Clara University* , **Kareiva, Peter**

Environmentalists argue about whether corporate environmental responsibility should be motivated by the carrot or the stick—i.e., by rewards that come from voluntary embrace of sustainability measures, or by punishment from fines and penalties for violation of environmental regulations. In our research, we look at the size of rewards and penalties imposed on corporations by the reaction of investors to good and bad environmental actions. The study meta-analyzes 29 different papers that use an "event-study" methodology to quantify the effect on stock prices of positive and negative environmental news. Eighteen studies cover positive environmental news, with 2695 individual corporate share price reactions; 33 cover negative environmental news, with a total of 3779 events. Our analysis shows that negative environmental news results in a significant penalty to share prices of -0.61% of firm value, but there is no significant reward attendant to positive environmental news.

Monday, July 16 4:00 Global Climate Change Effects Upon Prairie Plant Pollination

Maxson, Elise*, *North Dakota State University* , **Travers, Steven**

Understanding the impact of global climate change on the biota of the planet is an under-studied aspect of this environmental problem. Phenological shifts in plant flowering times and pollinator emergence times are a potentially problematic outcome that might lead to disassociation of mutualistic species. We examined the effects of changes in the blooming times of a native prairie plant species, Lithospermum canescens, on the plant pollinator interactions in the tallgrass prairie of northwestern Minnesota. Our study was designed to quantify the degree of pollen limitation associated with the blooming period for this species which has shifted first blooming time compared to historical records. We found evidence of an optimal flowering time for the species indicating a potential cost to flowering at the wrong time.

Wednesday, July 18 10:00 Dynamic Ocean Management: A New Direction For Fisheries And MPA Management

Maxwell, Sara*, *Stanford University/Marine Conservation Institute* , **Lewison, Rebecca**, *San Diego State University* , **Abbott, Josh**, *Arizona State University* , **Bailey, Helen**, *University Of Maryland* , **Bograd, Steven**, *NOAA Southwest Fisheries Science Center* , **Hazen, Elliott**, *NOAA Southwest Fisheries Science Center* , **Henderschedt, John**, *Fisheries Leadership And Sustainability Forum, Duke University* , **Morgan, Lance**, *Marine Conservation Institute* , **Crowder, Larry**, *Stanford University*

Marine protected areas (MPAs) are one of the most commonly used marine management tools. While they are widely accepted as appropriate for sedentary and benthic species, conventional wisdom holds that they will not be as useful for more mobile species as their static boundaries greatly limit their effectiveness. This is particularly true in the open ocean where resource users and

animals alike track dynamic processes. This has led a number of scientists to suggest a need for dynamic ocean management that explicitly incorporates the changing nature of the marine environment, and that integrates management across multiple objectives such as species conservation and socioeconomic factors. Despite the increasingly frequent suggestion of dynamic ocean management as an effective strategy for managing marine systems, it has not been well defined or thoroughly conceptualized. Here we discuss our efforts with the fishing industry to create a proof of concept for dynamic ocean management that integrates ocean resource use with oceanographic, species distribution and economic data in the context of a real-world fishery case study. We put this example in the context of fisheries and MPAs by outlining how exercises of this nature can be used to prioritize management and develop dynamic MPAs.

Wednesday, July 18 8:45 Using Population Ecology To Plan The Restoration Of Bolson Tortoises (Gopherus flavomarginatus) To Their Pleistocene Range In The U.S.

Mccaffery, Magnus*, *Turner Endangered Species Fund* , **Phillips, Mike**, *Turner Endangered Species Fund*

The last wild bolson tortoise (Gopherus flavomarginatus) population is at risk of extinction in Mexico due to anthropogenic pressures and climate change. Through a bolson tortoise captive program in New Mexico, we have achieved high annual survival and reproductive rates, and increased our captive population size by over 500% since 2006. We are using population modeling to inform future reintroductions of this species to its Pleistocene range in New Mexico. We constructed post-birth pulse stage-structured matrix models for captive and reintroduced populations. We examined the relative impacts of different release scenarios on both wild and captive population growth rates, where the number and stage class of released individuals varied. Results from this approach indicate that we will have a sufficient number of releasable individuals to commence reintroductions in 2015, and that releasing a proportion of the juvenile stage-class annually over the first decade of the reintroduction phase will facilitate growth of the reintroduced population while maintaining a productive captive population for annual wild augmentation. We show how efforts to reintroduce endangered species can be guided by population tools, particularly when a balance must be struck between maintaining a productive source population and optimizing reintroduced population growth rates.

Monday, July 16 12:00 Breeding Site Heterogeneity Reduces Variability In Columbia Spotted Frog (Rana luteiventris) Recruitment And Population Dynamics

McCaffery, Rebecca*, *University Of Montana* , **Eby, Lisa**, *University Of Montana* , **Maxell, Bryce**, *Montana Natural Heritage Program*

Environmental stochasticity can have profound effects on the population viability of wild populations. Habitat heterogeneity provides one mechanism by which populations may be buffered against climatic fluctuations. For example, heterogeneity in pond hydroperiod may allow amphibian populations to persist despite variable interannual precipitation. We examined recruitment dynamics over ten years in a high-elevation Columbia spotted frog (Rana luteiventris) population that breeds in (1) short hydroperiod ephemeral ponds, (2) long hydroperiod ephemeral ponds, and (3) permanent ponds. We combined recruitment data with models to quantify the consequences of heterogeneity in pond hydroperiod on number of metamorphs produced and long-term population growth rates. We found that most eggs were laid in permanent ponds each year, but egg to metamorph survival was higher in long hydroperiod ephemeral ponds than either short ephemeral ponds or permanent ponds. There were weak negative correlations in egg to metamorph survival among all pond types,

suggesting that the different pond types have better recruitment success on different years. Variability in both recruitment and stochastic population growth rate were lowest in the modeling scenarios with high breeding habitat heterogeneity. These results suggest that diversity in pond hydroperiod on the landscape promotes amphibian recruitment and population persistence, which could inform amphibian conservation planning efforts.

Tuesday, July 17 12:00 Intersections At Sea: Seabird Hotspots In Central California's National Marine Sanctuaries

McGowan, Jennifer*, *San Francisco State University* , **Hines, Ellen** , **Jahncke, Jaime**

The goal of this study is to identify predictable foraging habitats used by resident species of marine birds to inform oil spill response preparedness and improve ocean zoning in central California. We will model the distribution and abundance of resident marine birds relative to predictive drivers using negative binomial regression. We will use models to predict preferred foraging habitat within the study area which will then be compared using MARXAN to identify hotspots for each species and across species.

Wednesday, July 18 3:45 Using The Mammal Fossil Record To Test Species Distribution Models (SDMs)

Mcguire, Jenny*, *University Of Washington*

Species distribution models (SDMs) use environmental variables within a species range to hypothesize the broader distribution of that species either on the modern landscape or under an alternative climate regime. These models are pervasive in conservation biology today as a way to project how species will respond to future climate change. However, the underlying assumptions of the model can be difficult to test under alternative climate regimes. Here, we use the global circulation models (GCMs) from the Last Glacial Maximum (~21 Ka) and known fossil occurrences to test how well SDMs project species distributions during glacial times. We first do so using six small to medium mammal species, broadly sampled phylogenetically and ecologically. Next, we zoom in to a specific clade, Microtus, and examine what environmental and ecological factors are consistent among those species whose paleontological distributions are not well-projected. We find a consistent southward bias in SDMs among the broadly-sampled mammal species. Once we examine Microtus species, we find that the species whose distributions are poorly projected, all have niche reconstructions that strongly depend upon precipitation variables. These results do not preclude the possibility that realized niches are shifting through time or that interspecific interactions are disrupting SDM projections. However it seems likely that difficulties in correctly reconstructing precipitation in GCMs are affecting SDM accuracy for the species examined.

Tuesday, July 17 12:15 Solar Energy Development And Desert Plant Conservation: Field Testing Species Distribution Models

Mcintyre, Patrick*, *UC Davis* , **Moore, Kara**, *UC Davis*

Despite their widespread use in conservation, the accuracy of species distribution models (SDM's) is seldom tested in the field. We report on two years of modeling and field surveys designed to asses the utility of SDM's for conservation planning involving the large-scale solar energy development of desert habitat in California. We are conducting distribution modeling for six rare desert taxa using an approach that involves: 1) building initial models, 2) assessing model accuracy based on field surveys, 3) revising models based on our survey results as well as additional plant occurrences from the Consortium of California Herbaria digitization effort and widespread surveys by consults and nonprofits, 4) field testing revised models. We report on the results of models and field surveys

for Grusonia parishii, Mimulus mohavensis, Eriophyllum mohavense, and Penstemon albomarginatus. We compare two approaches that have performed well in statistical evaluation of SDM's, Maxent and Random Forests in their ability to predict newly documented occurrences across two scales of climate data (250 meter and 1 kilometer). Field surveys resulted in the discovery of new populations of all taxa, including novel occurrences (>15 miles from known occurrences) extensions of the range of several plants. Models had mixed success in predicting novel occurrences, and when tested against the results of field surveys, models for many species performed similarly to models based on a null model of geographic distance.

Tuesday, July 17 3:00 Tell Me A Story: The Importance Of Future Scenarios For Ecosystem Service Science

Mckenzie, Emily[*], *World Wildlife Fund* , **Rosenthal, Amy**, *World Wildlife Fund* , **Fisher, Brendan**, *World Wildlife Fund*

Mapping and valuation of ecosystem services are increasingly used to clarify the economic and social importance of the benefits that nature provides to people. Scenarios – storylines about possible futures – are frequently used as inputs for these ecosystem service assessments. But the importance of scenarios for enabling ecosystem service science to bridge the science-policy interface has not yet been well-explored. Through comparative analysis of six case studies, we characterize critical steps, choices and lessons. We find that scenarios – both the process of developing scenarios and the product of the final storylines and maps – can play a critical role in managing the boundaries between knowledge and action. We propose that scenarios can enhance the real-world impact of ecosystem service assessments by making information more relevant, legitimate, plausible, understandable, and surprising.

Monday, July 16 8:45 An Adaptation Portfolio Approach To Managing Climate Risk

Mckinley, Peter[*], *The Wilderness Society* , **Aplet, Greg**, *The Wilderness Society* , **Irwin, Hugh**, *The Wilderness Society*

Predicted global climate change has led to a general recognition that past ranges of ecological variability no longer suffice as a guide to conservation objectives. Moreover, models of climate change and ecological response lack the resolution and predictive power needed to develop a reliable model to address specifics of climate change adaptation. However, adaptation strategies are possible that spread risk in a way that should increase the potential for adaptation. We present an adaptive management framework, to be implemented within a regional or sub regional conservation network, that consists of zones managed 1) to facilitate change through innovation, 2) to resist change through restoration, and 3) to allow observation of change in traditional ecological reserves. Delineation of the conservation network relies on well-established conservation biology principles of representation, connectivity, and configuration, but with specific points of emphasis (e.g. connectivity across topographic and habitat gradients) that enhance adaptive capacity. The framework is meant to be flexible to accommodate the situations and needs of different regions. We will present examples of the application of this network design strategy within northeastern and southern Appalachian climate adaptation landscapes.

Monday, July 16 3:00 Predicting Species Responses To Climate Change: Recruitment Dynamics And Climate Microrefugia In California Valley Oak (Quercus lobata Nee)

Mclaughlin, Blair[*] , **Zavaleta, Erika**, *Environmental Studies Dept.*

Anticipating range shifts under climate change is a major focus in conservation. Bioclimate models are one of the few predictive tools for adaptation planning, but are limited in accounting for 1)

climatic tolerances in pre-adult life stages that are potentially more vulnerable to warming; and 2) local-scale movement and use of climatic refugia as an alternative or complement to large-scale changes in distribution. To assess whether these shortfalls can be addressed with field demographic data, we used Quercus lobata, a long-lived species with climate-sensitive juvenile life stages. We hypothesized that a valley oak bioclimate model, based on adults, would overpredict the species' ability to remain in the projected persisting area due to higher climate vulnerability of young life stages; and underpredict the potential for the species to remain in the projected contracting area in local-scale refugia. We found that saplings were more constricted around surface water than adults in the projected contracting area. We also found that the climate envelope for saplings is narrower than that for adults. Rather than a complete shift northward and upward, as predicted by the bioclimate model, valley oaks are likely to experience constriction around water and eventual disappearance from areas exceeding maximum temperature thresholds. Our findings illustrate that targeted biological fieldwork can be central to understanding climate change-related movement for long-lived, sessile taxa.

Wednesday, July 18 4:15 Disturbance Protection In Semi-Protected Areas: A Case Study Of Fire Inhibition Provided By Indigenous Territories In The Brazilian Amazon

Mcmanus, Kelly[*], *Stanford University*

Roughly 21% of the Brazilian Amazon is designated as terras indigenas (TIs). While populated reserves may be included in studies of conservation within protected areas (PAs), TIs are not managed under uniform rules like most federally established PAs but rather as semi-autonomous territories granting indigenous people sovereign use rights. This study examined the effectiveness of 197 TIs across the Brazilian Amazon to inhibit fire. Using remotely-sensed fire incidence data from 1999-2006 for TIs and surrounding areas, we found that among the 69 TIs located in regions of high fire incidence, most (n=50) TIs offer some protection against fire compared to external buffers of 20 and 60km. TI effectiveness ranged from highly resistant (n=20) to highly susceptible (n=7) to fire pressure (a ratio of fire within a reserve vs. an external buffer). Twelve TIs had higher fire pressure within reserve boundaries, mostly in cerrado areas bordering the 'arc of deforestation'. To explore the influence of confounding factors (e.g. road proximity and vegetation type), we created a spatially-explicit probabilistic model of fire incidence. Proximity to paved roads, presence of cerrado and grassland ecosystems, and a long dry season were positively correlated with fire incidence, though did not explain higher fire inhibition within TIs. With increasing land-use demands on the Amazon, this study demonstrates that land sovereignty contributes to fire inhibition and thus conservation effectiveness.

Monday, July 16 The Effect Of Fences On Two Small Populations Of Greater Sage-Grouse In Southwestern Utah

McPherron, Heather[*], *Utah State University*

I investigated how fences might contribute to the mortality of greater sage-grouse (Centrocercus urophasianus) during all major seasons for the grouse (breeding, brood-rearing, fall, and winter) in two small populations located in southwestern Utah - Hamlin Valley and the Bald Hills. During 2011 and 2012, 100 randomly selected 1-kilometer sections of fences (60 in Hamlin Valley, 40 in the Bald Hills) were surveyed once in the brood-rearing, fall, and winter seasons. During these surveys, I located three avian and one bat collision, none of which were identified as sage-grouse. During the breeding season (i.e. lek attendance), all fences within a 2.5-kilometer radius of the lek were surveyed twice. No collisions of any species were observed. These results suggest that fence collisions in these two populations of sage-grouse are occurring at rates lower than can be detected in all seasons. While marking fences has been

shown to reduce collision in other populations and is not being rejected as a means of conserving sage-grouse in either of these two populations; results from this study indicate that land managers in these areas should focus time, attention, and money to the other causes of sage-grouse mortality (i.e. predator control, preservation of habitat, vegetation improvement, etc.). Future work to be conducted in the summer of 2012 will focus on avian predators (raptors and ravens) use of fences in sage-grouse habitat and the overall habitat usage of sage-grouse within Hamlin Valley.

Tuesday, July 17 8:30 The Role Of Genetic Management In Species Reintroductions: Lessons Learned From Chinook Salmon In The San Joaquin River, California

Meek, Mariah[*], *University Of California, Davis* , **Stephens, Molly**, *University Of California, Davis* , **Baerwald, Melinda**, *University Of California, Davis* , **Tomalty, Kat**, *University Of California, Davis* , **Bork, Karrigan**, *University Of California, Davis* , **May, Bernie**, *University Of California, Davis*

Species reintroductions are difficult undertakings that require cooperation among scientists, managers, and stakeholders. When planning a reintroduction, a scientific understanding of genetic issues can be vital to success. Spring-run Chinook salmon have been extirpated from the upper San Joaquin River since the 1950s. As a result of a legal settlement, a multi-agency group is involved in reintroducing Chinook salmon to newly re-watered sections of the river using both direct translocations and individuals reared in a conservation hatchery. We developed a Hatchery and Genetic Management Plan for spring-run Chinook salmon as part of the federal and state regulatory process to permit the reintroductions. Additionally, we have written a broader Genetic Management Plan, addressing potential genetic issues as they relate to the reintroduction and the monitoring of the newly formed population, hatchery population, and source populations. As part of the reintroduction, we are also using genetic tools to address remaining questions for these populations, including Central Valley spring-run Chinook population structure, spatial and temporal genetic stability, and gene expression under different temperature regimes. In this talk, we will present, as a case study, our process of working as academic scientists with government agencies to guide and inform the reintroduction process, highlighting the recommendations we make for the San Joaquin Chinook reintroduction. We will provide our insights on the opportunities and challenges in incorporating genetic information into reintroduction planning.

Monday, July 16 8:30 From Wild Lands To Working Lands To Urban Lands: Connecting Conservation Across The Landscape

Meine, Curt[*]

We stand at a critical moment in the evolution of conservation science, ideas, and practice. The critique of "fortress conservation" is one expression of a more general understanding that fragmented approaches to conservation can undermine progress toward the shared goal of restoring and sustaining whole, biodiverse, and resilient landscapes (that include the human communities embedded within them). In our professional commitments, and in popular perception, conservation has meant many things to many people in many places. Some are interested mainly in wildlife, or forests, or soils, or water. Some are focused on cities, others on "working lands," others on protected areas. Some work primarily at the local level (e.g. building local food economies), while others work on the global realities of biodiversity loss, climate disruption, and ocean degradation. Yet, basic hierarchy thinking suggests that no part of the whole is sustainable if the whole is not sustainable. Amid this diversity of interests, the need to build a broader and more integrated framework of conservation thinking is plain. This talk offers up one model for thinking about conservation connections across the entire land-use spectrum, from wild lands to urban cores.

Monday, July 16 9:30 Flows As An Indicator Of Ecosystem Resilience: Comparing Historic, Current And Future Flows To Identify Resilient Freshwater Systems For Conservation

Meitzen, Kimberly[*], *Duke University, Nicholas School Of The Environment*

The instream flow regime, including the amount, frequency, duration and seasonality of flow though a stream, plays a critical role in shaping freshwater ecosystems. Alterations in flow regime due to changes in patterns of precipitation, water withdrawals, land use and dam operations are common throughout North America and result in significant negative impacts on the species, communities, and habitats of the region's waters. We hypothesize that streams that are least altered and characterized by natural flow patterns will be more resilient to environmental and climate changes than highly altered streams, making them priority targets for conservation. We are assessing the relative degree of flow alteration in streams and rivers throughout North Carolina and the potential ecological consequences of this disturbance. This analysis will help us identify areas of resilience and vulnerability with respect to instream flows. We provide an innovative, user-friendly robust modeling approach to identify areas where the observed stream flow has been highly altered relative to historic conditions and where stream flow is least altered and closer to natural conditions. We will also use of this modeling approach to forecast how future climate and land use changes are likely to impact flows and consequently ecosystem resilience and vulnerability.

Wednesday, July 18 11:20 Targeting Habitat Linkages For Increased Climate Change Resilience

Merenlender, Adina[*] , **Feirer, Shane**, *UC Hopland Research & Extension Center*

Maintaining and enhancing habitat connectivity through the conservation of corridors or linkages is the most commonly used strategy for increasing resilience of reserve networks to climate change. However, we are still in the early stages of determining how to best design linkages to reduce the impacts of climate change in fragmented landscapes. Enhancing connectivity to facilitate predicted range shifts for species is fraught with uncertainty. Therefore, we focus on which habitat corridors in North Coast California expand the distribution and representation of climate space using down-scaled climate models. This approach examines different characteristics of climate (e.g. rate of change, diversity, and low temperatures) that are potentially desirable for improving reserve network resilience based on the following assumptions: 1) the advantages of connectivity are greatest for areas that will experience faster rates of change, 2) a reserve network that harbors greater climatic diversity will allow for greater adaptation, and 3) maintaining access to cooler climates is a high priority. Estimated cost of acquiring each linkage as well as the probability of future development is used in the final ranking of corridors for Sonoma County. Each climate characteristic results in a different suite of priority linkages, emphasizing the need for greater consideration of how corridors may function to increase climate change adaptation.

Wednesday, July 18 11:00 Modifying Policies To Permit Forward-Looking Restoration, Managed Relocation, And Other Climate-Change Adaptation Techniques

Meretsky, Vicky[*], *Indiana University*

Land and wildlife managers seeking to preserve biodiversity under climate change are faced with difficult choices and conflicting recommendations. Efforts to preserve local genetic variation are likely to conflict with efforts to maximize dispersal potential of affected species. Years of conservation recommendations to preserve local variation and prevent importation of non-native species are now being supplemented by suggestions that careful experimentation with managed relocation may be useful to maintain ecosystem function and may be necessary to conserve some wildlife and plant taxa.

Recommendations to preserve local genetic variation have resulted in a variety of policies on sources of propagules for restoration and other plantings (e.g., seed zones) and on translocation of animals (e.g., federal policy preventing introduction of listed species outside original range) that, in their present form, may frustrate plans to conserve species and genetic variation through managed relocation. Research results suggest that as climate change advances, many species may need some anthropogenic action to facilitate movement to areas with suitable climate. Modification of policies that prevent such movements should be undertaken adaptively to support continued conservation of local genetic variation where possible while also permitting movement of taxa when necessary.

Wednesday, July 18 11:45 Motivations, Misconceptions, And Management Of Coastal Fisheries: A Case Study From The Neotropical Western Atlantic

Meyer, Erin*

An understanding of the socioeconomic motivations for harvesting a species and details about its biology are required for effective fishery management. The West Indian top snail (Cittarium pica) is a conspicuous, rocky intertidal species that is harvested throughout the Wider Caribbean and Bermuda. The objectives of this research are to evaluate economic motivations driving the fishery, determine habitat preferences and distribution, and evaluate current management policies and misconceptions. I also provide the first detailed documentation of reintroduction and recovery of C. pica in Bermuda, from where it was extirpated in less than 250 years. Results from motivation analyses suggest that high fishing pressure is correlated with: high unemployment and human population density, low GDP and urbanization, high coverage of marine protected areas (MPAs), and lack of enforcement. Evaluation of C. pica habitat preference reveals that, contrary to previous assumptions, C. pica does not exhibit size-specific zonation. Remote sensing of intertidal habitats in Bermuda indicate that high-resolution imagery is necessary for accurate predictions of habitat and species distributions. The results of these studies demonstrate that current management practices are insufficient in most locations to ensure the future of this important fishery. Based on these data, I propose local-scale management strategies for the conservation of C. pica that comprise fishing regulations and targeted MPAs.

Monday, July 16 Pervasive Effects Of The Native Collared Peccary (Pecari tajacu) On Lianas, Understory Vegetation, And Leaf Litter In Central American Rain Forest

Michel, Nicole*, *Tulane University*

Collared peccaries (Pecari tajacu) are a dominant, intensively-hunted, Neotropical consumer with trophic and non-trophic effects on plants. We tested four predictions consistent with the hypothesis of top-down consumer limitation of plants at six Central American sites with P. tajacu densities of 3 to >14/km2 and within three sets of experimental mammal exclosures: 1) Peccaries reduce understory vegetation density and cover, and leaf litter depth, mass, and arthropod abundance; 2) Effect size of mammalian exclosure increases with peccary density; 3) Vegetation density and cover decline with peccary density across sites; and 4) Peccaries have stronger effects on lianas than free-standing plants. Relative to mammal exclosures, peccaries reduced understory vegetation, woody plant, and vine density, and liana cover at La Selva Biological Station (highest peccary density), and vine density at Barro Colorado Island and Gigante Peninsula. Peccaries reduced leaf litter depth and biomass at La Selva, but increased arthropod densities. Exclosure effect sizes were largest at La Selva, despite the younger and more permeable exclosures. Palm, liana, and forest cover declined with peccary density across sites. Primary consumers exert strong top-down effects on plant communities at both reduced and elevated densities, with cascading consequences

for other organisms. To preserve tropical forest biodiversity, large consumers such as peccaries should be maintained at moderate densities.

Wednesday, July 18 12:20 Measuring Bay Area Ecosystem Vital Signs Across A Conservation Lands Network

Micheli, Lisa*

The Sonoma County "Vital Signs" project is a coupled ecosystem-climate monitoring framework under development as a model for a Bay Area-wide initiative utilizing conservation lands as platforms for detecting climate change and biological response. The goal of monitoring is to both enhance our scientific understanding of relationships between biodiversity, habitat, climate and management and to support the implementation and evaluate the effectiveness of active conservation programs. This project supports the Sonoma County Biodiversity Action Plan (2010) which defines overall conservation objectives for the county and the current state of our knowledge about general relationships between natural system drivers, human threats, ecological stressors, and benefits of conservation programs both proposed and underway. Using this conceptual framework, a team of regional biologists convened under the North Bay Climate Adaptation Initiative (NBCAI) and benefiting from the research efforts of the Terrestrial Biodiversity Climate Change Collaborative (TBC3) are defining ecosystem-specific indicators to be measured in concert with collection of standard climatic data. The team is also defining working hypotheses to be tested via data collection. The project builds on and integrates into parallel monitoring efforts for the Bay and CA coast. The biggest data gap is the absence of county-wide biological surveys: thus the first years of the program will serve in concert with related efforts to set a biodiversity baseline for the County against which future change will be measured.

Monday, July 16 4:00 From The Mountains To The Sea: Developing Spatially Explicit Climate Adaptation Opportunities For Western Washington Ecosystems

Mielbrecht, Eric*, *EcoAdapt* , **Kershner, Jessi**, *EcoAdapt* , **Leonard, Jessica**, *Geos Institute* , **DellaSala, Dominick**, *Geos Institute* , **Koopman, Marni**, *Geos Institute*

The iconic ecosystems of western Washington support diverse and abundant wildlife populations, and provide important resources and services for human communities. However, the new and variable conditions that are emerging due to rapid climate change are expected to significantly alter the natural systems that wildlife and human communities both depend on. This project is determining how important watersheds from the coastal and inland mountains to Puget Sound are likely to be affected by climate change, and identifying spatially explicit strategies and actions to facilitate adaptation across ecosystem types. Terrestrial, freshwater, and coastal marine habitat and conservation area data, select biodiversity and species data, and projected climate change data were used as inputs to develop GIS-based conservation maps. The resulting climate-informed conservation maps identify priority areas and strategic actions that, when combined, are expected to provide species and linked ecosystems with the greatest likelihood of persistence and function under changing climate conditions. They are intended to evaluate the vulnerability of new and ongoing conservation planning processes in the region to climate change impacts, and will provide an integrated assessment of spatially explicit adaptation opportunities along the linked terrestrial, freshwater, and coastal marine systems studied.

Monday, July 16 3:15 American Pika (Ochotona princeps, Op) In The Sierra Nevada And Great Basin; Environmental Context, Climate, Grazing Impacts, And Radiocarbon Dating

Millar, Constance*, *USDA Forest Service, Pacific Southwest Research Station* , **Westfall, Robert**, *USDA Forest Service, Pacific Southwest Research Station* , **Heckman, Katherine**, *USDA Forest Service, Northern Research Station* , **Schmidt, Karena**, *USDA Forest Service, Northern Research Station* , **Swanston, Chris**, *USDA Forest Service, Northern Research Station*

We give results from 4 studies of Op in the Sierra Nevada (SN) and Great Basin. Distribution, environment, climate: Our expanded database (750 sites, 17 ranges) corroborates earlier findings of high density and wide elevation occupancy (1780m span) in the SN and west GB (wGB); much lower density and narrower elevation ranges characterize the central GB (cGB). Climatic envelopes for occupied sites extend beyond earlier limits in the SN. Unoccupied sites in the SN and wGB occur at low and high elevation bounds; in the cGB they occur across Op's elevation range and environmental contexts. Talus thermal regimes: Intensive measurement of Op taluses in the SN documents summer temperatures of rock matrices consistently lower than surfaces with attenuated variation. Locations at the low talus border are coldest; positions higher in the talus are warmer. Winter matrix temperatures are warmer than external air. Matrix locations resist warming, reaching asymptotes ~10°C as surfaces continue to warm. These conditions favor behavioral plasticity. Grazing impacts: Grazing by livestock of talus forefields is associated with haypiles higher in talus and comprising low-value intra-talus vegetation relative to areas without grazing. These conditions suggest low-quality habitat. Radiocarbon dating: Pellets submitted for radiocarbon dating (13C, 14C) from 40 sites returned calibrated dates throughout the 20thC and as old as <1904CE. Ages of many sites did not correspond to field-based estimates.

Monday, July 16 11:30 Nature Reserves As Catalysts For Landscape Change

Miller, Jim* , **Wright Morton, Lois**, *Iowa State University* , **Engle, David**, *Oklahoma State University* , **Debinski, Diane**, *Iowa State University* , **Harr, Ryan**, *Iowa State University*

Scientists have called repeatedly for a broader conservation agenda that emphasizes not only protected areas but also the landscapes in which they are embedded. We offer a conceptual model for integrating conservation actions on reserves and the management of private lands. The overall goal of this model is to blur the distinction between land management on reserves and in the landscapes that surround them in a way that fosters widespread implementation of conservation practices. Reserves assume a new role as natural laboratories where alternative land-use practices designed to achieve conservation objectives can be explored. Here, economic and conservation goals are seen as intertwined and mutually reinforcing. Successful implementation should result in broad-scale restoration that improves a region's capacity to conserve biodiversity and to support landowner goals, thus increasing the resilience of the overarching social-ecological system. We illustrate our points using a case study from the North American tallgrass prairie ecoregion.

Monday, July 16 9:00 Arctic Antlers And The Bones Of Newborns: A New Method For Studying Historical Caribou Calving Grounds

Miller, Joshua*, *Florida Museum Of Natural History*

A pervasive challenge to conservation is the paucity of quantitative historical data for contextualizing modern animal populations and patterns of landscape use. Fortunately, naturally occurring bone accumulations record many aspects of animal communities across extended durations (up to 10^3 years). Bone accumulations of caribou (Rangifer tarandus) may be particularly informative of historical landscape use because females grow antlers, which are shed during calving (male and

non-pregnant female antlers are shed post-mating). Using museum collections of caribou skulls and antlers, and bone surveys of modern calving grounds (Arctic National Wildlife Refuge, Alaska), this study tests (1) if gender of fragmentary antler remains is quantitatively distinguishable, and (2) if arctic calving grounds produce concentrations of shed female antlers and neonatal skeletons. Results show that adult caribou gender can be discriminated using measurements of the pedicle surface (skull attachment). Bone surveys reveal that calving grounds host abundant shed female antlers (up to 10^3/km^2). Compared to other bone assemblages, caribou calving grounds contain high ratios of neonatal:adult skeletal remains. Bone and antler accumulations are distributed nonrandomly among habitats, indicating preferences during calving. Bone accumulations record landscape use at multiple scales and provide a tool for studying historically important regions and habitats, and contextualizing patterns observed today.

Wednesday, July 18 11:40 Landscape Genetics For Conservation Planning

Miller, Mark[*], *U.S. Geological Survey*

The field of Conservation Genetics has an established history of providing information to facilitate conservation and management planning. Using well-characterized genetic markers and DNA sequence data, conservation geneticists have for decades been identifying genetic structure patterns in threatened and endangered species. Results of investigations have provided key information about the existence of subspecies-level entities through the identification of evolutionary significant units, distinct population segments, or management units. Though useful, outcomes of such investigations only provide course-grained information about genetic structure and the spatial distribution of genetic diversity. Little insights are gained that may help identify factors that promote the maintenance of genetic diversity within units themselves. To this end, the field of landscape genetics is poised to provide a more refined understanding of physical attributes of landscapes that influence genetic structure and diversity patterns within species. This presentation will provide an overview of landscape genetics analysis approaches and highlight their utility for conservation planning. The field is primarily concerned with identifying habitat attributes and features that promote gene flow and organismal movement across landscapes, and therefore aligns particularly well with major objectives of many conservation planning activities.

Monday, July 16 Deforestation Beyond Borders: Addressing The Disparity Between Production And Consumption Of Global Resources

Mills Busa, Julianne[*], *Smith College/ Scb Wgeess*

Identifying and understanding the underlying drivers of deforestation is an issue of great conservation concern, particularly given the implications of forest conversion for both biodiversity preservation and carbon sequestration. This study utilizes data on wood extraction, one of the direct drivers of deforestation, to explore the underlying relationships in global patterns of wood production and consumption across different income groups. In doing so, I ask for whom deforestation is being undertaken and challenge the notion that poverty drives forest loss. Evidence from 176 countries worldwide reveals that consumption by low-income countries results in forest losses primarily through the use of domestic fuelwood, whereas rich countries practice preservation within their borders but appropriate resources from poorer countries to sustain consumption. I further consider whether these relationships can be reshaped by changes in technological factors (either via increases in efficiency or through the use of fuelwood alternatives). High efficiency, though coincident with wealth, does not mitigate the effects of high consumption. Together, these findings suggest that both technological fixes and

national policies are insufficient means by which to preserve global forests.

Tuesday, July 17 11:00 Advancing Science For Eagles And Wind Energy Development
Millsap, Brian*, *U.S. Fish And Wildlife Service*
The United States Fish and Wildlife Service (FWS) supports responsible renewable energy development, but is also charged with implementing many federal laws that protect wildlife. Wind energy projects can cause mortality or disturbance of bald (Haliaeetus leucocephalus) and golden (Aquila chrysaetos) eagles, which are protected under the Bald and Golden Eagle Protection Act (Act). The FWS has implemented regulations under the Act that allow for issuance of permits to unintentionally take eagles at wind facilities, provided such take meets the Congressional standard in the Act that permitted actions do not risk preservation of both species. The Service interprets the preservation standard to mean that we cannot issue permits (singly or in combination) that would cause irreversible declines in eagle populations There is considerable uncertainty over (1) the population status of the golden eagle; (2) how much take can be authorized without violating the preservation standard; and (3) the degree of, and factors influencing, risk to eagles at individual wind development projects. The FWS, in cooperation with other federal and state agencies, has developed guidance for making eagle permit decisions in an adaptive resource management framework. We hope the processes described in the guidance will adequately protect eagles without unnecessarily restricting wind development, and over time, that they will reduce uncertainty in all three areas. This talk will review current FWS guidance and the adaptive management framework that is being implemented for this program.

Monday, July 16 Improving Biodiversity And Ecosystem Resiliency Through Removal Of Invasive Species In Coastal Dunes
Minnick, Sarah*, *Point Reyes National Seashore* , **Parsons, Lorraine**, *Point Reyes National Seashore*
Point Reyes National Seashore preserves some of the last remaining high quality coastal dune habitat in the United States. However, this habitat is threatened by the rapid encroachment of two invasive, non-native plant species, European beachgrass (Ammophila arenaria) and iceplant (Carpobrotus spp.). Over 70% (1,000 acres) of the park's dunes is dominated by these species. The Abbott's Lagoon Coastal Dune Restoration project, initiated in 2011, is restoring natural coastal dune processes and functions in a 300-acre area by removing up to 110 acres of European beachgrass and iceplant. Invasives removal will not only expand habitat for two endangered plant species, but may improve nesting success of threatened snowy plover by eliminating predator habitat. In addition, it will improve resilience of the dunes by allowing them to shift in response to changing sea levels and sediment supply. The first phase of the restoration project was very successful in eliminating invasives. Pre-restoration data on vegetation and topographic changes, as well as numbers of federally listed plants and plovers, will be compared with post-restoration data to determine whether restoration is successful in increasing biodiversity and population viability. Preliminary monitoring found endangered lupine seedlings germinating in 18 of the 80 acres restored. Plovers also established several nests near the restored foredunes, with one fledging the highest number of chicks recorded in years.

Wednesday, July 18 3:40 Effects Of Protected Areas On Poverty In Peru
Miranda, Juan Jose*, *Inter-American Development Bank / Georgia State University* , **Diaz, Ramon**, *Insituto De Estudios Peruanos*
Protected areas are commonly applied in developing countries to protect biological diversity

and ecosystem services, yet there is little empirical evidence on their effects on socioeconomic outcomes in adjacent areas (e.g., monetary incomes, non-monetary incomes, poverty). A better understanding of these effects, and the mechanisms through which they arise, can foster the legitimacy and sustainability of protected areas policies. This study evaluates the effects of protected areas on socioeconomic outcomes in Peru. Peru has 96 protected areas, representing 14% of the total land surface. Using the National Household Survey (2007 – 2009), which identifies households' geographic locations, we estimate the socioeconomic effects of Peru's protected areas on adjacent communities by applying a non-experimental statistical design. Specifically, we use matching methods to pre-process the data and then estimate simple differences and regression-adjusted differences in mean socioeconomic outcomes between communities near and far from protected areas. We distinguish protected areas by the type of activity allowed in each protected area (direct use, indirect use) and use three different measures of adjacency to define communities affected by protected areas: the park's officially designated buffer zone, and buffers of radius 3km and 5 km. Moreover, our detailed household surveys permit a better understanding of the mechanisms through which protected areas affect the poor in Peru.

Monday, July 16 Assessing The Effects Of Disinfectants On The Microbial Community Structure Of Spotted Salamanders (Ambystoma maculatum) Using Biolog? EcoPlates
Mitchell, Heather*

Some of the greatest losses in amphibian populations are the result of chytridiomycosis a skin disease caused by fungal pathogen Batrachochytrium dendrobatidis (Bd). Chytrid fungi are aquatic and amphibians such as the spotted salamander (Ambystoma maculatum) are not only excellent candidates for contracting the disease but also transporting the fungus to uninfected areas. When taking salamanders into captivity for study, disinfection to prevent the spread of Bd is required, but it is also important not to eradicate their ambient epidermal microflora which may serve as a natural defense against infections. Almost no information is available regarding the epidermal microflora of the spotted salamander, nor have studies been conducted that evaluate how those microbes respond to different disinfectants. In this study, three antimicrobial agents were evaluated for their ability to affect the functional diversity of the epidermal microflora of 5 captive-held spotted salamanders at Clarion University. Epidermal washes were collected from each salamander and each wash divided into quarters. Each quarter was either treated with Vorinconazole, Amphotericin B, F10 Biocare Disinfectant, or left untreated (control). Each treatment from each salamander was then inoculated into Biolog™ EcoPlates which are 96-well test plates that allow rapid determination of the metabolic capabilities of microbial communities. Differential utilization of the carbon sources in the wells by the introduced microbial community results in respiration-dependent reduction of the dye in the well and purple color formation producing a metabolic finger print that can be used to assess community-level structure and function. We hypothesized that all three antimicrobials would decrease functional diversity compared to the control and also predicted that as the most broad-spectrum antimicrobial agent, the F10 Biocare treatment would reduce or alter the functional diversity most.

Wednesday, July 18 4:20 Evaluating The Effect Of Protected Areas On Poverty In Indonesia
Miteva, Daniela* , **Pattanayak, Subhrendu**, *Duke University*

Establishing protected areas (PAs) is widely seen as the primary intervention for halting habitat degradation and preserving ecosystems. PAs also affect livelihoods by restricting extractive activities within their boundaries and by generating tourist revenue. However, we still have a poor

understanding of the effectiveness of PAs at protecting ecosystems and of their impact of livelihoods (Ferraro et al, 2012). Recent studies using credible identification strategies to isolate the causal impact of conservation policies have shown that protected areas can have a significant and heterogeneous impact on poverty and environmental outcomes. Using a multi-year panel dataset on the subdistrict level for all of Indonesia, our paper focuses on the heterogeneity of PAs impact on poverty as a function of the baseline characteristics of the area. Controlling for the endogenous placement of protected areas, we find that on average subdistricts with protected areas experienced less poverty between 2000 and 2006, with the estimates varying according to electoral participation, forest dependence and ecological degradation at the baseline. Our results have important implications for the selection of appropriate locations for rapidly emerging and somewhat controversial "REDD+" projects and, thus, have direct implications for both conservation and climate change mitigation policies.

Tuesday, July 17 3:45 Housing Development, Demographic Trends, And Amenity Characteristics Associated With Conservation Development In Colorado

Mockrin, Miranda[*], *USDA Forest Service, RMRS* , **Reed, Sarah**, *Colorado State University* , **Pejchar, Liba**, *Colorado State University* , **Ex, Lindsay**

Over the past several decades, people's preferences for living in small towns and near natural amenities, together with increasing affluence and workplace flexibility, led to widespread residential development in rural areas of the United States. Concerns about the environmental effects of low-density rural development have led some to advocate for conservation developments, where individual lot sizes are smaller, housing is clustered, and open space is preserved within the development. Conservation development projects are increasingly common, but their socioeconomic and ecological impacts are not yet understood. We present an analysis of the housing growth, demographic trends, and amenity characteristics associated with these projects in Colorado, a state where more than half of all counties (n=33) have adopted regulations specific to conservation development. We found that counties with regulations were those with more housing units and larger populations, as well as higher rates of housing and population growth from 2000-2010. We found no significant patterns between the presence of clustered development regulations and a county's natural amenities, or status as a recreational or retirement county. Additionally, the number of projects per county and houses per project varied widely. Preliminary analyses show that clustered development houses or lots range from less than 1 percent to up to 18 percent of new housing units per county from 2000-2010. We conclude with discussion about the potential social and ecological effects of conservation developments, as a new but increasingly common type of rural residential development

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Wednesday, July 18 4:30 National Park Service Monitoring At The Landscape Scale

Monahan, Bill[*], *National Park Service*

National parks are typically islands of protected lands, strongly influenced by surrounding landscapes and other broad-scale environmental drivers like climate change. Major landscape-level monitoring projects in the NPS Inventory and Monitoring Program include: NPScape – monitoring landscape dynamics of national parks; PALMS – Park Analysis and Landscape Monitoring Support; and LCCVP – Landscape Climate Change Vulnerability Project. These projects are designed to address two key questions: how are the natural systems, conservation context, and human drivers changing around parks, and how do these landscape dynamics combined affect park resources? This presentation describes where NPScape, PALMS, and LCCVP fall along the surveillance – targeted monitoring continuum. It

also uses results of select indicators (e.g., climate, land cover, human population) and areas of analysis (e.g., protected area centered ecosystems) to illustrate how results inform park management in an era of climate change. Although the indicator development process involves consideration of landscape-scale hypotheses, the resulting indicators share more affinity with characteristics of surveillance monitoring. Moreover the utility of this distinction is unclear for monitoring addressing such large spatiotemporal scales and management units tasked with protecting such a wide variety of resources.

Wednesday, July 18 9:45 Using Immersive Imagery And Stories To Create A More Vibrant And Inclusive Freshwater Conservation Movement
Monroe, Jeremy*, *Freshwaters Illustrated*
The inhabitants of freshwater ecosystems are inherently difficult to observe and have long been under-represented - and often misrepresented - in popular imagery. Freshwater organisms are also among the planet's most imperiled fauna, and few have broad public constituencies of conservation support. I argue that sharing powerful imagery and science-based stories through media are not only key to gaining broader public interest in freshwater conservation, but in fostering a freshwater conservation movement that can be more scientifically literate and useful as a monitoring force. I will share several examples from our current media projects and public awareness campaigns, and describe how we seek to engage the science and conservation communities in these efforts.

Monday, July 16 Ecological Effects On Vector Borne Diseases (Fleas) In Black-Tailed Prairie Dogs (Cynomys ludovicianus) In Janos Biosphere Reserve, Chihuahua, Mexico.
Montiel, Ana*, *UNAM* , **Acosta, Roxana**, *UNAM* , **Montiel, Griselda**, *UNAM* , **Ceballos, Gerardo**, *UNAM* , **Suzan, Gerardo**, *UNAM*
The study of pathogens in endangered species like the black-tailed prairie dog (Cynomys ludovicianus) is critical to understanding host-parasite dynamics and the factors involved in its prevalence. This will give us more and better tools to develop conservation management plans and ensuring the maintenance of prairie dog populations in the long term. Therefore, this study aims to determine parasite load in black-tailed prairie dogs northwest of Chihuahua are associated with extension of colony, density, proximity to human settlements, sex, age and weight. We captured a total of 266 PLCN in eleven colonies sampled in 2009. We analyzed 3,654 fleas from 251 individuals: Pulex simulans (1,986), Echidnophaga gallinacea (1,340) and Oropsylla hirsuta (328). Species of mites found was Androlaelaps farenhoizi and ticks of Ornithodoros turicata. In each colony, we calculated prairie dogs density, distance to nearest human settlement, species richness, composition and load fleas. We used analysis of correlation between ecological variables studied and total load fleas. We found one vector borne for Yersinia pestis. We found an vector borne for Yersinia pestis, bacteria who has been responsible to local extinction of prairie dogs colonies in USA. The most diversity fleas was found in colonies near to human settlements and in larger colonies the total load fleas was lower.

Tuesday, July 17 11:30 Demographic And Environmental Drivers Of Population Growth Or Decline Of The Rare Plant Penstemon albomarginatus In The Shadow Of Energy Development
Moore, Kara*
Proposed utility-scale solar developments across the Mojave and Sonoran deserts of California will significantly impact special status plants. Among these, the herbaceous perennial Penstemon albomarginatus, White-margin beardtongue, is restricted in California to a narrow habitat North of the Pisgah Crater in the Central Mojave Desert; the

majority of this habitat is slated for solar development in 2012. As part of an ongoing study, we explored the use of population demographic models to evaluate population demographics based on 11 years of data on several subpopulations in the Pisgah vicinity We aimed to address the following questions: 1) how sensitive is the population growth rate (lambda) to different estimations of seedling recruitment? 2) what demographic life stages make the greatest contribution to the population growth rate? 3) how is the population growth rate affected by herbivory? We constructed a stochastic model based on demographic and environmental data and used it to explore the effects of varying vital rates on the population trajectory with and without hypothesized impacts by energy development. We found that although seedling recruitment was a highly sensitive life stage, the population growth rate responded more rapidly to survival of plants in the largest size classes. Population growth was strongly tied to annual precipitation. Herbivores radically impacted P. albomarginatus seedling survival, seed production, and adult mortality. Protection from herbivory at the establishment and reproductive stages, particularly in dry years, is an important component of a mitigation or restoration plan for this special status species. We discuss the implications of disturbance by energy development and potential mitigation strategies that may promote on population viability.

Wednesday, July 18 9:30 Future Directions In Pelagic Conservation And Management : Highlights From IMCC Think Tank

Morgan, Lance[*], *Marine Conservation Institute*

In recent years several large marine protected areas (MPAs) containing vast pelagic realms have been designated. Despite this trend there is a lack of information available for pelagic protected area management. A recent workshop of marine scientists provided recommendations for managers on key considerations for pelagic ecosystems. While many strategies for managing coastal MPAs apply in the oceanic realm, the success of pelagic marine protected areas will depend on both the mitigation of direct threats to species within MPA boundaries, as well far beyond boundaries, a daunting challenge. Successful management of these protected areas also requires a detailed understanding of complex ecosystem interactions such as those between seabirds, pelagic fishes and commercial fisheries. Monitoring pelagic species differs greatly from many coastal species, but is key to understanding pelagic MPA effectiveness. Recommendations also included identifying new cost-effective techniques for monitoring, surveillance and enforcement of pelagic ecosystems. The scientists suggested focusing efforts on identifying and protecting key places where species concentrate to feed, mate, spawn, calve, rear young, and along migratory routes and bottlenecks, recognizing that pelagic ecosystems are dynamic and moving.

Monday, July 16 Local And Regional Patterns Of Atmospheric Nitrogen Pollution In Greater San Francisco Bay Area Serpentine Grasslands

Morozumi, Corinne[*], *UC Santa Cruz* , **Vallano, Dena**, *Environmental Protection Agency* , **Zavaleta, Erika**, *Environmental Studies Dept.*

The nitrogen (N) cycle is being altered dramatically by human activities such as fossil fuel combustion and fertilizer application. Increased human-derived reactive N deposition to sensitive ecosystems is known to alter the structure, function, and species composition of these systems. Serpentine grassland ecosystems, hotspots of regional native biodiversity in central coastal California, are thought to be impacted detrimentally by increased N deposition, but N deposition rates on fine temporal and spatial scales have not been established in these systems. For 12 months we used passive samplers across four Bay Area serpentine grassland sites to measure multiple species of dry N deposition: nitrogen dioxide (NO2), nitric oxide (NO), ammonia (NH3). We found up to a 17-fold difference in the total N

concentrations among the four sites that correlated with urbanization, proximity to roadways, and location in relation to prevailing winds in the Bay Area. Within sites, concentrations decreased up to threefold with distance to highway. We also observed seasonal differences in pollutants, with higher input rates of most N species occurring in the cooler winter months during the growing season. Total N deposition for the year was 12 kg/ha/yr at Coyote Ridge Reserve, thus exceeding a critical load for invasion in these grasslands (5 kg/ha/yr), illustrating the potential for regional N pollution to transform these historically N-limited ecosystems.

Wednesday, July 18 11:15 Putah Creek, California: Story Of A Reconciled Ecosystem

Moyle, Peter[*], *University Of California*

Putah Creek is a typical California stream, dammed, diverted, leveed, and full of alien fishes. Local citizens, UC Davis, and the City of Davis sued for restoration of flows to bring back its value for recreation, aesthetics, and teaching, resulting in a 'natural' flow regime, starting in 2000. The flows have resulted in recovery of native fishes, followed by native plants and birds. The Settlement Agreement resulted in establishment of a Stream Keeper, who keeps track of monitoring, , leads restoration projects , and serves as a liaison between the water agency and citizen groups. As a result, Putah Creek is now a local center of aquatic and terrestrial biodiversity with active citizen involvement in its management. Its recovery is a basis for restoration of the San Joaquin River. Today the creek is a narrow ribbon of habitat in an agricultural landscape. Putah Creek is a harbinger of future reconciled ecosystems in California, where human use is intense, alien species are abundant, and citizen-based efforts are essential to maintain a novel ecosystem that supports native species.

Wednesday, July 18 4:30 A Landscape Genetics Approach For Conservation Planning In The Context Of Landscape Change

Murphy, Melanie[*], *University Of Wyoming* , **Funk, W. Chris**, *Colorado State University* , **Muths, Erin**, *USGS* , **Evans, Jeffrey**, *The Nature Conservancy/University Of Wyoming*

Landscape genetics is a powerful approach combining landscape ecology and population genetics that can produce robust estimates of functional connectivity on a time-scale relevant to conservation decisions. Despite the potential, genetic data have rarely been applied to evaluate potential impacts of climate change or alternative conservation plans. Fort Collins Natural Area Program (FCNAP) is a municipal organization charged with managing and expanding a reserve program within and around Fort Collins, Colorado USA. Primary goals of the management plan are to maintain amphibian populations within the FCNAP and to acquire new reserves that will be beneficial to these populations. To assist FCNAP in meeting management goals, we assess probability of occurrence and functional connectivity (estimated by genetic distance) for boreal chorus frogs (Pseudacris maculata; 15 microsatellite loci, 36 locations, 471 samples) using gravity models. We then use these models to predict the effect of alternative management scenarios (protection and/or restoration of explicit habitats) on boreal chorus frog occurrence and connectivity in the context of continued urbanization and climate change. Our results suggest that roads, urban development, agricultural development, high temperatures (dd5), and isolation impede functional connectivity while protected (FCNAP) and moist areas (CTI) are associated with enhanced connectivity (? AIC 4.18). We rank the importance of spatially explicit habitats for maintaining or restoring functional connectivity, incorporate development risk and identify areas where bypass structures may be most effective. The novel analytical framework and tools developed for this study can be applied in any system for utilizing genetic data to evaluate management scenarios.

Tuesday, July 17 3:15 Climate Change And Terrestrial Habitat Conservation Plans: Concerns And Approaches

Murphy-Mariscal, Michelle* , *Center For Conservation Biology, University Of California Riverside* , **Allen, Michael**, *Center For Conservation Biology, University Of California Riverside*

Climate change is already occurring. The rising temperatures, projected to be from 2?C near coastal regions to 5?C in inland deserts, affects vegetation structure and composition. The stress events associated with both a mean increase in temperature and increasing variance will drastically affect the persistence of threatened species and lead to additional species of concern. We need to take these changes into consideration in designing, implementing, and managing conservation plans. These include use of niche modeling or climate envelope modeling to facilitate both locating core areas and incorporating migration corridors into the design. These include both elevational and latitudinal information. Finally, perturbations ranging from solar developments to nitrogen deposition need to be explicitly integrated into conservation planning and management. Even supposed green approaches may, in fact, contradict the goals of future biodiversity sustainability. In extreme cases, this may require the development of novel restoration techniques or even constructing designer ecosystems for conserving species.

Wednesday, July 18 9:30 Economic Profitability And Policy Of Game Ranching On Private Land: A Case Study Of Game Ranching In Limpopo Province , South Africa.

Musengezi, Jessica* , **Racevskis, Laila**, *University Of Florida* , **Child, Brian**, *University Of Florida*

Wildlife based land provides an alternative land use option in semi -arid areas of southern Africa where traditional agricultural activities of livestock rearing and crop cultivation are challenged by the harsh agro- climatic conditions. Although game ranching has been found to generate significant revenues, the operating costs of game ranches are believed to be high and the variability in size and sophistication of operations can mask the true comparative advantage of sustainable wildlife use. This paper assesses the incentives for game ranching on private land using observed rancher behaviour. Manager interviews and farm financial records were used to compile a case study of eight private game reserves in Limpopo province and Policy Analysis Matrix (PAM) methodology was used to determine the economic profitability and competitiveness. Results show that game ranches were both financially profitable and economically efficient. However, the policy and market environment imposed a net tax on wildlife producers, arising primarily from land, labor and capital markets. The ranchers faced a net disincentive that reduced net profits by 14% to 88%. The results are indicative of the diversity in the game ranch sector and the unseen penalties that wildlife based land use face relative traditional agricultural production systems.

Monday, July 16 The Feasibility Of Water Quality Markets For Rangelands In California's Central Valley

Musengezi, Jessica* , **Alvarez, Pelayo**, *Defenders Of Wildlife* , **Ogg, Clayton**

California has more than 18 million acres of rangelands, much of which are privately-owned and managed for livestock production. These rangelands provide several ecosystem services including clean water, wildlife habitat, watershed protection, open space and mitigation to climate change. However, land conversion for urban development and intensive agriculture is resulting in the loss of these valuable ecosystem services. Water quality markets are one option that allows regulated entities to cost effectively meet water quality standards, while providing landowners with financial incentives to adopt water quality enhancing conservation practices and discourage land conversion. This study used literature review, stakeholder workshops and interviews to compare

existing water quality trading programs in the U.S., identify successful program design features, and assess applicability to rangelands in California's Central Valley. Results show that (i) there are several key factors in designing successful programs, including stakeholder participation, low transaction costs, science-based monitoring programs and the availability of technical assistance to land-owners; and (ii) there are rangeland conservation practices that can improve water quality and provide environmental co-benefits. Overall, rangelands are a viable source for water quality credits, but with limited regulatory drivers, voluntary markets, such as source water protection programs, may provide an alternative.

Tuesday, July 17 8:30 Effects Of Land-Use/Land-Cover Change On Amphibian Habitat In The Northern Great Plains

Mushet, David[*], *U.S. Geological Survey* , **Neau, Jordan**, *U.S. Geological Survey* , **Euliss, Ned**, *U.S. Geological Survey*

Land-use/land-cover (LULC) across North America is rapidly changing in response to social, political, and environmental influences. One major change occurring within the United States is the return of conservation plantings associated with programs such as the U.S. Department of Agriculture's Conservation Reserve Program (CRP) to agricultural production. This LULC change is being driven primarily by high commodity prices, especially for biofuel feedstocks. Worldwide, amphibian populations have been declining with a primary causal factor being habitat loss resulting from LULC change. To investigate the potential effects of LULC change on amphibian habitats, we used the GIS based Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) model to simulate the conversion of various proportions of CRP plantings to croplands across three ecoregions, Northern Glaciated Plains, Northwestern Glaciated Plains, and Lake Agassiz Plain, within the northern Great Plains. Projected scenarios focused on CRP conversion rates of 25, 50, 75, and 100% within each ecoregion. Comparisons of amphibian habitat quality under present and projected LULC scenarios showed reductions in the amount of amphibian habitat of 19 to 40% if all CRP lands were returned to crop production. Habitat losses of this magnitude could have devastating effects on NGP amphibians. Even at our lowest conversion rate (i.e., 25%), habitat losses and potential effects on amphibians were still substantial.

Tuesday, July 17 4:00 Community-Based Conservation And Human Health: Effects Of Communal Conservancies On HIV/AIDS-Related Behaviours Of Rural Households In Namibia

Naidoo, Robin[*], *World Wildlife Fund*

Conservation initiatives, including community-based conservation efforts, are touted by some as having strong beneficial effects on human livelihoods, and by others as being detrimental to the well-being of those affected. Despite these polarized views, scant evidence exists for either contention, especially evidence from the rigorous impact evaluation methods that have recently been introduced to conservation scientists. Here, we evaluate the impacts of Namibia's Community-Based Natural Resource Management program on behaviours that are related to the risk of infection and spread of HIV/AIDS. We used data from household health surveys conducted in 2000 and 2006 to assess whether changes in these behaviours over time are affected by whether respondents live inside or outside of communal conservancies. We constructed matched comparison groups to control for the fact that socioeconomic characteristics of households in conservancies are likely to systematically differ from those of households outside of conservancies. We then used logistic regression to quantify the effects of (1) year, (2) inside/outside conservancy, and (3) their interaction, on 12 HIV/AIDS related behaviours. The temporal trend in behavioural responses was different inside of conservancies versus outside for only 3 of the 12 variables, with the direction of effect mixed. These results suggest

a largely neutral effect of community-based conservation in Namibia on HIV/AIDS-related health behaviours.

Monday, July 16 11:30 High Impact Management For A Small Endangered Annual Forb (Clarkia franciscana) In Oakland Ca

Naumovich, Lech[*], *Creekside Center For Earth Observation* , **Niederer, Christal**, *Creekside Center For Earth Observation* , **Quenelle, James**, *Creekside Center For Earth Observation* , **Weiss, Stuart**, *Creekside Center For Earth Observation*

Presidio clarkia (Clarkia franciscana) is a diminutive serpentine endemic restricted to two populations in the SF Bay Area. The Serpentine Prairie (Oakland, CA) is a small remnant outcrop of serpentine soils that supports many rare and endemic plants including Presidio Clarkia. This area has been highly modified over the past 50 years with tree plantings and nitrogen deposition. Our restoration work seeks to increase Clarkia habitat and numbers at the Prairie. We have experimented with spring mowing to reduce annual grass and thatch, fall raking to reduce thatch, and tree removal to increase open grassland habitat. After three years of spring mowing, total non-native cover decreased from 45.8% to 23.5%, annual native forb cover increased from 5.5 to 21.0%, and thatch decreased from 23.8 to 4.5%. Spring mowing has dramatic visual effects with the increase in colorful native forbs. In tree removal plots, Clarkia increased from 184 to 810 individuals in one year due to passive recruitment. Tree removal created public interest in the project which contributed to restoration success. Fall raking had little effect on plant composition, but significantly increased bare ground and reduced thatch. Our results (biologically and aesthetically) recommended utilizing rotational spring mowing on a larger scale.

Monday, July 16 10:15 The Coastal Resilience Framework: Identifying Multi-Benefit Strategies For Adaptation And Threat Abatement

Newkirk, Sarah[*], *The Nature Conservancy Of California*

Estuaries are among the most ecologically rich and complex areas on earth, providing critical habitat for birds, fish, and many other species. Many estuarine watersheds are also places of dense human habitation. If conservation projects in estuaries and adjacent lands are to succeed, they need to reconcile the objectives of land use and other human activities with conservation objectives. Coastal Resilience is a framework developed by The Nature Conservancy that encourages and supports analysis and visualization to identify multiple benefit solutions to critical environmental problems. It does this through science, decision-support tools, partnerships and policy: • Advance the science of some facet(s) of a threat or resource; • Promote extensive stakeholder engagement to identify the local risks and values, and understand the threats to coastal ecological, social and economic assets; • Promote the development of decision-support tools to visualize multiple resources, threats and alternative strategies; • Encourage the collaborative examination of options and advance multi-benefit strategies. The Nature Conservancy developed the Coastal Resilience framework for climate change adaptation planning. However, in California, we are using the framework to provide a unified approach to collaborative conservation in estuaries, with three different conservation themes: climate change, conservation of nursery habitat, and restoration of estuaries for salmonids. We will describe the genesis of this conservation planning approach, and its evolution.

Wednesday, July 18 3:15 Citsci.Org: Cyberinfrastructure Support For Grassroots Conservation, Citizen Science, And Community-Based Monitoring

Newman, Greg[*], *Natural Resource Ecology Laboratory* , **Masching, Amy** , **Mueller, Megan**, *Rocky Mountain Wild* , **Scarpino, Russell**, *NREL*

Citizen science and community-based monitoring conservation programs are increasing in number and breadth, generating volumes of scientific data. Many programs are ill-equipped to effectively manage these data. We built a cyber-infrastructure support system for citizen science programs (www.citsci.org) to support the full spectrum of program management and data management needs. The system affords program coordinators the opportunity to create their own projects, manage project members, build their own data entry sheets, streamline data entry, visualize data on maps, automate custom analyses, and get feedback. Thus far, CitSci.org has engaged 34 programs resulting in some 7,000+ natural resource observations. The majority of programs are grassroots efforts with conservation biology-oriented goals and objectives. For example, The Front Range Pika Project engages citizen scientists in conservation research on the American pika (Ochotona princeps). Volunteers follow protocols to collect data about pikas and their habitat in high altitude sites, thereby assessing the impacts of climate change on pika populations. Here, we discuss the unique opportunities afforded by CitSci.org to support the needs of citizen science, community-based monitoring, and grassroots conservation biology programs to connect people, nature, research, and climate.

Wednesday, July 18 3:30 Monitoring For Conservation

Nichols, James[*], *U.S. Geological Survey*

Monitoring for Conservation Conservation typically focuses on sustainability and the long-term maintenance of natural systems or components of such systems. As an active endeavor, conservation entails the potential to implement actions designed to promote these objectives of sustainability and maintenance. Conservation programs should represent informed decision processes that incorporate at least 5 critical components: objectives, potential actions, models (of system response to actions), monitoring, and some sort of decision algorithm (e.g., optimization). Monitoring of system state and other focal variables serves 4 well-defined roles in conservation: (1) estimation of system state for state-dependent decisions, (2) determination of the degree to which objectives are being met, (3) estimation of system state for the purpose of learning, and (4) estimation of model parameters. Specification of these roles facilitates the design of monitoring programs, increasing the probability that they will be useful and provide the needed information. Note that this tailoring of monitoring programs to specified objectives does not preclude use of resulting data for other purposes. Climate change carries several challenges for conservation programs and each of their components. Modifications to monitoring programs in response to climate change may include: inclusion of additional climatic and/or land-use variables in order to inform models of nonstationary change, use of reduced-effort monitoring to detect areas of range expansion and contraction for focal populations, and inclusion of dynamic rate parameters needed to model transient system dynamics. Common arguments against the use of targeted monitoring are considered.

Wednesday, July 18 8:50 Decision-Making Triggers In Adaptive Management And Resources Planning

Nie, Martin[*]

Natural resource agencies often approach adaptive management in a way that prioritizes flexibility, discretion, and expedited decision-making. Such approaches can make it difficult to hold agencies accountable. Decision-making triggers are pre-negotiated commitments within an adaptive

management or mitigation framework specifying what actions will be taken, and when, based on monitoring information. Triggers help bound adaptive management processes by providing more certainty that particular actions will be taken by agencies in the future. The political and legal context of adaptive management and its application by U.S. federal agencies is first provided. The research consists of case studies of high profile adaptive management plans that include triggers. Examined are how triggers are designed and what is contentious about their use. Rather than adaptive management, adaptive mitigation is a more accurate way to describe these cases. Another recurring theme in these cases is the limited enforceability of monitoring commitments and triggered mitigation actions. Enforceability is contingent upon several factors, but, if they choose to, agencies can design triggers so that they are enforceable and promote learning. Triggers also bring to the fore a number of long-standing scientific and political considerations about monitoring. Some interests want triggers to be used in a more precautionary way in order to acknowledge diminished ecological baselines and to prevent the crossing of ecological and regulatory thresholds. Though not without challenges, well-designed triggers can be used as a way to improve implementation of adaptive management in its complicated political and legal context. The paper concludes with recommendations in how triggers can be effectively used in the context of adaptive land and resources planning by federal and state agencies.

Monday, July 16 Two Listed Butterfly Species Have Been Reintroduced To Historical Bay Area Habitat

Niederer, Christal[*], *Creekside Center For Earth Observation* , **Naumovich, Lech**, *Creekside Center For Earth Observation* , **Quenelle, James**, *Creekside Center For Earth Observation* , **Weiss, Stuart**, *Creekside Center For Earth Observation*

One reintroduction has brought Bay checkerspot butterflies to Edgewood Preserve in Redwood City. This species appeared extirpated in 2003. Restricted to serpentine grasslands, its host plants were overrun by nonnative annual grasses, which took hold due to the fertilizing effect of nitrogen deposition from adjacent Highway 280. Research identified spring mowing as a successful management tool. In 2007, 1000 larvae and 12 adults were introduced. Unfortunately this was the fourth driest year since 1895. Only one larva was found the next year. Multiple reintroduction efforts were deemed appropriate to increase chances of meeting favorable establishment conditions, and to encourage sedentary butterfly behavior by increasing the number of individual encounters. In 2011, 4000 larvae and 24 adults were introduced. Surveys found ~6 times more adults after this larger attempt, and early 2012 results noted larval presence. Mission blue butterflies became undetectable at Twin Peaks in San Francisco. Mapping showed 97% of host plants were one species, a lupine subject to fungal dieoff in warm and wet springs. Other host species and corridors of nectar sources were planted to increase resilience. 22 adults were introduced in 2009, and 60 in 2011. Adults and larvae have been found each year. In 2011, 295 eggs were found, the highest number ever recorded onsite. It appears butterfly reintroductions can be successful when conducted over multiple years into appropriately restored habitat.

Wednesday, July 18 8:45 ESRI'S Ocean Initiative

Noll, Guy[*], *ESRI* , **Wright, Dawn**, *ESRI*

Increasing threats to our planet's oceans such as carbon loading, plastics, non-point source pollution, invasive species, and shipwrecks create multiple paths to failed ecosystems. Mapping these and other threats in the context of mankind's growing needs is a first step towards understanding how to collaboratively address the threats with a diverse, cross-discipline team. Oceanic usage patterns, once mapped, also provide critical input to proper utilization of ocean resources. To assist

public and government entities with understanding their role in ocean management, Esri has funded the development of SeaSketch, a new tool to build optimized geospatial decisions through active engagement with all stakeholders. As completed by the UC Santa Barbara team that created MarineMap, the tool enables marine spatial planning on local, regional, national and global scales. Esri is also working with Conservation International and National Center for Ecological Analysis and Synthesis at UC Santa Barbara to improve the visibility and utility of the Ocean Health Index. These data can be integrated into a variety of basemap products now available in ArcGIS Online to visualize humanity's impact. Esri continues to build other web data layers to provide a context for geospatial planning. New Esri maritime technologies are improving marine research data management and increasing visualization speed of high-density bathymetric data sets. By combining marine research and commercial data in novel ways, Esri will continue to build tools to enable scientific insight into oceanic processes and bring rational thought and geodesign to the marine field.

Tuesday, July 17 9:15 Biodiversity Research And Conservation Biology From Space: NASA's Biological Diversity And Ecological Forecasting Programs

Nunez, Cassandra[*], *AAAS Science and Technology Policy Fellow, NASA* , **Turner, Woody**, *NASA* , **Leidner, Allison**, *NASA Earth Science Division*

The National Aeronautics and Space Administration (NASA) is a research and development agency that has a mandate to promote "the expansion of human knowledge of the Earth" derived from the 1958 Space Act that established the agency. In the last decade alone, NASA has supported ~ $15 billion of research and technology developments that have advanced our understanding of the atmosphere, cryosphere, oceans, carbon cycle, and ecosystems via remotely sensed airborne and satellite observations. For almost a decade, NASA has had Biodiversity and Ecological Forecasting programs that have funded numerous projects with academic, non-profit, for-profit, and other U.S. federal agencies. Despite such advances, many conservation biologists and natural resource managers are unfamiliar with the contributions of NASA-funded science and applications to biodiversity research and conservation biology. Here, we provide an overview of the Biodiversity and Ecological Forecasting Programs and highlight several projects with a North America focus. These activities have both advanced our fundamental understanding of biodiversity patterns and processes and have developed tools that inform policy and management decisions.

Wednesday, July 18 11:45 Seabird Hotspots In The California Current System: Multi-Species Modeling To Support Marine Spatial Planning

Nur, Nadav[*] , **Jahncke, Jaime** , **Howar, Julie**, *PRBO Conservation Science* , **Veloz, Sam**

We developed predictive models to identify areas supporting seabird foraging aggregations ("hotspots") and so inform marine spatial planning in the California Current System (CCS). We modeled 16 species using at-sea observations collected between 1997 and 2008 throughout the annual cycle. Collaborators provided survey data extending from Vancouver Island to the US/Mexico border and up to 600 km offshore. Predictive models included bathymetric variables (e.g., proximity to land), oceanic habitat types (e.g., continental shelf-break), and remotely sensed data (e.g., sea-surface temperature). Predictions were applied to the CCS for each season in each of 11 years. Single-species predictions were then combined to identify potential seabird hotspots using three criteria: 1) overall abundance, 2) importance of "core areas", and 3) predicted persistence. Predicted hotspots often aligned with currently protected areas, but we also identified potential hotspots (e.g., in Southern Oregon) that may warrant additional protection. We also demonstrate the use of Zonation, software for

spatial conservation prioritization, which has the potential to incorporate economic and other considerations to identify priority sites for multiple species. Modeling seabird aggregations provides a powerful tool to identify marine hotspots and, when combined with information on specific threats and economic constraints, assist marine spatial planning at multiple spatial scales, in the CCS and elsewhere.

Tuesday, July 17 4:00 Climate Change Adaptation For Fire Management

Nydick, Koren[*], *Sequoia & Kings Canyon National Parks* , **Schwartz, Mark**, *University Of California At Davis* , **Sydoriak, Charisse**, *Sequoia & Kings Canyon National Parks*

Federal managers are challenged to adapt fire management strategies to a future of unprecedented change and uncertainty where restoring natural fire regimes may no longer be appropriate or possible. In the Southern Sierra Nevada, managers and research scientists are facing climate change head on with a hybrid process that incorporates elements of scenario planning, vulnerability assessment, and a climate change adaptation toolbox. In the first phase of the project a science-management team identified priority resource values, described plausible future conditions, and examined key vulnerabilities. Next we defined limits of acceptable change and proposed short and long term resource objectives. To identify specific management action options, we applied general climate change adaptation strategies (resist change, increase resilience, prepare to react, and realign response) to projected conditions outside the limits of acceptable change. Using a spatially explicit vulnerability assessment, locations on the landscape were selected as possible sites to experiment with these actions. Lastly, we described indicators to monitor success and allow us to learn from mistakes. In this presentation I will describe this process with examples and discuss lessons learned from this approach.

Wednesday, July 18 4:15 Monitoring Birds At Regional Scales: Will Migratory Bird Joint Venture Monitoring Be Useful In Predicting Effects Of Climate Change

O'Brien, Lee[*] , **Dratch, Peter**

Migratory Bird Joint Ventures (JVs) have been involved in cooperative, regional scale, conservation planning for birds for over two decades. As part of conservation planning, some have also been conducting regional scale inventory and monitoring (I&M) of focal bird species. These monitoring efforts would be classified somewhere between long-term, omnibus surveillance monitoring and hypothesis testing, targeted monitoring. This monitoring commonly consists of short term (1-2 years) surveying of a few focal bird species over large geographic regions. The purpose of this type of monitoring is to discern local and landscape scale habitat associations, distribution, and abundance of focal birds across regions. The management objectives of these efforts are to learn how habitat conditions affect bird numbers and distribution, and to target management towards improving habitat conditions for particular bird species. Some JVs have taken a further step to test the effects of managed sites compared to control sites on particular bird species. With stepped-down climate change predications of landscape effects, these types of monitoring methods can be used to predict how changing habitats will in turn affect particular bird populations.

Monday, July 16 Best Management Practices For Solar And Wind Energy Development: A Conservationist's Guide

O'Connor, Amy[*] , *Wild Utah Project* , **Jones, Allison** , **Vasquez, Emanuel**

Best Management Practices provide science-based criteria and standards that land managers and conservation planners follow in making and implementing decisions about human uses and projects that affect our natural resources. BMPs are usually developed based on legal obligations,

pragmatic experience, and institutional practices, and should be supported by the best available scientific knowledge. Up to now, conservation advocates lacked a comprehensive set of science-based Best Management Practices they could systematically bring to land managers, renewable energy developers and the public process that are designed to minimize the adverse impacts of wind and solar energy development projects on wildlife and wildlife habitat. This document draws from over one hundred other scientific studies, renewable energy development guidance documents and other published BMPs in order to bring the best conservation science to the process of wisely choosing wind and solar energy sites, as well as permitting, construction and operation of renewable facilities destined for wild places. These BMPs are organized according to the needs of sage grouse, raptors, other birds, bats, general wildlife (not covered by the first 5 categories), and soil/vegetation/site hydrology. Within each of these categories the BMPs are broken down into siting BMPs, pre-construction/planning BMPs, construction BMPs, and monitoring BMPs. These BMPs also offer guidance on how to address renewable energy development within the context of public land-use planning. This document should offer sound guidance for all stages of wind and solar energy development in the West, and offer pathways for development that are “smart from the start” for wildlife and their habitat.

Monday, July 16 Comparative Foraging Ecology Of Reticulated Giraffe And Domestic Camels In Laikipia, Kenya

O'Connor, David*

The reticulated giraffe (Giraffa camelopardalis reticulata) have fallen in number from perhaps 30,000 a decade ago to about 5,000 today. Giraffe are thought to be able to coexist with traditional pastoralist livestock. However, domestic camels (Camelus dromedarius) are increasing in stocking levels in Laikipia, Kenya due to their ability to resist drought, and premium milk prices. Using behavioral observations and GPS, this study gathered data on the foraging ecology of camels and giraffe to try to understand whether there are indicators of overlap in resource utilization. Female camels actively browse from ground level up to 3 meters, while giraffe range spans 1.1 - 4.8m. Camels browsed most intensively between 0.7-1.5m, while giraffe at 2.4m. However, giraffe showed sexual dichotomy, with males browsing most often between 3.6 - 4.8m, and females most frequently between 1.1 - 2.1m. Excluding grasses and forbs, camels most frequently browsed on Acacia brevispica. Giraffe most often ate Acacia mellifera. Feeding heights corresponded to vegetative structure, but giraffe do not feed at the highest neck extent given the opportunity. Camels are constrained in where they browse by their herders, covering 8km with browsing orbits radiating 2.2km from the boma. Camels overlap in feeding heights with female giraffe, and feed on seven of the same species. These results show that camels utilize similar habitat and will overlap with giraffe for resources.

Monday, July 16 A Roadmap For Action: The National Fish, Wildlife, And Plants Climate Adaptation Strategy

Ocana, Melissa*, *U.S. Fish And Wildlife Service* , **Shaffer, Mark**, *U.S. Fish And Wildlife Service*

The National Fish, Wildlife, and Plants Climate Adaptation Strategy is a response to the novel challenges resulting from climate change. In 2010, Congress urged the Council on Environmental Quality and the Department of the Interior to develop a national adaptation strategy to promote species resilience to climate change impacts. The resulting Strategy is a framework for unified action by natural resource managers and decision-makers. The U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and the New York Division of Fish, Wildlife, and Marine Resources co-led this effort with assistance from the Association of Fish and Wildlife Agencies. A Steering Committee comprised of representatives from 16

federal agencies, five state fish and wildlife agencies, and two inter-tribal commissions guided the process. The Strategy focuses on seven primary Goals, stepped down into a series of Strategies and Actions, to reduce the vulnerability of fish, wildlife, plants, and the ecosystems they rely on. Additionally, background papers on the eight major ecosystems of the U.S. were developed with expert technical teams. This poster will summarize the key points that arose in developing the Strategy.

Wednesday, July 18 12:20 Assessing The Impacts Of Climate Change On Our Natural And Cultural Resources: Climate Information And Techniques Useful To Managers.

Ojima, Dennis*, *NREL/Colorado State University*

Climate affects a number of key environmental aspects. Observations indicate that climate change is affecting landscape stability, coastal landscapes, species migrations, ecosystem services, and are associated with large scale habitat changes. Understanding these changes from climate changes and anticipating how climate change may affect the environment and ecosystem processes in the future are important aspects adaptive management strategies. The ability to manage for resilience and to strengthen conservation efforts under changing climate conditions in complex terrain is difficult without climate information at the appropriate scales. A1km daily down-scaled climate data set was created for the Western mountain regions of USA. We present here analysis from the Colorado Rockies to demonstrate the ability to evaluate local coping strategies and assessing impacts of climate change in these mountain systems. This 1km multi-year daily climate data set provides a 1980 to 2003 baseline to link to scenario output from the NCAR's Community Climate System Model (CCSM) and other general circulation models. Statistical down-scaling methods developed in the 2000 National Climate Assessment based on VEMAP project and at NCAR were used to create the 1km data set for the Western US. Use of these climate projections in our natural resource and conservation analysis is critical to the development of adaptation strategies for these natural and cultural resources.

Monday, July 16 9:15 Estimating The Resilience Of Freshwater Habitats In The Northeastern United States

Olivero Sheldon, Arlene*, *The Nature Conservancy* , **Anderson, Mark**, *The Nature Conservancy*

Ecosystem resilience is the ability of an ecosystem to retain essential processes and structure in the face of disturbances like climate change. Resilient systems will continue to sustain high levels of biodiversity and ecosystem function, even as their species composition changes. We hypothesized that that the resilience of freshwater systems can be characterized by six elements: lateral connectivity, water quality as shaped by surrounding land cover, and instream flow regime (condition variables) and complexity of the stream network, linear connectivity, and the diversity of geophysical settings (diversity variables). We mapped each element for every connected stream network (miles of stream bounded by dams or upper headwaters) in the Northeast and Mid-Atlantic to develop a comprehensive assessment of resilience across the region's freshwater systems. Results identified 346 networks that were composed of at least five stream or lake sizes, with 211 of those networks scoring above the mean for variables related to both condition and diversity. A seventh element, access to groundwater, was not used because fine-scale regional data sets were not available

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Monday, July 16 11:30 Emerging Infectious Diseases In Amphibians And Reptiles: The Role Of Partners In Finding Solutions

Olson, Deanna*, *U.S. Forest Service* , **Nanjappa, Priya**

Population die-offs begin as a mystery, with the roles of scientists and managers becoming

intertwined as they explore causes and actions to forestall losses. A prime example is the enigmatic amphibian decline phenomenon – sites that were full of frogs have become eerily empty. Globally, scientists have studied multiple potential causes of declines, their partners in the zoo community developed emergency procedures to retain rare stocks, and natural resource managers have assisted with development of on-the-ground abatement plans. The description of a fungal pathogen that can infect members of the entire vertebrate class has led to improved global communication of science –management efforts. A second pathogen is now implicated in some amphibian die-offs, and die-offs in other vertebrate classes including turtles. A world mobilization of scientists is accelerating coordinated knowledge discovery relative to this new emerging infectious disease. In our overview of herpetofaunal health issues, we outline the complex trajectories between disease discovery to species conservation, and describe the novel roles international partnerships are taking. Ultimately, a shifted focus from cause to solution is occurring, with a new lens on assisted adaptation processes so that afflicted species may persist again in the wild rather than in glass boxes in perpetuity.

Tuesday, July 17 3:30 Challenges And Prospects For Sustainable Management Of Prosopis Juliflora (Sw.) DC In Marigat District, Baringo County, Kenya

Omondi, Samson[*], *Kenyatta University* , **Mariita, Richard**, *Portland State University* , **Makori, David** , **Muriuki, Gerald**, *Kenyatta University* , **Muya, Joshua** , **Munguya, Eliud**, *Kenyatta University* , **Mwangi, Lawrence**, *Kenyatta University* , **Ocholla, Gordon**, *Kenyatta University* , **Kirui, Alan**, *Kenyatta University* , **Nyaoro, Wilson**, *Kenyatta University* , **Opinde, Godwin**, *Kenyatta University*

Despite the benefits of Prosopis juliflora to the environment and economy, the local communities in Marigat District in Kenya are becoming increasingly concerned about its negative impacts on their lives, livelihoods and ecology. It has colonized extensive areas in Marigat District and this has highly weakened their economic base by colonizing pasturelands, farming areas and waterways in the area and displacement of native species of socio-economic importance.The locals lack sufficient information on alternative measures for control and management. The main aim of the study was to assess the challenges and prospects of sustainable management of Prosopis juliflora in Marigat District. The objectives of the study were (1) To establish the socio-economic livelihoods of the communities in Marigat District, (2) To assess the impacts of Prosopis juliflora on bio-physical and socio-economic environment of Marigat District, (3) To evaluate the measures undertaken to manage and control of P.juliflora(4) To explore alternative investment options for Prosopis juliflora products. The study sought to use the information gathered to prepare a planning matrix for sustainable management and control of Prosopis juliflora in the district. Field visits were made by the research team and interviews, focused group discussions, observation and photography conducted to gather information. This was achieved by use of questionnaires for households and institutions, observation guides and interview schedules. Cluster sampling was used to map out areas along identified transects from which households were selected using simple random sampling. Purposive sampling was used to select institutions to be interviewed. Indicators such as agriculture and pastoralism practices in the area were used to identify the socio-economics of the area. Negative impacts of the plant were determined by using indicators such as blocking of river channels, poisonous thorns that prick animals and people, loss of animals and pasture land to the plant and bushes used as hiding places for cattle rustlers. Indicators for positive impacts include control of water and wind erosion, provision of shade, soil improvement and nitrogen fixing by the plant. Management and control measures practiced in the districts include commercialization of Prosopis juliflora products, the ineffective policy intervention, land tenure which is being looked

into, use of fire as a traditional method, mechanical removal using power saws, manual uprooting of seedlings of the weed and chemical application which is expensive to the residents of Marigat District. However the respondents indicated that they prefer a combination of fire, mechanical, manual and chemical methods to control the weed spread. Prosopis juliflora has a high investment potential in selling of charcoal, pods for cattle feed, provision of forage, construction materials. It is being used as herbal medicine, provides tannins, dyes and fibre and its flowers provide nectar for bees to make honey and wax. Most of the respondents and residents were of the idea that the weed be well managed than eradicated and this is evident from the many advantages it has compared to the disadvantages.

Monday, July 16 Potentials For The Development Of Irrigated Agriculture In Arid And Semi Arid Lands Of Kenya, Kibwezi District

Omondi, Samson*, *Kenyatta University* , **Opinde, Godwin**, *Kenyatta University* , **Mariita, Richard**, *Portland State University* , **Ocholla, Gordon**, *Kenyatta University* , **Mwangi, Lawrence**, *Kenyatta University* , **Kirui, Alan**, *Kenyatta University* , **Nyaoro, Wilson**, *Kenyatta University*

The Arid and Semi Arid Lands (ASALs) of the world make up over 40% of the earth's surface of which over one billion people depend for their livelihoods. ASALs are home to the world's poorest and most marginalized people. In Kenya, the ASALs occupy over 80% of the country and host about 10 million people while 20% of the land is classified as medium to high potential agricultural land. These areas have the lowest development indicators and the highest incidence of poverty. The economy of the country is mainly dependant on agricultural activities which contributes 24% of the GDP and 65% of export earnings. In addition, the sector provides the livelihoods of over 80% of the Kenyan population and their food security. Kibwezi district falls in the ASAL region of Kenya and is characterized with low productivity in agricultural produce leading to food insecurity in the district. The district has some irrigation schemes which are instrumental in improving the state of food security. Over 70% of the population depends on agriculture for their income. However, the rainfall pattern in the area is erratic and has led to farmers making great loses which affect greatly the communities livelihood. The estimated potential land for irrigation in Kibwezi is 2219 hectares while only 769 hectares is utilized. The main aim was to investigate the potentials for the development of irrigated agriculture in arid and semi arid lands of Kenya, Kibwezi district and specifically to examine the potentials for promoting irrigated agriculture ASALs and to provide an assessment of environmental issues associated with the development of irrigation schemes. Samples for the study included 140 farmers of which 120 practiced irrigated agriculture while 20 farmers who were used as a control sample practiced rain fed agriculture. Key informants from relevant institutions in the district were interviewed. The research instruments used included household and institution questionnaires to solicit for information from farmers and officials in the district. The research findings showed that irrigated agriculture has relatively high potential in Kibwezi which has black cotton soil and rivers that can be used as sources of water taking advantage of the topography which allows water supply by gravity. As a result of continued water use for irrigation purposes, the areas hydrological balance and river flow regimes have been drastically affected. Increase in soil salinity has been caused by solutes applied to the soil in the form of artificial and natural fertilizers as well as some pesticides which cannot be utilized by the crops. The nature of soils and type of irrigation in use (furrow irrigation) coupled with a gently sloping terrain in Kibwezi expose the soil to erosion agents such as water, wind, human activities and livestock. The local residents complained of prevalence of water borne diseases such as bilharzia, typhoid, filariasis and malaria. It was recommended that there should be involvement of communities in water resource management, distribution and equitable sharing

within the scheme. There is need for the government to support farmers associations especially with regards to loan provision, recovery of lost assets and capacity building.

Wednesday, July 18 10:15 Evaluating Opportunities To Promote Recovery Of Coho Salmon Through Habitat Restoration: A Case Study From The South Fork Ten Mile River, California

Orr, Bruce* , **Ligon, Franklin**, *Stillwater Sciences* , **Porter, Daniel**

The South Fork Ten Mile River basin was used as a test case for evaluating the potential for targeted habitat restoration actions to increase coho salmon populations in central and northern California. Our approach is based primarily on reestablishing natural processes, coupled with direct habitat restoration actions where necessary, to achieve self-sustaining populations. We begin by using a conceptual model to analyze existing watershed data with regard to identifying habitat constraints most likely to limit survival at key life stages. We then develop hypotheses about how a basin's land-use history and geomorphic and ecological characteristics might cause such factors to limit populations under current conditions. Focused field studies coupled with a landscape-scale population model are then used to evaluate the potential population benefits of different restoration scenarios and compare them to current and likely historical conditions. Recovering this coho population is a regional priority and our results suggest that winter refuge habitat is limited. Restoring low-gradient floodplain habitat by creating off-channel areas (side channels and alcoves) and adding large wood to create in-channel cover and velocity refuge are cost-effective and proven means of increasing winter rearing habitat, and sites suitable for such treatments exist in the lower basin on properties owned by conservation-minded landowners.

Tuesday, July 17 10:15 Climate Change And The American Public: Differences In Belief And Attitude Among Zoo-Goers In The Presence And Absence Of Themed Exhibitry

Owen, Megan* , **Danoff-Burg, James**, *San Diego Zoo Global* , **Reinbold, Megan**, *San Diego Zoo Global*

We characterized the support of zoo visitors to genuinely engage with global climate change (GCC) messaging and determined whether GCC-themed exhibitry improves receptivity to this messaging. We used the fully validated survey tool designed by the Climate Literacy Zoo Education Network to assess visitors' cognitive, attitudinal, and behavioral predispositions toward climate change, and also to describe their attitudes and beliefs regarding wildlife, nature, and conservation actions. We examined the effects of GCC-themed exhibitry on visitors' attitude towards climate change by comparing data from the San Diego Zoo (with GCC exhibitry) and the San Diego Zoo Safari Park (without GCC-themed exhibitry). We collected survey data from 1,000 randomly-selected adult visitors at both facilities. Data from other Association of Zoos and Aquariums-accredited institutions suggest that zoo-goers are more receptive to climate change messaging than the general public. We evaluated receptivity differences between visitors to our two facilities and determined how effective GCC-themed exhibitry is at changing attitudes. Results suggest that more frequent visitors tend to be more receptive to GCC-themed messaging, as are those that use smart phones. As visitors age, they tend to be more receptive to GCC-themed messaging as well. As expected, visitors to GCC-themed exhibitry show greater concern for the effects of GCC. This research will enable us to more effectively develop and communicate educational messages that build on zoo-visitors' values and emotional connections with animals and plants and inspire actions that have a positive collective impact on climate change.

Monday, July 16 11:15 Local Cultural Models Of Conservation And Organization Legitimacy: A Comparison Across Scales

Packard, Jane[*], *Texas A&M University* , **Weeks, Priscilla**, *Houston Advanced Research Center* , **Paolisso, Michael**, *University Of Maryland, College Park*

Communication with stakeholders adjacent to protected areas may be shaped by expanding circles of influence at local, national and international scales. In this paper, we examine the extent to which three conservation organizations one local, one national and one international, working in East Texas, variously integrate local cultural models of conservation and scientific theories into their programs. We hypothesized that the local level organization, whose members were primarily from East Texas, would construct conservation programs that speak to local cultural models of land and conservation and the non-local organizations, with mandates crafted outside of the region, would actively promote conservation science. We found the opposite to be true. We discuss the reason for this seeming contradiction in terms of the need for legitimacy at different scales combined with the particular history of the local organization.

Tuesday, July 17 4:30 Market Forces At Work: The Current Reality Of Investing In And Implementing Conservation Development In The United States

Palmer, Carl[*], *Beartooth Capital*

Beartooth Capital is a private investment firm committed to the restoration, protection, and stewardship of important ranch properties in the American West. The firm works collaboratively with community and conservation groups to find ranches with critical habitat and high value resources and to develop plans for restoration, agriculture and appropriate development of the properties. Beartooth's portfolio currently includes eleven ranches in five states, where the firm is actively engaged in restoration, value creation, enhancement and the marketing and sale of ranch properties. Carl Palmer, the principal and founder of Beartooth, will share an on the ground perspective of the reality of launching an entrepreneurial conservation development venture, including the many challenges and opportunities associated with developing a strategy, raising capital and executing a plan. He will provide a practitioner's perspective on CD's successes and failures as a product in the marketplace, its risks and potential returns, its image in the eyes of investors, and the effects of the economic downturn and today's uncertain economic climate on the prospects for CD as a conservation tool.

Tuesday, July 17 3:00 Weed Profiling: A Molecular Phylogenetic Approach To Darwin's Naturalization Hypothesis In Asteraceae

Park, Daniel[*], *University Of California, Davis* , **Potter, Daniel**, *University Of California, Davis*

Invasive species have major ecological and economic impacts, making the ability to understand and predict the invasiveness of species of great import. Rare and endangered species seem to be particularly impacted by invaders, and once exotic plant species are established in a new region, they are frequently proven extremely difficult to control. Hence, preventing potential invasive species from reaching ground zero is the most economically and environmentally desirable management method. Here we explore the use of evolutionary distance as a quantifiable measure of predicting invasiveness, using the weedy cosmopolitan family Asteraceae as a model system. Molecular phylogenies of the thistle tribe, Cardueae, were generated with nuclear and cpDNA markers, not only including taxa present in CA, but representing the entire diversity of the clade worldwide. Branch lengths separating invasive and non-invasive exotic taxa from native CA taxa were compared to ascertain whether invasives are more or less closely related to natives than non-invasives are. Patterns within this monophyletic group show

that exotic plants more closely related to natives are more likely to become invasive, suggesting that pre-adaptive traits are more important than novel traits and/or enemy escape in determining an invader's success. Such molecular phylogenetic research can further our understanding of biological invasions, pertaining to developing a predictive framework for screening potential invasive taxa.

Tuesday, July 17 11:15 Improving Watershed Health Through Large-Scale Wetland Restoration
Parsons, Lorraine*, *Point Reyes National Seashore*
Wetlands are believed to play many important functions for both wildlife and humans. However, these functions are lost when wetlands are altered. Tomales Bay lost 50% of its wetlands in the 1940s when a large marsh was leveed for a dairy ranch operation. In 2000, the National Park Service bought this dairy for a 613-acre wetland restoration project, which was implemented in 2007-2008. The Park Service believed that restoration could not only improve quality of the degraded wetlands within the ranch, but improve overall watershed health by increasing habitat for wildlife, as well as improve downstream water quality. While Tomales Bay is often viewed as pristine and is a Ramsar Wetland of International Importance, its waters have been impacted by leaking septic tanks, agriculture, and mercury and are designated as impaired under Section 303(d). To determine restoration success, the Park Service developed an innovative long-term pre- and post-project monitoring program that incorporates both the Project Area and reference wetlands. Monitoring in the first three years after restoration indicates that many of the improvements anticipated to take decades to occur after conversion of pastureland to marsh are already occurring, including substantial reduction in pollutants in water and soils; dramatic changes in hydrology; changes in the food web structure and number and types of wildlife; and rapid transformation to salt marsh through establishment by salt marsh plants.

Tuesday, July 17 10:00 Unconventional Natural Gas Development: Potential Impacts On Wildlife And Bmps To Ensure Natural Resource Protection
Patnode, Kathleen*, *U.S. Fish And Wildlife Service*
Unconventional natural gas development refers to the use of horizontal drilling and hydraulic fracturing into very low permeability geologic formations. Deep vertical and extended horizontal drilling in combination with hydraulic fracturing enables oil and gas development of shale formations that were previously inaccessible and uneconomical. Throughout and beyond North America, the rapid pace of their development is resulting in major habitat changes in otherwise undeveloped areas including habitat fragmentation, noise and light pollution, significant freshwater withdrawals from streams and rivers, surface water contamination from spills and poorly treated discharges, creation of wastewater impoundments, and air quality degradation. Federal and state natural resource agencies have been working through multiple channels to develop best management practices to reduce the detrimental effects and ensure protection of terrestrial and aquatic biota as these natural gas developments rapidly expand.

Tuesday, July 17 3:00 A Review Of The Ecological, Economic, And Social Effects Of Residential Land Development In The United States
Pejchar, Liba*, *Colorado State University* , **Reed, Sarah**, *Colorado State University* , **Ex, Lindsay** , **Mockrin, Miranda**, *USDA Forest Service, RMRS* , **Bixler, Patrick**, *Colorado State University*
The rapid rise of residential housing development has led to the fragmentation of natural ecosystems and changes in the provision of ecosystem services. Housing developments, however, vary widely in

density and configuration. Understanding how development design impacts human and natural communities is crucial to thoughtful and sustainable land use planning. We conducted a comprehensive and interdisciplinary review to synthesize the state of our knowledge regarding the ecological, economic and social dimensions of residential land development. We limited our review to papers that specifically address how the density, extent, pattern, age and proximity of development influences a variety of biophysical, economic and social response variables such as species richness and abundance, ecosystem services, sales price, willingness to pay, attitudes, health, demographics and equity. 450 empirical peer-reviewed articles published between 1942 and 2011 met our criteria and were coded by two or more investigators. We found that research on this topic is unevenly distributed among ecological, social and economic foci, taxonomic group, geographic location and institutions involved. For example, most studies included only biophysical response variables and of those, over 90% focused on birds and mammals. This work identifies gaps in our collective understanding of how residential development impacts natural systems and society.

Tuesday, July 17 4:00 Forecasting Plant Invasions: Can We Predict Impact From Occurrence Data?

Pelech, Lori[*], *Dept. Of Environmental Conservation* , **Bradley, Bethany**, *University Of Massachusetts* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Finn, John**, *University of Massachusetts Amherst*

Numerous habitat suitability models have been constructed based on invasive species occurrence points, resulting in models of invasion risk defined as any location suitable for the species to establish or survive. However, a more conservation-relevant measure of invasion risk should emphasize environmental conditions where an invasive plant can become abundant, a better predictor of ecological impact. Since most available invasive species datasets do not contain abundance information, we aim to determine whether it is possible to model abundance based on distribution data alone. We compiled distribution data for nine problematic invasive species in the western U.S. from regional archives, and collected abundance data through a combination of field efforts and expert surveys. We compare the climate space of locations where a given species is known to survive to locations where it is thriving and find a significant difference. We use the multi-species results to test whether abundance points are located within a consistent subset of occurrence points, which would suggest that abundance can be predicted from occurrence alone. However, it is clear that regional data collection differentiating high abundance from occurrence would vastly improve predictions of impact risk.

Tuesday, July 17 3:45 Spatial Land Management To Meet Water Quality Goals While Maximizing Co-Benefits Across A Suite Of Ecosystem Services

Pennington, Derric[*], *World Wildlife Fund*

Many areas in the US fail to meet water quality standards. Management actions to improve water quality also impact other ecosystem services, both positively and negatively. We developed an integrated approach to analyze how to meet various levels of water quality while maximizing the net benefits of other ecosystem services in an agricultural watershed. We used the SWAT model (Soil and Water Assessment Tool) to predict crop yield, flow, sediment and phosphorus export and the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) model to estimate market returns from agriculture production and non-market values from sediment and phosphorus reduction and from carbon sequestration. We applied these models to an agricultural watershed located in South Central Minnesota to find optimal landscape arrangements for a range of water quality goals. Results showed that the current landscape is near the economic optimum and that market returns from agricultural production dominate total economic returns, even when

ecosystem services such as water quality and carbon sequestration are valued. We find that land use patterns that achieve 50% reductions in sediment and phosphorus result in significant annual losses in economic returns. However, marginal water quality improvements (10-15% reductions in sediment and phosphorus) could be achieved with no net loss in market returns. Further, when including ecosystem service valuation, reductions in sediment and phosphorus on the order of 15-20%, respectively, could be achieved with no net loss of total value. These results highlight the trade offs to achieving water quality goals while maximizing market and non-market benefits.

Wednesday, July 18 8:45 The Ultimate Trump Card: Science Or Politics

Phillips, Mike[*], *Turner Endangered Species Fund*

Modern societies are challenged by pressing problems for which science offers clarity and solutions. From issues as disparate as energy policy to endangered species restoration, elected officials are expected to develop sufficient scholarship on scientific matters to support an informed vote on relevant legislation. This is an especially daunting challenge and one that is often not met because politics tend to select for and reward individuals who possess characteristics (e.g., a willingness to be ill-prepared, obfuscate, or purposefully mislead) that are anathema to good science. Consequently, legislative bodies lack members who are trained in the sciences. For some issues the lack of expertise with and respect for science creates palpable tension with political agendas. Since 2006 I have served in the Montana legislature and have gained a perspective that allows me to illustrate through several case studies that too often politics play a greater role in final decisions than science. This tendency leads to passage of legislation that either fails to redress the problem or makes matters worse. A greater emphasis on science would improve the legislative process by at least drawing consistent attention to: 1) the precautionary principle, 2) the unequal usefulness of information, 3) the persistence of uncertainty, and 4) the shortcomings of short-term perspectives for redressing problems characterized by large and complex spatial and temporal scales. Science would be more useful in governmental decision making processes if conservation biologists redoubled their involvement in the political process, including serving in elected office.

Wednesday, July 18 9:00 The World's Most Significant Effort To Conserve Imperiled Species On Private Land

Phillips, Mike[*], *Turner Endangered Species Fund* , **Kruse, Carter**, *Turner Biodiversity Divisions* , **Mccaffery, Magnus**, *Turner Endangered Species Fund*

The primary cause of the extinction crisis is habitat loss that occurs, mostly on private land, in the name of development and economic growth. It is clear that in the United States most threatened or endangered species will not be recovered without the cooperation of private landowners. The Turner Endangered Species Fund and Turner Biodiversity Divisions were launched in 1997 to illustrate the usefulness of private land for conserving nature by ensuring the persistence of imperiled species and their habitats with an emphasis on properties owned by media executive R. E. Turner. Our projects are based on a multidisciplinary strategy and framed by the principles of conservation biology. We work closely with state and federal agencies, universities, non-governmental conservation organizations, and private citizens. Whether restoring extirpated populations or managing extant populations our goal is population persistence with little or no human intervention. We believe that self-sustaining populations illustrate a healthy or at least a recovering landscape. Since inception, we have been involved in restoration projects involving imperiled plants, birds, reptiles, amphibians, fishes, and mammals in the continental United States, Alaska, Poland, and Russia. Our projects are original in concept and

design and have led to landmark breakthroughs for several species including the red-cockaded woodpecker, swift fox, westslope cutthroat trout, Chiricahua leopard frog, desert bighorn sheep, black-footed ferret, and Mexican wolf. Our success illustrates the tremendous untapped potential of private land, and of the need to redouble efforts to engage landowners in the fight to save vanishing species.

these efforts include the Department of interior's Landscape Conservation Cooperatives, the Bureau of Land Management's Rapid Ecoregional Assessments, and the Western Governors Association's Crucial Habitat Initiative. This presentation will highlight the commonalities shared by these efforts that provide an opportunity to develop a collaborative unified conservation strategy across the west.

Wednesday, July 18 11:20 Integrating Conservation Priorities And Objectives Across The West

Pierce, D. John*, *Washington Department Of Fish And Wildlife*

A major challenge facing natural resource conservation in the west is the lack of a set of agreed upon common conservation priorities and strategies that define the roles and responsibilities of state, federal and other partners to act on. Some of the reasons for the lack of a common strategy are historic. State and federal agencies each have their own mandates that guide their institutional culture and associated priorities. Other factors include perceptions that mandates compete for resource allocation, restricted or specialized funding support, and a culture of doing 'business as usual' that often stems from insufficient resources that do not allow for creative, proactive efforts to change this historic paradigm. Unfortunately, budgets are getting tighter and tighter and ecosystem stressors (human population growth and associated land use changes, climate change, accelerated fire regimes, and other disturbances) will occur at scales beyond single ownerships or jurisdictions. Given this future, it is critical that a new paradigm emerges that dissolves political, jurisdictional and geographic boundaries in order to achieve successful conservation. Fortunately several significant cross-jurisdictional conservation initiatives have recently emerged that are interested in aligning conservation priorities and strategies across a diversity of partners, including State, Federal, Local governments. Examples of

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Tuesday, July 17 12:30 Variation In Community-Assembly Processes Has Important Implications For Assemblage-Wide Conservation

Pinney, Tracy*, *Baylor University* , **Gutzwiller, Kevin**, *Baylor University*

The relative importance of niche (habitat-based) and neutral (dispersal-based) processes in community assembly has received much attention. We hypothesized that niche processes were more important than were neutral processes in structuring communities of Texas birds, which we sampled in the field at 206 sites. We used regression, spatial eigenvectors, and variance partitioning to assess evidence for niche and neutral processes during 2008 and 2009. For the overall bird assemblage each year, remotely-sensed habitat variables accounted for more of the variation in species composition than did spatial variables, suggesting that niche processes were consistently more important than were neutral processes in structuring this assemblage. For a subset of species exhibiting long-term population declines, spatial variables accounted for more of the variation in species composition in 2008, and habitat variables accounted for more of the variation in 2009. Thus, in 2008 the relative importance of assembly processes for the overall assemblage differed from that for the declining species, and the relative importance of assembly processes differed between years for the declining species. Conservation efforts aimed at an entire assemblage may or may not be appropriate for subsets of declining species. Repeated assessments of assembly processes are needed to determine

whether management for entire assemblages will be consistent with processes that underlie the assembly of species subsets.

Monday, July 16 Challenging The Wetland Policy Paradigm: Incorporating Biological Connectivity Into Wetland Conservation

Pitt, Amber*, *Clemson University* , **Baldwin, Rob** , **Stegenga, Benjamin**, *Clemson University*

Wetland conservation often focuses on distinct aquatic features that fit into particular delineation categories based on geophysical characteristics and plant communities. Federal wetland policy does not protect small, non-navigable, temporally dynamic wetlands, despite their importance for maintaining biodiversity, unless a "significant nexus" with a traditional navigable water body is established. Determination of a significant nexus falls under the jurisdiction of the U.S. Army Corps of Engineers and is currently largely based on surficial hydrological connectivity. However, if biodiversity conservation is to be a major goal of federal wetland policy, biological connectivity requires attention. We used radio-telemetry to track three anuran species to assess biological connectivity of aquatic features in two index landscapes with a variety of water bodies. We found that anurans moved among ephemeral and permanent aquatic features in the landscape, suggesting biological connectivity of water bodies. Wood frogs, green frogs, and southern leopard frogs used a permanent stream, ephemeral wetlands, emergent lacustrine wetland, and open water. These results support that wetland conservation should focus on protecting a variety of aquatic features in order to maintain biodiversity and that biological connectivity can be used to establish the existence of a significant nexus between small, non-navigable, temporally dynamic wetlands and traditional navigable water bodies.

Wednesday, July 18 3:45 Geographic Delineation Of Woodland Caribou Ecotypes In Northern Ontario, Canada

Pond, Bruce*, *Ontario Ministry Of Natural Resources* , **Brown, Glen**, *Ontario Ministry Of Natural Resources* , **Wilson, Kaitlin**, *Trent University*

In Ontario, Canada, the forest-dwelling (sedentary) woodland caribou ecotype is listed as threatened by federal and provincial legislation; whereas the forest-tundra (migratory) ecotype, also indigenous to Ontario, is not listed. Other research has identified key differentiating behavioral characteristics; however, discrimination between the ecotypes on the basis of morphology, pelage, or genetics has not been definitive. We use GPS collar data from 144 animals to examine locational and movement metrics that might serve as indicators of two discrete behaviors and be consistent with the known characteristics of the two ecotypes. Using the metric that demonstrated the greatest distinction between ecotypes, we assigned each animal to one ecotype and, by mapping the distribution of each ecotype, delineated management boundaries appropriate for the application of conservation measures. The percent of calving season fixes lying within the two Hudson Bay Lowland ecoregions provided the best discrimination between two caribou movement behaviors. Indeed, all but one animal had either 100% or 0% fixes in the Hudson Bay Lowlands during this time. Other variables (e.g. range size and shape, annual path length, minimum distance to the Hudson Bay Coast) were consistent with this discrimination. Maps of the distribution of these imputed ecotypes show significant overlap, particularly during winter, which presents challenges for conservation and management of the forest-dwelling ecotype.

Wednesday, July 18 9:45 Incorporating Natural Processes Into Conservation Priority Setting And Strategy Development: A Case Study From California's North Coast

Porter, Daniel* , **Howard, Jeanette**, *The Nature Conservancy*

For California's freshwater environments, conservation strategy has shifted in recent years away from direct protection and towards the long-term maintenance and restoration of ecological integrity. Implicit in this change is conserving the natural processes that underpin biodiversity however, few conservation planning products or programs have demonstrated where and how natural processes are most effectively and efficiently conserved. For California's North Coast, we evaluated and prioritized coastal watersheds for conservation based on their (a) forest development trajectory, (b) anadromous salmonid restoration potential and (c) estuarine function. All three analyses rely on process-based conservation targets (e.g. freshwater inputs to estuaries) to evaluate how these processes will affect traditional conservation targets (e.g. wetlands). Forest development trajectories reveal where ecological integrity is projected to improve because of regulated and voluntary harvest practices. The salmonid analysis presents a composite index value that identifies where aquatic restoration strategies will lead to the greatest gains in protection of salmonid diversity at the lowest possible cost. The estuaries assessment classifies estuaries based on their key physical and biological processes and identifies estuaries with climate adaptive potential. We conclude from the results that sufficient information exists to identify restorable watersheds with explicit reference to their sustaining natural processes. We present a real-world application of our approach from coastal Mendocino County where resource based industries (e.g. forestry and rangeland management) appear capable of sustaining both ecological and economic viability through time provided that specific restoration actions and management modification are applied.

Monday, July 16 Dynamics Of Space Use By Understory Birds In A Heterogeneous Amazonian Landscape

Powell, Luke*, *School Of Renewable Natural Resources* , **Stouffer, Philip**, *School Of Renewable Natural Resources*

Due to widespread regeneration following deforestation, Amazonia now contains vast areas of secondary forest, yet its value for wildlife remains poorly understood. We hypothesized that birds using young secondary forest with few resources would have relatively large home ranges and high movement rates, with metrics of avian space use gradually converging on those in primary forest as secondary growth matures. From 1996–2011, we captured and radio tracked 24 Glyphorynchus spirurus, 23 Xiphorhynchus pardalotus and 26 Formicarius colma in primary forest and 10–30 year old secondary growth at the Biological Dynamics of Forest Fragments Project near Manaus, Brazil. Birds using secondary forest did not have larger home ranges than those in secondary growth for any species. Home ranges were similar among treatments, although G. spirurus had significantly smaller home ranges within forest fragments, which we speculate was due to release from competition by other woodcreepers. X. pardalotus and G. spirurus had higher movement rates when birds used young secondary growth. F. colma appeared to take a different strategy, using little or no young secondary growth, and then appearing in older secondary growth with movement rates similar to those in primary forest. If we can quantify the value of secondary growth to understory birds, we can better focus conservation strategies as secondary forest and small fragments become increasingly significant in tropical landscapes.

Monday, July 16 12:10 Environmental, Economic, And Energy Security Advantages Of Distributed Solar In The Built Environment Over Utility-Scale Solar Projects On Undevel

Powers, Bill*, *Powers Engineering*

The Joint Investor-Owned Utility (IOU) California Energy Efficiency (EE) Strategic Plan places priority on achieving net zero energy residential and commercial buildings. “Net zero” means the structure produces as much energy as it uses over the course of a year. The three IOUs, PG&E, SCE, and SDG&E, would achieve 45% renewable power by 2020 with no new utility?scale wind or solar projects if the 2020 targets in the EE Strategic Plan are achieved. If the IOUs continue to meet EE Strategic Plan goals, they will hit 65% renewable power by 2030, and 80% before 2040. However, California is currently pursuing a renewable energy development strategy that relies primarily on utility-scale remote solar and wind projects. The high cost to ratepayers of utility-scale solar energy projects has become a source of national debate. These utility-scale projects are also typically used to justify high cost, high return-on-investment transmission lines that the utilities own and operate. Distributed generation resources located at the point-of-use provide maximum energy security relative to transmission-dependent remote resources. Mr. Powers will summarize the environmental, economic, and energy security advantages of distributed solar in the built environment over utility?scale solar projects on undeveloped desert sites.

Monday, July 16 Disentangling The Effects Of Multiple Nonnative Species In California Wetlands

Preston, Daniel*, *University Of Colorado* , **Henderson, Jeremy**, *Oregon State University* , **Johnson, Pieter**, *University Of Colorado*

The spread of nonnative species around the globe represents a major driver of ecosystem change and a pressing conservation challenge. Among ecosystems, freshwater wetlands are of particular concern because they are the most imperiled habitat type in the United States and they frequently support multiple nonnative species. We combined wetland surveys in the San Francisco Bay Area of California with a mesocosm experiment to examine the individual and combined effects of nonnative fish predators and nonnative bullfrogs on native communities. Among 139 wetlands, nonnative fish (bass, sunfish and mosquitofish) negatively influenced the probability of occupancy of Pacific treefrogs (Pseudacris regilla), but neither invader had strong effects on occupancy of California newts (Taricha torosa), western toads (Anaxyrus boreas) or red-legged frogs (Rana draytonii). In mesocosms, mosquitofish dramatically reduced the abundance of zooplankton and palatable amphibian larvae (P. regilla and T. torosa), leading to increases in nutrient concentrations and phytoplankton (through loss of zooplankton), and rapid growth of unpalatable toad larvae (through competitive release). Bullfrog larvae reduced the growth of native anurans but had no effect on survival. Improving our understanding of the complex interactions among native and nonnative species will help inform wetland management decisions and improve our capacity to conserve threatened wetland biota.

Tuesday, July 17 4:30 Evaluation Of The Introduction History And Genetic Diversity Of A Serially Introduced Fish Population In New Zealand

Purcell, Kevin*, *North Dakota State University* , **Stockwell, Craig**

Reconstructing routes of invasion and characterizing the genetic diversity of invasive populations is crucial to the management of invasive species. The western mosquitofish, Gambusia affinis, has been widely introduced from its native range in the southeastern United States as a mosquito control agent. We evaluate the introduction history of G. affinis, to New Zealand using molecular markers to verify the historical record of this invasion, and to evaluate the genetic

diversity among populations following its serial introduction to the island. We found strong support for the published introduction history, indicating that New Zealand populations are descended from populations in central Texas. Introduced populations show significant loss of allelic richness (AR =4.55-7.77) compared to the founding populations (AR =11.44-12.33). We also found evidence that genetic divergence among introduced population in New Zealand (FST = 0.0843) is greater than among native source populations (FST = 0.002 -0.009). The bottleneck and founder effects resulting from serial introductions in these populations have reduced allelic richness but have had little impact on overall genetic diversity. Understanding the relationship between introduced and founding populations including the impact of genetic variation on invasion success is crucial to the management and study of differential success in invasion biology.

Monday, July 16 12:30 Recovery Steps For An Endangered Annual Forb (Acanthomintha duttonii)

Quenelle, James*, *Creekside Center For Earth Observation* , **Weiss, Stuart**, *Creekside Center For Earth Observation* , **Niederer, Christal**, *Creekside Center For Earth Observation* , **Naumovich, Lech**, *Creekside Center For Earth Observation*

San Mateo thornmint (Acanthomintha duttonii) is a federal and state endangered annual with only one known population, in San Mateo County, CA. This population had 53,000 individuals in 1994, and only 249 in 2008. Restoration efforts began to address Italian ryegrass and thatch cover in 2008. Small-scale experiments in unoccupied habitat determined post-germination scraping was the most effective treatment for seeding trials by reducing annual grass cover and thatch, and increasing bare ground. Seed increase experiments conducted by the UC Berkeley Botanical Garden refined propagation techniques, leading to subsequent large-scale seed increases. In November 2009, 12,500 seeds were placed in 25 1m² experimental plots by the extant population. A 30% germination rate yielded 3,111 seedlings, resulting in 2,885 mature plants in June 2010 (census total 3,135 plants). In December 2010, 9,000 seeds were placed in 30 new scraped plots, of which 1,416 reached maturity. 3,450 plants were censused in June 2011. Mowing and dethatching continues to improve overall habitat. Though the population increased only slightly from 2010 to 2011, fecundity increased from 1.3 to 2.2 whorls per plant. Introductions to additional sites are planned. An adaptive management plan was created with USFWS with objectives for current and introduction sites, and specific management directions if objectives are unmet.

Monday, July 16 Modeling And Mapping Of Plant Diversity In Mexican Watershed

Quijas, Sandra*, *Centro De Investigaciones En Ecosistemas, Unam* , **Martínez-Harms, María José**, *Centro De Investigaciones En Ecosistemas, Unam* , **Merenlender, Adina** , **Balvanera, Patricia**, *Centro De Investigaciones En Ecosistemas, Universidad Nacional Autónoma De México*

Plant diversity maps, used to highlight priority areas for conservation, are getting more accurate as they are not based on field censuses. Yet, no information is available on how the spatial patterns of different life forms or different components of diversity may differ, and thus require different conservation strategies. In this study we model the spatial patterns of four different plant life forms and four diversity indices for a small watershed in Mexico. We estimated local plant diversity in fifty sites along a small watershed. Field estimates were used as response variables in multiple regression models employing biophysical and management data as explanatory variables; the best models were used to extrapolate values throughout the watershed. Our models explained from 30 to 80% of the observed variance; the most important explanatory variables were normalized vegetation index and land use. The spatial patterns of the different plant life forms and diversity indices

differed, though several hotspot locations were identified. The results show that the choice of life form and diversity index may affect the accuracy and prediction of priority conservation areas and should thus be taken into consideration in conservation planning.

Wednesday, July 18 4:45 Using Conflict Analysis To Identify Opportunities For Progress In Endangered Species Conservation

Ragland, Chara*, *Texas A&M University* , **Bernacchi, Leigh**, *Texas A&M University* , **Peterson, Tarla Rai**, *Texas A&M University*

We explored a socio-political conflict centered on wintering grounds of the Whooping Crane to identify opportunities for involving local communities in management of endangered species. Recommendations are based on results from 36 semi-structured interviews and a public meeting with approximately 80 attendees. Analysis indicated that the conflict is rooted in issues of democracy and uncertainty about the future. Participants agreed on issues of increased freshwater inflow to the estuarine system as well as continued protection of Whooping Cranes. Issues of contention included development of land adjacent to marshes, critical habitat boundaries, habitat management practices, opening of bays to the main Gulf of Mexico, supplementary feeding, and increasing tourism. All participants wanted an active voice in decisions regarding these issues coupled with increased communication with state and federal agencies. Future uncertainty was associated with being powerless to change the direction of development and degradation of the environment, which threatens their livelihoods and quality of life. We suggest implementation of participatory processes that provide opportunities for local voices to learn more about the biological needs of the species and influence development and planning in the region. These initiatives have implications for both the greater Coastal Bend ecosystem in Texas and other ecosystems that provide critical habitat for endangered species.

Tuesday, July 17 3:30 How Well Can We Predict Wildlife Corridors? Validating Connectivity Models With GPS Data From Migrating Elk And Dispersing Wolverines

Rainey, Meredith*, *Montana State University* , **Hansen, Andrew**, *Montana State University*

Landscape connectivity has become a key focus of conservation biology as natural habitat is increasingly fragmented by human land use. Several approaches to modeling landscape connectivity are now frequently relied upon to identify probable dispersal and migration corridors and guide conservation planning. However, the predictive accuracy of these methods has seen limited testing against empirical movement data, which limits confidence in their utility and confuses selection of appropriate methods for a given application. To address these issues, I used GPS collar data from migrating elk and dispersing wolverines to evaluate the ability of common modeling approaches (least-cost corridor models and circuit theory models) to predict observed movement routes. While both methods made generally similar predictions, least-cost corridor models consistently outperformed circuit theory models, and predictive success was much higher for elk than for wolverine movements. Furthermore, the form and complexity of underlying landscape resistance maps influenced model performance and revealed unforeseen differences between connectivity modeling approaches. These findings illustrate that connectivity model performance depends greatly on focal species and landscape characteristics as well as selection of appropriate methods for the application at hand.

Monday, July 16 Multi-Scale Long Term Monitoring Of Land Cover Change At The Monarch Butterfly Region, Mexico

Ramirez, Maria Isabel* , **Salas Canela, Lidia**, *Universidad Nacional Autonoma De Mexico* , **Paniagua Ruiz, Ignacio**, *Comisión Nacional De Áreas Naturales Protegidas*

The emergence of long-term research has been oriented to monitor and tackle most urgent environmental problems. It includes permanent monitoring programs able to adapt to both technical and scientific advances, and changes in monitored indicators. We present results of a long-term monitoring effort of land cover change at the monarch butterfly region. For our monitoring, we have used multi resolution imagery, visual interpretation, and field verification. We have considered two scales of analysis. The regional one, that will be carried out every six years, matching federal government terms, includes 27 municipalities that are part of regional Land Management Plans of two states. The local analysis has been applied consistently every three years since 2000 and retrospectively since 1986. It includes the Monarch Butterfly Biosphere Reserve, and its surroundings. Results present differential land change cover processes according to each scale. At the regional scale outcomes show some changes in agricultural production. While the local analysis shows that natural vegetation has been progressively decreasing or being disturbed. However, this trend seems to be reversing in recent years.

Monday, July 16 3:30 Effects Of Microclimate On Patterns Of Survival In The American Pika Inferred From Long-Term Data On A Population In The Central Rocky Mountains

Ray, Chris* , *University Of Colorado-Boulder*

Recent State and Federal opinions on the potential for climate-mediated endangerment of the American pika have cited a lack of information on population trends and on trends in climate relevant to this species. Pikas thermoregulate in part by frequenting sub-surface habitats which exhibit lower summer temperatures than those above the surface. This behavior may allow pikas to avoid effects of rising summer temperature more readily than species that do not use such microclimates. Thus, it is unclear whether pikas are more vulnerable to climate change than other species. However, it is also unclear whether summer warming is their main hazard. The morphology, physiology and behavior of these non-hibernating lagomorphs suggest a legacy of selection for surviving cold winters. Ironically, pikas may now face colder winters in places where dwindling snow cover exposes sub-surface habitats to ambient temperatures. In this study, long-term data on pika survival in relation to sub-surface temperatures are used to infer climate-mediated trends in a population in south-central Montana. Nineteen years of mark-resight data on 542 pikas indicate a lasting decline in survival of first-year territory owners beginning in 1999. Although reduced survival in response to (lagged) summer heat and especially winter cold are supported in these data, compensating recruitment has ensured long-term stability of this population. Projecting recruitment will be key to projecting effects of climate.

Tuesday, July 17 3:30 A Comparison Of Land Use And Home Sales In Conservation And Conventional Development Projects

Reed, Sarah* , *Colorado State University* , **Pejchar, Liba**, *Colorado State University* , **Laposa, Steven**, *Colorado State University* , **Hannum, Christopher**, *Colorado State University* , **Theobald, David**, *Colorado State University* , **Ex, Lindsay**

Although conservation development (CD) accounts for a growing proportion of private land conservation and residential development in the US, little is known about its ecological and socioeconomic outcomes. We compiled a database of nearly 400 CD subdivisions in unincorporated areas of 29 Colorado counties. In five counties, we also identified comparable conventional development projects, located near CD

subdivisions and similar in total area and development yield. We used high-resolution aerial photography to digitize fine-scale land use and land cover within individual lots and protected open space, and we applied a detailed database of residential sales transactions to examine home prices and absorption rates in CD and conventional subdivisions. CD subdivisions range in area from 2 to 900 ha, and a mean of 62% of each property is set aside as protected open space. Agriculture is the most widespread form of human land use, and the degree of fragmentation by roads and residential development is highly variable among CD subdivisions. Residential properties in CD subdivisions had a sales price 19% greater than similar properties in nearby conventional subdivisions. The results of this study will be extended to land use planning, conservation, and development practitioners to enhance the effectiveness of CD as a tool for financing conservation and protecting biodiversity and ecosystem services on private lands.

Monday, July 16 Balancing Multiple Mandates And Values To Manage Introduced Bison In The Grand Canyon Region

Reimondo, Evan* , **Sisk, Thomas**, *Northern Arizona University* , **Theimer, Tad**, *Department Of Biology, Northern Arizona University* , **Vaughn, Jacqueline**, *Department Of Politics And International Affairs, Northern Arizona University*

An introduced herd of American Bison (Bison bison) has become a source of management conflict between state and federal agencies on the Kaibab Plateau of Arizona. As a symbol of the American West and a species of conservation concern, this herd continues to draw stakeholders of greatly varied perspectives and values to weigh in on the debate. Beyond the regional management conflict, these bison represent broader debates of bison conservation and restoration across the public lands of the United States. We conducted research of bison impacts on riparian vegetation to inform the conflict past a former stopping point, utilized case studies of introduced bison and other ungulates to review potential management options, and considered the drivers and values of the major players in each of these cases. These findings were then applied to the current and potential regional bison stakeholders and considered in structured discussions of bison management options with individual management agencies. We surveyed managers to identify points of compromise and agreement, and hosted inter-agency, cooperative meetings to share research results and facilitate the determination of, and agreement on, mutually amenable management actions. We propose this model of delineating overlapping agency management mandates and stakeholder values to allow opportunities for science to inform discussion as an effective method for addressing many wildlife management conflicts.

Tuesday, July 17 4:30 Natural Community Conservation Plans Are Too Small To Conserve The Biodiversity Of Southern California- Are There Are Solutions?

Rempel, Ronald*, *San Diego Management And Monitoring Program*

With the execution of the Implementing Agreements for San Diego and Orange County Natural Community Conservation Plans in 1996, California began an innovative partnership to establish and manage an extensive interconnected preserve system (multiple large core habitat areas connected by habitat linkages). The goal of the NCCPs in southern California was and continues to be the conservation of the biodiversity of the region. Key components of the NCCPs are (1) creation and adaptive management of preserves and (2) preservation and restoration of linkages between core blocks of habitat. While planning has occurred at one spatial scale based on political considerations, management and monitoring must occur at an ecosystem scale if the plans are to going to meet their biodiversity conservation goals. Significant progress has been made to address scale issues but major hurdles still need to be

overcome. Key first steps include the development of a single database for management and monitoring data and strategic plans to prioritize funding management and research. Challenges still exist. What steps do the local, state and federal agencies need to take to meet the challenge? Will they work together improve ecosystem resilience or go their separate ways?

Tuesday, July 17 3:30 Mapping Marginal Values Of Saturating Ecosystem Services

Ricketts, Taylor[*], *University Of Vermont* , **Lonsdorf, Eric**, *Chicago Botanic Garden*

Ecosystem service valuations can best inform resource decisions if they estimate the economic impacts of ecosystem change. Here we develop an approach to mapping marginal values – those resulting from the next unit of ecosystem change – across landscapes. We fit a recent model of pollination services to an agricultural landscape in Costa Rica, then simulate deforestation events to predict resulting marginal changes in pollination services to coffee farms. We find that marginal values vary widely across the landscape and are concentrated in relatively few forest parcels not identified using present value approaches. These parcels lack substitutes: nearby forest that can supply services in the event of loss. Financial risks for farmers from these losses and marginal benefits of forest restoration show similar spatial variation. The approach we develop is applicable to any ecosystem service, but is most informative for those in which spatial dynamics are important. Combined with information on costs, it can help target conservation or restoration efforts to have the greatest marginal impact on human economies and communities.

Tuesday, July 17 3:15 Reproductive Success Of Endangered California Least Terns In The San Francisco Bay, California Resulting From Gull Predator Management

Riensche, David[*], *East Bay Regional Park District* , **Kitting, Christopher**, *California State University East Bay* , **Groff, Tierra**, *University Of California Davis* , **Dulava, Sharon**, *University Of California Berkeley* , **Bell, Douglas**, *East Bay Regional Park District*

Gull predation is known to be an important source of egg and chick mortality for many waterbirds and can have severe impacts on recovery efforts for special status species. From 2005 to 2011, nesting success was monitored at a newly established California least tern (Sternula antillarum brownii) colony at Hayward Regional Shoreline in San Francisco Bay, in relation to implementing a California gull (Larus californicus) predator control program. No gull management was undertaken prior to 2007. We evaluated the effectiveness of gull management and removal, by monitoring tern hatching and fledgling success annually. California gulls were the most abundant aerial predator (97%). We recorded 3,769 predatory gull-tern interactions and presumptive take of 26 tern eggs and 23 chicks. Although gull predatory behavior did not change statistically, gull management efforts resulted in significant improved tern breeding success (measured by number of nests, eggs, chicks, and fledglings). From 2007 to 2011, this colony produced a total 242 successful nests and 291 fledglings, an average nesting density of 196 nests per ha, and an average of 1.07 fledglings per breeding pair. We discuss difficulties of lethal control of predators, and suggest the importance of human presence for reducing gull predation at the site.

Monday, July 16 12:00 Current Issues Affecting Gyps Vulture Populations In Assam, India

Risebrough, Robert[*] , **Lahkar, Kulojyoti**, *Wildlife Conservation And Study Centre* , **Phukan, Mridu Paban**, *Wildlife Conservation And Study Centre*

The populations of three species of Gyps vultures have been declined disastrously in south Asia in recent years as a result of contamination of livestock carcasses with diclofenac and possibly to

a lesser extent other NSAIDs (non-steroidal anti-inflammatory drug)with similar properties. To know the status and to initiate a long term conservation process for two critically endangered vultures (G. tenuirostris and G. bengalensis), a survey was initiated in 2003 and thereafter surveying and monitoring regularly to know about the factors which are currently affecting their survival. These include destruction of nests and cutting and thinning of nesting trees; egg collection for medicinal purposes, hunting chicks and adult birds for meat; being killed accidentally by vehicles and trains while feeding on carcasses on roads and railway tracks and, in 2010 – 2011, the deliberate poisoning of carcasses with insecticides to kill carnivores. Three-year running averages of the number of nestings of both species suggest a decline in the order of 50% over the seven year period, with a particularly sharp drop recorded in 2010 – 2011. In order to ensure the long-term conservation of vultures in wild in Assam, we propose: awareness campaigns among local communities to protect nests, nestlings and nesting trees; to use safer drugs in veterinary medicine instead of diclofenac and other NSAIDs with similar properties, and to avoid the poisoning of carcasses likely to be consumed by vultures.

Wednesday, July 18 4:15 Gaps In Monitoring And Evaluation Across Centralized And Decentralized Land Conservation Policy Networks
Rissman, Adena[*], *University Of Wisconsin-Madison* , **Smail, Robert**, *University Of Wisconsin-Madison*
Conservation scientists, funders, and practitioners are increasingly calling for evidence-based conservation, in which outcome monitoring is used to assess and improve conservation programs. To better understand outcome monitoring in well-established conservation programs, we compared four different land conservation policy networks: a federal government, local government, nonprofit land trust, and nonprofit market-based certification program. We asked, How do conservation programs, and their systems for performance measurement and accountability, incorporate conservation outcome information? How do program goals and the structure of different governance networks affect the flow of monitoring information? Through interviews, document analysis, and network analysis, we found few efforts to monitor program outcomes for wildlife, water quality, or forests. Most monitoring and reporting focused on proxy output measures of acres, dollars, and staff time. Connectivity scores for each network revealed gaps in the flow of monitoring data, especially for decentralized networks, and significant disconnects between scientists and staff responsible for program design and implementation. This research suggests the need for integration of monitoring and implementation networks, and a general lack of demand for evidence or outcome information, except at local levels or when driven by external sources of accountability pressure.

Wednesday, July 18 9:15 Marine Geospatial Ecology Tools (MGET): GIS Tools For Open Ocean Research And Conservation
Roberts, Jason[*], *Duke University* , **Best, Ben**, *Duke University* , **Dunn, Daniel**, *Duke University* , **Treml, Eric**, *University Of Queensland* , **Halpin, Pat**
Marine Geospatial Ecology Tools (MGET) is an open source geoprocessing toolbox designed for marine researchers and conservation practitioners. MGET includes over 250 tools useful for a variety of tasks, such as downloading popular oceanographic datasets in GIS-compatible formats, identifying fronts and eddies in satellite images, building statistical habitat models from species observations and creating predicted habitat maps, modeling biological connectivity by simulating hydrodynamic dispersal of larvae, building grids that summarize fishing effort and catch, and modeling spatial patterns in fishing effort when limited data are available. MGET integrates with ArcGIS and may also be accessed via popular programming languages such as Python and R. In this presentation, we will survey the tools within

MGET, focusing on recent developments and tools applicable to problems in the pelagic zone, such as tools for querying the Ocean Biogeographic Information System (OBIS) for species observations, for working with the newly-released Chelton et al. (2011) mesoscale eddy database, and for accessing 4-dimensional oceanographic models such as HYCOM and ROMS-CoSiNE, and for building multivariate habitat models for pelagic species using these data as inputs.

Tuesday, July 17 4:45 Avian Community Responses To Sierra Nevada National Forest Management: Who Is Covered Under The California Spotted Owl Umbrella?

Roberts, Lance[*], *PRBO Conservation Science* , **Burnett, Ryan**, *PRBO Conservation Science*

In the last 20 years, National Forest management in the Sierra Nevada has been largely focused on promoting suitable habitat for the spotted owl (Strix occidentalis) and other late seral habitat associates. Along with nearly a century of fire suppression, this has resulted in increased canopy closure and tree density on the landscape. Understanding that some species will be “winners” and others “losers” if the ecosystem trended towards habitat conditions favored by spotted owl, we sought to assess how the avian community would respond in order to help guide future forest management. We estimated point-scale occupancy and species richness inside and outside of spotted owl home range management boundaries (Core Areas) in the Lassen and Plumas National Forests in northeastern California. We used a hierarchical Bayesian multi-species occupancy model for 53 species recorded on 1165 points inside and outside Core Areas from 2005-2006. Estimated species richness was higher outside the Core Areas than inside. 12 species had significantly higher occupancy outside Core Areas, while only 4 were higher inside. Most species negatively associated with Core Areas were tied to early successional and other disturbance-dependent habitats, with many having experienced regional population declines. While managers must consider individual rare species, information on the needs of the broader ecological community is crucial for establishing balanced approach that sustains biological diversity.

Tuesday, July 17 9:30 Seabirds And The Adaptive Management Of Marine Protected Areas In Central California

Robinette, Daniel[*], *PRBO Conservation Science* , **Jahncke, Jaime** , **Graiff, Kaitlin**, *Cordell Bank National Marine Sanctuary* , **McChesney, Gerard**, *USFWS* , **Roletto, Jan**, *Gulf Of The Farallones National Marine Sanctuary*

Adaptive management of MPAs should begin with hypothesis driven questions that help define realistic expectations of MPA success. The questions should address 1) what community-level changes are expected to occur as a result of MPA establishment and 2) how quickly these changes should take place. Here we use the Applied California Current Ecosystem Studies (ACCESS) as an example of how multidisciplinary partnerships can shape ecosystem-based adaptive management. We integrate data from recent studies of seabird diet and foraging distribution, fish larval abundance and oceanographic indices to illustrate how temporal variability in primary and secondary productivity on the regional scale can translate into spatial variability in fish recruitment on the local scale. The results show that localized recruitment rates are influenced by 1) regional larval abundance, 2) oceanographic conditions promoting the survival of larvae to settlement age, and 3) coastal topography influencing the delivery of recruits to nearshore habitats. These results have direct implications for developing realistic expectations for newly established MPAs. For instance, MPAs established in larval retention areas will likely show results sooner than MPAs established along exposed coastlines. Anticipating changes within individual MPAs will allow mangers to better understand when management strategies should be adjusted.

Monday, July 16 3:30 Integrated Watershed Restoration Program (IWRP): Success Collaboration For Balancing Farming And Wetland Restoration In The Watsonville Sloughs

Robins, Jim*, *Alnus Ecological*

Between 1998 and 2003, the RCD of Santa Cruz County (RCDSCC), the State Coastal Conservancy (SCC), California Department of Fish and Game (CDFG), and Central Coast Regional Water Quality Control Board (CCRWQCB) funded over 15 fish passage, erosion risk assessments, and watershed restoration plans for seven watersheds in Santa Cruz County. Staff from RCDSCC along with its planning partners recognized that implementing the recommendations of these assessments and plans would be best accomplished by bringing together federal, state, and local resource and permitting agencies to identify the highest priority projects in the County and assist with locating funding, providing technical assistance, and facilitating design and permitting. This realization led to the creation of the Integrated Watershed Restoration Program (IWRP) for Santa Cruz County in 2003. The mission of IWRP is to facilitate and coordinate projects to improve fish and wildlife habitat and water quality in Santa Cruz County watersheds using a voluntary, non-regulatory approach. The Watsonville Sloughs ecosystem is recognized as the largest and most significant wetland complex between Pescadero Marsh (San Mateo County) and Elkhorn Slough (Monterey County), making it a key priority for IWRP. Like Pescadero and Elkhorn, the Watsonville Sloughs have been significantly modified through urban and agricultural land-use. The upper Sloughs are within the boundaries the City of Watsonville, which is the fastest growing municipality in Santa Cruz County and the lower watershed sits with the verdant agricultural floodplain of the Pajaro River. From its inception in 2003, IWRP has been working with a diverse array of public and private stakeholders to overcome historic animosities and focus on identifingpotential win:win solutions in an effort to develop traction and trust amongst the key stakeholders and engender support for implementing a complex suite of conservation strategies that would focus on: reclamation and restoration of historic freshwater wetlands; improve water quality in the Sloughs and Pajaro River Lagoon; and maintain viable and sustainable farming operations. This presentation will focus on both the key strategies used to jump start dialogue with our stakeholder community and highlight the current conservation, opportunities and constraints to building on these successes.

Monday, July 16 The Song Sparrow As A Biosentinel For Methylmercury In Riparian Food Webs Of The San Francisco Bay Area

Robinson, April*, *San Francisco Estuary Institute*

High levels of mercury in the San Francisco Bay region pose a threat to local wildlife. Recent studies have documented unexpectedly high concentrations of methylmercury in terrestrial invertebrate-eaters indicating possible risk from exposure via the food web. Such discoveries prompted interest in developing a biosentinel for methylmercury in stream riparian food webs of the Bay Area. The Song Sparrow (Melospiza melodia) was determined to be the best riparian biosentinel candidate on the basis of its natural history, sampling feasibility, and sensitivity to mercury. The ability of Song Sparrows to reflect a wide a range of mercury concentration in their blood, and to thereby reflect differences in methylmercury risk between areas, was assessed by sampling individuals from riparian sites across the Bay Area. Results of this study confirmed the appropriateness of the Song Sparrow as a biosentinel species. Mercury concentrations at the site with the highest risk were associated with a decline in reproductive success in songbirds of greater than 25%, underscoring the need to understand and monitor methylmercury exposure in these systems. The riparian biosentinel tool developed here can be used to understand and monitor spatial and temporal patterns in mercury condition, long-term trends, and the impact of events such as management actions.

Monday, July 16 11:00 Sylvatic Plague Vaccine; A New Tool For Conservation Of Threatened And Endangered Species

Rocke, Tonie* , **Osorio, Jorge**, *University Of Wisconsin*

Sylvatic plague, caused by the bacterium Yersinia pestis, which was introduced into North America about 100 years ago, is a devastating disease of prairie dogs (Cynomys spp.) and the highly endangered black-footed ferret (Mustela nigripes). Current attempts to control plague rely on insecticidal dusting of prairie dog burrows to kill the fleas that spread the disease. However, vector control is labor intensive and costly, often applied too late to be effective, and indiscriminant in its effects. As an alternative, we have developed a novel, virally-vectored sylvatic plague vaccine (SPV) that could be delivered via baits to prevent plague in wild prairie dogs. Laboratory studies have demonstrated that consumption of SPV-laden baits effectively protects prairie dogs against plague infection. Field studies to assess the use of SPV as a preemptive management tool against plague will begin in selected prairie dog populations in 2012. If successful, an oral vaccination program could be initiated in key locations to decrease the occurrence of plague epizootics in prairie dogs, reducing the source of bacteria while avoiding the indiscriminate environmental effects of dusting. Control of plague in prairie dogs, and possibly other wild rodents through the application of SPV, could help stabilize grassland ecosystems, significantly enhance black-footed ferret recovery, and achieve additional economic, environmental, and public health benefits.

Tuesday, July 17 4:00 Does Public Education About Native Landscape Design Influence Residential Landscaping Preferences?

Rodriguez, Shari*, *North Carolina State University* , **Peterson, M. Nils**, *North Carolina State University* , **Thurmond, Brandi**, *North Carolina State University* , **Moorman, Chris**, *North Carolina State University*

In areas of urban sprawl, appropriate residential landscaping can retain suitable habitat for wildlife. However, in the US, residential landscapes typically consist of maintained lawns with few trees, shrubs, or native plants, which provides poor wildlife habitat. We conducted a study of Raleigh, North Carolina residents (n=180) to determine how educating residents about the wildlife-related benefits of native landscaping influenced their preferences for landscaping. We measured preferences using a 7-point Likert scale, where 1 = strongly do not prefer and 7 = strongly prefer. We used paired sample t-tests to determine if landowner preferences for 0, 50, 75 and 100% native landscape designs changed after they were informed about the benefits native plants provide for wild birds. Prior to educating respondents, the 50% native landscaping design was the most preferred and the 100% was the least preferred. Preferences for all 4 native landscaping designs were significantly different after providing information about wildlife benefits associated with native landscaping. Neutrality changed to opposition for the 0% native landscaping design, while opposition changed to support and neutrality for the 75% and 100% designs, respectively. The 50% design remained the favorite despite a decline in support. These findings suggest support for native landscaping is already much higher than reflected by typical residential landscaping, and that education efforts regarding the benefits of wildlife-friendly landscaping can dramatically alter public preferences for native landscaping.

Monday, July 16 The Mangrove Forests Of Mexico: A Nationwide Spatial Distribution Assessment And Establishment Of A Monitoring System.

Rodríguez-Zúñiga, Teresa*, *CONABIO* , **Troche, Carlos**, *CONABIO* , **Vázquez-Lule, Alma** , **Márquez, Daniel** , **Valderrama, Luis** , **Vazquez, Berenice** , **Cruz, Isabel** , **Ressl, Rainer**

Mangroves are one of the most productive wetlands in the world, and have been considered as key ecosystems due to the ecosystem services

they provide. Regarding covering of mangroves, Mexico is in the fourth place. However, there are discrepancies between the published estimations. In order to solve this controversy the aims of this study were to estimate the recent (2005) and historical (70´s - 80´s) distribution and extension of mangrove forests in Mexico. Estimations were made with different tools. The recent date distribution and extension were devising with high resolution remote sensing data and the historical ones with aerial photographs. The map accuracy (recent) was assessed with aerial photographs using a method that employed a systematic sampling through helicopter flights along the coastal zone of Mexico. The result is the first reliable national mangrove map for 2005(scale 1:50,000), with a total area of 7,780 km. The results obtained in this project were integrated in order to develop a National monitoring system, which presents three basic components a) The spatial component, it include the mapping of Mexican mangroves (2005), which include a surrounding vegetation coverage analysis (70´s-2005) and the calculation of indexes (fragmentation and connectivity) that will allow to monitor spatial-temporal trends of mangrove. b) The experimental component, will consists in the set of pilot sites to test new and mangrove-adapted indicators (vegetation index and biomass) that could contribute with the monitoring of mangrove forests over the time, and c) a social component that will focus in developing some indicators that allow to know the effect of public policy in mangrove conservation. At this moment data recorded allow us to develop a base line that will be used as a tool to evaluate the impact of different management decisions on mangroves.

Tuesday, July 17 8:30 Conservation Value Of Non-Native Plant Species: The Science Of Exceptions

Rogers, Deborah[*], *Center For Natural Lands Management*

Rapid climate change is contributing to changing distributions of native and naturalized non-native plants, creating novel plant communities, and potentially increasing the incidence of useful conservation roles for non-native plants. Determining the most appropriate response to those non-natives with apparent benefit will be directed by the management objectives—they reflect the societal values in each situation and provide the foundation for evaluating risk and defining costs and benefits. Although specific science-based information will not often be available to fully inform the decision, a scientific perspective can help frame the decision-making process, provide useful principles, and suggest the most reasonable extrapolation to available information. Appropriate conservation-directed response to non-native plants requires an adaptive approach and perhaps a change in traditional perspectives, with consideration of the ecological context, evolutionary history, and genetic risks and benefits. California—with its high levels of biodiversity, threatened and endangered species, and current and recent invasions of non-native plants—provides many case studies for such determination. Rigorous exploration of diverse case studies should help natural resource managers better navigate their own decisions and develop both short-term and long-term management responses, if different, that best serve their objectives.

Monday, July 16 GIS And Qualitative Methods For Conservation Of Andean Bear (Tremarctos ornatus) In National Park Cordillera Azul, Perú

Rojas, Roxana[*]

Human activities threaten Andean bear (Tremarctos ornatus) presence across its distribution. It is essential to identify those threats to establish and direct good conservation projects for it. The objective is to investigate the influence of men in the distribution of the species in Chazuta district, part of Cordillera Azul National Park (CANP) in Peruvian Amazon. The methodology focused on three components: distribution modeling using

Maxent, interview with local people and collect spatial information about economic activities. Through an animal geography perspective joins quantitative and qualitative methodology and GIS methods. Within the results, is concluded the animal is still present, although are sporadic sightings. Potential distribution represents 39% of the study area. These show a natural connectivity between CANP and its buffer zone. But migration and opportunistic hunting are the biggest threats. The first reduce his habitat and affect connectivity and the latter provide food (meat and organs) and medicine (fat generally) to local people. Most residents think is a quiet animal that eats “100% vegetables” and is not considered a cattle predator. To future local conservation projects is important to emphasize that creeks headwater are his habitat. Linking these to water resource as a single conservation goal lets join efforts in preserving natural areas.

Monday, July 16 Monitoring The Influence Of A Heterogeneous Landscape On The Movements And Ecology Of The Eastern Box Turtle

Root, Karen[*], *Bowling Green State University* , **Wilson, Steven**, *Bowling Green State University*

Nearly all extant land turtle species are experiencing widespread, global decline. The Eastern Box Turtle, Terrapene carolina carolina, is no exception. The only place this land turtle can be found in Northwest Ohio is in the highly heterogeneous Oak Openings Region. Our research focused on the general ecology of this species locally, especially in regards to movement and site selection characteristics. In particular, identifying which land cover types are most heavily used is important in directing conservation and management for this population. We located five adult box turtles twice a week from May through December using radiotelemetry and measured a number of environmental and habitat variables for each location. Home range size averaged 3.55 hectares for the 101 locations. The turtles were found more often in floodplain and coniferous forests and less often in deciduous forest than the proportions on the landscape would predict. These patterns varied over time, especially during June and July, and between sexes. Carex pensylvanita, Berberis thunbergii, and Osmundastrum cinnamomeum, were plant species most often noted near turtle sightings. Even based on this small sample size, it is clear that management that preserves a suite of habitat types, particular of different forest types, will be important for conservation of this species in the Oak Openings Region.

Tuesday, July 17 9:15 "When You Assume...": Transparent Assumptions, Uncertainty, And Conceptual Models Support Decision-Making And Adaptive Management

Rosenfield, Jonathan[*], *The Bay Institute*

The adaptive management (AM) paradigm is a means of responding to uncertainty regarding the outcome of conservation activities. Uncertainty may stem from a variety of sources (e.g., lack of basic data, competing theories about relationships among system components). In order to implement AM in restoration of highly modified ecosystems, restoration planners must first document the key assumptions and uncertainties surrounding conservation actions. Transparent documentation of these knowledge gaps focuses subsequent monitoring and research efforts and facilitates revision of management actions to increase overall efficacy. Communication of uncertainties and assumptions (aka, the plan’s “Logic Chain”) helps to set realistic expectations for plan success and implementation among decision makers and the general public. The San Francisco Bay-Delta Estuary is an ecologically complex environment that has been altered (simplified) in myriad fundamental ways leading to the near extinction of numerous species. Restoration of this ecosystem involves huge uncertainties and is the subject of contentious debate. I describe three tools used to document and respond to the rationale for, expectations of, and uncertainty underlying

management actions that may contribute to a long-term habitat conservation plan for the Bay-Delta and demonstrate how application of these tools guides both initial plan development and the overarching AM strategy.

Monday, July 16 Restoring Oak Woodlands In Southern Oregon: Invigorating Partnerships And Monitoring On Private Land

Ross, David[*], *U.S. Fish And Wildlife Service* , **Cocking, Matthew**, *Lomakatsi Restoration Project*

Oregon white oak (Quercus garryana) habitat provides life history elements for more than 300 species of vertebrates; oak habitats in the Klamath-Siskiyou Bioregion hold some of the highest biodiversity in the western U.S. These important ecosystems are threatened by vegetation shifts associated with loss of frequent fire (e.g. conifer encroachment) as well as expansion of human infrastructure. On private, non-urban lands, loss of frequent fire disturbance due to suppression is accentuated, and many oak woodlands decline following the steady advance of fire-sensitive conifers and increasing tree densities. Restoration often involves hand removal of many encroaching conifers, radial thinning of large oaks, and re-introduction of fire. Much more science development is needed to better understand changes occurring in oak habitats and improve restoration and conservation efforts. To meet this demand, our partnership in Southern Oregon has initiated monitoring of avian and plant community responses in oak woodland restoration project areas. Our landscape-scale planning approach involves prioritizing where larger blocks of habitat exist, identifying and linking corridors, developing partnerships and local networks, establishing science-based oak conservation and monitoring, employment and training of local residents, and partnering on restoration to leverage funding.

Monday, July 16 9:30 Effects Of Salt Pond Restoration On The Small Shorebird Carrying Capacity Of A South Bay Mud Flat

Rowan, Aariel[*], *San Francisco State University* , **Woo, Isa** , **Lovvorn, James**, *Southern Illinois University* , **Takekawa, John** , **Davis, Jerry**

A major question challenging the South Bay Salt Pond Restoration Project is whether migratory waterbirds displaced as existing salt ponds are converted to tidal marsh can be supported elsewhere in the region. We calculated the carrying capacity of a mudflat adjacent to the SBSPRP, and then considered how future changes to that mudflat may impact the energy budgets of foraging Western Sandpipers and Dunlin. We employed a daily ration model to explore how seasonal changes in prey stock effect small shorebird use-days. This model evaluates the carrying capacity of a study site based on estimates of daily bird energy requirements, energy content of prey stocks, and the efficiency with which birds convert ingested prey to metabolic energy. From August 2009 to May 2010, partners with the USGS Shoals Study collected the data used to populate the model. We determined that additional small shorebirds could be supported on the site during the wintering period but not during spring migration. In April, prey stocks on the Dumbarton Shoal were only able to provide 31% of the energy needed by small shorebirds. Large flocks must find prey beyond the mudflats, so SBSPRP managers should ensure that foraging habitat remains available within salt ponds during spring migration. Sea level rise may have significant impacts to the foraging availability of intertidal habitats beyond the San Francisco Bay, and this type of modeling may aid managers in predicting the effect of habitat loss.

Monday, July 16 3:30 Pathways To Adaptation-Relevant Vulnerability Assessments: Challenges And Recommendations

Rowland, Erika L.[*], *Wildlife Conservation Society* , **Dubios, Natalie S.**, *Defenders Of Wildlife*

Vulnerability assessments are widely considered a key precursor to climate change adaptation planning at all scales. In recent years, several approaches and guidance documents have been developed. Fewer resources exist that detail the challenges of implementing the process in real-world settings. We compare two case studies in which we applied the same species-based climate change vulnerability index tool within different geographical contexts, in Florida and coastal Arctic Alaska. Despite differences in setting, many common issues arose: (1) Questions about the appropriate scale and unit of analysis; (2) The importance of capturing and distinguishing among sources of uncertainty; and (3) Stakeholder confidence in the applicability of results for adaptation planning. Addressing these common issues required modifications specific to each landscape setting and group of expert stakeholders. The comparison of efforts suggests that factors such as management and landscape context, as well as differences in projected environmental change, influenced our decisions regarding methodological modifications. We conclude that climate change vulnerability assessments are most effective when approached as part of an iterative management process rather than simply a one-time output, and identify a number of key factors that are likely to affect whether the assessment results will be integrated into conservation and management.

Monday, July 16 Adapting To Climate Change: Using Genomic Scans To Detect Signatures Of Selection In American Pika Populations

Russello, Michael[*], *The University Of Bristish Columbia* , **Henry, Philippe**, *The University Of British Columbia, Okanagan Campus*

In the face of predicted climate change, a broader understanding of biotic responses to varying environments has become important within the context of biodiversity conservation. The American pika (Ochotona princeps) is a climate change sensitive species that is distributed along elevation gradients in the Coast Mountains of BC, Canada, providing an ideal system for studying adaptive population divergence, as environmental conditions change rapidly over short geographical distances. Here, we investigated the genetic basis of adaptation in pika populations from the Coast Mountains using amplified fragment length polymorphisms-based genomic scans, allowing for genome-wide searches of adaptive loci among populations inhabiting varying environments from sea-level to 1500m. Using a conservative approach employing multiple algorithms, we identified 23 loci that are candidates for selection. Additionally, six of these “outlier” loci displayed significant associations with environmental variables including annual precipitation, and maximum summer temperature. These results represent a novel application of genomic scans to detect candidate loci under selection in pikas, providing preliminary evidence for adaptive population divergence along multiple altitudinal gradients. As our ability to detect adaptive genetic variation within natural populations increases, so does our need to consider novel in ways in which this information may be incorporated into conservation strategies.

Tuesday, July 17 8:40 Post-Restoration Plant Community Assembly Patterns On The Giacomini Wetland Restoration Project

Ryan, Amelia[*], *Point Reyes National Seashore*

The 600-acre Giacomini Wetland Restoration Project, completed in 2008, offers an opportunity to examine the way in which plant communities form after restoration, and to compare restored and natural habitats. In some portions of the project area pre-restoration plant communities completely died when they became subject to tidal action (die-off zone). These areas offer a chance to examine the way plant communities form (or

"assemble"). In other areas, restoration did not eradicate existing species, but the changed conditions shifted plant community dominants. We compared the project area plant communities assembling in the die-off zone to reference sites to evaluate its trajectory towards a "desired" future condition. In the die-off zone, overall species diversity is still much lower than the reference site, but it has increased significantly in the three years since year one, with species richness approaching that of the reference site. We also looked at how broader measures of plant community function differed before and after restoration throughout the project area, including diversity, biomass, and nativity. We found a loss of diversity in the die-off zone/low elevation areas, but little change in higher areas, and no change in biomass production. Plant communities changed from being dominated by non-native grassland species to native salt marsh species.

Monday, July 16 Monitoring Eastern Spadefoot (Scaphiopus holbrookii) Burrow Emergence With Passive Integrated Transponders

Ryan, Kevin* , **Calhoun, Aram** , **Zydlewski, Joseph**, *University Of Maine*

Eastern spadefoot toads (Scaphiopus holbrookii) are one of the rarest and least-understood amphibian species in New England. Efforts to detect and subsequently monitor/track them are complicated by their nocturnal and fossorial habits. The purpose of this study was to examine the environmental factors associated with burrow emergence. We used passive integrated transponders (PIT tags) to monitor burrow emergence with the aid of continuously-running, stationary PIT tag readers ("toad totes"). We monitored the activity of individual toads by placing circular antennae directly over burrows of PIT tag-implanted individuals. In the spring, summer, and fall of 2009-2011, eighteen toads were monitored from 1 to 84 consecutive nights. Our results indicate that, on average, toads emerged on 50% of nights they were monitored. Logistic regression models revealed that spadefoot emergence nights were warmer and more humid than non-emergence nights. Toads were also found to be much more likely to emerge on a given night if they had emerged the night before.

Wednesday, July 18 12:30 Assessing Conservation Success: People, Wildlife, And Parks In The Albertine Rift

Ryan, Sadie* , *SUNY College Of Environmental Science And Forestry* , **Hartter, Joel**, *University Of New Hampshire*

Africa's Albertine Rift is an area of extremely high endemic biodiversity, and classed as a world conservation priority. However, it is essentially a chain of protected forest areas in a matrix of intensive smallholder agriculture and dense human settlements. While landscapes outside parks contain considerable biodiversity, they also have rapidly growing human populations and agricultural development. Kibale National Park, our study area in western Uganda, is an island of the only remaining large area of mid-altitude forest in East Africa. Emblematic of pressure on parks in Africa, it is surrounded by growing, agriculturally-dependent populations excluded from park land and resources. Combining analyses of satellite imagery with household surveys of two agricultural areas neighboring Kibale, we examine multi-scalar landscape change and diminishing resources in the context of population increase, potential climate change, adaptation, and conservation. Park boundaries have remained relatively intact, but land conversion to for agriculture in response to land and resource scarcity has resulted in increased fragmentation of the surrounding landscape over the past 30 years. Unprotected forest fragments are shrinking, becoming more isolated, and suffering decreased productivity. Quantifying landscape responses to local-scale anthropogenic change (agricultural conversion) is essential to developing frameworks of complex islandized park landscape interactions.

Monday, July 16 Effect Of Land Use And Land Cover Change On The Distribution Range Of Birds In The Sierra Madre Oriental, México
Sahagun Sanchez, Francisco Javier*, *Universidad Autónoma De San Luis Potosí - Pmpca* , **Reyes Hernández, Humberto**, *Universidad Autónoma De San Luis Potosí* , **Flores Flores, José Luis**, *Instituto De Investigación De Zonas Desérticas - Universidad Autónoma De San Luis Potosí* , **Chapa Vargas, Leonardo**, *IPICYT*
We analyzed the potential impact of land use and land cover change processes on distribution ranges of birds in the portion of the Sierra Madre Oriental corresponding to the Mexican state of San Luis Potosi. This region is considered an important site for conservation of biodiversity, due to the high concentration of species and the variety of ecosystems present. We developed a spatio-temporal analysis of satellite imagery for 1989 and 2005 with cellular automata software and determined the rates of change and scenarios of change in land use and land cover. Then were modeled potential distribution of ecological niches for 37 endemic birds and 33 birds under conservation concern with the software GARP. Finally, we identified the areas for distribution range potentially affected. The yearly rate of land use and land cover change is between 0.2% and 1.7%, with an accelerated loss of oak forests and rainforests, resulting in potential loss of about 45,330 ha of land cover types which contain priority habitat for bird conservation in the region. We also found a lack of correspondence between priority habitat and the areas designated for conservation. This information is valuable for the development of management guidelines for bird conservation in the region. Keywords: Land use change, Sierra Madre Oriental, Distribution Modeling, Cellular automata, Garp.

Wednesday, July 18 4:00 Performance Measures Systems For Federal And State Agency Conservation Work
Salafsky, Nick*, *Foundations Of Success*
Federal and State/Provincial government agencies play a critical role in the conservation of North American biodiversity and natural resources. In this era of ever-increasing budget scrutiny, it is imperative that these agencies be able to demonstrate credible short-term performance to decision makers and the public, while taking conservation actions that may require years or decades before they are fully implemented. The Open Standards for the Practice of Conservation are a series of best-practice science-based standards for designing, managing, monitoring, and learning from conservation work originally developed by conservation organizations to manage their specific projects. In recent years, however, we have made major strides in applying these standards to the development of performance management systems for the conservation work of government agencies such as the US Fish and Wildlife Service, State Wildlife Agencies, the US Department of Agriculture, Environment Canada, and the Puget Sound Partnership. In this presentation, I provide several case studies and share key lessons that have emerged from this work, such as the need to distinguish between status and effectiveness measures, the utility of results chains for laying out short and long-term theories of change, the advantages of being able to “follow the money” in assessing effectiveness, and the need to integrate performance measures with routine business processes and established data collection systems.

Monday, July 16 12:30 Assessing Demographic Impacts Of Climate Change On Tidal Marsh Birds: Population Modeling And Viability Analysis Tools
Salas, Leonardo*, *PRBO Conservation Science* , **Nur, Nadav** , **Veloz, Sam** , **Wood, Julian**, *PRBO Conservation Science* , **Liu, Len** , **Ballard, Grant**, *PRBO Conservation Science*
Tidal marsh habitat is at high risk of severe loss and degradation as a result of human uses, sea-level rise, changes in salinity, and more frequent and extreme storms projected by climate models. To

provide management guidance to reduce species' vulnerability and recover depleted populations, we developed interactive population dynamic models for four key marsh species: Black Rail, Clapper Rail, Common Yellowthroat, and Song Sparrow. The models can be used to assess known and potential risks, and to evaluate the efficacy of proposed management actions to counteract threats to long-term viability. For example, a 5% change in Black Rail juvenile survival alters growth rates by 2.5%. For tidal marsh Song Sparrows, detailed demographic information enabled us to develop a stochastic model to project the effects of changes in temperature, precipitation and tides on future population viability. Extreme high tides were the most significant factor threatening long-term viability of Song Sparrows. However, short-term management actions can effectively arrest and even reverse anticipated declines due to sea-level rise and high tides. Our findings show that increasing nest survival through reduction of nest predation is an effective option for managers to help tidal marsh birds to adapt to climate change, and that, more generally, management actions targeting specific threats identified through demographic models will reduce the impacts of climate change on wildlife populations.

Monday, July 16 Reconstructing The Conservation History Of The San Francisco Bay Area Over The Last 80 Years

Santos, Maria[*], *Stanford University* , **Thorne, James**, *Information Center For The Environment, University Of California Davis* , **Frank, Zephyr**, *Stanford University* , **Christensen, Jon**, *Bill Lane Center For The American West, Stanford University*

We are in a challenging era for conservation, wherein exceptionally rapid human-caused changes in climate and habitats threaten the persistence of biodiversity. Learning from conservation history can help us strategically define future conservation goals. Conservation history describes the process through which current day conservation came to place. Documenting this process entails a spatial and temporal depiction of historical conservation activities, implementation, and achievements. Using historical (1930-1940's) and current (2006-2008) land cover maps, we conducted a change detection analysis to assess the amount and locations of change in the San Francisco Bay Area region. In the overlapping area of the historical and current land cover maps (8800km2), 85% has changed over the last 80 years. Of the historical extent, grasslands and urban areas were the land cover classes that transitioned the least, and oak woodlands and agriculture transitioned the most. The greatest transition went into urban areas (from 386km2 to 2144km2), and greatest loss from agriculture (3205 km2 to 515 km2). Using the map of Open Space areas, we linked the chronology of protection, conservation targets, with historical landmarks. Since 1850, 3723 Open Space properties have been "acquired" (2960 km2) in the overlapping area of the historical map. To date we have been able to track the acquisition dates of 1737 of these properties (2116 km2; ca. 70% area). Of those Open space areas with acquisition dates, we observe that the greatest boom of acquisition occurred after 1960, with 1575km2 after 1960 and 541km2 before 1960. This matches the funds provided by the 1955 funding for State Park acquisition, and some of the funds of the 1945 Omnibus Parks Acquisition Act (to acquire coastal areas). There was high variability on which land cover classes were protected and when. After 1960, there was a major increase in agricultural lands, grasslands and redwood forests (after an initial effort in 1920's) in Open Space properties. We expect that the completion of the acquisition dates of Open Space areas will further our understanding of the history of the region's protected network.

Monday, July 16 Measuring Incidence Of Ground-Nesting Native Bees Using Emergence Traps

Sardinas, Hillary[*], *Uc Berkeley* , **Kremen, Claire**, *ESPM, UC Berkeley*

Native bees are integral to ecosystem functioning and provide critical pollination services to agriculture. However, native bees are predominantly solitary ground-nesters, and the edaphic factors that enhance or limit bee nesting have been understudied because many nests are cryptic. Thus, the factors that induce different species to nest in specific locations remain relatively unknown. Using a novel technique, emergence traps, we assessed ground nest occurrence and examined correlation to soil characteristics. We also compared the difference between the floral visitors and nesting bee community within the site. Our trap technique had high success rate (85%) but only collected a portion of the native bee community present. We did not discern any differences in soil type or structure among nesting sites. Nevertheless, this is a promising technique that could enhance assessments of native bee occurrence and resource use, as well as benefit restoration and conservation efforts.

Monday, July 16 Does It Pay To Be "Green?" Exploring The Relationship Between Sustainability And Profitability In Fortune 500 Companies

Saunders, Martin[*], *Santa Clara University* , **Matzek, Virginia**, *Santa Clara University* , **Kareiva, Peter**

The collection and publication of environmental performance data is a growing trend in corporate sustainability reporting, providing researchers with a new avenue to pursue a concrete answer to a controversial question: “Does it pay to be green?” Where most previous work in this area has used third party ratings to gauge sustainability performance, the work presented here uses “hard,” self-reported environmental performance data to examine the relationship between environmental performance and profitability. Using the 2011 Fortune 500 ratings, we created a database consisting of the 10 highest-ranking companies in each of 13 industry groups, and populated it with sustainability and profitability data taken from the firms’ 2005-2011 annual reports. We used the following metrics for environmental performance, when available: GHG emissions; NOx, SOx, and VOC emissions; toxic releases; energy consumption; and water consumption. To control for firm size, we standardized sustainability data by the firm’s number of employees. For profitability, we used the return on equity, a measure relatively independent of firm size and comparable across firms within the same industry. Preliminary results varied widely across industries and emission types, with both positive and negative correlations between profitability and good environmental performance. In general, correlations were weak and environmental performance, as defined here, appeared to have little relationship to profitability.

Tuesday, July 17 4:00 Demographic Connectivity For Grizzly And Black Bear Populations At Wildlife Crossing Structures In Banff National Park.

Sawaya, Michael[*], *Montana State University* , **Clevenger, Anthony**, *WTI-MSU*

Wildlife crossing structures are one solution to mitigating the fragmentation of wildlife populations caused by roads, but their ability to provide demographic connectivity has only been superficially evaluated. In April 2006, we initiated a three-year investigation to determine how crossing structures provide connectivity for grizzly (Ursus arctos) and black bears (U. americanus) in the Bow Valley of Banff National Park, Alberta. We used multiple noninvasive hair collection methods to sample the grizzly and black bear populations around the Bow Valley. Our main objectives were to: 1) determine the number of individual male and female grizzly and black bears using wildlife crossings structures, 2) examine the spatial and temporal patterns of individual bear crossings, and 3) estimate the proportions of grizzly and black

bear populations in the Bow Valley using wildlife crossing structures. We identified a total of 15 grizzly (7 F and 8 M) and 17 black bears (8 F and 9 M) using crossing structures. The number of individuals detected at the structures was highly correlated with the number of passages in space and time. Grizzly bears showed strong preference for more open crossing structure types (i.e. overpasses and open-span underpasses). Peak use for both bear species occurred in July when high rates of foraging activity coincide with mating season. We detected considerable proportions of grizzly (15.1% in 2006 and 19.7% in 2008) and black bear (18.5% in 2006 and 10.6% in 2008) populations using crossing structures. We conclude that wildlife crossing structures provide demographic connectivity for grizzly and black bear populations in Banff National Park.

Tuesday, July 17 8:30 Mule Deer And Gas Development: Lessons For Evaluating And Mitigating Impacts To Migratory Ungulates
Sawyer, Hall[*], *Western Ecosystems Technology, Inc.* , **Kauffman, Matthew**, *Usgs, Wyoming Cooperative Fish And Wildlife Research Unit*
Increasing levels of energy development across western North America have created a variety of concerns for agencies tasked with managing migratory ungulates. Of particular concern is how ungulates respond to development in critical habitats, specifically winter range and migration routes. Here, we illustrate how these concerns have been examined with GPS-collared mule deer and before-after impact studies associated with gas development in Wyoming. Our results show that when winter ranges are converted into producing gas fields, direct and indirect habitat losses reduce the amount of habitat available to mule deer. In a 10-year period, mule deer avoided well pads and roads, never acclimated to the infrastructure, and abundance declined by approximately 50%. Our results further suggest that although mitigation measures (e.g., directional drilling, liquid gathering systems) may reduce direct and indirect habitat loss, they do not eliminate them. Indeed, we should expect winter ranges to support fewer animals once they become developed. It is less clear, however, what influence energy development has when it overlaps with migration routes. Because our understanding of how energy development and other potential barriers affect migratory behavior is poor, we show how migration routes can be identified and prioritized to minimize potential impacts. We discuss how the functional attributes of a migration route (e.g., stopover sites vs. movement corridors) can provide a powerful planning tool that allows managers to better evaluate the consequences of energy development in migration routes.

Monday, July 16 12:00 The Malpai Contingency: How Private Land Conservation Easements Can Improve Public Land Management
Sayre, Nathan[*], *Department Of Geography*
The western US is characterized by a mosaic of federal, state, tribal, county and private landownership, with private lands typically encompassing the areas of greater water availability, better soils, and higher biological productivity. Private lands are critical to conservation of biological diversity in the region, but they are also the most vulnerable to land-use conversion and development. To address this threat, public entities and private land trusts have made huge investments in conservation easements, which permanently restrict development on private lands while allowing other uses to continue. Easements can only be secured with the willing consent of private landowners, however, and ranchers who depend on leased public rangelands for forage are often reluctant to relinquish their private land development rights, for fear that they may someday lose their public grazing privileges. One land trust, the Malpai Borderlands Group, has resolved this conundrum by including a contingency clause in their conservation easements that allows for the easements to be extinguished in the event that

grazing leases are lost through no fault of the rancher. This would appear to weaken the easements' effectiveness, but our research indicates the opposite. The easements improve agency-landowner relations, and the contingency creates two-way leverage, raising the bar for both private landowners and public agencies to ensure that management achieves conservation objectives across the mosaic of landownership types.

Wednesday, July 18 9:30 Largescale Conservation: Issues Of Public-Private Collaboration, Science, And Governance

Scarlett, Lynn*, *Resources For The Future*

Public and private-sector partners are coalescing to deliver landscape-scale conservation. Several themes test the capacities of these collaborative endeavors. Relevant science is often complex and uncertain, and problem-solving also requires the knowledge of local experience that is imperative for effective action. Collaborative endeavors also need measures and metrics at relevant scales. Perhaps most challenging is the need for governance frameworks that sustant processes and decision structures to coordinate knowledge building and cooperative action. Five characteristics are important to sustaining structures and networks through which partners can pursue landscape-scale conservation. These include mechanisms for accountability and resilience; participant inclusivity; conditions that facilitate ongoing learning to identify information gaps, generate relevant knowledge, and adjust actions; and a policy context in which regulatory and other policy tools support coordinated action. Key questions include: How can the "governing" whole maintain collaboration which affirming the distinct identities of participants? How can participants strengthen linkages among initiatives? I will examine several emerging organizational options along a continuum of very formal structures to more informal networking of participants and explore their relevance to Landscape Conservation Cooperatives.

Monday, July 16 4:20 Protecting The Ecological Stage: Applying And Testing A Land-Facet-Based Approach To Conservation Planning In A Changing Climate

Schloss, Carrie*, *University Of Washington* , **Lawler, Joshua**, *University Of Washington* , **Mcguire, Jenny**, *University Of Washington* , **Michalak, Julia**

Conservation planning efforts typically focus on prioritizing areas that will protect current biodiversity. However, extensive shifts in species distributions have been observed in the past and are anticipated to accompany climatic changes in the near future. Therefore, reserves planned to protect today's biodiversity may fail to protect biodiversity in the future as species' ranges shift and communities are reshuffled. Abiotic features, such as soil, topography, and geology, largely determine the distribution of biodiversity, but will remain stable in a changing climate. Conservation planning that focuses on abiotic features will likely protect both today's biodiversity and biodiversity in the future. Here we identify unique combinations of abiotic diversity, or land facets, across 14 diverse ecoregions in the western United States. We then identify priority regions for conservation based on these facets. To assess the potential utility of the facet-based planning approach, we investigate the influence of methodological decisions and data choices on both facet designation and on subsequent conservation prioritization as well as test the ability of areas selected to protect land facets to capture today's biodiversity. We conclude that although different methodological approaches and data choices can have profound effects on facet designation, the impacts on conservation planning will likely vary by ecoregion.

Tuesday, July 17 12:15 Changing Responses To Physical Forcing In A Marine Ecosystem: A Tale Of Two Seabirds

Schmidt, Annie*, *University Of California, Davis* , **Botsford, Louis W.**, *University Of California, Davis* , **Eadie, John M.**, *University Of California, Davis* , **Bradley, Russell**, *PRBO Conservation Science* , **Jahncke, Jaime**

In the central California Current, annual productivity is primarily determined by the wind-driven upwelling of nutrients. In this bottom-up system, we expect parallel trends in productivity across trophic levels. For this study, we utilized 41 years of data from the Farallon Islands to examine recent contrasting trends in productivity between two seabird species at different trophic levels: the piscivorous Brandt's Cormorant (Phalacrocorax penicillatus), and Cassin's Auklet (Ptychoramphus aleuticus), a zooplanktivore. We often assume that a species' relationship to the environment is stable through time. Here, we test the hypothesis that contrasting productivity trends for these two species are linked to changes in how each species responds to the environment. We used a sliding correlation analysis with a 10-year window to examine how ocean conditions (measured locally and basin-wide) influence productivity of each seabird species and how these relationships change over time. We found that both species initially responded strongly to El Niño variability. In the last 15 years, Cassin's Auklet response to El Niño weakened while at the same time, the correlation to the North Pacific Gyre Oscillation (NPGO) strengthened. This occurred at about the same time that productivity of the two species began to diverge. Understanding what causes the physical drivers of productivity to change will be critical for population modeling and predicting the consequences of climate change.

Tuesday, July 17 11:00 Old Law- New Science: Use Of DFG Code 5937 To Restore Flows And Fish To The San Joaquin River

Schmitt, Monty*, *Natural Resources Defense Council*

Monty Schmitt, Senior Scientist, Natural Resources Defense Council. Monty will talk about the underlying scientific issues of using the Department of Fish and Game Code Section 5937 to increase flows to restore and benefit fish on the San Joaquin River and on other rivers in California. In 2006, the San Joaquin River Restoration Settlement agreement between conservation groups, farmers and the federal government transformed one of the West's longest water battles into one of the largest salmon and river restoration projects in the nation. Under the agreement, the San Joaquin River Restoration Program was created to restore over 300,000 acre feet of water on average to the river and to reintroduce the extirpated Chinook salmon runs in 2012. The primary claim of the lawsuit that was originally filed in 1988 was a failure of the Bureau of Reclamation to operate Friant Dam in compliance with California Department of Fish and Game Code Section 5937 that states: "The owner of any dam shall …. allow sufficient water to pass over, around, or through the dam, to keep in good condition any fish that may be planted or exist below the dam." This talk will examine the scientific issues that were important in the litigation and to the settlement agreement and the implications for applying S.5937 to other dams in California.

Monday, July 16 3:00 A Framework For Integrating Climate Adaptation And Landscape Conservation Planning

Schmitz, Oswald*, *Yale School Of Forestry And Environmental Studies* , **Trainor, Anne**, *Yale University*

Global changes in climate are projected to drastically alter the spatial distribution, structure, and function of species, communities, and ecosystems. In order to allow biodiversity to adapt to a changing climate, conservation planners are assigned the difficult task of identifying important conservation targets. Our goal was to develop a strategic framework that highlights, through a

critical evaluation process, how and when the different current approaches to geospatial habitat conservation planning may be applied and integrated to enhance decision?making to enhance the effectiveness of policy decisions related to wildlife (terrestrial and aquatic species) habitat conservation, climate change adaptation and compatible land use. The framework was created by a diverse panel comprised of 13 leaders from government agencies, academia, for-profit and non-profit groups. The panel provided a matrix with six major adaption objectives (e.g., protect current and future patterns of biodiversity and maintain ecological processes and connectivity) and three ecological levels (e.g., landscape, ecosystem, and species/populations) to encourage practitioners to employ various approaches to conservation with global changes. The Framework also provides insight into the types, formats and sources of geospatially referenced wildlife, habitat, climate, and land?use data that are available to support decision?making. This presentation illustrates the Framework's value in anticipating changes in wildlife and landscapes over time; and to how the maps based on geospatial analyses can be used to support decisions. This Framework provides systematic and comprehensive guidance for practitioners to identify and conserve biodiversity, ecosystems, and landscapes vulnerable to global climate change.

Monday, July 16 4:45 Assessing Climate Change Vulnerability For Southern Sierra Nevada Ecosystems

Schwartz, Mark[*], *University Of California At Davis* , **Nydick, Koren**, *Sequoia & Kings Canyon National Parks* , **Thorne, James**, *Information Center For The Environment, University Of California Davis* , **Holguin, Andrew**

Federal public lands are mandated to engage in climate change adaptation under the looming threat of climate change. For the southern Sierra Nevada, this poses significant challenges because of: (a) both wetter and drier futures projected from different climate models; (b) the ecological importance of precipitation form (snow versus rain); (c) the important role of fire as a driver of ecosystem change; and (d) the uncertainty associated with inter-annual variability in climate. Faced with these issues, we identified a process to assess the likelihood that different vegetation types would become exposed to change under future climates at three time periods (2010-2040; 2040-2070, 2070-2100) under different climate projections and different downscales of current climate. We identified portions of the landscape as exposed to change under rules of locations projected to fall outside, or in marginal zones of current locations for each vegetation type. This expression of exposure is overlain to projected fire likelihoods and the likelihood of high fire intensity to gain an overarching model of climate change vulnerability. This vulnerability assessment is then linked to management strategies for wildfire and prescribed fire management.

Monday, July 16 12:30 America'S Conservation Landscape 2076: Where,What, Who?

Scott, Michael[*]

America's Conservation Landscape 2076: Where, what who? J. Michael Scott University Distinguished Professor, University of Idaho Moscow Idaho 838944-1141 Increased losses of habitat as a result of increasing land use and environmental changes have placed increasing pressure on this nation's biodiversity. We lack a system of natural areas that represents the full range of biological and ecological diversity in the United States. Calls for a representative system of biological reserves in the United States dates back to an 1917 request from the National Research Council to the Ecological Society of America to prepare a listing of all preserved and preservable areas in the North America in which natural conditions persist" and "to urge the reservation of such areas as demanded immediate attention" Today more than 100 years after the establishment of Pelican Island, our first National wildlife refuge

and 95 years after the call for a representative system of conservation areas the current Protected Areas System of the United states is not representative of the nation's, geophysical or ecological variation. I will discuss gaps in America's current conservation landscape, consequences of those gaps and identify opportunities for filling them.

Tuesday, July 17 8:45 Knowledge And Attitudes About Bats And How Outreach Can Be Used To Increase Awareness And Propel Our Ecological Understanding Of Bats

Sewald, Jessica* , **Root, Karen**, *Bowling Green State University*

Despite their significant contributions to ecosystems throughout the world, bats continue to face numerous anthropogenic pressures, many that are potentially caused by negative perceptions and misinformation. We developed a 5 point Likert scale survey that measured knowledge of and attitudes towards bats to better understand this relationship and the gaps in knowledge. A baseline survey was administered to homeowners within the Oak Openings Region of Northwest Ohio, college students, and participants of classes at local organizations. A strong and positive link was found between knowledge and attitudes across all groups. When possible a follow-up survey was also administered after exposure to educational classes; this exposure resulted in a positive increase in knowledge and attitudes. In 2011 citizen science volunteers participated in data collection of bat presence using Anabat acoustic monitors. These volunteers had the largest gains in positive attitudes. To also demonstrate the value of these volunteer-collected data for ecological understanding, we used these data to test models of bat presence previously developed for protected areas within the region. This provided an independent set of data to test the model, and once tested, we found that they were successful at predicting the occurrence of individual bat species. Citizen science collected data can and should be used to help increase human awareness and ecological understanding.

Monday, July 16 9:45 The National Fish, Wildlife, And Plants Climate Adaptation Strategy: Implications For Land And Water Protection And Stewardship

Shaffer, Mark* , *U.S. Fish And Wildlife Service*

As the climate continues to change, biological systems will respond and the relative conservation value of current or planed protected areas may change. These changes will impact not only protected area designation, but also the stewardship of exisiing and future areas. Although biodiversity conservation in the United States has not relied solely on a "fortress" approach for some time, dealing with the anticipated impacts of climate change will highlight and underscore just how creative and fleixible our land and water protection and stewardship programs will need to be. The National Fish, Wildlife, and Plants Climate Adaptation Strategy is the first joint effort of federal, state and tribal governments to look ahead at the climate change challenge and begin to outline what needs to be done to safeguard biodiversity. The implications of the Strategy for land and water protection and stewardship will be discussed.

Tuesday, July 17 11:45 The Sea Level Rise and Coastal Flooding Impacts Viewer: a national tool for assessing the impacts of sea level rise on coastal resources

Shaughnessy, Gwen* , *I.M. Systems Group For NOAA Coastal Services Center*

Developed by NOAA's Coastal Services Center (CSC), the Sea Level Rise and Coastal Flooding Impacts Viewer allows coastal communities to visualize potential impacts from sea level rise. A slider bar is used to show inland extent and relative depth of inundation from 0 to 6 feet above mean higher high water (MHHW). Areas of inundation

that are shown include those that are hydrologically connected (according to the digital elevation model used) and low-lying areas that are considered hydrologically “unconnected” areas but may flood. Visualizations and the accompanying data and information displayed in this tool include sea level rise inundation, uncertainty, flood frequency, marsh impacts, and socioeconomics. The tool is being introduced to each region of the U.S. as high quality elevation data becomes available and will encompass the entire contiguous U.S. coast by 2013. The tool can be accessed from NOAA CSC's Digital Coast website (http://www.csc.noaa.gov/digitalcoast/).

Tuesday, July 17 11:30 Assessing Vulnerabilities Using The Roadmap For Adapting To Coastal Risk
Shaughnessy, Gwen*, *I.M. Systems Group For NOAA Coastal Services Center*
Coastal communities throughout the U.S. are struggling to understand how climate change will impact existing hazards, and in some cases create new ones, for their people, public infrastructure and natural resources. The Roadmap for Adapting to Coastal Risk is a training developed by the National Oceanic and Atmospheric Administration Coastal Services Center that provides communities a customizable and participatory approach for assessing hazard and climate change threats and impacts. This approach is designed to help communities characterize their vulnerabilities and assess how existing planning and policy efforts can incorporate vulnerability issues. During the training, participants learn the steps involved in this process and receive guidance on how spatial data, information, participatory processes and lessons learned working with communities can be helpful in their assessment. A case study of how a community is using the information and relationships forged through a Roadmap workshop will be presented.

Tuesday, July 17 9:30 Adaptation And Mitigation : An Risk Management Assessment For Ecosystems
Shaw, Rebecca*, *Environmental Defense Fund*
The longer we delay significant greenhouse gas emissions reductions, the more likely we are to face irreversible impacts to climate change and the more likely we will be forced to make much costly investments in human and natural system adaptation. Carbon sinks are disappearing as they become saturated with CO2 and as changes in the temperature decrease carbon storage capacity in critical ecosystems. In the absence of mitigation efforts, the effects of climate change would reach such a magnitude as to make adaptation impossible for some natural systems. While estimated mitigation cost would cost a mere 1 percent of GDP, the cost of adapting to unabated climate change could reach 20 percent of GDP of higher. Adaptation and mitigation can be viewed as two competing responses, with tradeoffs between the two. Responding effectively to climate change requires an iterative risk management process that includes both mitigation and adaptation and takes into account actual and avoided climate change impacts, benefits, and risks. Risk management can facilitate a diverse array of sectoral, regional and temporal analysis of trade-offs, but its application requires information from impacts resulting from the most likely climate scenarios and impacts arising from lower-probability but higher-consequence events. In this discussion, we will discuss the science of risk management as it pertains to the trade-offs in mitigation and adaptation and its relevance for ecosystem and biodiversity adaptation.

Monday, July 16 3:00 A Conservation Ethic For The Anthropocene
Shellenberger, Michael*, *Breakthrough Institute* , **Nordhaus, Ted**, *Breakthrough Institute*
We live in a new era - the "age of humans," or the Anthropocene. Today, almost every corner of the world is shaped by human activities. Pristine nature

or wilderness is therefore largely a thing of the distant past. As developing nations forge ahead on a path towards modernization and world population approaches 10 billion, only protecting patches of nature from human disturbance – closing them off in protected areas – is a losing proposition. A new paradigm is needed, one that embraces development and modernization instead of opposing it; emphasizes possibilities, not limits; and rejects apocalyptic narratives of ecological collapse. Only by engaging with the larger economic, social and political forces that ultimately shape the planet and its biosphere can conservation remain relevant. For example, urbanization not only raises human welfare, it also takes pressure off rural areas and lets nature grow back. Intensive agriculture spares land for habitats and species. And technology can allow us to do more with a smaller footprint. Only thus can we achieve a future where all the world's inhabitants enjoy secure, free, prosperous, and fulfilling lives on an ecologically vibrant planet.

Tuesday, July 17 8:45 A Multi-Scale Analysis To Identify Strategic Locations For Mitigating Barrier Effects Of Roads In An Urban Context

Shrestha, Namrata[*], *Toronto And Region Conservation* , **Tam, Jason**, *Toronto And Region Conservation* , **Gaetz, Noah**, *Toronto And Region Conservation*

The ecological effects of roads range from direct and visible impacts such as road mortality to indirect effects such as increased barrier effects that affect long term population viability of wildlife. Despite widespread recognition of the adverse impacts of roads, they continue to expand, especially in urban and urbanizing areas. Recognizing that the socio-economic and political pressure in highly urban area will continue to expand roads regardless of the ecological understanding, this study aims to facilitate transportation decision making process by identifying strategic locations where mitigation can be placed to minimize the barrier effects of road. This study used spring peeper (Pseudacris crucifer) as a case study to represent small anurans in wetland-forest guild in a highly urbanized area of the Region of Peel (Ontario). The strategic areas for mitigating barrier effects were evaluated at two levels to capture migration and dispersal movements. At a local level, road mortality hotspot analysis was conducted using distance based GIS techniques, which identified with highest likelihood of road mortality during migration. At a regional level, a circuit theoretic approach was used to quantify the probabilities of movement across the landscape that identified bottleneck locations for dispersal movement. The results from the two levels of analysis were validated using the empirical data on spring peeper presence and road mortality survey. The comparison of the two levels of analysis indicate that though strategic locations for mitigation do overlap between migration and dispersal movement in many areas, conducting only local level analysis such as road mortality hotspot analysis, often fails to capture the broader landscape connectivity bottleneck locations crucial for dispersal, which are rare but important movement type for long term viability of the species.

Monday, July 16 11:50 The Politics Of Renewable Energy In The Mojave Desert

Silliman, Sidney[*], *California State Polytechnic University, Pomona*

The deployment of renewable energy projects in the Mojave Desert reflects the decision of state and national officials to rely on large-scale production and long-distance transmission as the energy model for reversing climate change and to sacrifice desert species and desert ecosystems. The decision is reflected in California and federal policies that stimulated private sector investment in utility-scale energy projects and the expansion and upgrade of long-distance transmission lines. The national government facilitated access to public lands and mandated an expedited review of project applications. Political pressure from elected

officials and energy developers ensured agency implementation of key public policies. National environmental organizations responded by intervening with public agencies, commenting on environmental documents, lobbying government officials, and negotiating settlements with energy developers. These groups generally support the dominant energy model and typically seek only modifications in the deployment of energy facilities, better mitigation for impacts to flora and fauna, and planning that directs energy development to specified sections of the desert rather than the full protection of species and their habitats. Regionally-oriented, desert-focused, and smaller organizations more often advocate for conservation of desert ecosystems in conjunction with locally-generated and distributed renewable energy.

Monday, July 16 Conservation Of "Cerro Chango," Oaxaca, México

Silva-Torres, Beatriz*, *Universidad Autonoma Metropolitana* , **Gaona, Salvador**, *Universidad Autonoma Metropolitana* , **González-Ibarra, Minerva**

The community of Cerro Chango, is located on the side of the Gulf of Mexico in the north of the State of Oaxaca in México. This was declared a conservation area by the indigenous of the site, to conserve natural resources in the area in order to provide environmental services for ecotourism. The vegetation in the area is a tropical forest and has a great diversity of plant and animal. The knowledge of the available resources for the community must be part of the conservation strategies, one of the lines of research is the study of biodiversity. In this paper we present data on the diversity of birds in the area. We recorder in 2009-2010, 64 bird families with 317 species. Bird families: Accipitridae, Alaudidae, Alcedinidae, Anatidae, Anhingidae, Apodidae, Ardeidae, Bombycillidae, Caprimulgidae, Cardinalidae, Cathartidae, Certhiidae, Charadriidae, Ciconiidae, Columbidae, Corvidae, Cracidae, Cuculidae, Emberizidae, Falconidae, Fregatidae, Fringillidae, Gaviidae, Gruidae, Haematopodidae, Hirundinidae, Icteridae, Jacanidae, Laniidae, Laridae, Mimidae, Motacillidae, Odontophoridae, Paridae, Parulidae, Passeridae, Pelecanidae, Phaethontidae, Phalacrocoracidae, Phoenicopteridae, Picidae, Podicipedidae, Psittacidae, Psittacidae, Ptilogonatidae, Rallidae, Recurvirostridae, Regulidae, Remizidae, Scolopacidae, Strigidae, Strigidae, Sturnidae, Sulidae, Sylviidae, Thraupidae, Threskiornithidae, Trochilidae, Troglodytidae, Trogonidae, Turdidae, Tyrannidae, Tytonidae, Vireonidae.

Wednesday, July 18 3:00 Demographic Stochasticity Reduces The Synchronizing Effect Of Dispersal In Predator-Prey Metapopulations

Simonis, Joseph*, *Cornell University*

Classical models of metapopulations predict that dispersal strongly synchronizes subpopulation dynamics, increasing the risk that demographic stochasticity will cause metapopulation-wide extinction. However, dispersal itself is subject to demographic stochasticity, because dispersal rates are often low and subpopulations small. Yet we currently know little about the impact of demographic stochasticity on dispersal. To that end, I constructed two models of a two-patch predator-prey system: one that included demographic stochasticity (stochastic differential equations: SDE) and one that was entirely deterministic (ordinary differential equations: ODE). The ODE was the mean-field approximation of the SDE, allowing a direct comparison to determine the effect of demographic stochasticity on metapopulation dynamics. The SDE produced synchronized predator-prey dynamics only when dispersal was very high for both trophic levels. Further, high dispersal by only one trophic level in the SDE spatially decoupled the trophic interaction, reducing synchrony of the non-dispersive species. Conversely, the ODE generated tightly synchronized dynamics for both trophic levels across all dispersal rates. These results suggest that

demographic stochasticity strongly affects metapopulation dynamics by reducing the synchronizing ability of dispersal. Ironically, including demographic stochasticity a priori precluded it from causing metapopulation-wide extinctions under reasonable dispersal levels.

Monday, July 16 11:00 Climate Forced Lizard Extinctions Are Coupled To Dieback Events And Successional Change In Plants

Sinervo, Barry[*], *UCSC Department Of Ecology And Evolutionary Biology*

Climate models forecast species extinctions and distributional shifts in upcoming decades, but many predictions lack validation and thus are relatively uncertain. Sinervo et al. (Science May 2010) compared recent and historical surveys for lizards on five continents and presented a physiological model that predicted the extinctions with high accuracy (R2=0.72). We present new physiological measurements of operative model temperatures that validate the model for 3 of the original continental surveys. Furthermore, we validate the extinction model with new predictions and new extinction resurveys of several species of lizard in Europe and North America. Finally, we present new data on correlated changes in trees species that are correlated with the lizard extinctions. The tree death and branch die-back events foreshadow dramatic ecosystem level changes that will profoundly impact persistence of the lizard species of the world. Tree dieback events transiently elevate operative temperatures and thus elevate extinction risk. Furthermore, larger scale tree dieback events promote successional change that will alter species composition of lizards in those ecosystems. Any large scale alterations of the habitat such as deforestation in forest habitats or solar farms in desert habitats will alter local albedo, elevate local thermal environments and thus increase extinction risk of lizards.

Monday, July 16 9:50 Landscape Conservation In The West: Slow Progress On Policy While Practice Advances

Sisk, Thomas[*], *Northern Arizona University* , **Beier, Paul**, *Northern Arizona School Of Forestry*

In 2008, we convened a group of scholars and students to develop recommendations for landscape conservation in the American West. The group released a report on forests, water, and partnerships with Native America before the election that was presented to the Obama transition team afterward. SCB's subsequent recommendations referenced this report, emphasizing landscape connectivity. Here we revisit those recommendations and assess progress. For forested landscapes, results are mixed; we offer brief comment to complement other speakers. On western water, complex debates and ongoing negotiations largely overshadow specific actions to advance conservation. Cooperation with tribal governments has benefitted from recognition and engagement of tribal leaders and resource managers, but coordinated landscape conservation efforts remain uncommon. Yet, despite modest progress on overarching federal policies, landscape conservation has developed considerable momentum in recent years, as entrepreneurial efforts address emerging challenges outside the formal policy framework. We discuss efforts to enhance habitat connectivity through collaborative programs that engage scientists, citizens and government at multiple scales; and we examine partnerships between private landowners and public agencies that integrate conservation efforts at landscape scales. Results illustrate how local, issue-driven efforts inform and often drive overarching policy initiatives, rather than the reverse.

Wednesday, July 18 9:00 Undergraduate Research Located At The Intersection Of Marine Conservation Science And Policy

Siuda, Amy Ns[*], *Sea Education Association* , **Jensen, John**, *Sea Education Association* , **Zettler, Erik**, *Sea Education Association* , **Amaral-Zettler, Linda**, *Marine Biological Laboratory* , **Mcclennen, Caleb**, *Wildlife Conservation Society*

Divisions between science and policy impede rather than enhance progress in both disciplines and are all too common among undergraduate programs. A new semester-long program at Sea Education Association, SEA Semester: Marine Biodiversity and Conservation, challenges students to integrate scientific study of marine biodiversity with conservation planning for the high seas. During the initial discovery phase students operate as a research team to develop a conceptual framework, identifying gaps in biodiversity research and in methods used in ocean conservation. Students subsequently employ molecular and morphological techniques to measure biodiversity during a month-long transect cruise in the Sargasso Sea, also archiving samples for the global marine biodiversity effort. In the final application phase students generate science-based policy recommendations and defend these to scientists and public stakeholders. This program represents an unprecedented opportunity for undergraduates to concurrently complement leading-edge techniques in marine science research with the wisdom and skills to effectively operate within the world of public policy and tackle global-scale environmental challenges. Major elements of this curriculum are transferable to local biodiversity and conservation topics in any aquatic environment from a small pond or stream to the seashore.

Wednesday, July 18 3:45 Sex-Specific Effects Of Fragmentation From Ski Resorts On The Pacific Marten In The Lake Tahoe Region Of California

Slauson, Keith[*], *Pacific Southwest Research Station* , **Zielinski, Bill**, *Pacific Southwest Research Station*

From 2009-2011 we evaluated the effects of developed ski resorts on Pacific marten (Martes caurina) demographics using 3 pairs of ski area and adjacent control sites. Control sites were selected to match gross topographic characteristics, including elevation and macro-topography, and pre-development forest structural and compositional characteristics. To sample marten populations, we used a combination of hair snares, during the winter of 2009, and live traps, during the spring-summers of 2009-2011, deployed on systematic sample grids in each study area. Hair samples were used for individual genetic identification and live captured individuals provided individual identification, age, reproductive status (females), and body condition. Over the course of the 4 sampling periods from 2009-2011 we captured a total of 84 individual martens (54M:30F). Male martens used portions of ski resorts highly fragmented from ski run development and as a result had significantly lower apparent survival on resorts compared to controls. Females avoided the most fragmented areas of resorts and as a consequence did not have reduced apparent survival rates on ski resorts. Collectively, these effects have depressed population size by reducing the proportion of the landscape capable of supporting breeding females and increasing the proportion supporting unstable male occupancy.

Monday, July 16 Velocity Vs. Persistence: Contrasting Climate Change Velocity, Species' Persistence, And Future Projections Of The Ranges Of Threatened Species

Smith, Adam[*], *Missouri Botanical Garden* , **Long, Quinn**, *Missouri Botanical Garden* , **Albrecht, Matthew**, *Missouri Botanical Garden*

Though species can track their climatic niche by shifting their distributions in response to climate change, others may be able to persist in currently occupied locales. Here we investigate the relative pressure to migrate vs. the ability to persist in situ for 65 at-risk plant species in the Ozark and Ouachita Highlands and Tennessee’s Great Basin.

First, we develop ensemble species distribution models using techniques particular to rare species with few records. We then project these models to periods centered on the years 2020, 2050, and 2080 under the A2 emissions scenario using two general circulation models. Finally, we overlay two "template" maps to each species' projections to determine a) areas of greatest climatically-driven migratory pressure and b) areas of long-term persistence. Migratory pressure is estimated from climate change velocity, which indicates the distance a species would have to move over a given time to track its climatic niche, and potential persistence for a site is estimated from the temporal rate of change of environmental suitability from species distribution models. The intersection of each species' projection maps, migratory pressure map, and persistence maps demonstrates that while some areas may experience high migratory pressure, they may nonetheless remain favorable, at least in the near term. Our study also raises ethical and logistical questions about assisting migration of species into biogeographic realms in which they did not evolve and for what "future" (2020, 2050, 2080) plans for assisted migration should be developed.

Monday, July 16 4:30 Long-Term Dynamics Of An American Pika Metapopulation ? Resilience At The Population And Individual Levels

Smith, Andrew*, *Arizona State University* , **Nagy, John**, *Scottsdale Community College*

Metapopulation dynamics of the American pika (Ochotona princeps) have been investigated at Bodie, California, since 1972, including nearly annual censuses since 1989. The pikas at Bodie occupy anthropogenic ore dumps across a landscape of Great Basin sagebrush habitat. Annual frequencies of extinction of populations on patches and recolonization of vacant patches varied among years, although they have been nearly equivalent summed over years since 1989 (115 extinctions; 110 recolonizations). There are no obvious trends between available climate data and prevalence of extinctions or recolonizations among years. Percent patch occupancy ranged from 55-59% in early censuses (1972, 1978). Between 1989 and 1991 the southern constellation of patches collapsed and has not recovered. The northern constellation of patches (1-2 km north) has maintained a high occupancy rate (49-88%), and the percent occupancy in 2009 (84%) mirrored that of the original census in 1972 (83%). Metapopulation dynamics at Bodie is driven by frequent extinctions of populations on small habitat patches coupled with low recolonization rates due to decreased vagility of pikas at this low, hot location. A warming climate does not appear to be responsible for any change in patch extinction rate, but it may contribute to the inability of pikas to recolonize the southern constellation of patches.

Tuesday, July 17 11:30 Protecting Native Landscapes With Dogged Determination: A New Model Of Detection Dog Surveys As A Noxious Weed Eradication Tool.

Smith, Deborah*, *Working Dogs For Conservation* , **Goodwin, Kim**, *Montana State University* , **Marler, Marilyn**, *University Of Montana* , **Guscio, Dalit**, *Working Dogs For Conservation* , **Heide, Maggie**, *Working Dogs For Conservation* , **Tirmenstein, Deb**, *Working Dogs For Conservation* , **Hurt, Aimee**, *Working Dogs For Conservation*

Invasive weeds are a serious problem facing conservation managers today, given their ability to rapidly spread and out-compete native plant communities that are stressed due to climate change and other factors. In 2011, we investigated the capabilities of conservation detection dogs in a five year effort to find and eradicate the highly invasive weed, Dyer's woad (Isatis tinctoria) from Mount Sentinel in Missoula, Montana. From June to October, two trained dogs were deployed in a systematic, 5-meter transect grid search to detect plants on a 200 acre affected area. During the season, teams located 388 plants in 132 locations. Mapping revealed these were clustered in approximately 17 patches. Early in the season

when surrounding vegetation was short and many large plants were located, dogs and handlers contributed evenly to locating plants. Later in the season, dogs out-performed their handlers in woad detection, locating 85% of woads in August and October and 97% in September. Dogs led to the discovery that new woads sprouted from remnant roots left from hand-removed plants, indicating that more extensive root removal is necessary. Based on this first year's efforts, conservation dogs can improve levels of eradication, and increase frequency, coverage and efficacy of weed removal.

Monday, July 16 Patterns Of Selective Caching Behavior Of A Generalist Herbivore, The American Pika (Ochotona princeps)

Smith, Justine[*], *University Of California, Santa Cruz* , **Erb, Liesl P**, *University Of Colorado At Boulder*

The impact of climate on the American pika (Ochotona princeps) is currently being investigated in light of recent population extirpations. While recent studies have focused on patterns of population persistence, there is a lack of information on mechanisms that drive declines. Among possible mechanisms are pikas' behavioral responses to environmental variation. Selective foraging by pikas has been well documented throughout North America, but the results of these studies are inconsistent regarding plant characteristics that influence caching behavior. Such variation may be explained by environmental factors. To explore influences on selective caching behavior, we investigated patterns of pika selectivity at 13 sites with respect to temperature, precipitation, elevation, and latitude. We found that high summer temperatures and low available plant quality predict increased selectivity for plants with higher nutrient composition (low C:N ratios and high total N), while selectivity for plants with high water content was negatively correlated with elevation. Our data suggest that environmental variables and their interactions differentially influence the degree and nature of pika selective behavior. These results illustrate the complexity of pika caching behavior across a range of environmental conditions and forage values. In the face of changing climatic and vegetation dynamics in the alpine, such information may be critical in predicting future pika persistence.

Wednesday, July 18 12:00 Land-Use And Land-Cover Modeling For Conservation Planning

Sohl, Terry[*], *U.S. Geological Survey* , **Sleeter, Benjamin**, *U.S. Geological Survey* , **Sayler, Kristi**, *U.S. Geological Survey* , **Bouchard, Michelle**, *ARTS - Contractor To USGS* , **Reker, Ryan**, *ARTS - Contractor To USGS* , **Sleeter, Rachel**, *U.S. Geological Survey* , **Wilson, Tamara**, *U.S. Geological Survey* , **Bennett, Stacie**, *SGT- Contractor To USGS* , **Soulard, Chistopher**, *US Geological Survey*

With growing populations and an intensification of anthropogenic land uses, future land use data are required for conservation planning and to examine sustainability of land-use practices. To address conservation issues, a land-use modeling framework must have 1) a scenario framework, with multiple land-use pathways to address future uncertainties, 2) moderately high spatial, thematic, and temporal resolutions. The U.S. Geological Survey is producing scenario-based land-use and land-cover projections for the United States. Qualitative narratives and quantitative scenarios are produced for four, IPCC Special Report on Emissions Scenarios storylines (A1B, A2, B1, and B2). Scenarios are constructed in a workshop setting with stakeholder participation, with historical land-use data, coarse-scale integrated land-use models, and expert knowledge used in a spreadsheet downscaling model to produce quantitative "demand" for future land-use proportions. Regional land-use proportions for each scenario serve as input to the Forecasting Scenarios of land-use (FORE-SCE) model. FORE-SCE produces annual land-use and land-cover maps at a 250m spatial resolution for 17 thematic classes from 2006 through 2100. Land-use projections for all four scenarios will be completed for the conterminous U.S. in 2012. The open approach to

land-use modeling ensures confidence and buy-in from conservation planners and other stakeholders who participate in the modeling process.

Tuesday, July 17 3:45 Global Conservation Of Threatened Seabird Breeding Islands
Spatz, Dena*, *UC Santa Cruz* , **Croll, Donald**, *UC Santa Cruz* , **Heinz, Reina**, *UC Santa Cruz* , **Newton, Kelly**, *UC Santa Cruz* , **Tershy, Bernie**, *UCSC*
Seabirds play important functional roles in marine and terrestrial ecosystems yet 28% of species are at risk of extinction. The most significant threats to seabirds occur on breeding islands where conservation actions are feasible. To guide island-based conservation, we developed a database of all breeding islands for the 97 IUCN-listed threatened (Critically Endangered (CR), Endangered (EN) and Vulnerable (VU)) seabirds. The database contains present and historic distributions and island-threats. We found 883 threatened populations breeding on 625 islands with Procellariids comprising the largest proportion of threatened species (37%). We propose threatened seabird conservation is highly feasible because 1) colony-based threats can be mitigated for at least one population of each threatened species on only 56 islands; 2) 65% of seabird populations breed on islands controlled by relatively wealthy countries (New Zealand, UK, Chile, Australia, USA) where conservation dollars are available; 3) the most common threat to CR species are invasive species (33% of terrestrial threats), which can often be mitigated through eradication, and; 4) 70 seabird breeding islands are home to additional IUCN threatened vertebrates which are at risk from similar island-based threats and can be mitigated simultaneously. Thus, global seabird conservation aligns with the costs and priorities of other conservation issues and is a rare opportunity for relatively straightforward conservation success.

Monday, July 16 10:15 A Roadmap For Sea Level Rise Adaptation Along The Hudson River Estuary
Spector, Sacha*, *Scenic Hudson* , **Winner, Jason**, *Scenic Hudson* , **Miller, Dan**, *Hudson River National Estuarine Research Reserve* , **Blair, Betsy**, *Hudson River National Estuarine Research Reserve*
Sea level rise (SLR) is the most immediate climate change challenge to the Hudson River Estuary ecosystem, with up to 1.4m of relative SLR project by 2080. Within the projected inundation zone are over 13,000 acres of tidal wetlands and vegetated shallows, and over 5000 acres of supratidal and floodplain habitats that will likely be inundated. We conducted a vulnerability analysis that provides stakeholders with a high-resolution understanding, through both space and time, of SLR impacts on the estuary's natural habitats and built infrastructure and creates a planning framework for local and regional adaptation efforts. Along 160 miles of tidal river we 1) projected inundation and flood risk according to two SLR scenarios, with models reiterated at decadal time steps, 2) identified river stretches and sites that have important natural or built resources within or near the risk zone, and 3) classified each site according to their resiliency or vulnerability to periodic or constant inundation. We then classified sites at which natural resource conservation and infrastructure protection may proceed independently, as well as areas of potential conflict where balanced solutions must be found. Considering these conflict zones through time, and considering them within a whole-estuary context, provided different perspectives on trade-offs between shoreline hardening and habitat migration and point the way toward a range of locally-appropriate management options.

Tuesday, July 17 4:15 Addressing Climate Change In NCCP Independent Science Advisory Processes

Spencer, Wayne*

California's NCCP Act of 2003 requires Natural Community Conservation Plans to "establish a process for… independent scientific input" to ensure that plan decisions are informed by best available scientific information. I review the evolution of independent science advice concerning climate change for NCCP plans. Attention to climate change effects and adaptation measures has been fairly limited for smaller, less complex, and older NCCP plans, but more intense for larger, more complex, and more recent plans. Central themes include advice that planners closely monitor the rapidly evolving field of climate-change science; avoid simple "common sense" generalities, such as that organisms will move up and north; make reserve networks as large and interconnected as possible across broad environmental gradients and diverse land facets; and implement a robust, institutionalized, adaptive management and monitoring program. NCCP and other reserve network plans that emphasize ecological connectivity represent a necessary but not sufficient approach to sustaining ecological communities and processes during climate change. During implementation, conservation plans must remain adept at responding to monitoring results and new information emerging from climate-change effects and adaptation research.

Tuesday, July 17 4:00 Spatial And Temporal Understory Species Turnover In A California Foothill Oak Woodland

Spotswood, Erica*, *UC Berkeley* , **Bartolome, James**, *UC Berkeley* , **Allen-Diaz, Barbara**, *UC Berkeley*

California's oak dominated woodlands form complex spatial and temporal patterns on foothill landscapes. A key conservation goal is to enhance plant species diversity in the understory, often using fire and managed grazing. Better understanding of the spatial and temporal patterns of species turnover can determine efficacy of management and restoration activities and is critical to predicting the effects of disturbance and climate change. We used a continuous long term dataset of fine scale oak woodland understory vegetation composition in the Sierra Foothills Research and Extension Center collected from 1998-2008. Data were collected from the herbaceous vegetation layer in 66 permanent plots located in three watersheds across four categories of tree canopy cover. We examined spatial turnover at small and medium scales, comparing spatial to temporal turnover in understory vegetation composition using the Jaccard index of dissimilarity. Spatial patterns in vegetation structure were not consistent, with most plots showing a high and unpredictable degree of dissimilarity at small scales. However, plots showed a more consistent decline in similarity over time, with plots predictably more similar when sampled more closely in time. The high level of temporal consistency and spatial inconsistency suggest that conservation goals should be spatially explicit and management of oak woodlands will be most effective when targeted at small spatial scales. This research is critical to improving our understanding of the spatial and temporal controls on vegetation in Oak woodland habitats which have received comparatively little research attention, with most studies of this kind focusing on grasslands.

Tuesday, July 17 11:15 Results From Over 20 Years Of Rangeland Vegetation Monitoring At Point Reyes National Seashore

Steers, Robert*, *National Park Service* , **Voeller, Dylan**, *National Park Service* , **DiGregoria, John**, *National Park Service* , **DiGregoria, John**, *National Park Service*

Point Reyes National Seashore (PORE) was established in 1962. Prior to becoming a national park unit, much of the landscape was ranched for dairy and beef. The existing cattle operations were continued as leases once the land was transferred

to the National Park Service and many of the original ranches are still in operation today. In 1988, permanent vegetation monitoring plots were established on 51 rangeland sites located throughout PORE to assess vegetation status and trends. Vegetation sampling has shown that despite large differences in the environmental setting of all sampling sites, grazing practices appear to have homogenized most of the rangelands so that they differ little based on floristic composition. Over the last twenty years of monitoring, exotic cover has increased from about 70 to 80% while native cover has remained stable at around 10%. In grazed areas, certain exotic species like, Avena barbata, Brachypodium distachyon, Bromus diandrus, Holcus lanatus, and Romulea rosea var. australis, have increased over time while other exotic species like, Plantago lanceolata have decreased. Certain woody natives, like the shrub Baccharis pilularis, have increased in areas where grazing and other disturbances have ceased but have decreased slightly where grazing has persisted. These results illustrate how grazing practices can promote ruderal, exotic species and limit successional processes from taking place.

Tuesday, July 17 12:00 Marine Birds And Offshore Wind ? What Do We Know?

Steinkamp, Melanie[*], *U.S. Fish And Wildlife Service*

In the past, because of the logistical challenges associated with studies and surveys of marine birds in their pelagic habitats, most studies in the western Atlantic have focused on their breeding colonies, leaving scientists and planners with relatively little confidence in their knowledge about species use of and habitat needs within marine habitats. Various proposals to locate offshore wind energy projects along the U.S. Atlantic coast over the past few years have launched a set of new studies and surveys of marine birds in their offshore habitats. These studies and surveys will help scientists, managers, and planners better understand marine bird distribution and abundance in their marine environments, as well as the behaviors that increase their risk for impacts by wind turbines. Preliminary and final results of these studies will be described as well as gaps in the information that will be necessary to make informed decisions about siting wind energy projects and assessing the impacts of those projects.

Monday, July 16 Springs Stewardship: An Emerging Environmental Crisis In Point-Source Biocultural Diversity

Stevens, Lawrence[*] , **Ledbetter, Jeri**, *Springs Stewardship Institute* , **Springer, Abraham**, *Geology Department*

Alteration of springs ecosystems has become a global environmental crisis, warranting local, national and global conservation initiatives. Springs are ecologically important habitats that support high bio-cultural diversity and endemism, including 20 percent of USA endangered species and more than $10 billion/yr in water sales revenue. Springs are inadequately protected, poorly mapped, and insufficiently understood, and few remain ecologically intact. We developed geographic and ecological inventory and assessment tools to enhance springs stewardship, integrating existing methodologies to support collaboration, avoid duplication of effort, and encourage research. We provide a relational database to facilitate inventory data entry, archival, assessment, and landscape analysis, including georeferencing, geomorphology, soils, flora, fauna, water quality, flow, indigenous resources, human impacts, and administration. We also conduct springs ecosystem inventory, assessment, and restoration workshops for resource stewards, including professional geologists and hydrologists, federal land management agencies (e.g., the U.S. Forest Service, the National Park Service), non-governmental organizations, Native American Tribes, and interested individuals. Our website at www.springstewardship.org provides a portal to information about global springs stewardship, data collection protocols, methods for locating

unmapped springs, a manual for accessing and using the database, and articles and issues about springs ecology.

Monday, July 16 4:15 Resurveys Of Historic Pika Locations In Northern California: Summary And Critique

Stewart, Joseph[*], *California Dept. Of Fish And Game* , **Perrine, John**, *California Polytechnic State University* , **Wright, David**, *California Department Of Fish And Game* , **Massing, Cody**, *California Polytechnic State University*

We summarize recent resurveys of historic pika locations in northern California conducted by 3 separate research teams. Pika sites were deduced from historic field notes and museum specimens, and were surveyed to determine if currently occupied by pika. In the Yosemite region (2002-2005), 8 of 9 historic pika sites were occupied; extirpation at the lowest site suggested a retraction of pika's lower elevation limit. However, the 9th historic site, at the same elevation, was subsequently found to be occupied, erasing the apparent pattern of retraction. In the Lassen region (2009-10), 12 of 19 historic sites were occupied. Extirpation of a few peripheral sites drove the pattern of elevation and longitudinal contraction. In a survey centered on the Lake Tahoe region (2009-10), 15 of 17 historic sites were occupied, with the 2 abandoned sites representing the smallest talus areas resurveyed. All 3 surveys documented additional occupied pika locations in these regions, in some cases expanding the geographic or ecological range compared to the historic sites. The teams are currently examining the correlation between pika persistence and multiple environmental variables, e.g. elevation, patch size, local temperatures, and historic climate. However, differentiating stochastic metapopulation dynamics from deterministic responses to environmental change can be challenging. We will discuss the limitations of such resurveys and the implications for pika monitoring and conservation.

Monday, July 16 4:15 Acoustic Behavior Of Risso's Dolphins And Fin Whales As Part Of A Behavioral Response Study Off Southern California

Stimpert, Alison[*] , **Southall, Brandon** , **Calambokidas, John**, *Cascadia Research Collective* , **Tyack, Peter** , **Moretti, David** , **Hildebrand, John**, *Scripps Institution Of Oceanography* , **Kyburg, Christopher** , **Carlson, Rowena** , **Friedlaender, Ari** , **Falcone, Erin**, *Cascadia Research Collective* , **Schorr, Greg**, *Cascadia Research Collective* , **Douglas, Annie**, *Cascadia Research Collective* , **DeRuiter, Stacy** , **Goldbogen, Jeremy**, *Cascadia Research Collective* , **Barlow, Jay**

Marine vertebrates rely heavily on acoustics for navigation, foraging, predator evasion, and communication. Increasing anthropogenic noise in the ocean may affect the behavior and potentially the health of many marine species, in particular marine mammals. The Southern California Behavioral Response Study (SOCAL BRS) is a five-year, interdisciplinary scientific research project studying a variety of marine mammal species in biologically important areas throughout the southern California Bight. It focuses on whether and how marine mammals change their diving, foraging, or social behavior when they hear different sounds. This knowledge will help implement management strategies for noise regulation in the ocean, and will provide a better scientific basis for estimating risk and minimizing effects of active sonar for the U.S. Navy and regulatory agencies. During the first two years of the project, 101 tags have been attached to 79 individuals of 12 marine mammal species, including several that have not been previously studied using related technologies. Here we provide an overview of the project, and present data describing acoustic foraging behavior of Risso's dolphins (Grampus griseus; 8 tagged animals for a total of 35.1 hours) and sound production behavior of fin whales (Balaenoptera physalus; 7 tagged animals including over 300 calls), which are two of the priority species.

Tuesday, July 17 12:30 Estimating Time Of Divergence For Two Evolutionarily Significant Units Of A Protected Fish Species.

Stockwell, Craig* , **Heilveil, Jeffrey**, *SUNY College At Oneonta* , **Purcell, Kevin**, *North Dakota State University*

Delineating conservation units is an important task for the management and conservation of rare species. Methods for delineating conservation units often require long periods of isolation and the time of isolation for many rare taxa are often inferred from limited geological information. Such is the case for the White Sands pupfish, which consists of two native populations previously designated as the Malpais Spring and Salt Creek Evolutionarily Significant Units. The geologic record indicates these two populations were presumably isolated approximately 5000 years ago, but these populations may have actually diverged within the last few centuries, due to altered hydrology associated with over-grazing. We examined molecular diversity for these two populations using 13 microsatellite loci and applied an Approximate Bayesian Computation analysis to estimate long-term effective population size (Ne) and time of divergence. Our reference table consisted of 500,000 simulated data sets, with each record based on 14 summary statistics. The indicated time of divergence was 3000 generations (1500-3000 years) with a Ne of 842 and 1110, for Malpais Spring and Salt Creek, respectively. These findings suggest that Malpais Spring and Salt Creek were isolated for a least a few millennia, and thus warrant continued management as separate conservation units.

Tuesday, July 17 8:50 Effects Of Garlic Mustard Invasion On Arthropod Diets Using Stable Isotope Analyses

Strand, Sarah*, *Virginia Military Institute* , **Dehart, Pieter**, *Virginia Military Institute*

Invasive species have long been known to detrimentally alter native communities. Garlic mustard (Alliaria petiolata) is one invasive which displaces endemic communities by lowering levels of mycorrhizal fungi essential to native plant nutrient acquisition. Consequently, the diets of arthropods using native organisms as primary food sources may be disrupted by A. petiolata in a forest understory ecosystem. In order to measure these specific trophic disturbances in established pine forest ecosystems in Virginia, we compared ratios of stable isotopes of carbon (?13C) and nitrogen (?15N) in arthropods found in both A. petiolata-invaded and un-invaded regions. While generalist predators (order Opiliones and families Formicidae and Lycosidae) were all significantly enriched in both isotopes compared to consumers (families Noctuidae, Collembola, and Aphidoidea) in both invaded and un-invaded regions, A. petiolata significantly altered their relative consumption. Isotopic mixing models highlight enriched ?15N values of Lycosidae in invaded areas, indicating a significant increase in intraguild predation and cannibalism. These shifts are likely due to predators changing prey sources induced by A. petiolata, and provide further evidence for cascading trophic effects of invasions. This research underscores the need for examination of multiple isotope datasets to differentiate complex nutrient changes in the presence of invasive species.

Monday, July 16 3:15 Historical And Cultural Ecology To Inform Conservation Planning For A Central California Coastal Watershed: A Case Study From The Pajaro River

Striplen, Chuck* , *San Francisco Estuary Institute/Amah Mutsun Tribal Band* , **Grossinger, Robin**, *San Francisco Estuary Institute* , **Beller, Erin**, *San Francisco Estuary Institute* , **Salomon, Micha**

The Pajaro River, flowing through the counties of Santa Clara, San Benito, Santa Cruz, and Monterey, has undergone dramatic modification in the last two hundred years, including significant reduction in the ability of the upper basin to retain floodwater, reduction of important, regional wetland resources, and wholesale changes to terrestrial botanical assemblages. Planning and

conservation efforts to date have taken place in the absence of high resolution data on the historic [reference] form and function of the watershed. In order to aid land use planners in their efforts to resolve critical management issues in the upper watershed, we assembled hundreds of historical resources, synthesizing them into an analysis of the historic diversity and distribution of the area's freshwater wetlands, riparian communities, and terrestrial habitats. Our research revealed that more than 40% of the contemporary channel network was artificially constructed using new alignments; oak savannas have been diminished by 98%; most of the valley floor stream reaches were historically intermittent; and open riparian savannas and woodlands dominated by California sycamore once characterized the braided stream channels of South Valley, as opposed to the dense cottonwood-dominated riparian forests common (even managed for) today. This study was also our first effort to work closely with a local Indian Tribe (Amah Mutsun), who made some of their ecological knowledge and cultural narratives available for this planning-oriented historical ecology study, and which helped springboard the tribe into a much larger regional role in conservation.

Monday, July 16 Smart Grid: An Analysis Of How Socio-Political Contexts Shape Energy Technology, Development, And Policy

Strubb, Adrienne* , **Peterson, Tarla Rai**, *Texas A&M University* , **Stephens, Jennie**, *Clark University* , **Wilson, Elizabeth**, *University Of Minnesota*

The energy sector must integrate logics from diverse stakeholders in responding to urgent challenges of climate change. Smart Grid (SG) electricity systems are critical components of this response. To better understand how socio-political contexts shape visions of SG, and thereby influence energy policy, we conducted focus groups and interviews with influential actors involved in a pilot project for SG deployment in Austin, TX [Electricity Reliability Council of Texas (ERCOT)]. Informants are influential actors, including regulators, policy-makers, technology developers, scientists and engineers, and community leaders who work with environmental advocacy groups and relevant businesses. We used thematic analysis, working from categories identified in the Socio-Political Evaluation of Energy Deployment (SPEED) framework, for preliminary categorization of results (1). We contextualized the focus group analysis within SG development across three electricity transmission regions within North America: Midwest Independent System Operator (13 US states; Manitoba & Ontario, Ca), New England Independent System Operator (6 US states; Quebec & New Brunswick, Ca), and ERCOT. Results enabled us to outline the social networks associated with SG implementation in ERCOT and better articulate the socio-political context across North America. 1. Stephens, J.C., et al. 2008. Socio-Political Evaluation of Energy Deployment (SPEED). Technological Forecasting and Social Change 75: 1224-1246.

Tuesday, July 17 12:00 Communicating Newly Emerging Science On The Hill: Ocean Acidification As A Case Study

Suatoni, Lisa*, *The Natural Resources Defense Council*

One important role of environmental NGOs is to communicate scientific knowledge, in plain language, to decision makers and the public. The goals - to be clear, honest, and compelling - are straightforward. The execution is often much more complicated. This is particularly true when communicating about newly emerging environmental problems, such as ocean acidification. By following the arc of how NGOs have communicated about ocean acidification on the Hill, this talk will examine common challenges and pitfalls of getting the attention of our decision makers while communicating new science in a straightforward manner.

Tuesday, July 17 9:45 Managing Ecosystems To Be Resilient In The Face Of Change

Suding, Katharine*, *University Of California Berkeley* , **Hallett, Lauren**, *University Of California Berkeley*

A major conservation goal is to manage systems to be resilient to future change. However, a longstanding challenge is to identifying the appropriate management goals and strategies that increase resilience, particularly in the face of strong human impact. We address this challenge in three ways. First, we review how resilience has been addressed in the conservation literature, and detail major theoretical predictions and assumptions. While the importance of ecological processes, such as functional diversity and connectivity, have been widely emphasized, social processes have been less emphasized in ensuring the resilience of ecosystems to change. Then, in a survey of 200 restoration projects, we ask how actual projects have addressed resilience and future change. Here, we find that ecological resilience was rarely discussed but the importance of social elements was often linked with the resilience of the project. Lastly, we suggest ways the conservation practitioners can better incorporate resilience objectives, integrating both ecological and social elements. As the world becomes more "novel" and the feasibility of meeting historical benchmarks becomes more uncertain, this integrated resilience framework may help guiding management goals and strategies.

Tuesday, July 17 11:00 Diversity And Distribution Of Salamanders In Stream Ecosystems Along A Riparian Land-Use Gradient

Surasinghe, Thilina*, *Clemson University* , **Baldwin, Rob** , **Scott, Mark**, *South Carolina Department Of Natural Resources*

We investigated the community structure of stream salamanders along a riparian land-use gradient in Piedmont and Blue Ridge ecoregions of SC. We conducted field surveys to record diversity in streams representing four land-use conditions: forests, agricultural, residential, and urban. We recorded 11 in forested streams and two in other habitats. A MANOVA revealed that abundance and identity of both adults and larvae varied significantly among land-use types, indicating that riparian land-use is a useful predictor of species composition of stream salamanders. A one-way ANOVA showed that the abundance of larval and adult Desmognathus fuscus and Eurycea gluttolineata did not differ significantly among land-use types, and that of larval Eurycea differed only marginally, indicating disturbance-resistance. The abundance of other species was significantly different among land-use types. We performed an NMDS plotting species and site scores with the first two ordination axes (Bray-Curtis distance matrix, 50 starting configurations, converged after 7 runs) which revealed three species assemblages. The forest assemblage included disturbance avoiders; D. quadramacutatus, D. monticola, D. marmoratus, D. ocoee, and E. cirrigera. D. fuscus and E. gluttolineata consisted the disturbance-adapted assemblage that dominated the non-forest habitats and were also present in forested streams. Pseudotriton ruber, P. montanus and Eurycea wilderi showed intermediate response to riparian land-use and were recorded in low frequencies in all habitat types.

Tuesday, July 17 8:30 Science As A Second Language: Getting Science Used By Policymakers, Practitioners And The Public

Swanson, Christina*, *Natural Resources Defense Council* , **Gunther, Andy**

Conservation scientists share a growing awareness that our biological resources and the ecosystems that support them (and us) are increasingly threatened by human activities, including climate change, habitat destruction, harvest and mortality, and a rising tide of toxic chemicals. Many of us recognize a disconnect between risks revealed by our scientific findings and the relatively unresponsive actions of policymakers. There is growing desire among scientists to engage more

directly in the management and policy arena to reverse this trend. This presentation introduces the symposium, which explores strategies for scientists to more effectively extend and translate their research to natural resource management, policy and the public discourse. Subsequent presentations will provide perspectives and case studies from scientists, lawyers, policy analysts, regulators and communications professionals. Our objectives are to educate research scientists about the information and practical needs of resource managers and policy makers; describe new strategies, research and communication tools; introduce symposium participants to potential new research, implementation and communication partners; and lay the groundwork for future discussions and collaboration. The symposium will close with a facilitated discussion to capture and synthesize the lessons learned and explore next steps to foster and support more effective science "translation" by the conservation biology community.

Tuesday, July 17 3:30 Complex interactions among biocontrol agents, pollinators and an invasive weed: a structural equation modeling approach

Swope, Sarah* , **Parker, Ingrid**, *University of California*

Enemies and mutualists can exert strong impacts on their host plants, directly and indirectly. This phenomenon is especially relevant to biological control of invasive plants because most invaders are attacked by multiple agents. We used structural equation modeling (SEM) to quantify the effect of two biocontrol agents and generalist pollinators on the invasive weed Centaurea solstitialis, and to identify and quantify the direct and indirect interaction pathways among them. Surprisingly, bud herbivory had a larger total effect on the weed's fecundity than did seed predation by both agents combined. SEM also revealed important indirect interactions: By reducing the number of inflorescences plants produced, bud herbivory indirectly reduced the plant's attractiveness to ovipositing seed predators. This indirect pathway reduced bud herbivory's direct negative effect by 25%. In the same way, bud herbivory also reduced pollinator visitation, although the magnitude of this pathway was small. Eustenopus villosus oviposition deterred Chaetorellia succinea oviposition, which is unfortunate because C. succinea is the more voracious of the seed predators. Finally, C. succinea oviposition indirectly deterred pollinator visitation, thereby enhancing its negative effect on the plant. This study demonstrates the powerful insights that can be gained from the SEM approach in understanding the multiple direct and indirect interactions among agents and pollinators on an invasive weed.

Tuesday, July 17 9:50 Bird Use Of Non-Native Tamarisk In The American Southwest: Complexities, Consequences, And Changing Perceptions

Theimer, Tad* , *Department Of Biology, Northern Arizona University* , **Sogge, Mark**, *U.S. Geological Survey* , **Paxton, Eben**, *USGS*

The realities and complexities of how non-native species interact with and impact native flora, fauna, and ecosystems are often oversimplified and issues become framed as a "native good - alien bad" argument. As a result, non-native species are frequently vilified and become the targets of aggressive control or eradication programs. Tamarisk (Tamarix spp.) is an introduced plant that has become widely established and is often portrayed as a key factor in the decline and reduction of riparian breeding birds in the American Southwest. However, tamarisk habitats are used by many breeding birds and in some river systems tamarisk supports larger local and regional bird populations than would occur in its absence. Tamarisk is also used as migratory stopover habitat by many bird species. The recognition of tamarisk as habitat for birds does not mean that all tamarisk habitats are equal in value to native habitats, nor

that tamarisk serves as suitable habitat in all cases. But it is time to recognize that for many bird species, and likely other wildlife, there are many locations at which tamarisk has habitat value and contributes ecological services. Indeed, in some areas tamarisk may be the only option for a functioning riparian forest. This evolution of perspective of tamarisk as bird habitat is becoming mirrored in other aspects of the tamarisk issue, and leading to riparian habitat management alternatives that go beyond the simple elimination of tamarisk.

Tuesday, July 17 10:15 Detailed Measures Of Landscape Integrity And Connectivity For Freshwater Systems In The West

Theobald, David[*], *Colorado State University* , **Salo, Jessica**, *Colorado State University* , **Harrison-Atlas, Dylan**, *Colorado State University* , **Mueller, David**, *Colorado State University* , **Reed, Sarah**, *Colorado State University*

Today, freshwater ecosystems in the western US are highly modified by human activities, and tomorrow they are likely to be stressed even further by growing human populations, increasing vehicle miles travelled, and changing precipitation regimes (amount, form, and timing). To assist conserving, mitigating, and restoring these systems from likely impacts requires consistent, standardized information about freshwater systems at multiple scales (from watershed to river network to within-reach) and need to be are relevant to a process-level understanding of ecological integrity of freshwater systems. These data are critical for broad-scale, integrating efforts such as the Western Governor's Association's Crucial Habitat Assessment Tool. We will describe a modeling approach that builds on previous work, called the Western Riparian Threat Assessment, to map and model freshwater ecosystems by characterizing factors that fundamentally influence riverine and riparian functioning: in-stream (i.e., flow regime, longitudinal processes), near-stream (riparian/valley-bottom; lateral connectivity), and watershed (upland, overland flow processes such as sedimentation). We will demonstrate three important advances using a state-level case study (for Colorado): incorporating hydrologic data at a management-relevant scale (1:24,000); modeling reach-scale variability (~20x river wetted width); and determining bounded alluvial valley and other factors important for groundwater-streamwater exchange.

Wednesday, July 18 12:15 Ecological Networks & Animal Migration; Building Bridges For Transboundary Wildlife Conservation

Thiele, Monika[*], *United Nations Environment Programme* , **Kuehl, Aline**, *UNEP/CMS*

The ranges of migratory species are too large to put them entirely under protection. The effective conservation of migratory species is dependent on the identification and management of critical sites and networks. Connectivity within the ecological network needs to be maintained, which tends to be more challenging for terrestrial and riparian species moving in a two-dimensional environment. Case studies are presented to illustrate the challenges of critical site network identification for animals on the move and highlight sites and taxonomic groups where further attention is urgently required. Examples include the migration of grassland birds in the Americas, marine mammals in the Eastern Pacific and the Beluga whale (Delphinapterus leucas) in Canada's High Arctic, where a planned iron mine and related shipping traffic are threatening the connectivity of the ecological network. This presentation will discuss the application of spatial planning tools and integrated management approaches to conserving species regionally, within the context of UNEP's Convention on the Conservation of Migratory Species of Wild Animals (CMS).

Monday, July 16 Insufficient Regulation And Overuse Of Maui'S Marine Protected Areas May Reduce Benthic Biodiversity

Thomasson, Kelly*, *California State University, Sacramento*

The waters of Maui County are essential to the livelihood of its residents. In addition to sustenance value, annual revenue from international tourism and marine activities keeps the island's economy afloat. Overuse of Marine Protected Areas (MPAs), due to their appeal as aesthetically vivid, conservation districts, has potential to degrade the very systems that MPAs are intended to protect. Marine ecotourism activities have been previously indicated as factors involved in coral reef degradation. Maui Counties MPAs are exploited as ideal eco-tourism destinations and potentially used to a higher degree than non-conserved areas and therefore are more prone to degradation. Here, I attempted to establish whether or not there was a notable decline in benthic substrate biodiversity in the MPA-managed areas of Maui County relative to that of non-conserved areas. Based on biodiversity indices, I hypothesized that there would be lower benthic biodiversity at MPA sites relative to those sites with no protected-status, within the boundaries of Maui County. Photographic quadrats of benthic organisms and substrate from 4 accessible conservation sites and 8 biogeographically similar controls were quantified and assessed through the use of biodiversity indices at two depth ranges. Using MANOVAs, I found significantly lower biodiversity indices (Shannon Diversity or H', Species Richness, Percent Cover) in MPAs relative to control areas. Given the lengthy establishment of MPAs in Maui County and the importance of marine preservation for the aesthetics, economy and biology of Maui county, these results suggest the need for change in the level of MPA usage and regulation of that usage.

Monday, July 16 9:45 Moving To Action: Experts Identify Science Priorities In The North Pacific Landscape Conservation Cooperative's Marine And Freshwater Ecosystems

Tillmann, Patricia*, *National Wildlife Federation* , **Siemann, Daniel**, *National Wildlife Federation* , **Whitely Binder, Lara**, *University Of Washington Climate Impacts Group*

The North Pacific Landscape Conservation Cooperative (NPLCC) is uniquely positioned to meet the region’s need for landscape-scale climate change adaptation and interdisciplinary cross-boundary collaboration. To assist the NPLCC in its near- and long-term prioritization of applied science work, we are convening twelve focus groups with over 150 natural resource managers, conservation practitioners, and scientists to examine the challenges and applied science needs associated with managing marine and freshwater species, habitats, and ecosystems in light of current and projected climate change impacts. Initial qualitative data analysis of focus group and survey responses suggests applied science needs fall into three categories: identifying management priorities given current and projected climate change impacts, data and science targeted to climate change questions, and incorporating climate-related uncertainty into daily work and long-term planning processes. Three non-science needs are also emerging for the region, and can be summarized as capacity needs, assistance addressing institutional and cultural barriers, and enhanced coordination, collaboration, and communication among natural resource professionals and climate change scientists. The NPLCC will use this information to select science priorities optimized to meet the needs of those working in the region and best-suited to facilitating landscape-scale climate change adaptation and cross-boundary collaboration.

Monday, July 16 Potential Effective Impact Of Land Cover Changes On Stream Ecology

Timm, Raymond* , **Knutson, Christopher**, *King County Department Of Natural Resources* , **Lucchetti, Gino**, *King County Department Of Natural Resources* , **Gregerson, Christopher** , **Latterell, Joshua** , **Wilhelm, Jo** , **Fore, Leska**, *Statistical Design*

Puget Sound lowland streams that remain undeveloped contribute substantially to the region's overall biological productivity and biodiversity. Development represents the single most important and controllable factor that could degrade ecological conditions in remaining undeveloped areas. The goal of this study was to establish and implement a framework for quantifying environmental responses to development under new (2005) land use regulations and identify where/ if regulations might be ineffective and need to be changed. To measure the impacts of changing landcovers in developing rural areas of King County, Washington, we hand digitized high-resolution aerial photographs (bi-annually 2005-2012), and quantified the hydrologic distance of upstream land cover changes to study sites at the bottom of nine study watersheds. Land cover changes were analyzed as discrete transitions from one type to another and in two broad categories: recovering or degrading. These transition values were then compared against measures of habitat complexity, water quality, various macroinvertebrate community metrics, and discharge characteristics to test their relative degree of relatedness with land cover changes. Finally, distance-weighted impacts were incorporated into a model of potential effective impact (PEI). To estimate PEI, all known activity within study watersheds was tracked relative to the potential to either degrade or improve conditions and qualitatively rated for the potential to cause an effect based on type and area of disturbance, site sensitivity and proximity to a receiving stream.

Monday, July 16 8:45 Salvage Logging And Post-Fire Management Effects On Occupancy Of A Vulnerable Indicator Species, The Black-Backed Woodpecker

Tingley, Morgan* , *Princeton University* , **Siegel, Rodney**, *Institute For Bird Populations* , **Wilkerson, Robert**, *Institute For Bird Populations*

The effectiveness of indicator species is predicated on the ability to detect population-level effects in an unbiased way. The Black-backed Woodpecker (Picoides arcticus) is a management indicator species for post-fire snags in western North America but its occurrence is potentially affected by salvage logging and other snag removal operations. To investigate this interaction, we used hierarchical occupancy models on a multi-year dataset of woodpecker occurrence at 67 fires in the Sierra Nevada and southern Cascade Mountains. We found that the environmental characteristics of occupied sites and sites with snag removal overlapped substantially, obscuring potentially negative interactions. However, negative effects of post-fire snag removal were demonstrated through a positive relationship between woodpecker occurrence and snag abundance. The finding that both woodpeckers and snag removal operations preferentially select sites with the same characteristics reveals important tradeoffs in the management of this conservation target. More generally, we caution that overlap in environmental space between land management actions and habitat selection by wildlife may pose important inferential roadblocks in the ability to fairly assess potentially deleterious effects. Where such overlap occurs, the extent to which honest conservation choices can be made will depend on the magnitude of environmental overlap and whether it is detected and incorporated into analyses.

Monday, July 16 The Effect Of Socio-Economic Costs And Future Climate Change Scenarios On Conservation Planning In Madagascar

Tondrasoa, Tendro*, *University Of California Berkeley*

Recommendations from multiple conservation planning workshops has resulted in the current locations of protected areas in Madagascar. Past reserve planning workshops were based solely on species habitat and important conservation sites. Landscape costs received little to no attention. In this research we used the reserve selection software Marxan to identify the most cost-effective planning units. We considered a total of 1141 fauna and flora species habitats and 11 important conservation sites. Landscape cost maps were generated using current rice field distribution data, fire occurrence data, and deforestation data. This paper discusses how the introduction of landscape costs changes current priority reserve areas and how future climate change scenarios change the selection of reserve. The paper also identifies new reserve areas that meet the government target of 10 million hectares of protected area.

Monday, July 16 12:00 Brucellosis, Disease Regulations, Agency Conflicts And The Diminishment Of Conservation Opportunities

Torbit, Stephen*

The conflict surrounding brucellosis in Greater Yellowstone's wild ungulates and its impacts on the viability of the area's cattle industry continues unabated. Public concern regarding Chronic Wasting Disease began to intensify in 2002 and the human health aspects of Transmissible Spongiform Encephalopathies have stimulated significant concerns about transmissibility to humans. Public concerns regarding the potential for an H5N1 outbreak has focused the world's attention on migrating waterfowl. The conflicting viewpoints and authorities of human and livestock health officials and conservationists regarding diseases have been detrimental to wildlife conservation. In 2002, Congress passed the Animal Health Protection Act clarifying the authority of the Department of Agriculture to assert jurisdiction over all non-human members of the animal kingdom. As the impacts of a changing climate continue along with expansion of the global economy, we can expect dispersal of new diseases and conflict with our conservation efforts. We must develop an expanded discipline in disease ecology to assist with the conservation challenges of future wildlife disease threats. However, we cannot ignore the regulatory constraints of human and livestock health authorities as we design and implement our conservation strategies. Should we choose to ignore these regulatory authorities, future conservation assessments, designs and strategies will risk failure.

Wednesday, July 18 9:10 Mapping San Francisco Coastal Fog For Conservation

Torregrosa, Alicia*, *Western Geographic Science Center, U.S. Geological Survey*

Advective fog moderates coastal climates in California, alters evapotranspiration rates, provides substantial moisture for coastal plants including redwoods, and modifies stream temperatures. If climate change induces temporal or spatial alterations in fog distributions, this impact will likely be a major driver of landscape change and will also affect California water supply and energy use. Coastal fog is a complex phenomenon with many measurable parameters including extent and frequency of cloud cover; cloud deck thickness, heterogeneity, base height above land, density, liquid water content, and thermal properties. These variations span multiple scales and processes such as land-surface interactions and linkages to synoptic weather and ocean patterns. The conservation community needs useable data to quantify the regional effect of fog on the hydrologic and thermodynamic components of ecological, biological, and economic systems in California. To address this need a multidisciplinary collaboration of ecologists, climatologists, satellite meteorologists, fog modelers, statisticians, and

natural resource managers are working to derive ecologically relevant fog indices from multiple existing data sources: satellite (AVHRR, GOES, Modis, Landsat), NOAA buoys, and airport and meteorological stations. This presentation will highlight methods and preliminary fog measurement indices along with a description of the conceptual design for a West Coast fog monitoring network.

Monday, July 16 Ocean Observing Technologies For Monitoring The Effectiveness Of California's North Central Coast Marine Protected Areas
Tougher, Brendan*, *University Of San Francsico* , **Mcgillivary, Phil**
Coastal oceans are in decline because of natural and anthropogenic changes in the terrestrial and marine environment. National and state regulations are being established to restore ocean ecosystems. In 2010 regulations on marine activities for California's North Central Marine Protected Area (MPA) region came into effect as part of the California Marine Life Protection Act (MLPA). The MLPA establishes MPAs to conserve marine biological diversity, protect habitats, aid in the recovery of depleted fisheries and promote recreation, study and education. California's MLPA requires marine environment monitoring to determine if management initiatives are successful and the marine ecosystems are improving. Ocean observing technologies can be used to improve monitoring changes in the marine environment, both spatially and temporally, thereby allowing managers to make more informed decisions. Whereas a variety of ocean monitoring technologies exist, in some areas specific monitoring tools can be more effective than elsewhere. For managers to clearly understand the success or failure of an MPA it is necessary that proper monitoring techniques be used to provide the necessary data. Within the twenty-one MPAs that make up California's North Central MPA region new monitoring technologies could be added to technologies now in use to improve data collection over varying time and space scales to enable a more holistic image and understanding of the marine environment.

Tuesday, July 17 11:15 The Wildlife Picture Index: A Conservation Tool For Monitoring Biodiversity
Townsend, Susan*, *Wildlife Ecology & Consulting* , **Galtbalt, Batbayar**, *Steppe Forward Program* , **Myagmar, Munkhjargal**, *Steppe Forward Program* , **Baillie, Jonathan**, *Zoological Society Of London*
The Wildlife Picture Index (WPI) is a composite biodiversity indicator based on the geometric mean of occupancy estimates derived from camera trap sampling at the landscape level. Camera trapping targets medium to large sized terrestrial vertebrates in forested and grassland ecosystems. As a case study from 2009 to 2011, we assessed how well Protected Areas were functioning to conserve wildlife (biodiversity) in Mongolia. Mongolia supports a rich ungulate and carnivore fauna, has low human population density, and has established protected areas, presenting ideal conditions to test this new conservation tool for assessing trends in biodiversity. Our effort resulted in 27,165 trap nights producing 416,300 photographs from 5 study areas in total. We were able to establish a baseline for each study area and calculate and plot the WPI for the one site for which we had three seasons of data. For the remaining sites, we present species specific baseline occupancy estimates stratified based on management zones. Thus far, we have documented occupancy for heretofore undetected species. Additionally, we found increased levels of human disturbance in the most protected areas that correlated with decreased occupancy for certain rare species. We show how this approach has proven to be cost effective and easily implemented in assessing biodiversity and the status of individual species at a landscape level. Finally, we discuss how these results could be applied to improving protected area management and conservation actions.

Monday, July 16 Selfing And Inbreeding In A Rare Orchid (Platanthera praeclara) From A Fragmented Grassland Landscape

Travers, Steven* , **Harris, Marion**, *NDSU* , **Anderson, Kirk**, *NDSU* , **Vitt, Patti**, *Chicago Botanical Garden* , **Ross, Andrew**, *NDSU*

Habitat fragmentation can reduce the viability of populations of plants by isolating them and promoting mating among closely related individuals and selfing within individuals. The problem is particularly acute for plants that provide rewards to pollinators and thus encourage geitenogamy and local visitation. The Western Prairie Fringed orchid (Platanthera praeclara) is a model system for studying inbreeding in rare, rewarding orchids because it is federally threatened species that has declined with fragmentation of its native biome, the tallgrass prairie. Moreover, they have one of the largest nectar spurs and nectar rewards of any orchid. We conducted a series of experiments on P. praeclara to: 1) compare the seed and fruit characteristics of selfed and outcross flowers, 2) estimate levels of selfing in natural populations, and 3) quantify the genetic health of populations of the Western Prairie Fringed Orchid. By hand pollinating flowers of bagged plants over the course of two growing seasons we found that fruit characteristics of selfed and outcrossed flowers do not differ but that seed mass was smaller from self pollinations. Moreover, natural pollinations resulted in a large proportion of fruits with seed characteristics more typical of selfed than outcross seeds suggesting that geitenogamy or selfing within a flower are not atypical in this species. Analysis of microsatellite marker data from eight populations of P. praeclara indicate relatively high levels of homozygosity suggesting moderate inbreeding. We conclude that the persistence of small populations of this species is potentially at risk due to negative demographic effects that can result from inbreeding and may have contributed to its decline.

Monday, July 16 Remote Sensing-Based Approaches For Residual Dry Matter Monitoring Across Rangeland Conservation Easements

Tsalyuk, Miriam* , *UC Berkeley* , **Koy, Kevin**, *UC Berkeley - Geospatial Innovation Facility* , **Kelly, Maggi**, *Dept. Of Environmental Sciences, Policy & Management ,UC Berkeley* , **Butterfield, Scott**, *The Nature Conservancy California Field Office*

California's rangelands are important conservation target since they possess significant biodiversity, provide ecosystem services and allow habitat connectivity. Residual dry matter (RDM) standards are broadly used by conservation organizations, federal and state agencies, and private landowners to monitor grazing impacts on rangelands' sustainability. In California, The Nature Conservancy uses ground-based approaches to monitor RDM, which can be time intensive, expensive, and difficult to replicate annually across ~300,000 acres of conservation easements. The Conservancy, in collaboration with UC Berkeley, is evaluating whether satellite remote sensing technologies can be used to increase the efficiency, effectiveness, and scientific robustness of current RDM monitoring efforts. We tested remote sensing-based RDM monitoring approaches across Simon Newman Ranch from 2000-2011 using MODIS satellite imagery. We found a strong correlation between RDM and three different MODIS-based vegetation indices: the normalized difference vegetation index (NDVI), lead area index (LAI), and fraction of photosynthetically active radiation (fPAR). NDVI is a strong predictor of biomass and tightly related to precipitation. These results demonstrate the potential utility of remote sensing for RDM monitoring across rangeland conservation easements. Future efforts will be focused on testing other satellite-based vegetation indices that would allow direct quantification of RDM in the fall.

Monday, July 16 Overcoming Recovery Challenges In Ontario, Canada Through Collaborative Partnerships, Management And Research

Tuininga, Ken*

Canada's Species at Risk Act has spurred increased recovery planning, monitoring and implementation activities for threatened and endangered species across Canada. This poster highlights some of the challenges and opportunities encountered in implementing recovery actions for several federally listed species at risk in Ontario. Successes include the discovery of new populations of species at risk, returns of captive-bred birds to breed, increased knowledge about survivorship of species on the breeding and wintering grounds, and habitat restoration. These successes have been achieved through stewardship, research, adaptive management, and productive multi-stakeholder and multi-agency partnerships. For example, recovery efforts for the endangered Loggerhead Shrike (Lanius ludovicianus migrans) will be outlined, including early results from a captive breeding program; habitat restoration efforts; monitoring and research efforts to locate wintering areas, and effects of variable winter conditions in the United States on survivorship and recruitment. Challenges faced in recovery efforts for this species were assessed through scientific reviews of the first five years of the shrike program. The reviews helped inform decisions about allocating limited funding resources and determining the level of monitoring (i.e. comprehensive colour banding) necessary to measure success. Conservation experiences with other species (e.g., Piping Plover, Kirtland's Warbler) will also be shared.

Wednesday, July 18 3:30 The Seemingly Intractable Problem Of Non-Point Source Water Pollution: Could The Endangered Species Act Offer A Solution?

Tzankova, Zdravka*, *UCSC*

Nutrient pollution from non-point sources (NPS pollution) is one of the most pervasive, most serious, and longest-standing threats to the health of aquatic ecosystems in the US. According to USGS estimates, non-point sources are responsible for 90% of nitrogen and 75% of phosphorous in surface waters, many of which are significantly impaired by these nutrients and associated algal blooms, oxygen deficiencies, etc. Controlling NPS nutrient pollution has proven to be among the toughest and arguably most frustrating policy and regulatory challenges in contemporary environmental regulation. This situation is largely attributable to the administrative and political dynamics of fragmented regulatory authority with significant state and local control over highly organized and politically powerful polluters, especially agricultural polluters. This paper develops a conceptually new policy approach to overcoming the political challenges of controlling non-point sources of aquatic nutrient pollution. It applies a model of combined legal and ecological analysis (a model developed in a separate paper) to demonstrate that federally listed species which are negatively affected by NPS nutrient pollution can be strategically used to strengthen and expand controls on such pollution in many US water bodies. Specifically, we show how Sections 7 and 9 of the ESA can be leveraged against currently underperforming federal and state controls on NPS pollution to attain stricter and better enforced regulation of such pollution.

Wednesday, July 18 4:00 Evaluating The Quality Of Citizen-Scientist Data On Pollinator Communities

Ullmann, Katharina*, *Dept Of Entomology, UC Davis* , **Kremen, Claire**, *ESPM, UC Berkeley*

Insect pollinators provide critical services to natural and agricultural systems. As such, pollinator declines are cause for concern. Despite their recognized value, long-term studies for most pollinating taxa are lacking and existing data is patchy over space and time. Citizen scientists may be able to bridge this data gap. However, their effectiveness in doing so will depend on the quality

of their data. We developed a citizen scientist monitoring protocol and taught 13 citizen scientists how to observe and identify floral visitors at the resolution of orders and families (e.g. bee, wasp, fly) and, for bees (superfamily: Apoidea), to family, genus or species. To assess data quality we compared citizen scientist observational data from 17 sites with professional data collected using standard, specimen based, netting and pan trapping techniques. We found that higher level taxonomic composition, honey bee (Apis mellifera) abundance, non-Apis bee abundance, bee richness, and bee community similarity were positively correlated. However, citizen scientists only observed about half of the species collected by professional scientists. This suggests that while citizen science data may document broader trends in floral visitor abundance, richness and similarity, finer resolution data (e.g. at the species level) may be less reliable. These findings have important implications for conservation professionals interested in developing citizen science projects.

Monday, July 16 Biogeography And Conservation Of Cuba's Endemic Non-Flying Mammals

Upham, Nathan*, *University Of Chicago; Field Museum Of Natural History* , **Borroto-Páez, Rafael**, *Instituto De Ecología Y Sistemática*

The Cuban archipelago is one of the world's biodiversity hotspots, consisting of over 4000 islands and the greatest floral and faunal diversity of any area in the West Indies. Cuba also hosts the most introduced and invasive species in the region, contributing to 26 recorded species extinctions of endemic mammals since the late Quaternary (7 bat species and 19 non-flying mammals). Only 11 living species of non-flying mammals remain from Cuba's endemic fauna, including the shrew-like almiquí (Solenodon cubanus), and 10 species of hutias (rodents in the family Capromyidae). Here we focus on the biogeographic patterns and relevant conservation concerns for these non-flying species, with the goal to identify priorities for habitat management. Species ranges were updated and mapped from recent surveys and compared to the geographical distribution of available habitats, human developments, and invasive mammal species. Ecological competition from black rats (Rattus rattus), and predation from wild dogs (Canis lupus familiaris) and wild cats (Felis silvestris catus) were identified as major threats to almiquí and hutia populations, especially for several rare hutia species that are restricted to small islands and cays. We find that greater organization and planning is needed to control pest species populations, along with targeted protection of intact forest habitat across the archipelago. We also highlight recent studies that link hutias with the diverse radiation of Neotropical spiny rats, and place almiquís as one of the most primitive mammal lineages, as a motivation for conserving these evolutionarily unique species.

Tuesday, July 17 12:15 An Extendable System For Climate Change And Ecosystem Impact Evaluation

Urich, Peter*, *CLIMsystems Ltd* , **Li, Yinpeng**, *CLIMsystems Ltd*

Population and development pressures will, in all likelihood, continue to grow at a rapid rate. This process could result in unprecedented risks to ecosystems from climate change impacts, such as sea level rise, storm surge, extreme rainfall and temperature events, and cascading secondary effects. A prototype toolkit to support policy-making and planning based on the Global Environment and National Information Evaluation System (GENIES) has been developed that focuses on the core issues of adaptation, mitigation, risk, and economics of climate change and how they interrelate with aspects of water, ecosystems, energy, the built environment, transport and waste. While recognizing the plethora of methodological perspectives that pertain to each sector, a system dynamics method is presented, which lends itself to integrated assessment, given its flexibility and ease of extension and revision as

new policy and planning questions emerge. The framework design starts with a clear definition of a problem and then draws together the appropriate models and data, to enable relationships to be defined and processed in a scientifically robust manner to evaluate adaptation and mitigation options. The tool can provide indicative assessments of risks and potential costs and benefits of different adaptation options that could be applied to the risks posed by climate change.

Wednesday, July 18 3:00 Variation In Long-Term Threshold Responses To Habitat Availability

van der Hoek, Yntze[*], *College Of Staten Island/CUNY* , **Renfrew, Rosalind**, *The Vermont Center For Ecostudies* , **Manne, Lisa**, *College Of Staten Island*

The minimum amount of habitat needed in a landscape for a species to persist has been a widely recognized conservation target. Several studies have identified habitat thresholds below which the probability of persistence declines rapidly, but as yet little is known of the extent to which thresholds vary spatially and between species. However, we do know that characteristics specific to the study region (e.g. level of fragmentation) or species (e.g. level of specialization) are considered determining factors of the minimum habitat requirements for long-term persistence. In order to determine variation in threshold responses, we modeled long-term responses of forest associated breeding birds to habitat availability. Our models, based on repeated state-wide breeding bird atlases of several U.S. states and remote sensed land cover data, provided estimates of minimum habitat requirements for 25 breeding bird species. We showed that variation in habitat requirements for persistence is prevalent between both species and regions, and provide preliminary insights in the variables driving this variation. This allows us to investigate how results from species-habitat studies can be extrapolated to other areas or species and inform the establishment of conservation targets based on species-habitat relationships.

Monday, July 16 12:20 How Can Conservation Science Create A Bio-Logical Capitol And Biological Capital?

Van Schyndel, Zoe[*], *The Evergreen State College*

SYM – 13 Investing Capital for Bio-Logical Capitol Zoë Van Schyndel, CFA Member of The Faculty The Evergreen State College Sustainable Investing has been one of the fastest growing parts of the investment world for several years. From its roots in shareowner activism and community investment, socially responsible investing (SRI) has broadened to include environmental, social, and corporate governance (ESG) criteria, As sustainable investment research becomes more sophisticated, the strategy's potential for long-term out performance increases and its ability to influence society is far more likely. Sustainable investing has been endorsed by the United Nations in two forms – 1) The United Nations Principles for Responsible Investment, which has over 8 trillion dollars of pension funds and other large portfolios pledged to be guided according to its principles and its own Secretariat, much like a treaty coordinating body, and 2) The United Nations Environment Program's Finance Initiative, which was represented in SCB's 2007 global policy workshop in South Africa, a fitting reminder of the political power of boycotts and selective investment. In this session we will review these initiatives, how sustainable investing is conducted by a range of public and private funds, as well as the trend toward measuring the transformative social and environmental impact of these investments. We will also explore the availability of sustainable investing in employee retirement plans and what impact the growth of these options is likely to have.

Wednesday, July 18 10:15 Scientist And Manager Collaboration And Communication Networks: The Case Of Fish And Fire

Vance-Borland, Ken* , **Burnett, Kelly**, *USFS PNW Research Station* , **Creighton, Janean**, *Oregon State University* , **Fischer, Paige**, *USFS PNW Research Station* , **Hummel, Susan**, *USFS PNW Research Station* , **Johnson, Sherri**, *USFS PNW Research Station*

It is unclear to what extent hurdles to science-based freshwater conservation management arise from knowledge gaps or from communication gaps. Social network analysis is a longstanding method for mapping relationships among people; it is used in fields that include corporate management, military intelligence, and public health. We invited over 500 federal resource managers, technical specialists, and scientists in Oregon, Washington, and Idaho to take an online survey about their work on “fish and fire” issues: the effects of wildfire, fuels treatments, and post-fire restoration on riparian and aquatic species and ecosystems. Network questions requested the names of people with whom the respondent collaborates or communicates on such issues. Over half of those invited responded, identifying >800 other actors and over 3000 network relationships. Network analysis revealed that: scientists primarily collaborate and communicate with other scientists, and managers with other managers; actors cluster by geography, agency, and discipline; and actors who selected the same priority “fish and fire” research need are often not communicating with one another. Network participants have begun identifying and implementing actions to improve communication and collaboration among “fish and fire” scientists and managers. Until obstacles to knowledge diffusion and adoption are addressed, benefits from investments in new freshwater conservation research are unlikely to be fully realized.

Tuesday, July 17 9:00 Empathy -- The Missing Ingredient In Conservation Biology

Vandeman, Mike*

We recognize that empathy is essential for understanding and caring for preverbal humans, and yet it is considered inappropriate, even heretical, for application to other species. It is considered "anthropomorphizing", a scientific "sin". On the other hand, we know that we have an enormous amount in common, genetically, with all other species (98.6%, in the case of the chimpanzee). That would tend to support the hypothesis that we have feelings and motivations in common. Even when feelings aren't involved, as with plants, empathy is still possible, and has obvious value. A scan of textbooks in conservation biology confirmed that the word "empathy" does not appear in any of their indexes. A search of Conservation Biology online found only a few instances of its use (notably in a 2002 editorial by Reed Noss). It's high time that we stop doing science and advocacy with one hand tied behind our back! The available evidence supports the legitimacy of empathy, and the need for setting aside areas that are off-limits to humans.

Wednesday, July 18 12:00 Drought Reduces Ecosystem Services Provided By Freshwater Mussels

Vaughn, Caryn* , *University Of Oklahoma* , **Atkinson, Carla**, *University Of Oklahoma* , **Riggsbee, Adam**, *Riverbank Ecosystems* , **Spooner, Daniel**, *U.S. Geological Survey*

Freshwater mussels are large, long-lived suspension feeders that provide important ecosystem services such as biofiltration, nutrient recycling and nutrient storage. Mussels occur in speciose aggregations (mussel beds) at high biomass, and species have different biofiltration and nutrient excretion rates. In 2011, an exceptional drought in the southern plains resulted in very high mussel losses in the Kiamichi River in southeastern Oklahoma. From previous studies, we know the location, size, species composition and

biomass of most mussel beds in the river, and the filtration rates, nutrient excretion rates, and tissue nutrient concentration of dominant mussel species. We used this information to calculate mussel aggregate biofiltration and nutrient stores and fluxes in the river (1) during a typical summer and (2) following the drought. We estimated that mussel biomass and species reductions from the drought resulted in losses of 2.6 kg/day in N recycling, 720 kg of N storage, and 19,783,840 L/day of biofiltration. We then compared the estimated dollar values of mussel-provided services with the costs of providing similar services through engineered and best management practices.

Monday, July 16 Monitoring Blue Oaks In California's Foothills: A Citizen Science Pilot Project

Velas, Karen* , *Audubon California* , **Hardie, Erin**, *University Of California, Davis* , **Cardenas, Susana** , **Forrester, Tavis**, *University Of California, Davis* , **Ballard, Heidi**, *University Of California, Davis*

The lack of recruitment in blue oak (Quercus douglasii) woodlands, one of the most wildlife rich habitats in California, has caused widespread concern. The situation is further complicated because ~75% of blue oak woodlands are privately owned. Research has shown that seedling survival is quite low and the factors contributing to seedling mortality are complex, and the consensus is that long-term data is critical to understand this problem. To meet this need U.C. Davis ecology and education researchers partnered with Audubon California to design and test a pilot citizen science blue oak monitoring program. The monitoring protocol was designed for long-term monitoring of blue oak stands for seedling, sapling, and tree survival across different aspects, soil types, and land management. To maintain data quality the method did not depend on any particular expertise on the part of volunteers. We recruited and trained a group of 20 volunteers and established 12 plots on 3 sites (one Audubon preserve and two private ranches). Pilot monitoring showed the protocol gathered accurate data. Participants also reported learning more about the conservation of blue oak woodlands and feeling more connected to the landscape. While meeting the goals of both scientific and educational objectives continues to challenge many citizen science projects, we found that an important outcome of this project was connecting people to place and gathering quality scientific information.

Tuesday, July 17 12:45 Our Coast Our Future: A Decision Support System For Assessing The Vulnerability Of San Francisco Bay Area Shorelines To Climate Change

Veloz, Sam* , **Ballard, Grant**, *PRBO Conservation Science* , **Barnard, Patrick**, *USGS* , **Higgason, Kelley**, *Gulf Of The Farallones National Marine Sanctuary* , **Psaros, Marina**, *San Francisco Bay NERR* , **Fonseca, Thomas**, *PRBO Conservation Science* , **Wood, Julian**, *PRBO Conservation Science*

With a changing climate, coastal ecosystems and human communities face challenges from sea-level rise, increased storm frequency and intensity, and coastal erosion. To prepare for future impacts, coastal managers and decision makers need to understand how these impacts will affect landscapes, ecological conditions and human infrastructure. Through an interdisciplinary collaboration, we are developing a decision support system to model vulnerabilities to sea-level rise and storm hazards and to interpret data in the context of management and policy decisions. The system incorporates state of the art modeling of coastal storm hazards using the Coastal Storm Modeling System (CoSMoS) and delivers the results through an interactive website. A critical component of this process has been the ongoing participation of key stakeholders to help ensure that the system will address their needs and is actually used to develop local adaptation and response plans. I will describe the process that was used to develop the system and illustrate how it can be applied to support adaptation planning using a case study. The Our Coast Our Future

project is a model for how scientists and decision makers can collaboratively develop tools which address the impacts of climate change and ensure that our actions benefit coastal ecosystems and societal needs.

Monday, July 16 4:00 The Nature Conservancy's La-Ventura Project: Protecting Riparian And Coastal Biodiversity In A Rapidly Urbanizing Landscape

Verdone, Lily[*], *The Nature Conservancy* , **Parker, Sophie**, *The Nature Conservancy*

Since 1999, The Nature Conservancy's LA-Ventura Project has worked to protect the Santa Clara River and coastal areas of Ventura and Los Angeles Counties, a geography of great biological richness and the second largest watershed in the South Coast and the last to remain in a relatively natural state — in stark contrast to other southern California rivers, such as the Los Angeles, San Gabriel, and Santa Ana, which are heavily dammed and lined by concrete channels. This diverse mosaic of habitats and critical natural resources coexist with an estimated 12 million people living within an hour's drive who rely on freshwater water, fertile agricultural lands and recreational opportunities all supplied by this unique yet rapidly urbanizing environment. Over the last decade, our conservation strategies have broadened from traditional land acquisition to include protecting fresh water resources, analyzing the economic and ecological impacts resulting from a changing climate, engaging non-traditional partners to address land use and infrastructure planning, and developing conservation nodes, groups of contiguous strategic parcels, where subsequent habitat restoration and management can be accomplished more efficiently than individual parcels.

Tuesday, July 17 10:10 Finding Life Where It Is Unexpected: Kangaroo Rat Exploitation Of Veldt Grass Habitat

Villablanca, Francis[*], *Biological Sciences* , **Trunzo, Juliana**, *Biological Sciences*

Kangaroo rats (Dipodomys sp.) are a diverse and ecologically important group of granivores. They are well known for their adaptations to arid environments and their effects on plant community structure in arid ecosystems. Their success in arid ecosystems is partly attributed to their ability to detect and avoid predators, particularly in open and sparsely vegetated habitats. Therefore, Veldt grass (Erharta calycina), a non-native perennial bunch grass, is inferred to reduce success in kangaroo rats by inhibiting their ability to visually detect predators and directly impairing their typical escape tactics. Currently there are no data to substantiate such a perspective. We report on a site in Central California where kangaroo rats are as abundant in areas with veldt grass as they are in areas without. Further, a five-year demographic study, fails to uncover any negative relationship between veldt grass cover and kangaroo rat demographic parameters. We find no evidence that the presence or abundance of veldt grass, per se, has any detectable negative effects. We plan to explore the potential for a non-negative, and even positive, relationship. Seed selection trials, and seed utilization experiments are planned to test a mechanistic hypothesis of veldt graminivory by kangaroo rats. In addition, experiments that test hypotheses regarding microhabitat decision-making by kangaroo rats in response to Veldt grass cover are also planned.

Wednesday, July 18 4:00 Impacts Of Protected Areas On Population Growth, Inequality And Marginalization In Mexico

Villalobos, Laura[*], *Centro Agronómico Tropical De Investigación Y Enseñanza (Catie)* , **Robalino, Juan**, *Centro Agronómico Tropical De Investigación Y Enseñanza*

We assess the effects of protected areas on social

outcomes in Mexico. We use socioeconomic data and geographic information systems to estimate the effects of protected areas on three different socioeconomic outcomes: population growth, income inequality and poverty. With a two period panel data, we are able to estimate the effect using difference in difference and difference in difference after matching. We also test how the effects of protected areas in these social outcomes might evolve over time. At the national level, protected areas lead to higher levels of inequality and marginality in the short run but there are no effects on population growth. In the long run, population decreases, marginalization increases but inequality decreases. Given the adverse effects on population and marginalization in the long run, the reduction in inequality seems to be the result of an overall impoverishment of the municipality. When the sample is split by regions, we find that for four out of 5 regions, population growth does not increase, inequality does not decrease and marginality does not decrease. Only for one region, inequality decrease in the long run but also marginality increases significantly as at the national level. These results are evidence that if conservation efforts such as REDD are implemented in developing countries, inequality and poverty issues might also need to be addressed with complementary socioeconomic policies.

Wednesday, July 18 12:15 Viewing Conservation And Sustainability In The Albemarle-Pamlico Basin Through An Ecosystem-Services Lens

Villamagna, Amy[*], *University Of Maryland* , **Angermeier, Paul**, *US Geological Survey and Virginia Tech* , **Mogollon, Beatriz**, *Virginia Tech* , **Bennett, Elena**

Ecosystem services (ES) are important to a wide range of environmental issues, including biodiversity conservation and socio-ecological resilience, because they link ecosystem functions to anthropocentric interests that resonate with a broad spectrum of people. Although ES contribute significantly to human well-being, these relationships are complex and difficult to measure since many ES are social goods without explicit markets. However, ES offer a new avenue for connecting people with freshwater conservation that complements conventional species-oriented conservation. An ES lens can help develop an awareness and appreciation for the non-market benefits derived from freshwater ecosystems, which can bolster public support for conservation and sustainability. A major unresolved research topic is to identify the circumstances under which biodiversity conservation enhances (or diminishes) delivery of valued ES, thereby contributing to sustainability. We use water-focused ES (ie, water purification, surface water regulation, and wildlife-based recreation) to explore spatial relationships between ES capacity and demand, and between ES delivery and human well-being in the Albemarle-Pamlico basin of Virginia and North Carolina. Relationships between ES capacity and demand are especially germane to analyses of resource sustainability. We develop conceptual models and discuss the rationale for distinguishing among these ES components and demonstrate the use of this framework to evaluate freshwater ES. We also show spatial relations between ES capacity/demand and lands where conservation actions have been implemented. Finally, to link conservation actions to social outcomes, we explore the adaptation and use of the International Fund for Agricultural Development's Sustainable Livelihoods Framework for evaluating changes in human well-being as a result of changes in ES capacity and the flow of benefits. Overall, an ES approach provides information that species-centric conservation cannot, and may be widely useful in conservation planning.

Tuesday, July 17 12:45 Ant Communities Are Strongly Affected By Distance From Buildings

Vonshak, Merav[*], *Stanford University*

Urban ecosystems lead to biological homogenization through habitat degradation and

support of invasive species. Invasive ants are known to have a complex negative impact on their new ecosystem, mainly on other ant. As ants are an important component of natural ecosystems, this may have substantial consequences on many other organisms. We studied the effect of disturbance on ant communities over an urban-rural gradient in the San Francisco Bay. Our main hypothesis was that invasive ants have an advantage at disturbed habitats, while native species have an advantage at preserved habitats. We sampled ants along the gradient, in addition to various environmental factors, including distance from buildings, paved and unpaved roads, water source, and irrigation; land use cover, etc. As predicted, the natural sites were characterized by native ants, whereas the urban sites help up to 4 invasive species, in addition to occasional native species findings. Interestingly, the semi-natural sites had the highest abundance of Argentine ants, even when compared with the urban sites. Human disturbance factors explained 48.1% of the variance (RDA test, F=9.4, p=0.001). Distance from buildings was the most important factor, explaining 20-30% of the variance. Moreover, while concrete cover was the only human related factor that explained invasive ant species distribution, native species were affected by additional factors, as distance from parking lot and water sources.

Tuesday, July 17 12:45 Assessing Steelhead Vulnerability To Climate Change In The Pacific Northwest

Wade, Alisa[*], *University Of Montana* , **Beechie, Tim** , **Stoms, David**, *University Of California, Santa Barbara* , **Mantua, Nathan**, *University Of Washington* , **Wu, Huan**, *University Of Maryland* , **Elsner, Marketa**, *University Of Washington* , **Kimball, John**, *Flathead Lake Biological Station, University Of Montana* , **Stanford, Jack**, *Flathead Lake Biological Station, University Of Montana*

Steelhead (Oncorhynchus mykiss) play a critical role in ecosystems and economies of the Pacific Northwest (PNW) of the U.S., but many PNW populations are listed as threatened or endangered under the Endangered Species Act. Projected climate change is expected to further stress steelhead populations via changes in stream temperatures and flows. Here, we detail a novel approach for assessing salmon vulnerability to climate change. We introduce a vulnerability matrix, which allows comparison between potential threats to steelhead persistence arising from exposure to increased stream temperatures and increased maximum or decreased minimum flows versus the potential sensitivity of steelhead to those threats on the basis of habitat condition and population status. Given scenarios of increased stream temperatures and altered hydrological regimes, by the 2040s, we generally found steelhead populations in the south were more threatened by exposure to increased temperatures while northern populations were more threatened by changes in flows. By the 2080s, threats from increased temperatures expanded into northern steelhead populations. Our assessment of steelhead vulnerability suggested very few areas where protection of existing habitat would likely be sufficient to maintain healthy steelhead populations. On the basis of our results, we suggest the need for coordinated PNW-wide conservation efforts to ameliorate climate-induced threats and improve steelhead resiliency and habitat.

Monday, July 16 Revegetating Arrowhead Marsh After Treatment Of Invasive Hybrid Spartina (Cordgrass): Three Years Of Revegetation Strategies, And Recommendations For

Wainer, Laura[*], *Save The Bay*

Arrowhead Marsh in Oakland, California contains the highest local population of endangered California Clapper Rails in San Francisco Bay; and it is also completely overrun with invasive, hybridized Spartina(S. alterniflora) cordgrass. Three years of experimental revegetation have generated valuable prescriptions for species composition and placement in restoration efforts. Save The Bay (STB) is working with Invasive Spartina Project (ISP)

and East Bay Regional Parks District (EBRPD) to revegetate the western portion of Arrowhead Marsh in Oakland, CA, where hybrid Spartina has been chemically treated since 2006. Arrowhead Marsh is a 47-acre wetland within San Leandro Bay comprised of salt pans, mud flats, channels, and channel edges supporting mid-high marsh vegetative structure. Native vegetation restoration efforts will improve the ability of Arrowhead to keep pace with sea level rise, increase water holding capacity during flood events, provide multiple wildlife habitat benefits, and provide opportunities for public involvement and education surrounding the Spartina Project. The project represents a coordinated regional effort to engage stakeholders in adaptable, innovative, and cost-effective restoration techniques for restoring unvegetated flats after the removal of hybrid S. alterniflora . Our study assesses outplantings of Triglochin maritima, Seaside arrowgrass (TRMA) and Grindelia stricta, Marsh gumplant (GRST) as a means to reestablish native vegetation that provides critical habitat for endangered species, specifically the California Clapper Rail (Rallus longirostris obsoletus). We measure survivorship and vigor of T. maritima and G. stricta planted throughout the marsh, utilizing a strategic planting design based on elevation datum and channel edge proximity. Seedlings were grown and cared for with the intent of being installed in a regularly flooded marsh with high salinity content. Our adaptive management strategy is the result of three years of experiments and monitoring in Arrowhead; its results have influenced recommendations for revegetation projects around the San Francisco Bay.

Tuesday, July 17 12:30 Ensemble Of Habitat Suitability And Remote Sensing Models For Sampling Design: A New Approach To Detect Invasive Plant Species In The Sonoran Desert
Wang, Ophelia[*], *Northern Arizona Unviersity* , **Olsson, Aaryn**, *Northern Arizona University* , **Zachmann, Luke**, *Northern Arizona Unviersity* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Sesnie, Steven**, *US Fish And Wildlife Service*
Although the relationships between non-native plant invasion and increased fire frequency are appreciated for arid environments, predictors of spatial distribution of individual species are poorly understood. Developing predictive models to support conservation and management effort necessitates field-based detection. To confront this issue, we developed habitat suitability models for two prominent invasive plants in the Sonoran Desert of the U.S., Sahara mustard and Mediterranean grass. We also applied 12 years of satellite imagery and time series analyses to derive multiple phenometrics. Areas with medium to high habitat suitability and difference in spectral vegetation indices were extracted for potential field sites. We then identified spatially balanced plot locations with a weighted representation of suitable habitats and vegetation, but confined the plots within low slopes and proximity to roads. To integrate plot-based data with remote sensing imagery as response and predictor variables for models of invasion risk, we employed a design to match our plots and subplots to pixels of two satellite imageries in coarse and fine spatial resolutions. Habitat suitability-based sampling resulted in presence of at least one of our target species in 68% of the plots in the 2011 field season. The refined model ensemble approach for the 2012 season employed a spatially clustered sampling strategy that greatly improved the number of plot samples where target species were detected.

Monday, July 16 Teaching People To 'Like' Science: Using Facebook To Promote Scientific Discovery And Exploration
Wang, Yiwei[*], *University Of California Santa Cruz*
The rapid adoption of social media globally presents ecologists with unprecedented opportunities to both educate and involve the public in environmental science. In recognition of the expanding influence of the internet, we are developing an exciting and innovative citizen

science game on Facebook (https://apps.facebook.com/140369602412). By playing the game, users learn about the biodiversity of the Santa Cruz Mountains (and possibly other ecosystems in the future), and provide a dataset for our project, saving us the labor of tagging thousands of photos. The app collects each player's responses, which will allow us to gauge how accurately photographs are labeled and how quickly individual players improve. Here, we present our preliminary game design and logic and discuss potential challenges. Following the success of similar projects, we expect that our game can potentially enlist hundreds of thousands of volunteers globally to contribute remotely to our research and learn about biodiversity conservation.

Monday, July 16 New Monitoring Initiative For The National Wildlife Refuges:How Well Are Science And Conservation Linked At Different Spatial Scales?

Ward, James[*], *US Fish & Wildlife Service, NWRS IM* , **Dratch, Peter** , **Newman, Jana** , **Chase, Mark**, *US Fish & Wildlife Service, NWRS IM*

The National Wildlife Refuge System (NWRS) Improvement Act of 1997 widened the emphasis from focal wildlife species to maintaining the biological integrity, diversity and environmental health of the Refuge System. Policy-makers, scientists, and conservation planners developed, in 2010, a strategy for continuing this refuge mission in the face of rapid environmental change. Implementation of the new strategy calls for population monitoring at the refuge and landscape level, with results that can be rolled up to regional and national levels. Several approaches have been used within the NWRS to inventory and monitor wildlife populations. Some tie directly to management decisions (e.g., supporting Adaptive Management), while others serve to document the health of populations through surveillance trends. This poster presents examples of scientific activities that have and will be used to inform and support refuge management. Currently, data for the inventory and monitoring program are predominately generated from inventories or short term surveillance monitoring (< 5 years). These activities have not generally been tied directly to the management decision process. There are far fewer examples of targeted monitoring that tie directly to decisions in a true Adaptive Management process. As use of both approaches will continue, we recommend strengthening the link between surveillance monitoring and management decisions.

Monday, July 16 9:30 The Nature Conservancy's Updated Approach To Large Landscape Conservation: Challenges And Opportunities In The North America Region

Ward, Joni[*], *The Nature Conservancy*

Over the past 60 years The Nature Conservancy (TNC) has worked with partners to conserve over 15 million acres in the US, and over 100 million acres internationally. Although we have been quite successful at land conservation, to maximize our impact we've evolved over time from an organization that was largely opportunistic– focusing on small preserves, to embracing a systematic approach to our work. For nearly two decades TNC has used a landscape-based conservation approach to help guide our work, and we've broadened our toolkit to focus on partnerships with public land managers and other private land owners. We've also expanded to marine and freshwater conservation. However, despite our commitment to being a systematic and science-based organization working in the water and on land, we have found some aspects of our conservation approach to be limiting. Today the conservation framework of the Conservancy's North America Region is based on what we refer to as 'whole system' conservation. The purpose of this presentation is to briefly describe TNC's conservation approach, including the philosophy behind whole system conservation – which is as much art as it is science, the strengths and limitations of our approach, and how we've

updated it to meet today's challenges in North America.

Tuesday, July 17 12:15 Predicting The Invasive Mute Swan's Range Expansion Using Climate Change And Urbanization Scenarios
Weaver, Jennifer*
Urbanization, climate change and invasive species are major threats affecting biodiversity and species distributions. Invasive species are likely to thrive in ecosystems disturbed by urbanization and climate change due to their ability to capitalize on marginal habitats. We use ensemble forecasting to model current landscape correlates of the invasive mute swan's distribution in its non-native range of Ontario, Canada. We determine that percent water cover and percent urban land cover are the most important variables in determining the presence of mute swans. This is especially significant considering that mute swans are an aquatic species utilizing the limited water bodies found in urban areas. We then use these species distribution models to predict mute swan distribution in 2050 with different scenarios of urbanization and climate change. As urban areas expand, the probability of mute swan occupancy of these changing land covers also increases. In comparison to urbanization scenarios, all climate change scenarios predict a much larger increase in the number of sites with suitable habitat for mute swans. Overall, we conclude that urbanization and climate change will encourage mute swan range expansion by 2050. This has significant implications for invasive species management as efforts should focus on urban areas and especially expanding urban areas at the northern range limits of mute swans. While hunting mute swans is illegal in Ontario, egg addling is currently employed.

Wednesday, July 18 8:30 Confronting Climatic Complexity: Choosing And Using Fine-Scale Climate Projections For Conservation
Weiss, Stuart*, *Creekside Center For Earth Observation* , **Branciforte, Ryan** , **Flint, Lorraine**, *U.S. Geological Survey* , **Flint, Lorraine**, *U.S. Geological Survey* , **Micheli, Lisa** , **Thrasher, Bridget**
The San Francisco Bay Area is a semi-arid region of immense climatic complexity spanning a spatial hierarchy of macroclimate, mesoclimate, topoclimate, and microclimate. Climate change is a macroclimatic phenomenon driven by changes in atmospheric circulation, and is captured by ensembles of downscaled Global Circulation Models. Mesoclimates are dominated by coastal exposure modified by mountain barriers, creating summer Tmax gradients from 15° to 35°C, and winter rainfall gradients from 300 to 2000 mm, and are represented by 800m scale interpolated climate surfaces. Topoclimates include effects of insolation, cold-air pooling, wind exposure, and soil water balance, and are captured at 270m scales (and below) through the Basin Characterization Model and terrain modeling. This climatic complexity supports high biodiversity, and provides first-order buffering against macroclimate change because species ranges can shift short distances (<1-10 km) across topoclimates and mesoclimates to track suitable climate spaces under any climate change scenario. We have developed multivariate metrics of climatic complexity including integrated water balance that can assess the resiliency of a Conservation Lands Network to species losses. This combination of process-based and statistical models provides a powerful tool for assessing climate change impacts at regional and local scales.

Wednesday, July 18 11:45 Developing Conceptual Models To Inform Conservation Management Of Working Landscapes At Tejon Ranch, California
White, Michael*, *Tejon Ranch Conservancy*
Managers of conserved lands are increasingly focusing attention on adaptive management to

maintain and enhance conservation values, particularly in light of land use modifications in adjacent areas and changing climates. The Tejon Ranch Conservancy is developing an adaptive management plan for over 200,000 acres of conserved lands at Tejon Ranch, a privately owned, working cattle ranch in the Tehachapi Mountains of California. Our first step has been to use Conservancy-sponsored academic research, contractor surveys, citizen scientist observations, and Conservancy monitoring to formulate conceptual models of grassland composition, structure, and function at Tejon Ranch. Research on grassland vegetation - soil relationships is differentiating a number of grassland types, their respective environmental drivers, and potential transitions between states. Directed surveys and citizen science observations of vertebrate taxa, native geophytes, and special status taxa suggest associations of some taxa with specific grassland types. We have synthesized our understanding of grassland communities at Tejon Ranch into conceptual models showing states, transitions, drivers, and uncertainties to inform our management planning. I will present our conceptual models for Tejon Ranch grassland communities and discuss how we are using them to develop adaptive management hypotheses to enhance conservation values or fill key knowledge gaps.

Monday, July 16 10:00 Population Connectivity Of The Endangered San Joaquin Kit Fox Across A Human-Altered Landscape

Wilbert, Tammy R[*], *Smithsonian Conservation Biology Institute* , **Ralls, Katherine**, *Smithsonian Conservation Biology Institute* , **Cypher, Brian**, *California State University-Stanislaus* , **Van Horn Job, Christine**, *California State University-Stanislaus* , **Smith, Deborah**, *Working Dogs For Conservation* , **Westphal, Michael F**, *Bureau Of Land Management* , **Bremner-Harrison, Samantha**, *School Of Animal, Rural & Environmental Sciences* , **Maldonado, Jesus**, *Smithsonian Conservation Biology Institute*

The survival of the endangered San Joaquin kit fox is challenged by reduced and fragmented habitat. The metapopulation contains roughly 3,000 individuals located in central California and has declined due to land use changes, human expansion, roads, and poisoning. Three of the largest remaining kit fox populations living in natural habitat – scrubland – have been identified as conservation priorities: Panoche, Carrizo Plain National Monument, and Lokern. Nearby, another kit fox population continues to grow within Bakersfield, a metropolis with over 320,000 people in less than 300 km2. Previous studies show a large number of ecological factors differ between wild and urban kit foxes, and risks for inbreeding or disease transmission may increase in the city. The connectivity of the urban kit fox population within the city and with the wild populations was investigated with 12 tetranucleotide microsatellites for over 700 individuals from 1990-2009. Population analyses show varying degrees of connectivity between populations across the San Joaquin Valley with unique signatures of genetic diversity. The results are an important step in understanding the genetic diversity of the urban kit foxes as well as how the human-altered landscape is impacting their movement and population viability.

Monday, July 16 8:45 Conserving Migratory Species: What Should We Do About Species That Leave The Fortress?

Wilcove, David[*], *Princeton University*

Beyond the obvious (and important) fact that they don't stay in one place, migratory animals pose multiple challenges with respect to reserve planning: We rarely know where particular breeding populations spend the non-breeding season; the locations and relative importance of stop-over sites are often a mystery; volant species may not follow the same migratory route or use the same stop-over sites during a given season or in different years; and species may change the timing or routing of their migrations in response to

climate change. I propose four steps to conserve migratory species in the face of these uncertainties: (1) protect representative examples of breeding and wintering (non-breeding) habitats across the full latitudinal and longitudinal ranges of the species; (2) secure known concentration sites along the migratory route(s); (3) create incentives and/or regulations to promote diverse landscapes via protection of dune ecosystems, coastal wetlands, riparian areas, hedgerows, and remnant woodlots; and (4) support broad-scale efforts to mitigate widespread or diffuse threats such as commercial and subsistence hunting and wind farms. These steps are necessary but not sufficient to protect migratory species.

Monday, July 16 Rethinking The Beaver: A New-Old Tool Can Adapt Southwestern Stream-Riparian Ecosystems To Climate Change.

Wild, Cathryn[*], *Seventh Generation Institute*

The southwestern United States is expected to be an epicenter of climate change. Many Southwest stream-riparian ecosystems are presently in poor condition and may be further degraded by longer and more intense droughts, punctuated by more extreme rain events. This investigation asked two questions: 1) could the ecosystem engineering activities of beaver, often considered a nuisance species, be an overlooked climate change defense tool in southwestern streams; and 2) where in New Mexico could beaver be used most effectively to conserve biodiversity in the face of climate change? The first question was answered via an extensive review of literature on beaver-driven ecosystem modifications. For the second, GIS was used to model potentially suitable beaver habitat and this habitat was laid over areas of high biodiversity value and high climate change threat. Key findings were that ecosystem modifications by beaver can build stream-riparian resilience to climate change impacts; however in many parts of New Mexico, beaver numbers are too low to have this effect. Ten priority watersheds were identified where the abundant presence of beaver would be especially valuable to build the resilience that will help conserve biodiversity. We conclude that in the search for effective climate change adaptation strategies for southwestern stream-riparian ecosystems, ensuring the abundant presence of beaver is an overlooked strategy that can be easily incorporated into ecosystem management.

Monday, July 16 Rapid Behavioral Assessment: Population Management Through Behavioral Observation

Wildermuth, Robert[*], *School Of Life Sciences, Asu* , **Anadon, Jose Daniel** , **Gerber, Leah**, *Ecology, Evolution And Environmental Sciences, SoLS, ASU*

Conservation biologists must balance the need for well-informed science with the cost of monitoring and protecting vulnerable populations. Rapid behavioral assessment (RBA) may provide a means of approximating demographic parameters in managed populations through repeated, less costly behavioral observations. We develop and test an approach for RBA based on observations of aggression and territorial behavior by projecting abundance of California sea lion (Zalophus californianus) over 28 years of population surveys. Using a multiple regression of these behaviors on observed reproduction rates, we approximate birthrate in the sea lion population on Los Islotes island, Mexico. This parameter estimate is incorporated in a sex and stage structured model for population viability analysis. Results from our model overestimate abundance predictions from the fully demographic model by 4.3% and underestimate observed female abundance by 7.5%. We find that our models may be more robust to uncertainty in estimates of carrying capacity compared to the harmonic and modified harmonic mean birth functions, which approximate birthrate from male and female abundance. We propose that rapid behavioral assessment may provide managers with a sufficient means of updating estimates of demographic parameters between more detailed studies. This technique could allow limited resources to be allocated to other aspects

of management that would otherwise be spent on traditional parameter estimation.

Wednesday, July 18 10:00 The River's Calendar: Connecting Anglers To Environmental Changes In Stream Phenology
Williams, Jack[*], *Trout Unlimited* , **Schoen, Jerry**, *University Of Massachusetts*
Climate change is causing alterations to stream systems, particularly to temperatures and hydrographs, which have implications to the phenology of aquatic and riparian-dependent species. Evidence suggests that adult mayflies are emerging earlier in western streams as snow shifts to rain and peak flows occur earlier. Such changes will have profound implications for coldwater species like trout as well as anglers. Ironically, processes by which climate change may impact streams and fishing are not well understood by fly fishers, who are well positioned to observe subtle changes in stream systems as they adjust their fishing techniques to match insect hatches and stream conditions. The River's Calendar is a citizen science program designed to improve understanding of stream phenology by enabling anglers to systematically observe changes in their local streams. Anglers will record temperature, stream flow, and aquatic insect, fish and plant observations while fishing. This information will be translated into detailed calendars of hatches and other riparian life for each river studied – suitable for use by various river recreationists. This information will also form the basis for a science-based examination of threats caused by various environmental changes. The angler monitoring network and resulting data will support Trout Unlimited's efforts to build broad-based conservation alliances to promote informed decision making on climate change among its 145,000 members.

Tuesday, July 17 3:30 Opportunities And Constraints For Restoration Of Floodplains During Periods Of Increasing Storm Disturbances
Williams, Jack[*], *Trout Unlimited* , **Danforth, Trygg**, *Trout Unlimited*
Floodplains provide important fisheries habitat and are also critical for protection and maintenance of instream habitat. Because of these values, floodplains and associated channels across New England have been restored to provide increased habitat for native brook trout and improved fishing opportunities. During the past several decades, precipitation has increased throughout much of the region. Notably, major storm events producing 2" or more of rain have increased, resulting in additional flooding and damage to human-built structures in floodplains. In response to the flood and flood-related damage, some communities and state agencies have channelized streams and cleared channels in efforts to increase flow capacity and decrease flood damage. The flood control projects often undercut ecological restoration efforts and prove counter-productive for flood control in the long run. In an attempt to help educate the public and decision-makers on the ecosystem service values provided by natural channels and functional floodplains, as well as the damage caused by recent flood control efforts, Trout Unlimited has embarked on a project to demonstrate the value of restored and reconnected floodplains to reduce the impacts of flood events while also providing aesthetic and recreational benefits to local communities.

Wednesday, July 18 9:15 Building A Science Foundation For Conservation Of Arid Rangelands: The Kane And Two Mile Ranches, Arizona
Williamson, Matt[*], *Grand Canyon Trust* , **Albano, Christine**, *John Muir Institute Of The Environment* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Sisk, Thomas**, *Northern Arizona University* , **Aumack, Ethan**, *Grand Canyon Trust*
Increasing temperature and prolonged drought are likely to exacerbate the effects of invasive species,

soil loss, and uncharacteristically severe wildfire on rangelands throughout the West. Considerable uncertainty exists regarding both the impacts of these changes on ecosystem resilience and effective management strategies for mitigating these impacts, especially when considered in conjunction with livestock grazing. Here we describe the Kane and Two Mile Research and Stewardship Partnership, a unique public-private partnership comprising the primary livestock permitee, land management agencies, and academic partners working on the 3,340 km2 Kane and Two Mile Ranches in northern Arizona. Through data development efforts, ranging from fine-scale measurements of soil stability and reseeding response to landscape-scale predictions of cheatgrass (Bromus tectorum) occurrence, fire behavior, wildlife occupancy, and connectivity, we are actively developing tools for monitoring the effects of changing climatic and management regimes at multiple scales, and incorporating the results into management plans. Continued expansion of the Partnership provides an exciting opportunity to leverage diverse skills and expertise to address the challenges facing grazing lands in the arid West.

Monday, July 16 Spatially Explicit Models Of Occupancy For Evaluating Forest Restoration And Climate Change On The Kaibab National Forest, Arizona

Williamson, Matt[*], *Grand Canyon Trust* , **Dickson, Brett**, *Nau/Conservation Science Partners* , **Olsson, Aaryn**, *Northern Arizona University* , **Sesnie, Steven**, *US Fish And Wildlife Service* , **Stein Foster, Valerie**, *United States Forest Service - Kaibab National Forest*

Rising temperatures and prolonged drought are likely to increase the risk of uncharacteristically severe wildfire across the western United States. Forest restoration activities have failed to keep pace with current fire risk often due to disagreements regarding the effects of such treatments on wildlife and challenges with subsequent monitoring of those effects. Landscape scale predictions of occupancy based on remotely sensed forest structural covariates provide a powerful mechanism for addressing these concerns. Through digital manipulation of these covariates one can evaluate trade-offs under differing climatic and management regimes. To demonstrate the utility of this approach, we present results for Grace's Warbler, Ruby-crowned Kinglet, and Western Bluebird; three proposed Management Indicator Species on the Kaibab National Forest, Arizona using four years of survey data and management relevant covariates under a single season occupancy estimation framework. Our results suggest that differing combinations of mechanical restoration treatments and fire are likely to produce substantially different outcomes in terms of occupancy for these three species. In addition, increases in temperature that alter the distribution of vegetation types are likely to decrease occupancy for all three species across the Kaibab National Forest. These types of information can help land managers build and evaluate both short- and long-term strategies for dealing with climate change.

Wednesday, July 18 9:00 Easier Importation Of Satellite Data Into ArcGIS Through The Environmental Data Connector (EDC)

Wilson, Cara[*], *NOAA/NMFS/SWFSC ERD* , **Mendelssohn, Roy**, *NOAA/NMFS/SWFSC ERD*

Environmental satellite data, such as sea-surface temperature, surface chlorophyll, sea-surface height and ocean winds, are valuable resources for characterizing and monitoring marine ecosystem and habitats. However oceanographic satellite data has been largely underutilized by the marine resource community. One reason for this is that satellite data can be difficult to access, manipulate and process, particularly when the skills and computational resources needed for the quantitative manipulation of terabytes of data are lacking. In particular, importing satellite data into ArcGIS, is a mapping and spatial analysis software

that is used widely within the marine resource management community, can been challenging, since importing multiple HDF files into ArcGIS is quite cumbersome. To help alleviate this issue an ArcGIS extension called the Environmental Data Connector (EDC) has been developed. The EDC can access data served by OPeNDAP and THREDDS, ERDDAP, IOOS SOS and also local files. The EDC allows the user to search and graphically select the temporal and spatial subset of the data desired, and then the selected subset of the data is automatically brought into ArcGIS. There are also versions of the EDC that work from within Matlab, R and Excel.

Tuesday, July 17 10:15 The Role Of No-Take Closures In ITQ Fisheries

Wilson, Jono[*], *Bren School / UCSB* , **Gleason, Mary**, *The Nature Conservancy* , **Costello, Christopher**, *UCSB*

The U.S. West Coast groundfish fishery targets a mix of high productivity “strong” stocks and low productivity “weak” stocks off the states of Washington, Oregon and California. Overfishing of weak stocks motivated the implementation of the Rockfish Closure Areas (RCAs) in 2002 along the entire west coast of the US. The RCAs effectively eliminated harvest of both strong and weak stocks between 75-150 fathoms water depth. In 2011, the trawl sector transitioned from limited entry to individual fishery quotas (IFQ) which allocate a fraction of the scientifically determined allowable catch for 29 species and species groups to individual fishermen. One hundred percent observer coverage eliminates discarding of non-target, weak stocks and incentivizes conservative fishing behavior near known weak stock habitat due to prohibitively low quotas and high market prices. IFQs therefore may effectively reduce weak stock harvest while simultaneously allowing for maximization of target stock quotas. Here we explore the tradeoffs in catch, biomass and profits between managing weak stocks via spatial closures and IFQs. We examine if spatial closures are ever part of the optimal solution for maximizing profits while maintaining minimum stock sizes of weak stocks in IFQ fisheries with observer coverage. We develop a two patch, mixed species, bioeconomic simulation model of species similar to those encountered in the west coast Groundfish fishery. We explore the optimal yield of the strong stock species as well as the size of spatial closure necessary to maximize the present value of future profits under a range of observer coverage costs, fishing costs, and conservation restrictions. Our results shed light on the role of spatial closures in IFQ fisheries and the future of the west coast Groundfish fishery.

Wednesday, July 18 11:30 Golf Courses As Refuges For Freshwater Turtles In Urbanized Landscapes

Winchell, Kristin[*], *University Of Massachusetts Boston* , **Gibbs, James**

Urban-associated wetland loss and degradation threaten freshwater turtles, which are declining globally. Golf courses may provide refuges as some of the few semi-natural habitats in urban areas. In 2009 and 2010 we sampled 88 wetlands on golf courses, urban zones, and wildlife refuges near Syracuse, New York, capturing 413 turtles of two species: Chelydra serpentina (n=249) and Chrysemys picta (n=164). Golf course wetlands had the smallest areas, the most circular shapes, mostly inorganic substrates, and abundant rooted-vascular vegetation but lesser extent of other vegetation. Developed land dominated uplands with little forest and grassland but had lower road densities. Despite habitat differences, turtle occurrence and female fraction did not vary by context although capture success was lowest in golf courses. We noted skew in age and sex structure related to roads in all contexts. Our results suggest that golf courses provide viable habitat while reducing urban threats such as road mortality, yet management is necessary for creating high-quality habitat. The conservation value of these wetlands can be easily enhanced by creating more favorable

upland habitat, promoting emergent and rooted vascular vegetation, increasing wetland area, and varying wetland shape. In our study region, only 4.5% of the county lies in protected areas yet 25% of wetlands are in urban zones, emphasizing the need for private land management such as on golf courses.

Monday, July 16 4:30 Fishery Management Strategy Evaluation In The Context Of Incidental Take Of An Endangered Species, Sacramento River Winter Chinook Salmon

Winship, Arliss[*], *University Of California, Santa Cruz And Southwest Fisheries Science Center, NOAA* , **O'Farrell, Michael**, *Southwest Fisheries Science Center, NOAA* , **Mohr, Michael**, *Southwest Fisheries Science Center, NOAA*

Management strategy evaluation (MSE) is a simulation method commonly used to evaluate the expected performance of harvest strategies with respect to target populations. However, the MSE approach is also useful for evaluating strategies designed to manage incidental take from endangered populations. We adapted MSE to the case of an endangered Chinook salmon population that is subject to incidental take by mixed-stock ocean salmon fisheries that target more abundant stocks. Our objective was to evaluate the population's risk of extinction under alternative harvest strategies. We simulated salmon population dynamics and the management process simultaneously. The management process included harvest strategies that set allowable fishing mortality rates as a function of population size. Strategies that reduced fishing mortality rates in response to low estimates of population size resulted in lower extinction risk than strategies that set fishing mortality at current or historical levels. The number of data used by a strategy and the extent of reductions in fishing mortality resulted in different frequencies and durations of reduced fishing opportunity. Our study quantified the trade-off between the risk of extinction of an endangered population and the opportunity for fisheries to harvest target stocks. Our approach to evaluating strategies for managing incidental take illustrates the utility of MSE for applications to endangered populations.

Wednesday, July 18 12:15 Understanding The Impacts Of Rapid Domestic Energy Development On Wildlife Systems With An Eye Towards Mitigation

Wittemyer, George[*] , **Northrup, Joe**

Energy development has increased rapidly on public lands in the United States over the last decade. Unconventional oil and gas and renewable energy development is projected to be one of the primary drivers of land conversion and habitat fragmentation in the coming decade, but the ecological impacts of these developments remains poorly understood. A more complete understanding of the environmental impacts of energy development is needed for informed decision making, regulation, and mitigation. We review the ecological and evolutionary consequences to wildlife from the surface impacts by unconventional and renewable energy development. This review aims to take stock of our current understanding of the consequences for wildlife, specifically highlighting our knowledge gaps. From this assessment, we provide guidance for future research directions and opportunities regarding this globally important process.

Monday, July 16 Do Salmon Want Humans To Harvest Rain? A GIS Exploration

Woelfle-Erskine, Cleo[*], *UC Berkeley* , **Merenlender, Adina**

As water demand grows and climate change increases rainfall variability, hydrologists must manage water to maximize human and ecological benefits. Storing rainfall can reduce stream diversions; relative human-ecosystem benefits depend critically on how much rain is captured and whether it is collected in tanks, ponds, or infiltration basins. On Salmon Creek (Sonoma Co., CA), stream intermittency is implicated in Coho

(Oncorhynchus kisutch) decline. Groundwater and stream diversions exacerbate low flows, so reducing summer diversions is a key objective in Coho recovery. We hypothesize that watershed-scale rainwater harvesting will delay stream intermittency in Mediterranean climates by reducing the need for summer diversions and that small tanks will produce a more natural flow regime than large impoundments. We assess flow restoration potential in a GIS using (1) a water balance model that measures hydrologic impacts throughout a stream network; (2) rain catchment potential maps; and (3) groundwater recharge zone maps. In average years, rainwater can replace diversions on most parcels. In dry years, most residents can meet 75% of water demand with rainwater. Roofs cover less than 1% of the watershed so capturing roof runoff will not measurably decrease winter flows. We conclude that rainwater harvesting can restore more natural flow regimes and improve water security for rural residents. Future field studies will assess human and hydrologic response to cistern installation.

Monday, July 16 4:30 Protecting Species Threatened By Climate Change Under The U.S. Endangered Species Act: Opportunities And Challenges

Wolf, Shaye*

Climate change is predicted to significantly increase the extinction risk for many species, underscoring the need for effective mitigation (greenhouse gas reduction) and adaptation (increasing resilience) measures to reduce this risk. The U.S. Endangered Species Act is an existing tool that has the potential to provide mitigation and adaptation benefits to species threatened by climate change. We analyzed provisions of the ESA that can provide protections to climate-imperiled species, and examined how those provisions have been utilized to date. Listing petitions have been submitted for 11 species for which climate change was identified as the primary threat, one of which has been listed. Of 106 additional petitioned species for which climate change was identified as a principal threat, 11 have been listed. Once species are listed, ESA recovery plan and critical habitat provisions can provide mitigation and adaptation options. However, recovery plans for only 13% of listed species with plans address climate change, 10% identify climate change as a threat, and 5% suggest recovery actions to reduce climate change impacts. Although many recent critical habitat designations mention climate change as a threat, few designations factor knowledge of those climate change threats into critical habitat delineation. We find underutilized opportunities to apply ESA protections to climate-threatened species and examine the scientific, institutional, and political challenges to doing so.

Monday, July 16 12:45 Unraveling Post-Breeding Season Migration Patterns Of Harbor Seals From A Marine Protected Area In Alaska

Womble, Jamie*, *Oregon State University & National Park Service* , **Gende, Scott**, *National Park Service* , **Horning, Markus**, *Oregon State University*

The development of effective conservation strategies for wide-ranging marine vertebrates requires an understanding of their long-distance movement patterns as threats may occur in one area that can influence demographic processes in other areas. Marine protected areas (MPAs) for pinnipeds have typically focused on breeding areas where individuals are highly aggregated, but do not always consider habitats that may be used outside of the breeding season. Glacier Bay National Park (GB) in Alaska is one the largest MPAs in the northern hemisphere, yet harbor seals have declined by -11.5%/year (1992 to 2009), despite protection measures in GB. However, it is unknown if seals move outside of GB after the breeding season, the threats they encounter, and if they return to GB. We attached satellite transmitters to female seals (n= 37) in GB to quantify the post-breeding season (Sept–May) distribution of seals and to identify hotspots used by seals. Seals ranged extensively beyond the boundaries of GB (up to

900 km away) and were associated with seasonal prey aggregations and anti-cyclonic eddies. Fidelity of seals to GB was lowest from November to April with 89% of seals departing GB. Although seals ranged extensively beyond GB, there was high degree of site fidelity of seals (93%) back to GB the following breeding season. Our results have implications for the design of MPAs for pinnipeds and other wide-ranging species that have discrete breeding and non-breeding areas.

Monday, July 16 Floristics And Diversity In Coastal Scrub Of The San Francisco Bay Area

Wrubel, Eric[*], *San Francisco State Universtiy* , **Parker, Thomas**, *San Francisco State Universtiy*

The San Francisco Bay Area is rich in coastal scrub vegetation types (soft-leaved coastal shrublands); from low-growing mats on coastal bluffs to tall dense scrubs on inland hills. Local species richness varies considerably within the coastal scrub mosaic, which comprises roughly 1/3 of all shrubland vegetation in the region. While coastal scrub is relatively common and well protected in the Bay Area, some rare associations or areas with high species diversity may represent conservation gaps. I conducted a floristic survey along gradients of maritime influence and topographic position to describe patterns of species richness and associations within coastal scrub vegetation of the Bay Area. Local richness of vascular plant species was significantly higher on coastal bluffs when compared to interior locations. Ordination results suggest that water availability and stress from windborne salts are two major environmental factors affecting community composition. Sites with significant maritime influence and high water availability appear to have relatively high species richness. These locations tend to have a rich mixture of species with northerly affinities, and represent important climate change refugia for coastal plant species. I present the major physiognomic groupings in Bay Area coastal scrub and a preliminary classification of vegetation alliances and associations. The results of this study can be used to inform gap analyses for coastal conservation targets.

Tuesday, July 17 8:55 Implementing Science Across Scales: Collaborative Approaches To Large Landscape Conservation In North America And Australia

Wyborn, Carina[*], *Fenner School Of Environment And Society, Anu*

Large landscape conservation initiatives have gained increasing prominence globally. Motivated by the science of conservation biology, these initiatives use innovative models of collaborative governance to connect landscape-scale science with local-scale action. However the many tensions between such scales of decision-making and action pose significant challenges for connecting conservation science with practice. Drawing on a longstanding case in North America and an emerging initiative in Australia, this paper will discuss the challenges and opportunities collaborative approaches present for implementing conservation action across multiple scales. This presentation will summarise key findings from an interdisciplinary doctoral dissertation. Qualitative social science was used to examine the interplay between science, values and action in cross-scale governance. Despite different social, ecological and institutional contexts, these cases highlight the importance of both science and social values to collaborative conservation. However, both cases faced early challenges to their legitimacy through a loss of connection with the local scale. Research findings demonstrate that while collaboration can serve as an important mechanism to bridge science and practice across scales, it cannot be engineered from the 'top down'. Landscape-scale science may provide a guiding vision, however this research highlights the importance of grounding conservation science and action in a local context.

Monday, July 16 11:00 Grouting Mosaics: Motivating Collaborative Conservation Across Patchy Landscapes

Yaffee, Steven*, *University Of Michigan*

Just as ecosystem processes link dispersed structural elements, so do human social processes link isolated land ownerships, human needs and institutional capacity to achieve conservation and protection at the landscape-level. Governance structures, legal mandates, public programs, scientific research activities and other structural elements help provide mechanisms that lead to coordinated action. However, less tangible elements such as leadership, a sense of place or shared identity, and strategic thinking provided by third parties are needed to produce action that is meaningful and durable. This paper will examine some of these critical "grout-like" elements, drawing from a recent set of world-wide case studies of marine ecosystem-based management. It will also highlight the challenges resulting from current social dynamics. Ironically, while the need for landscape-scale action is greater, the technology for connectivity is more robust and the space that separates critical elements is less, forces promoting polarization and fragmentation and the inability to concentrate on interconnected complex problems make achieving collaborative conservation at the landscape scale more difficult.

Monday, July 16 Quantifying Forest Vertical Structure To Determine Bird Habitat Quality In The Greenbelt Corridor Along The Elm Fork Of The Trinity River, North Texas

Yamamoto, Shiho*, *Univeristy Of North Texas*

This paper seeks to create a multi-dimensional habitat map to examine the relationship between forest stand structure, landscape heterogeneity and bird community composition. Avian community structure is an established indicator of forest health and overall biodiversity. Avian communities in turn are determined by bird breeding success and territory occupancy both of which are correlated with vegetation density and habitat spatial configurations. This study integrates Hypersectral data for dominant tree species delineation with LiDAR data for height detection to analyze forest bird niche requirements. The study site is associated with the Eastern Cross Timber ecosystem, which defines the limits of many wildlife taxa, spanning the western treeless Great Plains and eastern deciduous forests, much of which has been developed for residential and commercial purposes due to its close proximity to the Dallas-Fort Worth metropolitan area. What remains is a remnant patch of bottomland hardwood forest, providing an important sanctuary for both non-migratory and migratory birds. Preliminary results based on bird census conducted biannually during the 2009 & 2010 breeding seasons combined with the vegetation survey show that the integrated habitat map serves as an effective conservation/communication/education tool not only to display the known location of target species occurrence but also the potential location of the species based on the habitat properties at landscape level.

Monday, July 16 11:30 Delineating Limiting Features Of Climate And Habitat Of American Pika (Ochotona princeps) Subpopulations In The Face Of Climate Change

Yandow, Leah*, *University Of Wyoming Cooperative Research Unit* , **Chalfoun, Anna**, *University Of Wyoming* , **Doak, Daniel**, *University Of Wyoming Coop Research Unit*

The distinctive life-history traits of the American pika (Ochotona princeps) including physiological constraints, limited dispersal ability, and occurrence in small isolated populations render them particularly vulnerable to climate change. Because of these qualities and their role in the alpine community, pikas are an emblematic species of alpine habitats and are widely viewed as an indicator of change. However, disparate climatic and habitat forces appear to limit pika populations across the species range, suggesting that climate effects are highly context-dependent. We tested

three hypotheses including summer heat, winter snowpack, and forage availability to investigate the importance of climate and habitat characteristics in explaining relative pika abundance across two distinct Central Rocky mountain ranges in Wyoming. Data from the Wind River and Bighorn ranges show similar patterns of pika abundance, with the strongest support for explanatory models including elevation and forage availability. Our results support each of the three hypotheses exemplifying the complex dynamics of climate influences on pikas. The data also emphasize the importance of alpine meadow and apparent limitations at upper elevation limit, which is contrary to current understanding that low elevation range limits are the main driver of pika distribution. The model we present will allow for better prediction of existing pika populations across the Central Rocky mountain region.

Wednesday, July 18 9:50 Conservation Targets As A Unifying Tool For Collaboration

Yarris, Gregory*, *Central Valley Joint Venture*

Landscape scale approaches to conservation require collaboration among diverse stakeholders to be successful. Shared philosophies are often sufficient to coalesce groups initially, but meaningful goals and identifiable outcomes are necessary for long term commitment of time and resources. The Central Valley Joint Venture (CVJV) is a successful partnership of diverse groups unified by migratory bird habitat conservation in the critical but highly-altered landscape of California. The CVJV was formed in 1988 to locally implement the North American Waterfowl Management Plan, an ambitious effort to restore waterfowl populations to levels observed during the 1970s. Initially, the CVJV used regional population abundance objectives for waterfowl to quantify habitat objectives and frame conservation delivery strategies. The CVJV eventually broadened its focus and partnership to address the needs of other wetland and riparian avian species. The success of the partnership stems from a commitment to conservation targets and strategies based on the best available science. The CVJV uses directed research and a network of expert scientists to test assumptions and improve the scientific foundation for conservation delivery. Using conservation targets that are objective and based on science provides a common currency to unify diverse partners, and a strong foundation for developing state-wide and regional policies, garner public support, and ultimately secure funding for conservation actions

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Tuesday, July 17 9:00 Training Teachers Improves Support For Conservation

Young, Samantha*, *San Diego Zoo Institute For Conservation Research* , **Keith, Robin**, *San Diego Zoo Global* , **Lacombe, Corrin**, *San Diego Zoo Global* , **Reinbold, Megan**, *San Diego Zoo Global* , **Danoff-Burg, James**, *San Diego Zoo Global*

An understanding of environmental issues is essential for cultivating a personal involvement in conservation, something that is particularly important among teachers of conservation science. Of particular importance along these lines are hands-on curricula that involves both lab and field experiences and provides resources that teachers can bring back to the classroom. In 2011, 124 teachers participated in online surveys evaluating their personal and professional perspectives teaching conservation biology. Two groups were surveyed – a treatment group (that participated in the teacher training program at the SDZG Institute) and a control group (that did not). Individuals in the treatment group spent more time in their classroom on conservation related topics, are more comfortable and feel better prepared teaching about conservation, and place great value on offering conservation solutions to students. Additionally, the treatment group appears to value wildlife conservation more and recognizes the contribution of zoos to conservation. These results suggest that conservation organizations are directly benefited by training teachers how to teach conservation science. Placing teacher training as a

central component of conservation education efforts improves the quality of instruction and increase our public outreach exponentially.

Monday, July 16 4:20 Diverse Conservation Approaches For A Diverse World

Zavaleta, Erika*, *Environmental Studies Dept.*

Diverse conservation approaches for a diverse world People now influence most places on Earth and will likely leave an enduring stratigraphic mark into the geological future. But most conservation is not global; it takes place in regions that vary vastly in the nature and degree of human influence, from pristine to urban. Even entirely anthropogenic landscapes vary widely, from recent, highly engineered systems to ancient, evolved ones with very different dynamics. Conservation thus can and should pursue different goals, through different means, in different places. This diversity is valuable in itself, conferring resilience on the conservation sector as it does in ecosystems. Moreover, there is rarely one inherent best goal for a given place; the biodiversity that persists in working landscapes, the biodiversity that does not, and the ecosystem services that support local livelihoods and global society each deserve better than for us to pick one or two and leave the others behind. So what can conservation efforts do better in our era of accelerating change? We must work better with people and across disciplines and sectors, whether we are pursuing protected areas or food security. We should mature the science of transformation: the stewardship of self-renewing systems through inevitable change. We need to conserve bottom-up, evolved, hierarchical complexity – the essence of nature – in both ecological and socio-ecological systems. Finally, conservation's paths should reflect the vast diversity of places where it happens and of values that inspire it.

Monday, July 16 Interactions Between Nitrogen Deposition And Grazing Inform Invasive And Native Species Management In A Serpentine Grassland

Zavaleta, Erika*, *Environmental Studies Dept.* , **Pasari, Jae**, *UC Davis* , **Hernandez, Daniel**, *Carleton Colllege*

In the native-rich, nitrogen-limited serpentine grasslands of the San Francisco Bay Area, the most widely cited threat to native species is the fertilizing effect of nitrogen (N) deposition and the most widely recommended management strategy is cattle grazing. Despite the perceived primacy of N deposition as a threat and grazing as the solution, no one has experimentally-manipulated both factors to confirm their importance in this system. We manipulated grazing and N at Coyote Ridge, the largest serpentine grassland in California, from 2007-2011. We used camera trap technology to precisely quantify grazing intensity, and low fertilization levels to mimic possible increases in N deposition and accumulation. We found that grazing maintained native species richness and reduced exotic grass cover under current N levels, but may not manage exotic cover as effectively under future, increased levels of N deposition and accumulation. While grazing benefited most native forbs, it also reduced native grass cover, suggesting both positive and negative grazing effects on native species conservation. Huge differences in measured levels of grazing intensity within a single stocking rate suggest that more intensive management might be required to better distribute the conservation benefits of grazing in this system.

Tuesday, July 17 12:45 Linking Nitrogen Pollution To The Decline Of Threatened Species And Ecosystems: The Case Of Bay Area Serpentine Grasslands

Zavaleta, Erika[*], *Environmental Studies Dept.* , **Vallano, Dena**, *Environmental Protection Agency* , **Pasari, Jae**, *UC Davis* , **Hernandez, Daniel**, *Carleton Colllege* , **Selmants, Paul**, *University Of Hawaii-Manoa* , **Tzankova, Zdravka**, *UCSC* , **Koch, Paul**, *UCSC* , **Morozumi, Corinne**, *UCSC*

Nitrogen (N) pollution has far-ranging effects on ecosystems and biodiversity, especially in historically N-limited systems like serpentine grasslands. We examined (1) the extent of N pollution threats to federally listed species in the US, (2) evidence of N deposition effects on the listed Bay checkerspot butterfly (Euphydryas editha bayensis) in serpentine grasslands, (3) restoration strategies to reduce the effects of N deposition and plant invasion on these grasslands, and (4) possible policy & regulatory approaches to reduce N deposition at regional or national scales. 15N isotope records in Quercus durata were consistent with increased anthropogenic N inputs over the last century, and atmospheric samplers indicated high current input rates. A competition study confirmed that N inputs advantage Lolium multiflorum, the main exotic invader of Bay Area serpentine areas. Field experiments indicated that moderate cattle grazing reduced exotic cover, but its effectiveness declined under simulated future N loads. We identified an approach to reduce atmospheric N deposition based on novel use of existing policy and regulatory tools: it may be possible to reduce N pollution by leveraging the Endangered Species Act to trigger the Clean Air Act and state air quality regulations. The USFWS documents at least 85 listed or candidate species throughout the US as negatively affected by N pollution. Great potential thus exists for the mechanisms we identified to extend to other cases.

Tuesday, July 17 9:15 Novel Approaches For Restoring Wetlands In Novel Sites: A Practical Necessity

Zedler, Joy[*]

Restoration targets need to be broader than “returning a site to its historical state.” For wetlands, targets such as “restore diverse vegetation” are unachievable, especially in downstream positions of watersheds that are irreversibly altered by agriculture and urban development. Such watersheds discharge excess water and nutrients, making downstream wetlands highly eutrophic and readily invaded. The typical outcome of restoration projects in downstream wetlands is dominance by a clonal graminoid invader (e.g., hybrid cattails). Although the resulting novel ecosystems retain sediments, produce biomass, and store carbon, they fail to support historical biodiversity. Continual weeding and replanting are impractical, so novel approaches are needed. A futuristic target is a positive feedback system whereby native plants would reverse the stressor that favors invaders. Toward that aim, I promote starting sedge meadow restoration with a native dominant, Carex stricta. This “superplant” grows tussocks, enhances microtopography, stores carbon, supports diverse plant species, and takes up added nitrogen. Our next step is to compare denitrification rates of tussocks under various restoration approaches. To restore novel sites, I encourage research on native plants that might reverse stressors, thereby favoring their own dominance over that of invaders. With multi-functional dominants in place and countering eutrophication, restorationists could focus on augmenting biodiversity.

Tuesday, July 17 4:45 Trading-Off Fish Biodiversity, Food Security And Hydropower In The Mekong River Basin

Ziv, Guy[*], *The Natural Capital Project* , **Levin, Simon**, *Princeton University* , **Rodriguez-Iturbe, Ignacio**, *Princeton University* , **Baran, Eric**, *Worldfish Center*

The Mekong River Basin, site of the biggest inland fishery in the world, is undergoing massive hydropower development. Planned dams will block critical fish migration routes between the river's downstream floodplains and upstream tributaries. Here we estimate fish biomass and biodiversity losses in numerous damming scenarios using a novel ecological model of fish migration. Our framework allows detailing trade-offs between dam locations, power production, and impacts on fish resources. We find that the completion of 78 dams on tributaries, which have not previously been subject to strategic analysis, would have catastrophic impacts on fish productivity and biodiversity. Our results argue for reassessment of several dams planned, and call for a new regional agreement on tributary development of the Mekong River Basin.

Author Index

We have done our best to index all authors and apologize for any omissions. Due to inconsistncies in author formatting during submission, some authors may be indexed by first rather than surname.

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