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Recent Books on the National Wildlife Refuge System and Its Uncertain Future

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BOOK REVIEWS

THE STATE OF THE NATURAL RESOURCES LITERATURE

Richard J. Finkmoore* on Recent Books on the National Wildlife Refuge System and Its Uncertain Future

Books included in this review:

Rick Bass, *Caribou Rising: Defending the Porcupine Herd, Gwich-'in Culture, and the Arctic National Wildlife Refuge* (Sierra Club Books 2004)

Mathew T. Cogwell, ed., *Arctic National Wildlife Refuge* (Nova Science Publishers 2002)

Eric Jay Dolin, *The Smithsonian Book of National Wildlife Refuges* (Smithsonian Institution Press 2003)

Robert L. Fischman, *The National Wildlife Refuges: Coordinating a Conservation System through Law* (Island Press 2003)

Nancy Langston, *Where Land & Water Meet: A Western Landscape Transformed* (University of Washington Press 2003)

Marc L. Miller & Robert N. Fabian, eds., *Harmful Invasive Species: Legal Responses* (Environmental Law Institute 2004)

Stephen H. Schneider & Terry L. Root, eds., *Wildlife Responses to Climate Change: North American Case Studies* (Island Press 2002)

Jake F. Weltzin & Guy R. McPherson, *Changing Precipitation Regimes and Terrestrial Ecosystems: A North American Perspective* (University of Arizona Press 2003)

In its one hundred year history, the National Wildlife Refuge System has never been stronger than it is today—and never more threatened. Public awareness of the Refuge System is growing, conservation organizations new and old increasingly advocate for it, and local refuge "Friends" organizations work literally at the ground level. The system continues to expand. In October 2004, Glacial Ridge National Wildlife Refuge in Minnesota became the five-hundred-forty-fifth refuge. Perhaps most important, the legal framework for the Refuge System was reformed and in many ways improved by Congress in 1997. However, other forces are at work that have begun to undermine decades of effort to build this largest collection of lands devoted primarily to wildlife and nature conservation. The largest and most pristine refuge is threatened by energy development, invasive species of plants and animals infest a growing number of refuges, and climate change likely will cause serious

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impacts in almost every refuge. In my view, the strengths of the Refuge System pale in comparison to the threats it now faces.

The literature on the national wildlife refuges is, regrettably, limited. Compared with the outpouring of works on the other federal land systems, such as the national forests and national parks, the number of academic articles and books on the refuges is minuscule. But, like the visibility of the refuges and their number, works about them are increasing. As is customary in this section of the *Journal*, this essay reviews only the recent books among these writings. But it also takes a broad view of what literature is pertinent in order to help readers understand the larger context now shaping the Refuge System.

The national wildlife refuges are usually treated from the perspective of the entire system, as do two of the books considered here. But given the amazing diversity among refuges, it also is illuminating to look closely at individual refuges. While there is no such thing as a typical refuge, the Malheur National Wildlife Refuge in southeastern Oregon is representative of the many refuges that have been impacted by economic uses, local political pressures, and a management emphasis on waterfowl production.[1] In particular, Malheur is emblematic of many refuges west of the one-hundredth meridian that are highly dependent on a limited supply of water and where reclamation efforts have been a major force for change. In *Where Land & Water Meet: A Western Landscape Transformed*, Nancy Langston, a history professor at the University of Wisconsin, tells the complex and fascinating story of a major wetland ecosystem set amidst the arid landscape of the Great Basin and the people who attempted to control it. Malheur, she tells us, is a remote place, "a full day's drive from the nearest big city, a place few people have ever heard of, much less visited"[2]—and water is its essence.

Langston begins her book in a way I particularly liked, by describing her walk following the path of water from the western slopes of Steens Mountain, which rises five thousand feet above the surrounding desert, descending along the Donner und Blitzen River to and then across the Malheur Lake Basin. When the river enters the nearly level valley, it slows dramatically and meanders across a wide floodplain to Malheur Lake. "Surrounded by desert, the riparian landscapes team with life," she writes, "millions of redheads and canvasbacks and pelicans and avocets and sandpipers and snow geese

1. *See generally* Richard J. Fink, *The National Wildlife Refuges: Theory, Practice, and Prospect*, 18 HARV. ENVTL. L. REV. 1, 63-76 (1994) (discussing the extent of such secondary uses in the Refuge System).

2. NANCY LANGSTON, WHERE LAND & WATER MEET: A WESTERN LANDSCAPE TRANSFORMED 16 (2003).

and trumpeter swans rise up in great flocks that blacken the skies."[3] Today, visitors find what looks like "a supremely wild refuge"[4] of ponds and marshes, meadows and willow thickets. Yet as wild as it may now seem, this landscape has been radically altered over the past one hundred years by ranchers, irrigators, and wildlife managers. That transformation and its underlying causes are the subjects of Langston's study.

The earliest cattle operations in the Malheur Lake Basin largely worked with, rather than against, the annual cycle of flood and drought, according to Langston. But beginning at the turn of the twentieth century, homesteaders and irrigation engineers embarked, William Cronon writes in the Foreword, "on a much more aggressive vision of wetlands...in the service of human progress....[The Basin] was channelized, tiled, dredged, and drained so that the old dream of Jeffersonian yeomen farmers could persist...."[5] At the same time, William Finley, biologist, photographer, and later Oregon's commissioner of fish and game, began a campaign to save the vast concentrations of birds and the trackless marshes that led to the establishment in 1908 of the Malheur Lake Bird reservation by President Roosevelt. But this protected only the lake itself. Several decades of overgrazing, agriculture, and reclamation, followed by several years of drought in the 1930s, left the Malheur Basin "a dust bowl....[R]anches failed, livestock starved, homesteaders went bust, and the primary occupation in the valley became suing neighbors over water rights."[6] These conditions, combined with significant declines in duck populations in the region and throughout the nation, prompted the federal government in 1934 to begin purchasing the empty farms and ranches to expand the bird reservation and create the Malheur National Wildlife Refuge.

The new refuge's managers employed drastic measures in response to what they saw as a crisis by bulldozing, digging, building, and connecting and disconnecting watercourses. Langston paraphrases one staffer at a nearby refuge who explained, "whenever a refuge manager found some water in the desert, he tried to develop it—dam it, ditch it, impound it in a pond, or spread it out—anything but leave it alone."[7] The effort to restore habitat included practices common at the time: spraying herbicide over creeks, mowing down willows, killing

3. *Id.* at 15.
4. *Id.* at 5.
5. *Id.* at xi.
6. *Id.* at 5.
7. *Id.* at 8.

beaver, and pouring the poison rotenone into rivers and lakes. Malheur became a major "production area" both for cattle and waterfowl on the Pacific Flyway. But by intensively managing the landscape, the refuge staff was beset by continual complications and battles with ranchers, farmers, and finally conservationists.

Langston shows how refuge policies were themselves transformed through environmental litigation and national political influence, as well as better understanding of ecosystem complexity. Interior Secretary Bruce Babbitt helped motivate stakeholders to reach a cooperative agreement that helps protect Malheur's water source by threatening to designate Steens Mountain a national monument. One of Langston's most important conclusions—with which I heartily agree—is that "[c]onflict is central to these processes....Conflict has been a key part of American environmental politics, and many people think that is a very bad thing. Yet conflicts among different users of Malheur Lake Basin eventually improved management, for those conflicts disrupted the hold of narrow orthodoxies on resource management."[8] Langston proposes "pragmatic" adaptive management as a promising solution to this and similar controversies, but, she cautions, "without strong enforcement of environmental laws,...compromises can prove dangerous...."[9] Langston's monograph is both thorough and insightful. Although it examines the history of only one refuge, this exploration provides a basis for understanding refuges throughout the West.

Refuge history of a different sort is presented by Eric Jay Dolin in the *Smithsonian Book of National Wildlife Refuges*, a non-academic review of the Refuge System as a whole. Although this book covers much familiar ground, it also performs a service by presenting in one place a summary of the important developments of the last decade concerning the refuges. Because it is part text and part photographs, the volume is more likely to be found on a coffee table than a professional's bookshelf. However, the photography is by Karen Hollingsworth and her late husband John who spent more than 15 years documenting over 400 refuges throughout the country, and the images do convey the great diversity, beauty, tranquility, and wildness that can be found in the refuges.

Dolin begins by recounting how European colonists and their descendants decimated America's wildlife through market hunting and habitat destruction during the "Age of Extermination,"[10] which fueled

8. *Id.* at 9.
9. *Id.* at 165.
10. ERIC JAY DOLIN, THE SMITHSONIAN BOOK OF NATIONAL WILDLIFE REFUGES 13 (2003).

the conservation movement and led to the birth of what became the Refuge System. Dolin recalls the early growth of the refuges "by fits and starts"[11] and the critical role that federal law protecting migratory waterfowl played in the development of the system. Along the way, readers are reminded of the impact one individual can have. Will H. Dilg, a Chicago advertising executive, avid fisherman, and founder of the Izaak Walton League, led the campaign that resulted in the creation of the 250-mile-long Upper Mississippi National Wildlife Refuge in 1924. Senator Peter Norbeck of South Dakota broke a legislative stalemate over hunting on refuges and a possible duck stamp requirement; his bill became the Migratory Bird Conservation Act of 1929. The period from the mid-1930s to 1950 was, according to Dolin, "the glory years"[12] of the refuges, which saw a dramatic expansion of the system under chief of the division of migratory waterfowl (and later chief of refuge management) John Clark Salyer II, the creation of the Fish and Wildlife Service, and Rachel Carson's writing of the first pamphlets in the "Conservation in Action" series, which profiled various refuges and sought to increase public awareness of the system as a whole.

The 1950s brought "conflict, controversy, and compromise"[13] with increasing and often successful efforts to use the refuges for military training, oil and gas production, and expanded hunting. The modern environmental movement prompted a flurry of activity by Congress during the 1960s and 1970s—the Wilderness Act, the Land and Water Conservation Fund Act, the Endangered Species Act, and other statutes were enacted that provided new opportunities and responsibilities for the refuges. One hundred and forty new refuges were created during this period, including the nine million acre Arctic National Wildlife Range, which in 1980 was expanded to more than nineteen million acres and renamed a refuge.

Dolin tells how the Refuge System, hindered by low visibility bordering on anonymity and anemic funding from Congress, weathered shifts in presidential administrations. For the refuges, Ronald Reagan's hostility to environmental protection took the form of James Watt, Secretary of the Interior. Dolin quotes one Fish and Wildlife Service employee at the time as saying the new leadership "had nothing but contempt for the whole operation."[14] The administration's pro-development philosophy was reflected in a 1981 agency memorandum asking refuge managers to find ways to increase economic uses of refuge

11. *Id.* at 65.
12. *Id.* at 95.
13. *Id.* at 117.
14. *Id.* at 167.

lands. The less than lukewarm response prompted a follow up memo in 1982 telling refuge managers to look harder: "We believe that there is the potential to expand economic uses in such areas as grazing, haying, farming, timber harvest, trapping, oil and gas extraction, small hydroelectric generation, concessions, commercial hunting and fishing....[U]se innovation and creativity, and if necessary a redirection of your efforts...."[15] Although such uses of refuge lands were hardly unprecedented, their considerable extent was an important impetus for Refuge System reform legislation in the 1990s.

Though lacking in depth (the entire text is probably a little more than one hundred pages), Dolin's overview does bring the refuge story up to date. For example, he gives much-deserved attention to the increasing efforts of national environmental organizations to protect and improve the Refuge System: Defenders of Wildlife, which in 1992 issued a comprehensive report on the troubled state of the refuges that advanced the movement for a major overhaul of refuge statutes by Congress; the Wilderness Society, the National Wildlife Federation, the National Audubon Society, and several others, which joined with sportsmen's groups to form the Cooperative Alliance for Refuge Enhancement (CARE), which has effectively advocated for the refuges in Congress, particularly for substantial increases in funding.[16] Dolin also describes the work of newer organizations devoted specifically to the Refuge System, such as the National Wildlife Refuge Association (NWRA), which in 1996 spurred the creation of refuge "Friends" groups of which there are now more than 200. For those who do not know the refuges well, the Smithsonian book provides much helpful background information in an engaging way.

A significant contribution to the literature on the Refuge System is Robert L. Fischman's *The National Wildlife Refuges: Coordinating a Conservation System through Law*, which offers a comprehensive and detailed discussion of the statutes and administrative policies governing the management of the Refuge System. This book rightly focuses on the National Wildlife Refuge System Improvement Act of 1997, a "path-breaking"[17] statute for the refuges. While principally a careful legal

15. *Id.* at 168–69.

16. *See* COOPERATIVE ALLIANCE FOR REFUGE ENHANCEMENT, RESTORING AMERICA'S WILDLIFE LEGACY: RESOLVING THE NATIONAL WILDLIFE REFUGE FUNDING CRISIS, 2001 UPDATE (2001); SHORTCHANGING AMERICA'S WILDLIFE: A REPORT ON THE NATIONAL WILDLIFE REFUGE FUNDING CRISIS (2001), *both available at* http://www.refugenet.com/new-publications/index-publications.html (last visited Dec. 18, 2004).

17. ROBERT L. FISCHMAN, THE NATIONAL WILDLIFE REFUGES: COORDINATING A CONSERVATION SYSTEM THROUGH LAW 31 (2003).

analysis, Fischman's presentation is not overly technical and it also touches upon the historical and administrative context of the law.

Fischman divides his text into three parts, the first of which introduces the Refuge System and the legal regime governing it before 1997, much of which has continuing relevance. The heart of the book is Part Two, which is an extensive discussion of five key components of the Refuge Improvement Act: the first statutory mission statement for the system; the hierarchy of designated refuge uses, the requirement for comprehensive refuge planning, the new substantive management criteria for refuge management, and opportunities for public participation in refuge decision making. Here Fischman integrates the new FWS implementing regulations and policies into his examination of the statute in order to present a complete picture of the applicable law. Part Three addresses specialized laws and documents that control the management of certain refuges. Throughout, Fischman makes a very complex, multilayered legal regime relevant and understandable.

Coordinating a Conservation System through Law accurately assesses the strengths and weaknesses of the Refuge Improvement Act. I agree with Fischman that, at least potentially, "the single most important aspect"[18] of the 1997 Act is the detail found in the new substantive management criteria. These substantive standards include those applying to determinations of what uses are "compatible" with refuges purposes and the system mission—"the key mechanism" to bring "real change" to the refuges[19]—and affirmatively mandating that the Service fulfill the conservation mission of the system. Another strength of the 1997 Act is found in the requirement to maintain the "biological integrity, diversity, and environmental health" of the refuges,[20] which Fischman believes "catapults the Refuge System to the front lines of conservation biology."[21] On the other hand, the Act allows individual refuge purposes to override the system's new mission statement where there is a conflict; this weakens the encouragement given to managing the refuges as a true system and undercuts the notion of a shared mission. While the statute imposes a duty on the FWS to acquire needed water rights for refuges, Congress failed to establish new federal reserved water rights and appears unwilling to substantially increase funding to purchase water rights.

Lawyers who are even occasionally involved in issues involving the Refuge System will find this book extremely useful. This is

18. *Id.* at 208.
19. *Id.* at 112–13.
20. 16 U.S.C. § 668dd(a)(4)(B) (2000).
21. FISCHMAN, *supra* note 17, at 125.

particularly true for attorneys who represent clients seeking to make more concrete the Refuge Improvement Act's allusions to conservation biology, to use the substantive management criteria to accomplish meaningful nature protection, and perhaps even to "generate a body of public trust case law and practices for federal lands"[22]—a laudable but probably unrealistic goal given the current orientation of the federal judiciary on environmental issues. Others, including citizen activists and resource managers, may find studying the entire book a bit daunting but will find those portions of most interest to them both accessible and of real benefit.

In addition to effective implementation of modern refuge law by the FWS, the future of the refuges will largely be determined by how successful we are in addressing the three major threats now facing them: energy development, invasive species, and climate change. The most imminent threat confronts the largest and wildest of the refuges, the Arctic National Wildlife Refuge. The more than 40-year-old debate over the refuge's coastal plain may well be brought to a close by the current one-hundred-ninth Congress, and, if it is, the decision will be in favor of oil and gas production. Another Alaska refuge, Yukon Flats National Wildlife Refuge, is also being considered by the Bush Administration for oil and gas development.[23]

One recent reference work on the background of the ANWR controversy, the related legal and other issues, and the legislative context is *Arctic National Wildlife Refuge*, edited by Mathew T. Cogwell. Although readers are not clearly told, this volume consists of reports by three members of the staff of the Congressional Research Service (CRS) of the Library of Congress. While it is useful to give these reports wider distribution and to have basic information about the issue collected in one place, there is considerable overlap among them. The project would have benefited from heavier editing to reduce the repetition and better organize the overall presentation (for example, by relocating a glossary that appears at the end of the first chapter). Readers also should be aware that the same publisher also produced a subsequent volume[24] that departs from the objective tone of this collection by including some

22. *Id.* at 143.

23. Dan Berman, *USGS Releases New Estimate for Alaska's Yukon Flats*, GREENWIRE (Dec. 20, 2004), *at* http://www.eenews.net/Greenwire/Backissues/122004/122004gw.htm #6 (last visited Jan. 7, 2005).

24. M. LYNNE CORN ET AL., ARCTIC NATIONAL WILDLIFE REFUGE: BACKGROUND AND ISSUES (2003).

passionate advocacy against the energy development option and that CRS issued updates of two of its reports in 2004.[25]

Central to the ANWR controversy are estimates of the amount of oil and natural gas that may be economically recoverable, judgments about the need for—and alternatives to—the development of this potential energy resource, and the likely impacts of such development on the nearly pristine refuge, particularly on its wildlife. The Arctic refuge is large enough to contain entire intact ecosystems and, more than any other area of federal land, is capable of being a genuine reserve for biodiversity. Much attention has been focused on the Porcupine caribou herd, which calves in the refuge's coastal plain and seeks relief from clouds of biting insects there. After considering the herd's migration patterns and normal population cycles and warning against comparisons with the impact of the Prudhoe Bay oil field on the Central Arctic caribou herd (a different situation in several ways), these reports do not reach a conclusion as to whether possible displacement of the Porcupine herd from the calving area would have harmful effects. But polar bears, endangered musk oxen, and the 135 species of migratory birds that breed or feed in the refuge may also be affected.

A host of other issues is part of the highly polarized controversy over ANWR ranging, from the environmental standards to be applied to any future oil leasing to the allocation of oil-related revenues between the state and federal governments and the impact of the International Polar Bear Agreement, ratified by the United States in 1976. The size of the development "footprint" in the coastal plain, which might be limited to two thousand acres under the ambiguous language in one bill pro-development that passed the House of Representatives in 2001, is regularly cited by proponents of oil production as a reason the impact on wildlife will be minimal. However, the CRS authors point out that lifting the current ban on development of the coastal plain would permit oil and gas leasing on federal lands within the refuge but also on more than ninety-two thousand acres of Native lands within the refuge. This is the result of an unusual 1983 exchange agreement that allowed a Native regional corporation to receive title to the subsurface estate of these lands. Because these lands are within the refuge, the Native corporation would not otherwise have been entitled to these rights.

The human dimensions of the threat to ANWR are presented in a personal account by Rick Bass, *Caribou Rising: Defending the Porcupine*

25. PAMELA BALDWIN, LEGAL ISSUES RELATED TO PROPOSED DRILLING FOR OIL AND GAS IN THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR) (Cong. Res. Serv. RL31115, updated Mar. 9, 2004); M. LYNNE CORN ET AL., ARCTIC NATIONAL WILDLIFE REFUGE (ANWR): CONTROVERSIES FOR THE 108TH CONGRESS (Cong. Res. Serv. IB10111, updated June 14, 2004).

Herd, Gwich-'in Culture, and the Arctic National Wildlife Refuge. Bass is a writer of fiction and nonfiction, a hunter, and a former oil industry geologist, and this short book tells of his visit to the refuge and to Arctic Village, south of the Brooks Range and just outside the refuge. It also presents a concise and passionate case against oil development there. The purpose of his trip was, ostensibly, to hunt caribou; in this, he was unsuccessful because the caribou were late in arriving that year. But, fortunately for his readers, he did not leave empty handed.

From Bass, I learned more about the Gwich-'in, Native Alaskans whose name means "people of the caribou" and who for about 20 thousand years have been "in every way relying upon...the Porcupine caribou herd, loving and celebrating and praying both to the caribou and the land they live on...." [26] The herd is an indispensable source of food for the Gwich-'in, but Bass tells us it is also "the spiritual and social fabric of this race of man, and the movements of the herd ground the entire tribe, at all times of the year—the life cycle of the caribou as powerful a force as the seasons themselves, like the seventy-below Arctic fronts that push through...."[27] The fact that the caribou are late this year, a native named Charlie Swaney tells Bass, has made everyone "edgy and uneasy....The caribou bring joy and happiness to the whole village....When they're not here, we don't feel right."[28] And so the possibility of losing the herd to satisfy the seemingly insatiable energy appetite of the outside world makes the Gwich-'in more than uneasy. They are fearful and a little angry. (Other Native Alaskans, principally the North Slope Inupiat, favor oil and gas development. The Inupiat have benefited financially in several ways from oil development at Prudhoe Bay and are concerned that the reduction of production from those fields will reduce their standard of living; they are also shareholders in the Arctic Slope Regional Corporation, which holds subsurface rights in ANWR's coastal plain and would benefit from any oil that might be found in those lands.)

Bass has a clear position on the oil versus refuge debate. He believes that industrial development of the coastal plain will result in the disappearance of the Porcupine herd, and with it Gwich-'in culture, if not the people themselves. "[A]s a lover of wild places," Bass feels he is now

26. RICK BASS, CARIBOU RISING: DEFENDING THE PORCUPINE HERD, GWICH-'IN CULTURE, AND THE ARCTIC NATIONAL WILDLIFE REFUGE 4 (2004).

27. *Id.* at 15.

28. *Id.* at 46.

> on the trapped end...and that Bush and Cheney and the [oil] industry minions are drawing the noose tight, sniffing around for one or two more senators, even as the majority of the nation asks them nicely, asks them politely, to not do this, to not make this final and cheap and damning shortsighted mistake.[29]

One important reason it would be a mistake is because there is, according to a commonly cited figure, only six months worth of fossil fuel under the Arctic National Wildlife Refuge, and this amount—and much more—could be saved just by raising fuel economy standards for one class of vehicles alone (light trucks, most often known as SUVs), Bass states. Likewise, ANWR oil's simply would not be needed if Congress were to set renewable portfolio standards for the nation's utilities requiring a modest 20 percent of energy to come from renewable sources by the year 2020. That the nation could have taken such steps a decade or two ago makes further environmental sacrifices all the more maddening.

It is apparent from reading *Caribou Rising* that the ANWR issue has many dimensions. It is about wilderness and wildlife preservation. It is also the United States' very own indigenous peoples' human rights problem, one surprisingly similar to the struggle of the U'wa people of Columbia whose cloud forest world has been targeted for oil exploration.[30] (We understand that such things can happen in places like that. Can we understand that they can happen in this country?) In an ironic twist, the oil that has been pumped from the Alaskan ground at Prudhoe Bay has circuitously contributed, if only a trifle, to recent changes in ANWR. Charlie, the Gwich-in who takes Bass out to hunt caribou, points to an area of tundra dotted with spruce five to ten feet tall. "Those never used to be here," Charlie says, and Bass continues:

> In all the years the Gwich-'in have lived here, it was only tundra. It was too cold, too frozen for trees to grow. But nine of the past ten years have been the warmest ever recorded, and suddenly a forest is growing. This is changing the feeding habits of the caribou and is also making it harder to see them.[31]

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29. *Id.* at 92–93.

30. John Vidal, *How a Disappearing Oil Field Was the Answer to One Tribe's Prayers*, THE GUARDIAN (London), May 13, 2002, at 3 (Home pages).

31. *Id.* at 44.

Climate change, which is affecting the entire Arctic Region now, has other consequences. Bass quotes Fred Pearce, writing in the *New Scientist*:

> Warmer summers mean the pastures are often past their best by time the caribou reach them. To make matters worse, warmer winters are triggering heavier snowfall in the mountains. This means the migration is delayed by deep snow and by raging rivers as the snow melts....[In 2000], for the first time, none of the females made it to the coast before their June calving....I watched for days, camped out on the edge of the calving grounds at the end of June, weeks after the caribou should have passed through....The females and their calves finally reached the coast at the start of July, but there were fewer than half as many calves as cows, a record low.[32]

During his visit to this far northern place, Bass talked with Sarah James, a native Gwich-'in woman in her fifties and a co-winner of the Goldman Environmental Prize for sustained and important grassroots efforts to preserve the natural environment. "'We were the last ones to be contacted by the so-called Columbus discovery,'" she told him, "'[t]he Russians came from the north, and the French from the south....'" But, Bass continues, "the Gwich-'in, out in the bush, were the last of the last."[33] And so, too, is the Arctic refuge.

The second major threat to the Refuge System is invasive species. One standard reference for the scope of the problem in the United States, a 1993 report by the former Office of Technology Assessment, concluded that more than 4500 species of foreign origins have established living populations in the country.[34] More recent estimates put the number at ten times that amount,[35] and the total area infested is believed to be more than 100 million acres.[36]

The refuges have not escaped the onslaught. The National Wildlife Refuge Association reports that at least 675 different invasive

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32. *Id.* at 129-30.

33 Id. at 70.

34. OFF. OF TECH. ASSESSMENT, HARMFUL NON-INDIGENOUS SPECIES IN THE UNITED STATES 3 (1993).

35. David Pimentel et al., *Environmental and Economic Costs Associated with Non-Indigenous Species in the U.S.*, *at* http://www.news.cornell.edu/releases/Jan99/species_costs.html (last visited Jan. 7, 2005).

36. Nat'l Audubon Soc'y, *Cooling the Hot Spots: Protecting America's Birds, Wildlife, and Natural Heritage from Invasive Species*, *at* http://www.audubon.org/campaign/invasives/pdf/invasives_report_2nd_edition.pdf (last visited Jan. 8, 2005).

species now occupy nearly eight million acres of habitat on one half of all refuges.[37] According to the Audubon Society, the Mississippi Sandhill Crane National Wildlife Refuge is threatened by nonnative fire ants and the rapidly spreading invasive weed cogon grass.[38] At the Willapa National Wildlife Refuge in Washington, *Spartina* has taken over 11,000 acres in the estuary and the area covered by this nonnative cord grass is expanding at the rate of 20 percent per year.[39] Melaleuca trees and Old World climbing fern infest more than 80 percent of the habitat within the Loxahatchee National Wildlife Refuge at the northernmost portion of the Florida Everglades and it is estimated that *each day* these species spread over an additional 16 acres.[40] The Fish and Wildlife Service believes that invasive species have become the single greatest threat to the Refuge System.[41] In 1998, the agency spent $13 million fighting such infestations, mostly by cutting, mowing, burning, trapping, and spraying the invaders and then restoring native species to the area; at that time, $150 million more was needed for similar projects.[42] Surely, additional funding and manpower for the refuges are required to respond on the ground to the invasive species menace. But virtually all refuges are habitat "islands" surrounded by a sea of mixed landscapes,[43] and they will continue at risk unless the challenge posed by invasives is effectively addressed at a much larger scale. Has this been done?

The answer to this question is found in *Harmful Invasive Species: Legal Responses*, edited by Marc L. Miller, a law professor at Emory University School of Law, and Robert N. Fabian. This book describes the law regarding non-indigenous species in six nations, New Zealand, South Africa, Argentina, Germany, Poland, and the United States. No rationale is given for why these particular countries were chosen for examination; it may have been happenstance. All of the authors of individual chapters, most of whom are environmental lawyers in their respective countries, have some affiliation with the World Conservation Union (IUCN), as do the editors. However, all of the countries share one thing in common: "a profound lack of complete or coherent law and policy with regard to invasive species."[44] Of the countries treated in this

37. NAT'L WILDLIFE REFUGE ASS'N, SILENT INVASION: A CALL TO ACTION 5 (2002).
38. Nat'l Audubon Soc'y, *supra* note 36.
39. *Id.*
40. NAT'L WILDLIFE REFUGE ASS'N, *supra* note 37, at 12.
41. Nat'l Audubon Soc'y, *supra* note 36.
42. NAT'L WILDLIFE REFUGE ASS'N, *supra* note 37, at 9, 7.
43. FINK, *supra* note 1, at 106–07, 91–94.
44. HARMFUL INVASIVE SPECIES: LEGAL RESPONSES 3 (Marc L. Miller & Robert N. Fabian eds., 2004).

book, only New Zealand has even tried to implement a comprehensive non-indigenous species policy.

This volume does make clear that the problem is a global one, requiring action at international and national levels, not just in the places directly affected by invasive species. The introductory chapter describes the emerging international consensus on the importance of the problem and briefly evaluates the principal international instruments related to harmful non-indigenous species. It also helps those who are relatively new to the subject understand why this issue is so problematic for governments, such as the difficulties in perceiving invasions and their effects and determining which non-indigenous species are beneficial and which are harmful, particularly when commercial interests may be affected.

National wildlife refuge managers and visitors can take little comfort in current law, according to Professor Miller, who contributed a lengthy chapter on the United States. He concludes that harmful invasive species "may present the single most important environmental issue overlooked"[45] under existing U.S. law. While there are a large number of federal laws granting authority and funding to agencies that *might* be applied to the problem, the framework is "fractured and incomplete."[46] Indeed, there is no law on the important issues of identifying new invasions, assessing the impact of known harmful non-indigenous species, or responding quickly to emerging threats. Two presidents, Carter and Clinton, did issue executive orders specifically addressing invasive species, the first described by Miller as "dramatic, ignored, [and] defunct" and the second as "hopeful [and] bureaucratic."[47] The Clinton order created a cabinet-level Invasive Species Council that issued the 80-page National Invasive Species Management Plan two days before the first inauguration of George W. Bush. Four years later, the Council reports that it is "currently working to establish federal and non-federal task teams to implement the action items of the [National Management Plan]."[48] The National Wildlife Refuge Association believes the implementation of this Plan—"the first comprehensive blueprint for coordinated action on invasive species"—is one of three key steps that should be taken to protect the Refuge System from invasives.[49]

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45. *Id.* at 166.

46. *Id.* at 125.

47. *Id.* at 146, 148.

48. Invasivespecies.gov, *National Invasive Species Management Plan*, *at* http://www.invasivespecies.gov/council/nmp.shtml (last visited Jan. 8, 2005).

49. NAT'L WILDLIFE REFUGE ASS'N, *supra* note 37, at 15.

The third major threat to the national wildlife refuges is a potentially catastrophic one: global climate change. A 2004 report from the Pew Center on Global Climate Change provides an overview of the kinds of impacts likely to directly affect the refuges.[50] This synthesis of scientific studies concludes that major changes in the distribution of ecosystems in the United States are a likely consequence of climate change, with species generally moving north and to higher altitudes where possible. Ecosystems themselves do not migrate, of course; individual animal and plant species do and at differing rates. New ecosystems with different compositions may develop, and some current ecosystems, especially those in colder locations, could be eliminated entirely. The Pew report found that "the risk to natural ecosystems from climate change is far more serious because development has put ecosystems under stress through habitat destruction, fragmentation, and pollution. Thus, climate change is expected to exacerbate the loss of biodiversity already resulting from development in the United States."[51] Aquatic ecosystems will be greatly altered. The report observes that "[c]hanges in runoff due to earlier snowmelt and changed precipitation patterns could adversely affect many fishes....Increased summer drought might eliminate or severely contract small wetlands important for migratory waterfowl."[52] Natural systems have much more limited adaptive capacities than human ones, such as agriculture and forestry, and therefore are at "much greater risk from climate change than societal systems...," the Pew synthesis report concludes.[53] The "could"s and "might"s in such predictions should be understood in light of the fact that climate change impacts that affect refuges are occurring now. A November 2004 follow up report from the Pew Center concluded that "the consequences of climate change are already detectable within U.S. ecosystems" and that "species composition within communities has changed in concert with local temperature rise."[54] Change resulting from human-induced emissions of greenhouse gases, largely due to the burning of fossil fuels, is already underway.

Defenders of Wildlife, which has a special program on the refuges, believes that when added to the impacts of pollution and encroaching development the "stresses of global warming could be

50. JOEL B. SMITH, A SYNTHESIS OF POTENTIAL CLIMATE CHANGE IMPACTS ON THE UNITED STATES (Pew Center on Global Climate Change 2004).

51. *Id.* at 14.

52. *Id.* at 16.

53. *Id.* at 18.

54. CAMILLE PARMESAN & HECTOR GALBRAITH, OBSERVED IMPACTS OF GLOBAL CLIMATE CHANGE IN THE U.S. 43–44 (Pew Center on Global Climate Change 2004).

devastating to the Refuge System."[55] Ocean water temperatures have risen globally over the last century, a trend that has been well documented in California coastal waters.[56] At the Farallon National Wildlife Refuge, a group of islands near San Francisco, this change has altered the food supply available to birds and fish; populations of Cassin's auklet, pigeon guillemots, and two species of cormorants have declined dramatically there.[57] Predicted temperature increases in the Northern Great Plains will dry up ponds, prairie potholes, and wetlands and may eventually eliminate these vital habitats in many refuges, such as Lostwood National Wildlife Refuge in North Dakota.[58] Globally, an eight- to ten-inch rise in sea level has been observed since 1901, largely due to thermal expansion of the oceans.[59] At the Blackwater National Wildlife Refuge in Maryland, the rise in sea levels during the past century has submerged more than one-third of the refuge's wetlands.[60]

Rick Bass's observation that new forests are growing near the Arctic National Wildlife Refuge is a glimpse of the widespread climate change impacts which will continue to affect the Alaskan wildlife refuges. In November 2004, the Arctic Council, an intergovernmental forum of eight nations including the United States, issued the first thorough assessment of the consequences of global warming for the region. The four-year study involving nearly 300 scientists shows that profound environmental changes—such as significant retreats of sea ice, melting glaciers, and thawing tundra—are now occurring and will continue for decades. The computer models used to estimate climatic changes, severely criticized in the past by some skeptics, long ago predicted that the Arctic would warm more rapidly than other areas. The Arctic Council's new assessment validates those models: the region "is now experiencing some of the most rapid and severe climate change on Earth."[61] The combination of warming and other factors—including over-fishing and the depleted ozone layer—"threatens to overwhelm the adaptive capacity of some Arctic populations and ecosystems."[62]

The changes now occurring in the Arctic will directly impact many refuges in the continental United States. Accelerated melting of ice,

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55. Defenders of Wildlife, *Climate Change and the National Wildlife Refuges, at* http://www.defenders.org/habitat/new/global2.html (last visited Oct. 9, 2004).

56. PARMESAN & GALBRAITH, *supra* note 54, at 30.

57. Defenders of Wildlife, *Threats Facing the Refuge System, Global Warming, at* http://www.defenders.org/habitat/new/farallon.html (last visited Jan. 3, 2005).

58. *Id.*

59. PARMESAN & GALBRAITH, *supra* note 54, at 30.

60. Defenders of Wildlife, *supra* note 57.

61. ARCTIC CLIMATE IMPACT ASSESSMENT, IMPACTS OF A WARMING ARCTIC 10 (2004).

62. *Id.* at 5.

particularly in Greenland, will cause sea levels to continue to rise around the globe.[63] The projected rise of an additional 19 inches during this century[64] will certainly affect refuges along eastern and western coasts of the continental United States and in Puerto Rico, Hawaii, and the Pacific. In addition, because several hundred million birds depend on breeding and feeding grounds in the Arctic, their populations stand to suffer. Shorebirds such as curlews, sandpipers, and red knots will find their breeding areas along the Arctic Ocean narrowed by forests growing further north.[65] Former Secretary of the Interior Bruce Babbitt has pointed out that snow geese, which feed on the Coastal Plain of the Arctic National Wildlife Refuge, "descend like thick white clouds" on the Sacramento National Wildlife Refuge in California's Central Valley and that more than 30,000 tundra swans winter at the Mattamuskeet National Wildlife Refuge in North Carolina.[66] Refuges in the lower 48 states, therefore, will be affected by continuing changes in the far north.

Two recent monographs present specific studies that both support the unhappy observations above and shed light on the current state of the relevant science. Both deal with climate change impacts in North America and thus are pertinent to almost all national wildlife refuges; one focuses on terrestrial ecosystems, the other on wildlife. Lacking a science background, I am not the most qualified reviewer for these two books, but both are for the most part understandable to the layperson—the volume on wildlife impacts more so—and can assist resource managers and other professionals working to conserve habitat and species.

Although a sizeable body of research has emphasized the effects of increasing atmospheric carbon dioxide concentration and increases in temperature on ecosystems, far less attention has been focused on changes in precipitation anticipated under climate change. *Changing Precipitation Regimes and Terrestrial Ecosystems*, edited by Jake F. Weltzin and Guy R. McPherson, addresses this emerging area of global change investigation. The types of changes examined in this volume may be due to factors such as alterations in atmospheric circulation and land surfaces, as well as to global warming.

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63. *Id.* at 10.

64. *Id.* at 13.

65. Alister Doyle, *Woes of Warming Arctic to Echo Worldwide via Birds*, *at* http://www.planetark.com/avantgo/dailynewsstory.cfm?newsid=28114 (last visited Jan. 8, 2005).

66. Bruce Babbitt, *The Arctic National Wildlife Refuge: As Close as Your Own Backyard*, *in* M. LYNNE CORN ET AL., ARCTIC NATIONAL WILDLIFE REFUGE: BACKGROUND AND ISSUES 129–30 (2003).

This monograph resulted from discussions at the 1998 Annual Meeting of the Ecological Society of America and is intended to increase awareness that shifts in the amount, seasonality, and intensity of precipitation from human-induced climate change will have major consequences for ecosystem structure and function. Weltzin, an assistant professor of ecology at the University of Tennessee, and McPherson, a professor in the School of Renewable Natural Resources at the University of Arizona, provide an overview of the topic and summarize conclusions drawn from the contributions of about 20 scientists. The early chapters make clear the importance of precipitation regimes, soil characteristics, and soil moisture to the distribution and abundance of vegetation (described more scientifically as "the role of geological substrate and the functional architecture of plant roots in dictating plant response" to precipitation). Later chapters present five case studies investigating the role of precipitation in shaping terrestrial ecosystems of the western and central United States, where precipitation already constrains community and ecosystem structure and function: Sonoran and Chihuahuan desert, sagebrush steppe, oak savanna, tall-grass and mixed-grass prairie, and deciduous forest.

Interestingly, one study was conducted near the Malheur National Wildlife Refuge, at the Northern Great Basin Experimental Range about 45 miles northwest of the refuge's headquarters. The Experimental Range comprises shrub steppe vegetation represented by sagebrush/bunchgrass and western juniper plant communities. Plants in the Great Basin are physiologically adapted to a winter/early spring precipitation pattern, where a reliable soil water recharge occurs prior to the growing season. This study determined that shifting precipitation to a spring/early summer pattern had a negative effect on herbaceous productivity, vegetation cover, and the ability of some key plant species to reproduce. Development of a spring/summer precipitation pattern as a result of climate change would result in, potentially, the eventual loss of some native plant species. Biomass production would also be reduced. Wildlife and domestic livestock that depend on the production of non-woody annual and perennial vegetation would be adversely affected by the new spring/summer moisture pattern. This conclusion regarding the importance of timing, or *seasonality*, of precipitation relative to the actual *amount* of precipitation was supported by data from four other case studies in this book and is a fundamental observation likely to have important ramifications as the climate continues to change.

A second book of empirical examinations that pertains to the future of the Refuge System is *Wildlife Responses to Climate Change: North American Case Studies*, edited by Stephen H. Schneider, professor in the Department of Biological Sciences at Stanford University, and Terry L.

Root, now a Senior Fellow at the Institute for International Studies at Stanford. Acting on the belief that conservationists need a better understanding of the possible local and regional effects of climate change on species, the National Wildlife Federation provided fellowships to eight graduate students to engage in original research on the subject. Their work, conducted under the guidance of Schneider and Root and subjected to external scientific peer review, comprises most of this volume.

This project is notable because it runs counter to the traditional academic position that discourages scientists from research outside recognized disciplines or with a strong policy component. Furthermore, unlike some in the scientific community, the editors/mentors believe in the value of training young scientists in the art of presenting scientific research clearly, without jargon, to make important findings available to the public and elected officials. One can hope that other senior academic scientists will heed the message that such efforts are acceptable and even essential in our present ecological predicament.

The overview chapter by Schneider and Root is thorough and comprehensible. They provide a very informative survey of key aspects of climate change related to wildlife, treating in order the synergisms between changes in climate and ecology, a history of climate, the causes of change, climate predictions and their validation, and downscaling predictions to correspond more closely to ecological scales. Chapters by the researchers include findings that warmer temperatures in the Pacific Northwest have contributed to a significant northerly shift in the range of the sachem skipper butterfly, that climate-related changes have had a marked effect on the composition of intertidal marine species, and that changes in sea temperature alter interactions between species, such as reduced feeding by ochre sea star, a keystone predator, on mussels, the dominant competitor for space in rocky tidal communities. The book as a whole does establish a credible scientific connection between the welfare of wildlife and human-induced climate change.

In light of the invasive species threat previously mentioned, the chapter on "Climate Change and the Susceptibility of U.S. Ecosystems to Biological Invasions" is particularly relevant to the refuges. This study focuses on the possibility than a warming and drying climate will expand the range sizes of invasive species generally, and in particular that of the red imported fire ant in the southeastern United States and the shrub tamarisk (also called salt cedar) in the West. Since its introduction from Asia and the Mediterranean in the mid-1800s, the genus *Tamarix* has spread rapidly into riparian areas, replacing native forest and scrub communities in 23 states. Tamarisk stands provide relatively poor habitat for native animals and, perhaps more

importantly, consume water more rapidly than native vegetation. This in turn impacts terrestrial and aquatic wildlife by drying up desert springs, drawing down water tables, and lowering lake levels. Among the refuges now suffering from tamarisk invasions are the Cibola, Imperial, and Havasu National Wildlife Refuges on the lower Colorado River, where the bald eagle has been affected, and the Bosque del Apache National Wildlife Refuge in New Mexico, where one population of the endangered whooping crane has been strongly impacted by the encroachment of tamarisk into marsh habitat.

The specific findings of this study support the consensus of scientific opinion that climate change will worsen the invasive species problem. Because tamarisk is limited by high moisture and by low growing season temperatures, this chapter concludes that changes predicted by regional climate models would allow tamarisk to spread eastward and westward into the central and Pacific coastal regions. More than a score of wildlife refuges lie in wait.

One of the salient characteristics of the three major threats to the wildlife refuges is their connectedness, and this fact makes addressing any of them more complicated and more difficult. One of the last true refuges from human development, ANWR, may be forever changed in order to yield some oil and gas, part of which will become carbon dioxide in the planet's atmosphere. This, in turn, will contribute to changes in the amount and timing of rain and snow falling on other refuges, and how warm or cold they are, and change which plants and animals inhabit them—which will likely include more species brought from distant places that will displace even more of their native species. The synergies among the threats make them even more ominous.

Near the end of her book, Nancy Langston states the broader truth she found in a single refuge: "Malheur's history shows that although what people do profoundly affects nature, people can never control nature—a critical distinction. People try to create an artificial machine of water and land, but that machine soon swings out of their grasp. More and more in modern life, we fool ourselves into believing that human and ecological processes are separate."[67] One could analogize what a few men did at this one refuge in the mid-twentieth century to what mankind is doing to all refuges at once in the early twenty-first century: people try to create an interconnected global consumer economy based on burning oil, gas, and coal, but that machine soon swings out of our grasp. More and more in modern life we fool

67. LANGSTON, *supra* note 2, at 169.

ourselves. The books reviewed here—particularly those by Langston, Bass, and Schneider and Root—can help us think more clearly.

REVIEWS

The Economics of Conserving Wildlife and Natural Areas. By Clem Tisdell. Cheltenham, UK/Northampton, MA: Edward Elgar Publishing. 2002. Pp. 308. $90.00 hardcover.

Few researchers match the energy of Clem Tisdell in writing on conservation and other ecological economics topics. The author notes in the Preface that as well as the 24 chapters in this book, his publications on conservation, management, and use of nature can also be found in eight other books he has authored! His prolific output over the past 30 years is best known in his native Australia, where much, but far from all, of his research is focused. The insights in the chapters are of relevance in many countries where conservation of wildlife and management of natural areas are important issues.

The Economics of Conserving Wildlife and Natural Areas is a compilation of essays of which 21 have been previously published in peer-reviewed journals. The book comprises four parts. In part I the author provides an overview of the contents of the book noting that in general the chapters are arranged so that the reader moves from general to more specific topics. Part II contains six chapters and is entitled "General Issues in Biological Conservation." These chapters were first published between 1985 and 1996. Part III contains ten chapters and is entitled "Economics of Conserving Wildlife Species." Five of the essays were first published during the 1970s and the most recent chapter was written in 2001. Part IV contains seven chapters and is entitled "Conservation and Use of Natural Areas." The earliest essay was first published in 1972 and chapter 24 was written in 2001.

The publishers have reproduced the previously published essays in their original formats and fonts. Chapters 2 and 7 are printed in 8-point font, with two columns per page. They are not easily read. All other chapters are in single column format and have larger, but varying fonts, layout, and referencing systems. These features detract from the value of the book and the impression created is that the publishers have avoided the cost of preparing each of the chapters in a consistent format and font by the simple expedient of reproduction of the original journal articles.

What of the content of the chapters? One way to describe the chapters is to group them under three headings: theoretical analysis and discussion of conservation topics (chapters 2, 3, 6, 7 are examples), analysis including illustrative diagrams but without empirical data