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Managing Biological Integrity, Diversity, and Environmental Health in the National Wildlife Refugees: An Introduction to the Symposium

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I. PREFACE

The challenge of acting at the intersection of science and the law in environmental policy is a little bit like the weather: everybody talks about it, but nobody does anything about it.[1] This symposium aims both to talk and to do something about the application of biology to an area of public land law that exemplifies the difficulties of interdisciplinary inquiry. It brings together scientists, law professors, and agency implementers to find some common ground for understanding the mandate of the U.S. Fish and Wildlife Service (FWS or Service) to maintain biological integrity, diversity, and environmental health in the national wildlife refuges.

In 1997, Congress overhauled the legislative charter for the refuge system.[2] Managed by the FWS, the refuges constitute one of the four principal federal public land systems.[3] It is the largest land system in the United States dedicated principally to biological conservation. The 1997 statutory revisions included a new system mission, an elaborate hierarchy of use preferences, mandatory planning for refuge units, and a set of path-breaking substantive management criteria.[4] Of the new

* Professor of Law and Professor of Public and Environmental Affairs, respectively, Indiana University—Bloomington. In addition to all of the authors of articles in this symposium, who significantly advanced our understanding of the issues we address in this introductory essay, we would like to thank Bob Adamcik of the U.S. Fish and Wildlife Service for sharing his insights on this material and exercising his leadership to make the workshop a success. We are deeply grateful to Professor Em Hall and Managing Editor Susan Tackman for their work that made this special symposium issue possible.

1. A DICTIONARY OF AMERICAN PROVERBS 646 (Wolfgang Mieder ed., 1992).

2. The National Wildlife Refuge System Improvement Act of 1997, Pub. L. No. 105-57, 111 Stat. 1252 (codified at 16 U.S.C. §§ 668dd, 668ee).

3. The other federal public land systems are the national forest system, managed by the U.S. Forest Service; the national park system, managed by the National Park Service; and the public lands, managed by the Bureau of Land Management. *See generally* GEORGE C. COGGINS & ROBERT L. GLICKSMAN, PUBLIC NATURAL RESOURCES LAW (1990).

4. These hallmarks of organic legislation are discussed in detail in ROBERT L. FISCHMAN, THE NATIONAL WILDLIFE REFUGES: COORDINATING A CONSERVATION SYSTEM THROUGH LAW (2003) and Robert L. Fischman, *The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation*, 29 ECOLOGY L.Q. 457 (2002).

management criteria that bind the Service, the most scientifically informed and advanced is the one addressing biological integrity, diversity, and health. In its entirety, it states:

> In administering the System, the Secretary [of the Interior, under whose jurisdiction the Service falls] shall...ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans.[5]

The Service promulgated its policy implementing this statutory mandate in 2001. Together, the legislation and the policy sew together legal principles of public land management with the scientific insights of conservation biology and ecology. Yet, these primary sources provide only an outline of how to proceed in turning the concepts into on-the-ground conservation in the national wildlife refuges. This symposium focuses not only on the conceptual issues lying at the intersection of science and policy but also on the practical problems of translating those ideas into action.

To accomplish these tasks, an interdisciplinary group at Indiana University convened an extraordinary workshop in April 2004. The group coalesced around the joint degree program of the law school and the school of public and environmental affairs at the Bloomington campus. Students prepared for the workshop by enrolling in a semester-long seminar that burrowed deeply into the subject matter. Most importantly, FWS officials also spent countless hours in preparation and support of the seminar and April workshop.

In advance of the April event, the Indiana University group organized background discussions and a series of seminars on the early drafts of some of the articles that follow. Then, on April 2, 2004, the workshop brought together faculty and students from Indiana University with scientists, law scholars, and federal agency staff. Unlike a typical academic conference where there is a separation between presenters and audience, the workshop design facilitated discussion among the participants. Everyone sat around a rectangular set of tables and critiqued each other's drafts. Presentations mixed together people from different disciplines to highlight alternative perspectives on central questions such as:

> Is the integrity, diversity, health provision a workable mandate?

5. Pub. L. 105-57, § 5(a)(4)(B) (codified at 16 U.S.C. § 668dd(a)(4)(B)).

How should the Service implement its integrity, diversity, and health mandate?

What are the standards for ecological protection, and how does the FWS meet them?

What should the refuge system's acquisition strategy be for its next hundred years?

The articles in this symposium are the result of the encouragement, provocation, and criticism generated by the drafts presented at the workshop. The authors approach this subject with disparate backgrounds that include environmental advocate, academic scientist, law scholar, refuge system biologist, U.S. Geological Survey staff scientist, and FWS headquarters policy maker. Nonetheless, many of the April discussions and much of the material in the articles identify similar issues of leadership, strategic behavior, and implementation.

In many ways, the 1997 Refuge Improvement Act thrust leadership upon the Service. In drafting refuge organic legislation that goes much further than any other federal public land charter to incorporate the insights of conservation biology, Congress asked the FWS to lead the nation in demonstrating twenty-first-century conservation. Though generated in the law, the integrity-diversity-health mandate provides all the perils and possibilities of leadership from an administrative and scientific perspective as well. Land managers will be shifting resources and scientists will be studying ways to better measure, diagnose, and understand the path-breaking objective. All of the articles offer important suggestions for strengthening the Service's conservation leadership.

But, the leadership does not spring solely from the text of the statute. The ecological conditions of the refuges heighten the challenge faced by the Service. Many non-Alaskan refuges were already in a severely degraded condition when they entered the system, and a tradition of intensive habitat manipulation has erased many of the historic conditions that signal health and integrity. While these circumstances make FWS implementation more difficult, they also make many refuges more like private lands than pristine natural reserves. Therefore, FWS implementation will be quite relevant to conservation over a large proportion of non-public lands.

The FWS has neither the money to perform all of the key tasks nor the land to cover all of the critical habitats essential for ecological protection. Strategic behavior will be necessary in order to fulfill the integrity-diversity-health mandate. Moreover, the emphasis on collaboration that both exponents of ecosystem management and recent administrations have urged raises the stakes for identifying

opportunities for leveraging federal resources to make large-scale conservation gains. This symposium is imbued with a realistic sense of the need to pick fights and opportunities carefully.

After seven years, the integrity-diversity-health mandate is no longer merely a statutory novelty. It now must provide operational direction for each of the nearly 550 national wildlife refuges. Though the 2001 policy established the broad outlines for implementation, it is the comprehensive conservation plans, the budget decisions, the performance measures, the staff training, and the scientific resources deployed that will shape how successful the mandate will be. The action is no longer in Congress but is now with the agency. Most authors in the symposium address the practical questions of how to conduct these activities in a manner that best fulfills the promise of the 1997 Act.

II. CONTENT

The symposium begins with the source of the integrity-diversity-health mandate: legislation. Both Robert Fischman and Robert Keiter take a close look at the legal setting into which Congress inserted the integrity-diversity-health goal. Professor Keiter examines how federal public land agencies have given meaning to terms associated with ecosystem management, such as integrity, diversity, and environmental health. He evaluates the various standards by assessing how clearly they establish priorities, how closely they parallel the principles of ecosystem management, and how well they provide accountability for actions.

Professor Fischman employs the tools of statutory interpretation to clarify the meaning of the integrity-diversity-health criterion in the 1997 Act. The analysis includes expounding on the definitions of the individual words in the legislation as well as parsing them in the context of the statute as a whole. A review of the legislative history of the 1997 Act, and the other occasions in which Congress employed the terms integrity, diversity, and health complete his analysis.

Fischman also stresses the long tradition of employing scientific concepts to establish objectives for the national wildlife refuges. The recent emphasis on this tradition is part of a broader trend in conservation law that employs integrity as an overarching management goal, relies on agency interpretation to establish the permissible limits of habitat alteration, and considers larger temporal and spatial scales in establishing plans and approving projects.

Both Keiter and Fischman demonstrate that Congress has increasingly incorporated biodiversity conservation and related ecological goals into legislative mandates for agencies. Over time, the statutory mandates have become more detailed, prescriptive, and

informed by the insights of conservation biology. Agencies have responded by writing regulations, policies, and plans that seek to interpret these laws in the context of public land administration. Keiter emphasizes that agencies and courts have interpreted the ecological mandates to require agencies to consider their decisions in the context of broader spatial and temporal scales. Adaptive management is another aspect of ecological management associated with implementation of the new legislative mandates. Fischman stresses that these most recent conservation imperatives require coordination and commitment far beyond the traditional timeframes and administrative boundaries of agencies. This will be a tremendous test of the Service's ability to implement the intent of the mandate.

Fischman's analysis supports the 2001 Service policy as well within the agency's range of discretion and generally consistent with the technical literature. Though the 1997 statute does not emphasize any one term over another, Fischman's analysis shows that integrity is becoming the ascendant umbrella concept in law and management to capture the insights of ecology and conservation biology.[6]

Eric T. Freyfogle highlights the shortcomings of the integrity-diversity-health goal. He argues that the criterion does not take the broader, landscape view necessary for achieving large-scale conservation. Though it is a wonderful goal for refuges, integrity-diversity-health does not speak to the concerns and problems faced by neighboring, private landowners. The disconnect makes it nearly impossible for refuge managers to address external threats generated on private lands.

Professor Freyfogle sees the integrity-diversity-health criterion as a missed opportunity because it does not articulate a landscape goal that embraces lands on which people live and work. In contrast, a legislative goal based on Aldo Leopold's conception of land health would have served as a hub around which more landowners in a watershed could connect. It would have more clearly articulated an overall landscape perspective to which all landowners could envision their contribution. The land health concept analogizes the land to an organism and employs the language of medicine to prevent sickness, recover from infirmity, and boost self-renewal. Though scientifically informed, a health-based conservation mandate would speak in clearly ethical terms.

6. This finding is consistent with Noss's observation. Reed F. Noss, *Some Suggestions for Keeping National Wildlife Refuges Healthy and Whole*, 44 NAT. RESOURCES J. 1093 (2004).

So, Freyfogle despairs at the integrity-diversity-health criterion's ability to accomplish those goals of the Improvement Act that involve ecosystem improvement across boundaries. Until we can articulate a goal that will define what constitutes good land use across a watershed, we cannot hope for the refuges to serve as the seeds of ecological improvement across larger ecosystems. Indeed, the refuges may be condemned to slow death from degradation of the surrounding landscape.

The academic scientists contributing to the symposium all focus their articles on the importance of articulating clear targets that can be measured to determine how well the refuge system is meeting its mission. Though science itself cannot offer normative judgments, it can and should provide the benchmarks for measuring achievements. The most important theme of all three articles from the scientists is that the FWS must establish clear, measurable objectives to aim for in meeting the integrity-diversity-health mandate.

Professor J. Michael Scott and his team of researchers, employing the gap analysis that Scott made famous,[7] stress the importance of articulating a long-range vision for the future of the refuge system. In this way, acquisition, management, and external relations all will have a polestar from which to navigate. The Scott et al. article focuses on the large, landscape-level spatial scale. It also poses the long-term question of what should the refuge system look like at its bicentennial in 2103. The current distribution of individual refuges is uneven both in terms of the ecoregions in which they occur and in terms of their biological composition. Contributing to the integrity of the ecological landscape of the United States will require a conscious, strategic choice between building on the existing strengths of the refuges or extending the representation of the system to improve its biological coverage. A focus on the former might augment the waterfowl habitat and wetland ecosystems of the system. A focus on the latter might stress the protection of plants and animals at high risk of extinction.

On the scale of individual refuges, the Scott et al. article sheds new light on the importance of the external threats concern. Along with management of the land within the refuge system and acquisition of new refuges, abatement of external threats is a key avenue for the Service to meet its integrity-diversity-health mandate. The article finds that the overall fraction of anthropogenic lands (places under agricultural cultivation or urban development) surrounding refuges is greater even

7. J. Michael Scott & Frank Davis, *Gap Analysis: A Geographic Approach to Protection of Biological Diversity*, WILDLIFE MONOGRAPHS No. 123 (Jan. 1993).

than the overall fraction of anthropogenic lands across the entire coterminous United States. These developed lands imperil refuge integrity-diversity-health in a variety of ways, including habitat fragmentation, reduced water quality, and introduction of exotic species. This highlights the enormous stakes at risk in implementing the external threats policy.

Professor James Karr is probably more responsible than any other single person for making integrity a scientifically rigorous concept that can be applied to test how well an area is meeting ecological goals. Karr stresses the importance of understanding the status of and trends in the living systems of which refuges are a part. This requires rigorous sampling and a precise definition of the parameters that will measure how well a refuge area is meeting the integrity-diversity-health goal. Though not an easy task, it is a challenge that entities as diverse as the U.S. Environmental Protection Agency and state river managers face. The refuges have the opportunity here to help create a model for measuring and monitoring.

The most promising tool suggested by Karr is the multimetric index, modeled on composite indicators such as the Dow-Jones Industrial Index. Finding the right indicators to track would enable the refuges both to monitor integrity-diversity-health and to diagnose, treat, and evaluate cures for ecosystem ills. Not all measures of biological attributes are good indicators of refuge conditions. Population size, though commonly monitored, frequently does not provide a reliable signal of overall ecological conditions. This is an important observation to guide the interpretation of the systemic conservation mission for the refuges, defined in the 1997 law as sustaining and, where appropriate, enhancing *"healthy populations"* of animals and plants.[8] As Fischman argued elsewhere, "healthy populations" should be interpreted to have a strong qualitative component and not be simply a population count.[9] Karr goes on to detail the characteristics of more robust metrics that open windows into biological integrity, diversity, and environmental health.

Professor Reed F. Noss synthesizes the scientific concerns of both refuge acquisition and planning. He evaluates management of the refuge system by looking at the four key goals of modern, ecological conservation: representation of ecosystems, maintenance of viable populations, support of ecological and evolutionary processes, and adaptability and resilience. Opportunities abound for meeting these

8. 16 U.S.C. § 668ee(4) (emphasis added).
9. FISCHMAN, *supra* note 4, at 81–82.

goals better. These opportunities constitute Noss's principal menu for fulfilling the integrity-diversity-health criterion.

Noss defines the criterion primarily in terms of integrity, which he argues is the broadest concept in the triad.[10] Moreover, Noss unpacks integrity into three components: wholeness, resistance, and resilience. Wholeness refers to the range of biological elements and processes that one would expect in any given area if it has not been significantly degraded by human actions. Resistance and resilience both pertain to stability. Resistance is an area's ability to retain its wholeness in the face of disturbance; resilience is its ability to return to wholeness after it has been upset. All three of these components must be understood within the range of natural, stochastic variability to which all ecological systems are subject. Noss concludes with the exhortation that the FWS "think big" in space, time, and ambition (leadership) in order to fulfill the 1997 statutory mandates.

Dr. Brian Czech, an FWS conservation biologist who helped write the integrity-diversity-health policy, defends the "ecological integrity" framework of the draft version, published for comment in 2000. He uses the term "ecological integrity" to mean the integration of biological integrity, diversity, and environmental health. Though rejected as a term in the final policy, it is a common shorthand for the unwieldy statutory phrase and is used widely in this symposium. "Ecological integrity" is a pithy distillation of the Service's ecological management criterion. Czech explores the differences in the meanings of the terms biodiversity, biological integrity, environmental health, ecological integrity, and naturalness.

Though not endorsed in the final, 2001 policy, the draft employed a specific, chronological frame of reference for natural conditions from approximately 800 to 1800 CE. Czech defends the use of this time period based, in part, on the work of ecological economics showing the human economy to grow at the competitive exclusion of wildlife in the aggregate. The end of natural conditions coincides with the beginning of the industrial revolution when the relationship of humans to nature experienced an economic transformation. He urges managers to research historic, ethnographic, paleoecological, and archeological records to identify the baseline of natural conditions. Ultimately, though, Czech believes that maintaining ecological integrity

10. This conception of integrity is consistent with Fischman's finding. Robert L. Fischman, *The Meanings of Biological Integrity, Diversity, and Environmental Health*, 44, NAT. RESOURCES J. 989 (2004). It is also the standard employed in the Scott et al. analysis of the refuge system. J. Michael Scott et al., *National Wildlife Refuge System: Ecological Context and Integrity*, 44 NAT. RESOURCES J. 1041 (2004).

requires the substitution of a steady-state economy for the unsustainable economic growth primarily promoted by public policy.

Noah Matson, the director of the public lands program at Defenders of Wildlife, offers an experienced outsider's perspective on the Service's implementation of its integrity-diversity-health mandate. Matson's article focuses on how the substantive management criterion dovetails with comprehensive conservation planning. He argues that the key to meeting the ambitious ecological mandate is incorporating its concepts into each refuge's comprehensive plan. As an alternative to the research-intensive demands of a concentration on historic conditions, Matson proposes a six-step framework for folding most of the aspects of the integrity-diversity-health policy into planning. Matson joins the academic scientists in highlighting the importance of deciding what the FWS will target for monitoring and enhancing.

The case examples in the remaining articles illustrate Matson's observations about the critical role played by planning and target selection in meeting the integrity-diversity-health mandate. They also show how refuges convert policy language into actual refuge administration. These two articles, written by FWS and U.S. Geological Survey biologists, demonstrate how refuges set management priorities and evaluate uses. They focus in particular on the issues facing the Sacramento, Sherburne, and Bosque del Apache national wildlife refuges.

One important fact that emerges from the case examples is that refuge establishment documents continue to play a predominant role in shaping the goals and target resources in refuge management. At the same time, though, these three refuges all seek to maintain and restore ecological features of regional importance. In that respect, they look outward not only at external threats but also at external contributions they can make to landscape-scale conservation. Restoring wetlands at Sacramento and oak savanna at Sherburne not only enhance integrity-diversity-health on the refuge. These refuges lead by example in regional conservation. These refuges create and then showcase the management techniques (such as controlled burning) and materials (such as native seeds) that succeed in the particular watersheds in which the refuges are located. It will be important to follow up on these case studies in the coming years to see whether these refuges succeeded in spurring ecological restoration outside of their boundaries.

The Sacramento case is also important in illustrating how the refuge system can maintain migratory bird populations while at the same time decreasing its reliance on the farming of crops for high-energy food. The Bosque del Apache case presents a somewhat more complex picture of a refuge grappling with the integrity-diversity-health policy.

Like the Sacramento refuge, it is experimenting with processes more attuned to the historic conditions, such as flooding and fire. However, its management focus on winter habitat for sandhill crane conservation has led the Bosque refuge to grow crops of corn, even though that habitat does not match historic conditions.

III. DISTILLATION

Over the past 15 years, ecosystem management has become an important organizing concept for administering the public lands. As a matter of policy, all of the federal public land systems have adopted an ecosystem management approach. However, the regulatory and statutory law is not so far along. Moreover, the meaning of ecosystem management, especially its substantive dimension, remains ill defined and contentious. This symposium presents an interdisciplinary look at a particularly well-articulated example of ecosystem management policy.

The refuge system's mandate to maintain "biological integrity, diversity, and environmental health" is the most expansive ecological mandate in U.S. public land law. As the most recent congressional expression of organic principles, it points toward the future of public land management. A detailed examination of the ongoing efforts of the U.S. Fish and Wildlife Service to implement this mandate serves as a jumping off point for considering the broader questions of using conservation biology in law and resource management.

For now, what we have is a policy framework that can steer refuges toward the restoration of historic conditions and a broad perspective on landscape-level conservation. While the intensive information demands and sparse mandatory language of the policy will likely result in some drift from the core systemic mission and integrity-diversity-health objective, the key pieces of national guidance are in place, and they resonate with the scientific literature on ecological integrity.

How can the FWS lead the way from here? Readers will find several different directions suggested in the contributions to this symposium. But there are important common themes that establish a set of priorities for FWS action. In addition to the cumulative actions of the hundreds of wildlife refuges, the Service's path will be blazed by the way in which it conducts its training for implementation of the 2001 integrity-diversity-health policy.

The first theme that clearly emerges in this symposium is that the FWS must carefully pick its targets. The refuges will never have the money, the staff, or the research capability to conduct complete, robust, adaptive management pursuant to the policy. Like the statutory mission,

some of the ecological goals established by the substantive management criterion will remain aspirational for the foreseeable future. Priority setting takes on critical importance under these circumstances where only the first one or two of a litany of needs may be met on a refuge. The first important choice that many refuges will make is whether a specific establishment purpose ought to receive greater priority than a goal that is more directly related to the integrity-diversity-health criterion. Overemphasis on establishment purposes may erode the systemic power of the shift urged by the 1997 Act. Though the Act requires deference to establishment purposes where they directly conflict with the system mission, it does not require refuges to give higher priority to achieving establishment purposes in refuge administration. The second important choice for setting strategic priorities is identifying the right measures for monitoring success on ecological terms. A focus on mere population numbers of a species peripheral to the integrity, diversity, and health of an area will distract the Service from its core obligation. A third important choice is the ecological processes, such as fire and flood, employed to attain refuge goals. The integrity-diversity-health policy correctly emphasizes the importance of the ecological processes occurring on a refuge as much as the ecological composition of a refuge.

The second theme, which every article stresses, is the large, systemic scale that distinguishes the integrity-diversity-health goal from the more traditional notions of refuges as isolated pockets of nature protection. Expanding the spatial and temporal scales of concern require the refuges to engage with neighbors, other government programs, and a variety of other players on the conservation scene. This is as true for refuge acquisition as for management. Although the 2001 policy explicitly identifies *external threats* as key issues that the refuges must address in order to achieve ecological goals, there is also an opportunity to generate *external benefits* from refuge leadership. Whether through simple demonstration of good land-health behavior, technical expertise developed through restoration experiments, or the establishment of a seed bank, refuges can galvanize regional conservation efforts.

The final theme that emerges from this symposium is the importance of collaborating across disciplinary as well as geographic boundaries. The way in which the articles in this symposium reach beyond traditional scholarship in the law, ecology, public administration, and policy fields mirrors the need for the FWS to extend itself beyond its traditional comfort zone. Achieving the conservation mission, meeting the integrity-diversity-health criterion, and succeeding in continental-scale ambitions will require teamwork that is able to recognize the insights of many fields of expertise. The mandate to maintain biological integrity, diversity, and environmental health is not

simply law. It is also science, administration, and philosophy. It is, in other words, a microcosm of the challenge facing public conservation in our world of competing uses, scarce resources, and pervasive spillover effects. It is our hope that this symposium will serve as a model approach to meet this trans-disciplinary challenge.