Comments on proposed changes to the National Forest System Land and Resources Management Planning Rule (36 CFR Part 219)

Submitted by the Society for Conservation Biology, North American Section
Committee on National Forest Planning and Management

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Summary

Sustainable management committed to the needs of and opportunities for future generations depends on maintaining ecosystem services as well as species and ecosystem diversity. The 1976 National Forest Management Act commits the U.S. Forest Service to sustainably managing our National Forests and preserving their biological diversity. Changes in land use and land cover outside the National Forests have increased the importance of National Forests for biodiversity conservation and the provision of critical ecosystem services while also increasing the challenges of managing for that diversity and those services.

The proposed changes to the National Forest System Land and Resources Management Planning Rule (36 CFR Part 219) acknowledge the importance of sustainable management and the need to conserve biodiversity. We applaud the more collaborative approach outlined for including science in forest planning, the emphasis on adaptive management, and the combined use of species and ecosystem level evaluations. However, other proposed changes are misguided and, if implemented, will likely increase threats to biodiversity and, thereby, diminish ecosystem functions and services provided by our National Forests. The following are changes of particular concern and recommendations to correct them.

- *The proposed revision of the National Forest System Land and Resources Management Planning Rule does not give precedence to maintaining and restoring ecological sustainability. Ecological sustainability is a prerequisite to social and economic sustainability and must have first priority in management*
- *The proposed changes often shift consideration of biological diversity from mandatory to optional. A commitment to sustainability in all its dimensions*

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requires that management for ecosystem-level and species diversity be mandatory and legally enforceable.

- *Neither of the proposed sustainability options for maintaining diversity provides sufficient direction, guidance or standards to judge management performance. Such standards are necessary to ensure that at-risk species are maintained and to support meaningful adaptive management programs. We therefore propose a third option that combines the strengths of both of the proposed options. This option emphasizes restoring biodiversity and includes population-level assessment of at-risk and focal species, coupled with ecosystem-level and community-level assessments that facilitate understanding of landscape and historical contexts of management actions, evaluation of human and natural disturbance, and means to identify rare and at-risk ecosystems. As we explain, the assumption that the level of quantitative information required for viability assessments precludes their practical use in the National Forest planning process is erroneous*
- *The 2002 proposed rule apparently assumes that all lands are suitable for all uses unless determined otherwise. Rather than determining the suitability of all lands for all uses, a plan should determine specific areas where particular uses are likely to result in substantial and permanent impairment of productivity of the land or renewable resources.*
- *The proposed rule does not stipulate that inventoried roadless and unroaded areas be considered for their special potential beyond possible wilderness designation. Such areas are often critical to biodiversity management and should be evaluated for their utility to protect species that are sensitive to human disturbance.*
- *The proposed changes allow 'categorical exclusions' for National Forest plans from environmental impact statements and the usual process of public involvement prescribed in the National Environmental Policy Act (NEPA). In order to ensure efficient analysis of cumulative effects and regional processes, provide consistency across forests and regions, and obtain appropriate input from scientists and the public, formal environmental impact statements as prescribed under NEPA should be required for National Forest plans.*
- *The proposed rule provides wide discretion to the responsible official with respect to monitoring and assessment. Because monitoring and assessment are critical to a meaningful program of adaptive management, they must be mandatory and meet minimum standards.*
- *To ensure that federal and scientific standards are met, assessments of population and community dynamics and viability as well as monitoring plans and results must be subject to routine and regular scientific (peer) review.*

Introduction

The Society for Conservation Biology is an international professional organization committed to developing the scientific and technical means for protection, maintenance, and restoration of biological diversity. The North American Section of the Society charged this Committee to prepare and file comments on the proposed changes to the National Forest System Land and Resources Management Planning Rule (36 CFR Part 219) published in the *Federal Register* on December 6, 2002, referred to here as the "proposed changes". More specifically, the Committee was charged with assessing whether the proposed rule is likely to protect adequately biological diversity and ecological sustainability in National Forest System lands over the long term. In our evaluation, we considered (1) the principles of conservation biology, a discipline that integrates ecology and population genetics with the social sciences; (2) the 1976 National Forest Management Act (NFMA); (3) the planning regulations promulgated in 1982 and 2000; and (4) the 1999 report of the Committee of Scientists charged to review the National Forest planning process. Our comments include suggested modifications to the proposed rule that we believe will improve forest management and conserve biological diversity in our National Forests for future generations.

Our comments focus on changes related to the following issues, which are particularly relevant to conservation of biological diversity and ecological sustainability on National Forest lands. With the exception of the first two sections—which we believe are of overarching importance—these issues are listed in the order in which they occur in the proposed rule.

1. *The priority given to maintenance and restoration of ecological sustainability (§219.13)*
2. *Expectations of Responsible Officials with respect to consideration of ecosystem and species diversity in the planning process [e.g., §219.6(b)]*
3. *Identification of suitable and unsuitable land uses [§219.4(a)(4)]*
4. *Compliance with National Environmental Policy Act [e.g., §219.6]*
5. *Proposed options for monitoring and evaluation [§219.11]*
6. *Consideration of species beyond vertebrates and vascular plants (§ 219.13)*
7. *Proposed options for addressing the ecological component of sustainability [§219.13(b)]*
8. *Scientific peer review (§ 219.14]*
9. *Avoidance of wilderness designation (§ 219.15)*

As a context for our comments, we first provide an overview of the role of biodiversity in ecological—and, thus, social and economic—sustainability, and describe land-use changes over the past century that have increased both the importance of, and management challenges to, National Forests for conservation of biological diversity.

The Role of Biodiversity in Ecological, Social, and Economic Sustainability

> *Then I say the Earth belongs to each generation during its course, fully and in its own right; no generation [should] contract debts greater than may be paid during the course of its own existence.* Thomas Jefferson

> *The days have ended when the forest may be viewed only as trees and trees only as timber. The soil and water, the grasses and the shrubs, the fish and the wildlife, and the beauty that is the forest must become integral parts of resource managers' thinking and actions.* Hubert H. Humphrey

> *Sustainable [management] meets the needs of the present without compromising the ability of future generations to meet their own needs.*
> "Our Common Future"

Sustainable management is first and foremost a commitment to the future; it foregoes short-term benefits or profits that may jeopardize land-use opportunities for future generations. Just as we construct and maintain our governmental infrastructure and national monuments to serve citizens in the distant future, we expect our public lands to provide benefits for future Americans. However, providing for future use of public lands is especially challenging because substantial short-term private gains from natural resource use often compromise future public benefits that may be even more substantial (Balmford et al. 2002).

As implied in the proposed rule and discussed in the Report of the Committee of Scientists (1999), sustainable management does not seek to maintain the *status quo*. The world is dynamic: the structure, composition, and function of ecosystems changes continuously regardless of our attempts to halt such changes. Society is changing: each generation's desires with respect to its National Forests reflect changing technologies and values. Human activities are changing the world: since the passage of the Forest Service Organic Act just over 100 years ago, the population of the United States has increased six-fold and the resulting intensification of land-use has led to extensive loss of natural land cover. We have transformed much of the land in private ownership, and our activities have altered fundamental chemical and physical properties of our environment worldwide (Vitousek et al. 1997). A meaningful vision for sustainable management must acknowledge all of these changes and the uncertainties they imply for the future.

In a world of more than six billion people, sustainable management must include social and economic as well as ecological considerations. Social, economic, and ecological considerations are often presented as "the three legs of the sustainability stool." While acknowledging this interdependency, it is also important to recognize that ecosystem functions and services are a necessary prerequisite for both social and economic sustainability (Committee of Scientists 1999), and that those functions and services depend directly and indirectly on the complexity and diversity of ecosystems. In the same sense that the construction of a complex building ultimately is constrained not by social and economic matters (although those clearly are important) but by the laws of physics, ecological sustainability must be the first priority in sustainable management.

The loss or addition of even a single species can result in profound changes in ecosystem functions and services. For example, the loss of top carnivores from many forested ecosystems has resulted in unbridled growth of populations of deer and other herbivores, as elucidated in a major symposium recently hosted by the Smithsonian Institution (McShea et al. 1997). The consequences of the loss of top carnivores extend beyond changes in the structure of forests to significant impacts on public health (e.g., automobile accidents and Lyme disease caused by increased deer populations). Similarly, the loss of seemingly insignificant organisms such as fresh-water mussels has greatly altered water quality in many streams. Introductions of non-native species have also altered ecological functions and, in turn, the services derived from many forested ecosystems; witness the impacts of Dutch elm disease, chestnut blight, and various insect pests on conifers (e.g., balsam and hemlock adelgids). Likewise, the introduction of cheatgrass (*Bromus tectorum*) to many western rangelands has not only reduced the amount and quality of forage available for livestock grazing, but also increased the likelihood and severity of wildfires (Rotenberry 1998). The sustainability of ecosystem functions and services also hinges on the persistence of strongly interacting species that affect key ecological processes to an extent that greatly exceeds what would be predicted from their abundance or biomass (Mills et al. 1993; Fauth 1999; Power et al. 1996). Maintenance of such species may be critical to achieving restoration success.

The absolute number of species in an ecosystem may be less critical than the number and diversity of populations sustained (Hughes et al. 1997) or the functional ecological role that each species performs (Tilman et al. 2001). In the long term, of course, species richness provides "insurance" against the adverse effects of environmental change (Yachi and Loreau 1999; Tilman 2000; Loreau et al. 2001). The relationship between ecosystem sustainability and diversity is complex; there is not a one-to-one correspondence between the number of species and the number of functions or services that an ecosystem performs or provides. Many species appear to be functionally "redundant" in the sense that they may serve the same role with respect to ecosystem processes (Walker 1992). This "redundancy" in ecosystems is far more intricate than the simple duplication of systems (such as backup computers in an air traffic control tower). Because organisms vary in their tolerance to a wide range of environmental conditions, different organisms become important with respect to particular ecological functions as the environment changes. This is critical insurance against what engineers call "common-mode failure"—i.e., whatever caused the first computer to fail is likely to cause identical computers to fail.

The network of interactions among species extends across forested landscapes, linking key aquatic and terrestrial ecosystem processes. The strength of these interactions changes under different environmental conditions and management regimes. For example, the nutrients provided by runs of Pacific salmon in streams along the northwestern coast improve the growth of streamside trees, which in turn support populations of insects that provide food, shading, and shelter (fallen trees) for juvenile fishes (Willson et al. 1998; Helfield and Naiman 2001).

Changes in biodiversity also reflect the general health of aquatic and terrestrial ecosystems. For example, the sensitivity of some macro-invertebrates such as aquatic insects and mollusks to even slight changes in water quality is well known, and biological surveys for these organisms are commonly used to measure the influence of land use or restoration efforts in watersheds (Booth and Jackson 1997). Lichens too are being monitored by the Forest Service as indicators of air quality in the Region 6 Air Quality Program and the Forest Health Monitoring Program (now part of Forest Inventory and Analysis).

The Forest Service and the Land: A Century of Change

Sustainability was foremost in the minds of the authors of the 1897 Organic Act that formally established our national 'Forest Preserves.' The National Forest Service was created and charged with managing these Forest Preserves in 1905 (which became our National Forests in 1907) not only to provide a sustained yield of wood, but also to protect the nation's water resources. We have repeatedly witnessed that maximization of commodity production and maintenance of ecological services are not necessarily complementary in the short term. In response, the forestry community has developed "best management practices" designed to ensure that potential short-term economic benefits do not override the need to protect water and long-term economic benefits.

The Weeks Act of 1911 provided authorization and funding to nearly double the size of the National Forest system. This implicitly added a new component, ecosystem restoration, to the National Forest mission as unsustainable agriculture and timber extraction had seriously impoverished many of the eastern lands acquired under this Act.

From the beginning, our National Forests have provided important ecological, social, and economic services beyond those explicitly acknowledged in early legislation. These include aesthetic beauty, game and non-game wildlife, and a diverse array of recreational opportunities. These values were formally added to the National Forest System mission with the passage of the 1960 Multiple Use and Sustained Yield Act. Throughout the twentieth century, the demands for and consequences of multiple uses on National Forests increased dramatically. Part of the increase in demand was due to the increase in human population size. However, an equal if not greater part of the increased demand was attributable to widespread changes in land use outside the National Forests (Hansen et al. 2002).

Land-use change has significantly increased the importance of, and challenges for, managing biological diversity on National Forests. There has also been a dramatic increase in the public's appreciation for the value of biological diversity. These changes were central to the passage in 1976 of the National Forest Management Act and its provisions for protection of the diversity of both species and ecosystems. One hundred years ago, most of our National Forests were embedded within relatively uninhabited or rural landscapes. Today, many National Forests are islands in a sea of far more intensive uses—from urban development to agriculture to plantation forestry—that considerably reduce the native biological diversity of the land. The law of supply and demand tells us that resources become dearer as they become scarcer. Recognition of that increasing scarcity influenced the passage of the 1973 Endangered Species Act and similar state-level legislation. Changing patterns of land use have made our National Forests *de facto* "biodiversity hotspots" and, therefore, critical parts of a national strategy to ensure that biological diversity is maintained both for its importance to the maintenance of ecosystem services and for its own intrinsic value.

Evaluation of Changes in the Proposed Revisions

1. The priority given to maintenance and restoration of ecological sustainability (§219.13)

The proposed revision of the National Forest System Land and Resources Management Planning Rule does not give top priority to the maintenance and restoration of ecological sustainability. We disagree with this change. Ecological sustainability is a prerequisite to social and economic sustainability and must have first priority in management. There is no question that socially and economically unsustainable activities can have adverse ecological consequences, but, as the Committee of Scientists (1999) recognized, the long-term provision of social and economic values from our National Forests ultimately depends on sustainable ecosystems.

Much environmental legislation, including the Clean Air, Clean Water, and Endangered Species Acts, as well as many state-level statutes, mandates that environmental sustainability should be the first priority in planning. The concept of multiple-use challenges the ability of National Forests to meet the standards set out in these laws, which often seem to be in conflict with one another. In addition to adverse environmental consequences, conflict and litigation that result from overlooking protection of ecological sustainability have negative social and economic consequences in their own right.

The temptation to sacrifice long-term ecological sustainability to meet short-term social and economic demands will only grow, increasing the importance of placing ecological sustainability first and foremost in the forest planning process.

2. Expectations of Responsible Officials with respect to consideration of ecosystem and species diversity in the planning process [e.g., §219.6(b)]

A commitment to sustainability in all its dimensions requires that evaluation of and management for ecosystem and species diversity be mandatory and legally enforceable. For example, the original Committee of Scientists wanted Forest Service planners "to consider diversity a major concern" and to provide "detailed justification" for any significant reductions in diversity (Final Report of the Committee of Scientists, Federal Register 44:26599, 26607 [1979]). In addition, the 1982 rule [36CFR §219.27(g)]generally requires planners to "preserve and enhance the diversity of plant and animal communities . . . so that they are at least as great as that which would be expected in a natural forest." However, the proposed changes often shift consideration of biological diversity from mandatory to optional. The 2000 rule included 33 instances of "must" and five instances of "should" as compared to 10 and 55 instances, respectively, in the proposed changes. From the standpoint of on-the-ground management, these proposed changes are among the most important and potentially far-reaching modifications of the 2000 regulations. Changes from "must" to "should" assume the Responsible Official fully understands the value of biological diversity and will act responsibly to evaluate the effects of management practices on plant and animal diversity. Because this assumption may be false, the value of biological diversity must be taken as a given so that responsible officials are required to determine if specific active and passive management strategies are likely to have positive or negative effects on biological diversity.

Inadequate management for biological diversity jeopardizes key ecosystem functions and services and, thereby, generates high risk that management outcomes will be unsustainable in all of the senses of that term. Furthermore, the Committee of Scientists (1999) and the Federal Register narrative related to these proposed changes in the expectations of Responsible Officials argue that forest management should go beyond the mandated protection of listed threatened and endangered species to ensure that other species do not experience systematic declines that could lead to further listings. Making protection of ecosystem and species diversity an option in forest planning as opposed to a mandated requirement will render that enormously important goal extraordinarily difficult to achieve.

The proposed changes argue that, given the multiple demands on Forest Service personnel, the shift to discretionary from mandated protection of biological diversity provides needed flexibility. The proposed changes assume that the Responsible Official will be able and inclined to recognize situations that demand particular attention to diversity issues. But it is in fact those multiple demands on personnel that create the dilemma. Without a requirement to consider ecosystem-level and species-level diversity, it is not merely possible, but likely, that potential threats to ecosystem-level and species-level diversity will be overlooked. Furthermore, whatever the intentions of a Responsible Official, given limited time and competing obligations, optional evaluation and planning for ecosystem and species diversity stands a high likelihood of not being conducted.

3. Identification of suitable and unsuitable land uses [§219.4(a)(4)]

We are concerned with the apparent assumption of the 2002 proposed rule that all lands are suitable for all uses unless determined otherwise. The 2000 Planning Rule stated that National Forest system lands "are suitable for a wide variety of public uses . . . except where lands are determined to be unsuited for a particular use." Lands would be determined not suited for a particular use if, among other things, that use "would result in substantial and permanent impairment of the productivity of the land" [§ 219.26, Federal Register 65(218):67577]. The 2000 rule also recommends that planning documents "describe or display lands suitable for various uses in areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions." The proposed 2002 rule states that "National Forest system lands are generally suitable for a variety of uses . . . Rather than determine the suitability of all lands for all uses, a plan should assume that all lands are potentially suitable for a variety of uses except when specific areas are identified and determined not to be suited for one or more uses" [§ 219.4(a)(4), Federal Register 67(235):72796]. The 2002 rule, like the 2000 rule, identifies "substantial and permanent impairment of the productivity of the land" as a circumstance under which National Forest System lands would not be suited for a certain use.

Even with an inexhaustible supply of money and time, it would be virtually impossible to determine the suitability of all lands for all uses. We therefore believe that successfully managing for ecological sustainability—sustained productivity of the land and its renewable resources—will be increased significantly by initially assuming that lands are not suitable for certain uses. Because of effectively irreversible change or degradation, different land uses are not equal in their capacity to provide sufficient latitude for future adjustments in use. For example, energy resource development and mining activities typically provide less latitude for adjustments to conform to changing needs and conditions than do some recreational uses or cultural and heritage interpretation. We suggest the following modification to the proposed rule:

"Rather than determine the suitability of all lands for all uses, a plan should determine specific areas in which one or more uses could result in substantial and permanent impairment of productivity of the land or renewable resources."

4. Compliance with National Environmental Policy Act [e.g., §219.6]

To date, forest planning under NFMA has provided an opportunity to take a 'big picture' look at past, current, and projected future conditions and lay out comprehensive plans for entire national forests. Furthermore, as National Forest Plans represent major federal projects, the National Environmental Protection Act (NEPA) was presumed to apply, requiring consideration of alternatives in planning and comprehensive assessments of the environmental consequences of planned management activities. In contrast, the proposed 2002 regulations permit a radical departure from past practices by allowing simpler 'environmental assessments' (EAs) or even 'categorical exclusions' (CEs) for National Forest plans. Thus, plans need no longer include comprehensive environmental review in the form of impact statements, nor require the associated processes of public involvement prescribed in NEPA. Plan revisions not involving significant changes in "goals, objectives, land allocations, monitoring requirements and desired resource conditions" will not require full NEPA evaluation (e.g., an environmental impact statement, or EIS) unless such revisions also authorize actions that commit funding or resources that "could have a significant effect on the quality of the human environment." More specifically, "[a]n EIS at the planning stage will not be required if the decision to adopt a plan revision or amendment is not an action significantly affecting the quality of the human environment" [Federal Register 67(235):72777]. This substantial reduction in required environmental review is doubtless motivated in part by the Forest Service's stated goal to 'streamline' forest planning. The Forest Service justifies this shift on the grounds that a forest plan itself does not (yet) authorize "ground-disturbing activities nor commit funding or resources" [Federal Register 67(235):72775] or "provide direction for site-specific decisions" [Federal Register 67(235):72776]. The weakening of environmental review is further justified on the grounds that many plans will only continue the direction of management already established under a previous plan and all these existing plans have already undergone EIS analysis and review. Because all plans in revision were adopted with full EIS analysis, the proposed changes suggest an EIS would be required only where plan direction changes substantially. NEPA was passed by Congress to ensure that the possible environmental impacts of major federal projects undergo careful consideration. This law also requires federal agencies to consider a range of alternatives, improving the likelihood that one with minimal impacts will be identified and chosen. Because forest plans extend over time spans of 15 years or more and areas the size of entire national forests, they clearly qualify as major actions requiring full NEPA compliance. The legality of such a dramatic shift in how planning is interpreted and implemented is questionable, raising the immediate question of whether the proposed regulations could even succeed in their first aim of accelerating and ‘streamlining’ forest planning. Aside from this legal question, however, we are seriously concerned with how major reductions in required environmental analysis and review will affect the quantity and quality of scientific analysis being applied in forest planning.

Throughout the proposed regulations, the role of science is emphasized with many excellent and sophisticated ideas being incorporated into the specifics of both Options 1 and 2. For any such approach to achieve its goals, however, it will be necessary both to do the science called for and to check that science against standards known and accepted in the scientific community. NEPA has served historically to ensure that minimal standards are met in terms of scientific and environmental analysis. By providing for public input, and insisting on explicit consideration of the trade-offs involved in planning, NEPA set at least procedural standards for forest planning. These standards will potentially be eliminated in the proposed regulations. While Forest Supervisors would still be allowed to conduct EISs, National Forests plans would be exempt from comprehensive environmental review and analyses unless they were deemed to significantly affect the quality of the *human* environment. Does this mean that likely significant impacts on the *natural* environment would be exempt from such standards?

Eliminating NEPA requirements for forest planning also undermines the broad-scale regional analyses of habitat types, disturbance dynamics, and landscape condition that are central to Option 2 and similar modern approaches to conservation planning. That is, such sophisticated and integrated approaches to forest planning only make sense if they are conducted systematically on a regional scale and at a time when strategic long-term decisions are being made at the whole-forest level. Forest Plans provide the proper and most efficient place and scale for these analyses and for analyses of cumulative and regional impacts on individual species, as required in Option 1. Shifting NEPA requirements for EAs or EISs to the finer level of individual forest stands and projects makes it difficult to adequately consider cumulative impacts over time and space. Most important biotic impacts in forest planning (e.g., habitat fragmentation, invasions of exotic species, threats to community or species persistence, and so forth), however, do extend over time and space. It is far more effective and efficient to consider these biotic processes once, at the whole-forest level, rather than piecemeal and repeatedly in the context of each project. We therefore question whether the deletion of NEPA requirements at the Forest Plan level would actually save time and resources; deletion may instead lead to duplicated effort and greater overall costs. The published cost-benefit analysis for the proposed rule appears to omit the inevitably increased costs of environmental analysis, review, and litigation at levels below forest planning.

Finally, we are concerned that abandoning NEPA-stipulated consideration of alternatives and environmental impact statements will considerably reduce opportunities for constructive input by scientists and the general public. Although the Forest Service asserts a commitment to collaborative relationships with scientists and the detailed analyses outlined under Options 1 and 2, these affirmations are undermined if no explicit and definitive ‘check-points’ exist for evaluating the quality and adequacy of science used in the environmental analyses. By design, NEPA provides clear guidelines for these evaluations as well as a publicly transparent process to ensure that such guidelines are met. Both scientists and the general public will be discouraged from participating in forest planning if plans are merely sketchy outlines of overall direction devoid of specific and comprehensive analyses and not subject to any firm standard, review, or appeal. Such involvement is also discouraged if interested outsiders are forced to track a complex and continuing set of project-level decision documents and associated EAs or EISs. Again, efforts on both sides would be duplicated and diffused, reducing efficiency. Finally, shifting formal environmental review to finer-scale projects and forest stands would also likely reduce the adequacy and consistency of analysis, given limited resources.

In summary, eliminating historic NEPA requirements or displacing them to lower levels seems likely to

- lead to duplicated efforts in environmental review and analysis
- reduce the quantity and quality of scientific analyses used in forest planning
- discourage collaborative input from scientists
- reduce opportunities for public input
- eliminate formal review 'check-points' for the quality and quantity of scientific analysis
- eliminate clear standards for the analyses used in planning

Although the proposed regulations are said to be designed to improve collaborative input from scientists and to streamline the planning process, eliminating NEPA requirements seems likely to achieve the opposite, resulting in less input from scientists at just the time when such input would be most valuable. Conflict and litigation might also increase as planning becomes less clear and more diffuse.

To ensure efficient analysis of cumulative effects and regional processes, provide consistency across forests and regions, and obtain appropriate input from scientists and the public, we advocate formal environmental impact statements as prescribed under NEPA for all National Forest Plans.

In addition, the assertion that amendments to plans that have already had NEPA evaluation should not require additional NEPA scrutiny assumes that we might not have gained knowledge in the interim that would alter our assessment, and that the social and environmental context within which the plan will be carried out has remained constant. Both of these assumptions are often incorrect. It is at the planning stage that public input is most important and that the appeal process is most relevant to ensure sustainability it all its dimensions.

If forest plans are to efficiently analyze cumulative effects and regional processes, the EIS is the most effective way to ensure such analysis. Furthermore, the NEPA process ensures consistency among forests and across regions. Finally, the EIS process provides the surest and most efficient mechanism for scientist and public input.

5. Proposed option for monitoring and evaluation [§219.11]

Ecological systems are dynamic and highly complex. As a result, there will always be uncertainty about how these systems will respond to human use and management. Therefore, responsible management requires that ecosystems be monitored to assess the degree of concordance between expected response to various uses and actual outcome. To the extent that outcome deviates from expectation, land-use practices should be changed in an adaptive fashion. Such a response minimizes future adverse outcomes and provides an opportunity to increase understanding of how ecological systems respond to management.

The preamble to the proposed 2002 rule implies that management will be conducted in an adaptive fashion. However, section §219.11 of the 2002 proposed rule provides extensive discretion to the Responsible Official. The practice of adaptive management is critically dependent on monitoring and assessment—it is not a discretionary activity. In addition, although the proposed rule makes reference to performance measures, these are never specified—that is, there is no minimum set of measurements that must be conducted. This change contrasts starkly with the 2000 rule, which specified a minimum set of measures at both the ecosystem and species levels. Finally, in contrast to the 2000 rule, the proposed rule does not specify (or require) a feedback between the results from monitoring and the management decision-making process.

Given the importance of monitoring to understanding the effects of management and to respond adaptively as needed, we recommend that monitoring be mandatory. In addition, we recommend that performance standards similar to those contained in the 2000 regulations be specified and that the connection between results of monitoring and the decision making process be made explicit.

6. Consideration of species beyond vertebrates and vascular plants [§ 219.13]

Forest planning regulations must provide clear safeguards for native and desired non-native species conservation that are currently not specified in the proposed rule (e.g., invertebrates and non-vascular plants) beyond the assurances written in the earlier Provisions and Intent of the Proposed Rule [Federal Register 67(235): 72788]. Such organisms make up much of the biodiversity of and often play critical roles in forested ecosystems. For example, old-growth temperate forests support a diverse array of epiphytic macrolichens and bryophytes (Lesica et. al 1991; Peterson and McCune 2001; Price and Hochachka 2001) whose diversity can exceed that of vascular plants in the same forest (McCune et al. 2000).

In many areas, non-vascular plants and fungi are harvested as non-timber forest products. Mushrooms such as boletus, chanterelle, morel, and shitake are among the best-known of the long list of harvested species. In some areas of the country these species represent important economic resources that local communities have come to expect from their National Forests, making it all the more important that populations of these species be monitored to ensure their sustainable use. For example, increasing harvest of commercial moss in the Pacific Northwest has recently come under scrutiny because little is known about the long-term impacts of harvesting on species composition and ecosystem functions associated with epiphytic mosses, the extent of the moss resource, how much moss is being removed, and the rate at which mosses become reestablished (Peck and Muir 2001).

7. Proposed options for addressing the ecological component of sustainability [§219.13(b)]

Although both of the proposed options for biodiversity planning have desirable components, each also has significant shortcomings. By emphasizing assessment of species viability, Option 1 provides the basic elements necessary to trigger management intervention and measure management success that are absent in Option 2. The community and ecosystem (so-called coarse filter) approaches emphasized in Option 2 provide much-needed understanding of landscape and historical contexts, evaluation of human and natural disturbance, means to identify rare and at-risk ecosystems, and an emphasis on diversity restoration. Option 2 does not, however, provide necessary management performance standards, nor does it provide operational mechanisms to detect risks to individual species before they are truly threatened. Most conspicuously, neither option sets clear guidelines or requirements that would trigger changes in management when monitored variables exceed these values. This omission seriously undermines the value of the careful analyses proposed in Options 1 and 2 in the proposed regulation.

Proposed "Option 3". We support an option for the ecological component of sustainability that combines the strengths of both of the options in the proposed regulations. Our proposal presumes that attention to biodiversity will be mandatory in the new regulations. The valuable and efficient community and ecosystem analyses outlined in Option 2 should be retained, and extended to evaluate key components of ecosystem diversity. Because our current understanding of the connections among ecosystem functions, community variation, and species diversity remains incomplete, monitoring and adaptive management under Option 3 are aimed toward improving our understanding of these relationships. Maintaining community diversity, resilience, and ecosystem services, as required under NFMA, requires that we sustain the species that make up these communities. Thus, the only way to ensure that communities are being sustained is to require careful monitoring of a suitably chosen set of indicators, including species (Noss 1990). The choice of such indicators should be based on their proven scientific value as indicators as well as practicality and economic efficiency.

Standards for species viability are central in National Forest planning for evaluating management performance and the adequacy of adaptive management. Population assessments can provide the data necessary to identify undesirable trends before risks reach crisis levels. Focal species (including but not limited to species that play key roles in ecological processes) should be identified and monitored to provide a connection between population and ecosystem management. Population-level assessments are also important for rare and invasive species. Below, we discuss in more detail the bases for our concerns and support for a new option.

Species viability assessment. We believe that measures of species viability are essential for (1) evaluating whether plans are ecologically sustainable—hence socially and economically sustainable, (2) assessing whether plans successfully provide for the diversity of plant and animal communities as required under the National Forest Management Act, (3) evaluating management performance and implementing meaningful adaptive management, and (4) promoting successful compliance with statutory authorities related to planning and management of the National Forest System, including the

Endangered Species Act [see § 219.2(c), Federal Register 67(235):72795]. Use of viability standards is severely compromised by the proposed changes.

The Forest Service concludes in the proposed changes that the 2000 National Forest System Land and Resource Management Planning Rule "is neither straightforward nor easy to implement" [Federal Register 67(235):72770]. The agency's proposed rule is intended to be "more readily understood . . . within the agency's capability to implement [and] within anticipated budgets and staffing levels" [Federal Register 67(235):72770]. A review conducted by Forest Service personnel found that "[t]he 2000 rule has both definitions and analytical requirements that are very complex, unclear, and subject to inconsistent implementation . . . for example, species viability" [Federal Register 67(235):72771-2]. Reviewers were concerned that species-level analyses, in particular those directed toward assessment of viability, may be "far more costly" than ecosystem-level analyses for addressing the NFMA requirement that plans provide for the diversity of plant and animal communities [Federal Register 67(235):72772]. These conclusions reflect a misunderstanding of the importance of species viability assessments and the range of available assessment methodologies. Monitoring indicators and assessing species viability need not be impractical, provided methods are carefully chosen and administered.

Several potential misunderstandings about viability analysis may have led to concern about financial costs that influenced the proposed changes. Viability assessment is a generic concept that may take many forms depending on the available data and the goals of the analysis. All approaches are designed to assess a population's risk of extinction or its projected increase under current conditions or proposed future management (Reed *et al.* 2002) [2]. Wide agreement exists in the scientific community about the need to identify species at risk of loss (either at local or landscape scales) and to identify risk factors. In addition, methods to assess viability are now well-developed across various levels of sophistication. Viability analysis is a routine and well-accepted practice within the discipline of conservation biology; a simple internet search using the Google engine generated 242,000 references (3/14/03). For example, a private conservation organization (The Nature Conservancy) recently sponsored a workshop that resulted in 'A practical handbook for population viability analysis' (Morris *et al.* 1999) that emphasizes the use of basic information. In addition, the Forest Service sponsored a special workshop at the National Center for Ecological Analysis and Synthesis in 2000-01 aimed specifically at developing practical and reliable guidelines for assessing population viability (Andelman et al. 2001). The NCEAS report emphasized the need to adopt a systematic and consistent approach to species viability assessments within the context of National Forest planning and recommended developing a viability working group to develop standards and provide service and support to the Forest Service. The report also stressed the need to distinguish real from inferred data and opinions and to

[2] Alternative, less data-intensive viability methodologies include time series analysis, (Morris and Doak 2002), . "Bayesian Belief Network" (BBN) approaches that rely on empirical evidence and expert opinion (Lee 2000, Marcot et al. 2001), and and "Rule of thumb" assessments based on qualitative ranks of risk using specified criteria (Samson 2002).

explicitly acknowledge levels of uncertainty associated with viability assessments. We strongly concur with all these recommendations.

Risk often can be defined in terms of dependence on particular habitat types (e.g., riparian zones, springs, and so forth). Factors that influence a species' vulnerability to decline often include population size (number of individuals), trends in population size, number of populations, and geographic range—all of which are appropriate, and presumably feasible, types of information to collect to evaluate species diversity. However, coarse-filter characteristics of species diversity, such as species composition and species richness, are not sufficient to evaluate viability. Therefore, viability analysis is central to managing for species persistence. The availability of GIS techniques increasingly makes it possible to assess the probability of changes in the spatial distribution of habitat for particular species. These techniques also allow for rule-based analysis that permits managers to assess the relationship between species persistence and current and potential future configurations of habitat.

The success of viability assessment depends on reliable, spatially referenced data and a thorough understanding of land cover types and their associated assemblages of species. The first step in conducting a viability analysis is to establish a causal quantitative relationship between land management practices and species-level and community-level responses. If spatially referenced data exist and the latter relationships are understood, it is possible to run predictive scenarios to assess the potential impacts of management activities on ecosystem structure and composition. This approach is conceptually sound, supported by the latest science, objective, easily understood, transparent, and can be adapted to new data and analytical techniques as they become available.

If data and expertise allow, more sophisticated spatially explicit assessments of risk can be conducted. These assessments link demographic data with (1) information on the distribution and quality of existing habitat and (2) comparisons of management scenarios that would resulting in changes to habitat distributions and quality. Such analyses are commonly conducted and widely accepted by the scientific community as methods to identify both species whose persistence is at risk and the specific threats to those species. Accordingly, the assumption that the level of quantitative information required for viability assessments precludes its application in the National Forest planning process is erroneous. Certainly an increase in data availability generally decreases the uncertainty associated with any risk assessment. However, general assessments of risk *per se* do not require substantial data if the range of alternative management options and their ecological costs are considered together.

Standards and triggers for action. The 2000 rule stated, "[p]lan decisions affecting species diversity must provide for ecological conditions that the responsible official determines provide a high likelihood that those conditions are capable of supporting over time the viability of native and desired non-native species well distributed throughout their ranges within the plan area" [§ 219.20(b)(2)(i), Federal Register 65(218):67575]. The 2002 proposed Option 1 states, "[p]lan decisions should provide for ecological conditions that the Responsible Official determines provides a high likelihood of supporting over time the viability of native and desired non-native vertebrates and vascular plants well distributed within their ranges in the plan area" [§ 219.13(b)(2)(ii), Federal Register 67(235):72800]. Thus, the proposed Option 1 is somewhat similar to the 2000 rule. A critical difference, however, is that the proposed Option 1 requires a first step of evaluating "ecosystem diversity". It is assumed [Federal Register 67(235):72785] that this step will ensure "conditions capable of supporting viability for most species". Only if this is *not* the case would species at risk "be identified and separate analyses of species diversity performed." However, Option 1 provides no mechanism for triggering analyses of species diversity. The proposed evaluation of ecosystem diversity (Federal Register 67(235): 72800) is essentially an inventory of species. It is unlikely that such an inventory would actually identify species whose viability was at risk. Therefore, it is not clear what conditions, if any, would trigger the assessments described under "Evaluation of species diversity" [Federal Register 67(235):72800].

Here, the proposed Option 2 is vague and based on hypothetical and speculative approaches that are not operational by scientific standards. For example, Option 2 states, "[p]lan decisions, to the extent feasible, should foster the maintenance and restoration of biological diversity in the plan area, at ecosystem and species levels, within the range of biological diversity characteristic of native ecosystems within the larger landscape in which the plan area is embedded" [§ 219.13(b)(2)(i), Federal Register 67(235):72802]. The example given for an "unacceptable" change in biological diversity at ecosystem and species levels [Federal Register 67(235):72786] is "[t]he loss of an ecosystem type or species from all or a significant portion of the plan area or a substantial reduction in abundance, extent, or distribution within all or a substantial portion of the plan area as a result of actions under the direct control of Forest Service land managers." This, of course, would be an extraordinary event warranting a major shift in management. Also, the only mechanism used to predict such events is the judgment of the Responsible Official, again placing risk assessment of species diversity, one of the most complicated challenges in applied biology, in the hands of an administrator who may not have training in ecology. The triggers in Option 2 are non-repeatable and non-operational.

Although the Forest Service asserts that the proposed Option 2 will foster "biological diversity . . . at both ecosystem and species levels" [Federal Register 67(235):72787], the proposed rule provides no mechanism for evaluating or fostering biological diversity at the species level. Without some measure of species viability, it is not clear how Option 2 would actually use "community analyses to determine whether maintenance of ecosystem diversity is sufficient to maintain the existing pool of species within the planning or assessment area." [Federal Register 67(235):72787]. Option 2 would require "detailed analyses of individual species where significant concerns have been raised relative to continued persistence of particular species" [Federal Register 67(235):72787]. However, no mechanism is outlined to raise such concerns before species are jeopardized to the point that they warrant listing under the Endangered Species Act, undermining the implicit goal of NFMA to prevent such listings.

Use of focal species to meet the need for both species-level and ecosystem-level analyses. Consideration and evaluation of ecosystem diversity, species diversity, and viability are interdependent and complementary. Certain species have significant influences—whether desirable or undesirable—on ecosystem function, biological diversity, and environmental quality. Some species affect key ecological processes to an extent that greatly exceeds what would be predicted from their abundance or biomass; maintenance of such species may be critical to achieving restoration success. Similarly, some species, via morphology or behavior, modify, maintain, and create habitat for themselves and other organisms. Other species are especially sensitive to human perturbations. These taxa often can be used to track the effects of known environmental changes on species. In some cases, measurement of well-known species may serve as a scientifically reliable and cost-effective measure of environmental changes that are difficult to detect directly. All of these taxa may serve as "focal species" that bridge the mandate between ecosystem diversity and species diversity.

Acting on comments from Forest Service personnel, the Committee of Scientists (1999) acknowledged pragmatic constraints to compliance with the goal of "maintain[ing] viable populations of all native and desired non-native wildlife vertebrate species in the planning area" (§219.26) as specified in the 1982 regulations. In response, the Committee proposed the focal species concept, which retained the broad plant and animal diversity objectives of the 1982 regulations but largely restricted viability assessments to focal species and species listed under the Endangered Species Act. Committee recommendations were viewed by the Forest Service as a realistic solution to the implementation problems of the 1982 regulations and the focal species concept was incorporated into the 2000 regulations.

Focal species were intended to be a specific subset of species within a plan area that provided information far beyond their own measurement. Candidate focal species included those that played significant roles in ecological systems by their disproportionate contribution to flows of matter or energy, by structuring the environment and creating opportunities for additional species, or by exercising control over competitive dominants and thereby promoting increased biodiversity. Candidate focal species also included those that reliably indicated the state of an ecological system and acted as sensitive barometers of change. The 2000 regulations succinctly summarized possible categories of focal species previously proposed in the ecological literature.

We support the focal species concept because it represents a sensible compromise between the requirement to assess the viability of hundreds of vertebrate species (the 1982 regulations) and the abandonment of all mandatory requirements for species-level evaluation (the 2002 proposed changes). Combining coarse-filter measurements at broad spatial scales (based largely on vegetation communities and their seral stages) with fine filter measurements based on focal species as described in the 2000 regulations is a pragmatic response to the diversity requirements of the National Forest Management Act. Development of methods to identify focal species remains a high research priority among ecological researchers, and we recommend accelerated research for the development of such methods.

8. Scientific peer review [§219.1]

To ensure that the best science in applied in forest planning at all stages, we reaffirm the importance of routine scientific peer review (Meffe et al. 1998). The proposed regulations (§219.14) would make decisions on when and how to involve outside scientists and when and how to conduct monitoring discretionary in forest planning. This would lead to great inconsistency over forests and regions in how science is incorporated into forest planning and could lead to quality control problems. To ensure that federal and scientific standards are met, we therefore advocate the use of scientific peer review for regional and forest level assessments of ecological conditions, assessments of species and community viability, and the design and application of monitoring plans. Creation of a respected Science Advisory Board could further ensure that these goals are achieved and inspire greater confidence among contesting parties that quality science is being applied to forest management. In addition to ensuring the quality and consistency of scientific input, such a board and peer review would also better match how other federal agencies operate.

9. Avoidance of wilderness designation [§ 219.15]

Identification and evaluation of inventoried roadless areas and unroaded areas is not included in the 2002 proposed rule. These minimally disturbed portions of our National Forests are increasingly rare and disproportionately important to keeping our future land-use options diverse. Therefore we urge that their identification, and evaluation of inventoried roads and unroaded areas, be returned to the rule.

Landscapes with low road densities are generally in better ecological condition than areas with high road density (Findlay and Houlahan 1996; Moyle and Randall 1998; Trombulak and Frissell 2000). Areas with low road density are important habitats for top-level carnivores, including the gray wolf (Mladenoff et al. 1995). High road density has been identified as an agent of mortality for some species (Ferreras et al. 1992; Rudolph and Burgdorf 1997), and can interfere with migration or habitat selection of other species (Vos and Chardon 1998; deMaynadier and Hunter 2000). Roads also facilitate the establishment and dispersal of non-native species (Schowalter 1988; Wilcox 1989; Trombulak and Frissell 2000).

The 2000 rule specified that during the plan revision process, the Responsible Official must evaluate for recommended wilderness designation “all undeveloped areas that are of sufficient size as to make practicable their preservation and use in an unimpaired condition” [§ 219.27, Federal Register 65(218):67577]. Like the 2000 rule, the proposed rule stipulates that “inventoried roadless areas . . . must be evaluated and considered for recommendation as potential wilderness areas during the initial plan development or the plan revision process” [[§ 219.15(b)(3), Federal Register 67(235):72802]. Compared with the 2000 rule, the proposed 2002 rule restricts the types of lands that may be considered for special use (as opposed to wilderness designation, which is required under law). We are concerned that the proposed change thus reduces management flexibility that could be used to address ecological issues. The 2000 Rule was more flexible in this regard, in that the Responsible Official must “[i]dentify and evaluate inventoried roadless areas and unroaded areas . . . [and] must determine which inventoried roadless areas and unroaded areas warrant additional protection and the level of protection to be afforded” [§ 219.9, Federal Register 65(218):67571]. No such evaluation is required in the proposed rule.

Conclusions

National Forests are islands in a sea of intensive uses. They are thus increasingly important for the maintenance of native biological diversity and of ecosystem services that provide high social and economic benefits. The proposed National Forest Planning Rule, if implemented in either of its proposed options, is likely to cause increased loss of biodiversity and of ecosystem services. We urge the USDA Forest Service to revise the Rule in ways that promote sustainability. Historic changes as well as current trends convince us that the importance of sustainability, as well as the value of the diverse goods and services provided by a well-managed forest, will only increase in the future. It is in the spirit of commitment to that future that we submit these comments.

Committee Biographical Sketches

Norman L. Christensen, Jr. is Professor and Dean Emeritus of the Duke University Nicholas School of the Environment and Earth Studies. He has written widely on forest dynamics and ecosystem management. He chaired a review of the fire management programs in the Sierra Nevada National Parks and the Interagency Review of the Ecological Consequences of the 1988 Yellowstone Fires, and served as vice-chair on the California Spotted Owl EIS Federal Advisory Committee. He was chair of the recently released National Academy of Sciences study of the ecological consequences of forest management in the Pacific Northwest and currently chairs the National Commission on Science for Sustainable Forestry.

Erica Fleishman is Research Associate at the Center for Conservation Biology, Stanford University. She has expertise in analysis and prediction of species richness and occurrence, practical application of surrogate species such as 'indicators' and 'umbrellas,' metapopulation dynamics, and the integration of science and land-use planning on public lands. Fleishman has served on scientific review panels addressing terrestrial indicators of ecological integrity (U.S. Environmental Protection Agency) and evaluation of methods for prioritizing species for actions under the Endangered Species Act (U.S. Fish and Wildlife Service), and currently facilitates the Science Advisory Panel for the East Contra Costa County, California Habitat Conservation Plan / Natural Communities Conservation Plan.

John Marzluff is Associate Professor of Wildlife Science in the College of Forest Resources at the University of Washington. He has published widely on experimental design and assessment of wildlife responses to human activities, raptor management, management of pest species and assessment of nest predation. He has led studies on the effects of military training on falcons and eagles in southwestern Idaho, the effects of timber harvest, recreation and forest fragmentation on goshawks and marbled murrelets in western Washington and Oregon, and conservation strategies for Pacific Island corvids. His current research includes long-term studies of the effects of urbanization on songbirds in the Seattle area, responses of nest predators and songbirds to settlement, recreation, and forest fragmentation on the Olympic Peninsula, and endangered species conservation. Dr. Marzluff edited *Avian Conservation: Research and Management* (1998, Island Press), *Avian Conservation and Ecology in an Urbanizing World* (2001, Kluwer Academic Publishers) and *Radiotelemetry and Animal Populations* (2001, Academic Press). He is leader of the U.S. Fish and Wildlife Service's Recovery Team for the Mariana Crow and a member of the Recovery Team for the California Condor. He is an Elected Member of the American Ornithologist's Union (1993) and serves as Councilor of the AOU and Board Member for the Cooper Ornithological Society.

Adina Merenlender is a conservation biologist with experience working on the forces that influence loss of biodiversity at all hierarchical levels from genes to ecosystems. Her current research projects include (1) Integrating economic and physical data to forecast land use change and environmental consequences for California's coastal watersheds. (2) A recent planning effort (2002) funded by the National Science Foundation to bring together physical, biological, and social scientists to develop a research framework to improve restoration efforts in Mediterranean climate watersheds. (3) Field studies on the effects of vineyard expansion and low density residential development on woodland bird, carnivore, and plant communities. For a full list of publications see http://hopland.uchrec.org. As a Cooperative Extension Specialist at University of California, Berkeley, she regularly extends science information on natural resources to the public, decision-makers, and interest groups.

L. Scott Mills is Associate Professor in the Wildlife Biology Program, University of Montana, on sabbatical leave for 2002-2003 at Virginia Polytechnic Institute and State University. He has published extensively in the areas of Population Viability Analysis, effects of forest fragmentation on wildlife species, the utility of the keystone species concept, and the use of genetic tools in wildlife biology. He has interacted with the Forest Service in a number of ways, including several presentations to Forest Service biologists and planners on viability analysis, genetic sampling, and snowshoe hare and Canada lynx ecology. He recently collaborated with Forest Service research scientists on a nationwide study evaluating the distribution of Canada lynx, which culminated in invited testimony to the U.S. House of Representatives Resources Committee in March of 2002.

Peter B Moyle is Professor of Fish Biology in the Department of Wildlife, Fish, and Conservation Biology, University of California, Davis. He has published widely on the ecology and conservation of fish and aquatic ecosystems. His latest book is *Inland Fishes of California* (2002, UC Press, Berkeley). He served as member of the Sierra Nevada Ecosystem Project science team, was head of the Delta Native Fishes Recovery Team, is presently a member of the Independent Science Board for the CALFED Ecosystem Restoration Program, and is a member of the NRC Committee on Endangered and Threatened Fishes in the Klamath River Basin.

Barry R. Noon is a professor in the Department of Fishery and Wildlife Biology, and Graduate Degree Program in Ecology, at Colorado State University, Fort Collins, CO. His fields of interest include conservation planning for threatened and endangered species; science-based management of public lands to conserve biological diversity; population dynamics and viability analyses for at-risk species; and vertebrate demography and life history. His personal research includes the management of forest ecosystems to sustain biological diversity with a particular focus on spotted owls and other imperiled species. He has worked extensively at the interface between science and policy formulation on public lands in the U.S. This included time working in Washington, D.C. during the Clinton Administration as Chief Scientist of the National Biological Service, serving on an independent Committee of Scientists that proposed changes to forest management practices on public lands in the U.S, and currently on a

National Academy of Sciences panel on adaptive management in the Army Corps of Engineers.

Don Waller is Professor of Botany and Environmental Studies at the University of Wisconsin-Madison where he teaches courses in ecology, evolution, field biology, and conservation biology. His research interests include the evolution of life histories and plant mating systems, the demography and genetics of small populations, and the effects of habitat fragmentation and deer browsing on plant communities. He has also worked extensively with state and federal resource agencies to improve forest and game management by linking these with conservation biology. This work earned several conservation awards and resulted in a book: *Wild Forests: Conservation Biology and Public Policy* (Island Press) co-authored with botanist Bil Alverson and attorney Walter Kuhlmann. Dr. Waller just retired as Editor-in-Chief of the journal *Evolution*.

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