Endangered Species UPDATE

Including a Reprint of the latest USFWS Endangered Species Technical Bulletin

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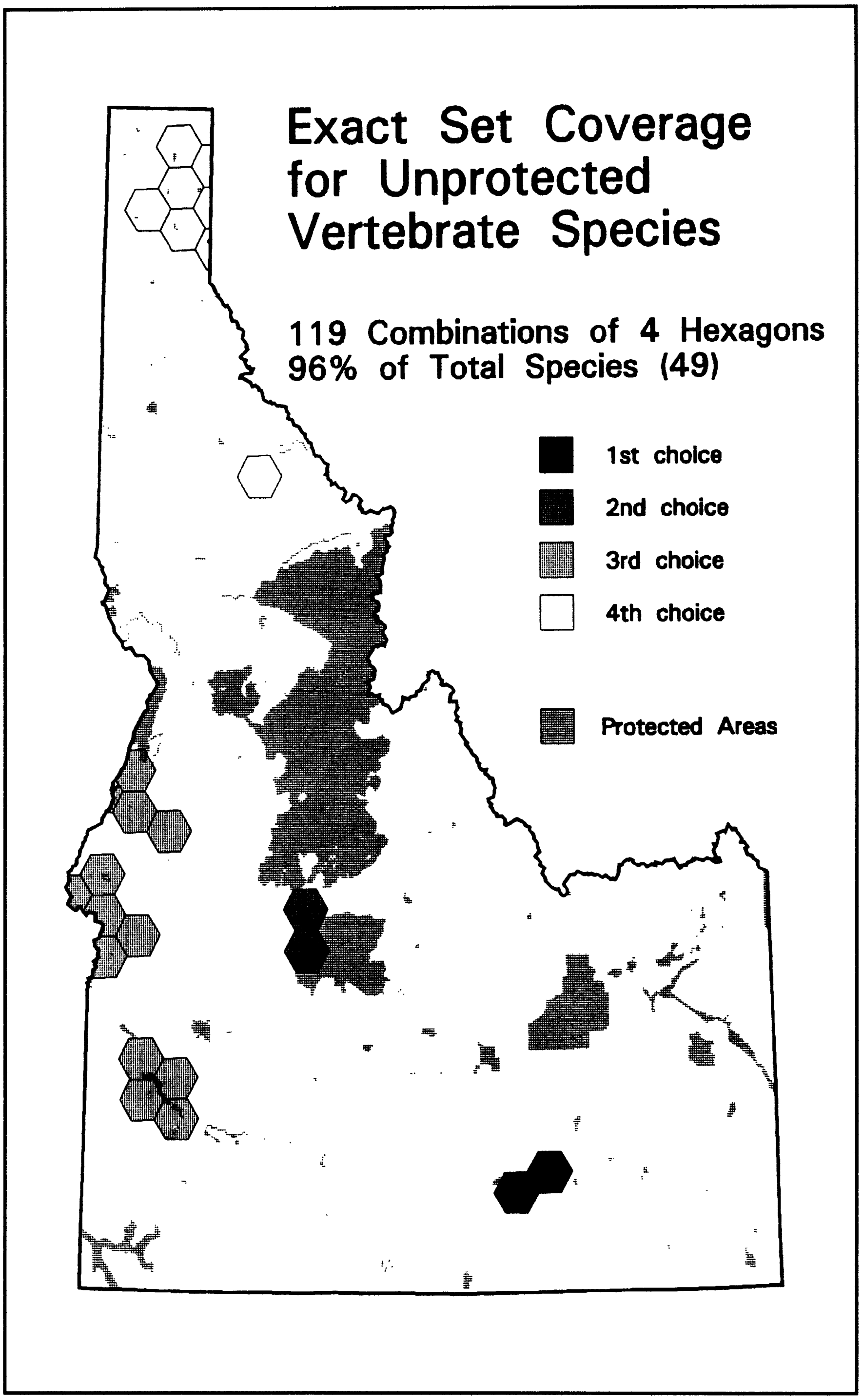


In this Issue:

Gap Analysis: Mapping Biodiversity for Conservation and Management

by

Blair Csuti

The Endangered Species Act of 1973 (ESA) provided legislative guidance to conservation inventories and actions in the United States. Attention initially was focused on relatively few species, typically charismatic vertebrates like the bald eagle (*Haliaeetus leucocephalus*) or grizzly bear (*Ursus arctos horribilis*), that had declined in parts of their range. In the two decades following passage of the ESA, the number of species listed as threatened or endangered, as well as candidates for such listing, grew to include many smaller vertebrates, invertebrates, and plants. By 1992, listed and candidate species together numbered approximately 4,000. This growth was not anticipated by many early champions of the Act. The inability of the ESA listing and recovery process to respond to this growth has cast doubt on the role of the Act as the primary tool for maintaining national biodiversity.

In 1986, the Society for Conservation Biology was established, growing out of several conferences devoted to the subject (Soulé 1987). Conservation biology was immediately recognized as an interdisciplinary science (Soulé 1985); however, most research in conservation biology focused on genetic, demographic and stochastic properties of populations (Jacobson 1990). This was a logical consequence of the importance placed on species under the ESA. Significantly, species-driven conservation objectives represent a departure from the earlier goal, as articulated by committees of the Ecological Society of America, of ensuring the representation of all ecosystem types in protected areas (Shelford 1926, Kendeigh et al. 1951).

Ehrlich and Ehrlich (1981) and Pitelka (1981) reminded us that conservation of biological diversity is best accomplished by protecting entire ecosystems. The rescue of individual species from the brink of extinction, however laudable, is not a viable strategy for reducing the planetary loss of biodiversity (Csuti et al. 1987, Scott et al. 1987, 1991). The publication of the book *Biodiversity* (Wilson 1988) did much to focus both the public and the conservation community on larger conservation issues than those addressed by the ESA. Still, most habitat protection in the U.S., both by public agencies and private organizations, is based on the presence of one or more endangered species. This has led to some spectacular successes, such as the 5,255 hectare Ash Meadows National Wildlife Refuge in Nevada. These successes, however, need to be supplemented with a national strategy to maintain biodiversity before ESA protection is required.

Reserve Selection versus Reserve Design

Biodiversity includes not only genetic, species, and ecosystem diversity, but also ecological processes. Because the entire range of ecosystem processes cannot be maintained through *ex situ* conservation strategies, conservation of biodiversity must take place in the wild. Developing an *in situ* conservation strategy is a two-step process: 1) deciding which general areas need protection, and 2) drawing specific boundaries around each area to be managed. Considerable energy has been placed on reserve design: how big and what shape must protected areas be for population survival and the maintenance of ecosystem dynamics? Determining requirements for population viability, for example, is a reserve design exercise.

In contrast, much less attention has been focused on reserve selection: the identification of areas that need to be protected in order to maintain representatives of all elements of biodiversity. Yet, reserve selection is a critical precursor to reserve design. Managing reserves to minimize extinction risk will not sustain biodiversity if the reserves being managed do not represent biodiversity adequately (Margules 1989). The considerable debate over SLOSS (the value of a single large reserve versus that of several small reserves) resulted from a failure to distinguish between reserve selection and reserve design. Population viability is often correlated with reserve size. However, if viability is held constant, more species will, by definition, be represented in reserves that maximize complementarity.

History of Gap Analysis

From 1976 to 1983, J. Michael Scott directed intensive field surveys of vegetation and endangered forest birds of the Hawaiian Islands (Scott et al. 1986). One result of these surveys was a map comparing the distribution of forest birds, based on field sightings, and nature reserves on the island of Hawaii (Scott et al. 1987). This distribution map identified two areas of maximum co-occurrence of endangered forest birds. Significantly, neither of these areas was protected. The obvious conservation action was to protect areas of maximum overlap, similar to the suggestions of Terborgh and Winter (1983) for conservation of endemic birds in Colombia and Ecuador. This simple analysis led to the establishment of the Hakalau Forest National Wildlife Refuge in one of the areas of overlap.

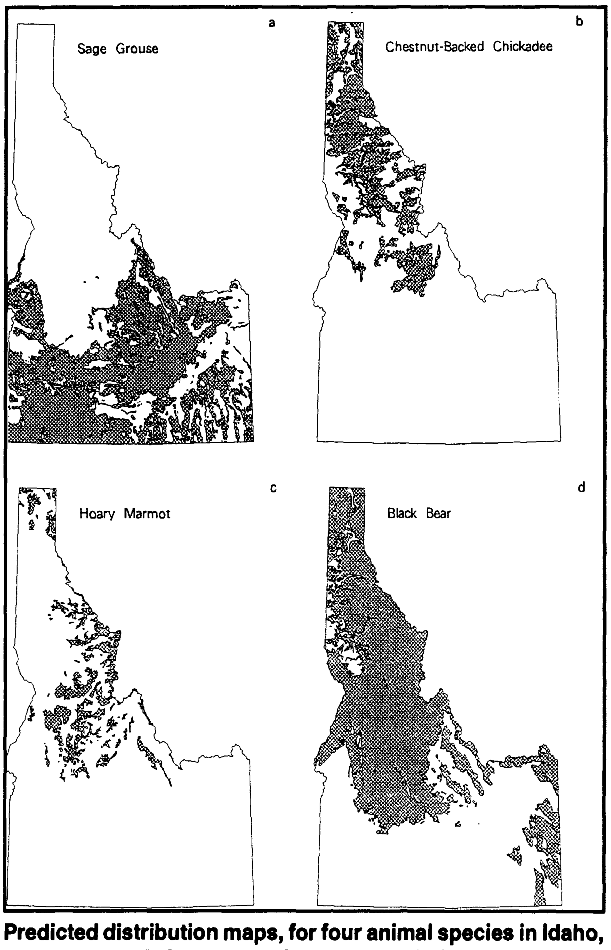
During the same period, I helped develop digital distribution maps of the terrestrial vertebrates of California for the California Wildlife Habitat Relationships Task Force (available from the California Department of Fish and Game, Sacramento, California). Superimposition of these maps held the promise of identifying species-rich areas that might have high conservation priority. Scott's work in Hawaii and my experiences applying distribution maps to conservation planning in California demonstrated that protecting concentrations of species richness was an efficient way to insure that maximum biodiversity was protected in a minimum area (with certain qualifications—species-rich areas may not be complementary, that is, they may not contain different sets of species; further, some species may not occur in centers of species richness).

Recognizing that reserve selection decisions draw on geographic information, we embarked on a program to develop a series of spatial data layers on the distribution of several elements of biological diversity in order to compare them with the distribution of nature reserves and other areas managed primarily for their natural values. This process took the name "gap analysis" from a paper by Burley in *Biodiversity* (Wilson 1988). The first gap analysis program was initiated in Idaho in 1987; there are now 32 active state programs.

Gap Analysis Methods

Gap analysis uses geographic information system (GIS) technology and satellite remote sensing to prepare maps of actual vegetation cover (see Scott et al. 1993 for details). Vegetation is used as an integrator of physical, climatic and edaphic factors that largely determine community composition and are involved in ecosystem processes. Vegetation and land systems (recurring patterns of vegetation and topography) have similarly been used as surrogates for ecosystems in Australia (Austin and Margules 1986).

LANDSAT Thematic Mapper digital imagery is now the standard source for gap analysis vegetation maps. Boundaries between landscapes dominated by different vegetation types are delineated through computer classification and/or on-screen interpretation. Ancillary data, including aerial photography, airborne video photography (Graham 1993) and field surveys, are used to assign labels that identify dominant plant species. Although the minimum mapping unit is 100 hectares, median polygon size is generally in the low thousands of hectares. Because it is not possible to map many important micro-habitat features, such regional and continental mapping efforts necessarily suffer from some degree of cartographic generalization. This limitation requires that the data be used to assess



Predicted distribution maps, for four animal species in Idaho, produced by GIS overlay of presence within a county and preferred habitat types within a county. Maps courtesy of Bart Butterfield, Idaho Department of Fish and Game.

Endangered Species
UPDATE

A forum for information exchange on endangered species issues

March 1994 Vol. 11 No. 5

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Instructions for Authors:
The *Endangered Species UPDATE* welcomes articles related to species protection in a wide range of areas including but not limited to: research and management activities and policy analyses for endangered species, theoretical approaches to species conservation, and habitat protection. Book reviews, editorial comments, and announcements of current events and publications are also welcome.

Readers include a broad range of professionals in both scientific and policy fields. Articles should be written in an easily understandable style for a knowledgeable audience. For further information, contact the editor.

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Cover: Identification of areas rich in unprotected vertebrate species in Idaho using an exact set coverage algorithm. Figure courtesy of Dr. A. Ross Kiester, USDA Forest Service, Forestry Sciences Laboratory, Corvalis, Oregon.

The views expressed in the *Endangered Species UPDATE* are those of the author and may not necessarily reflect those of the U.S. Fish and Wildlife Service or The University of Michigan.

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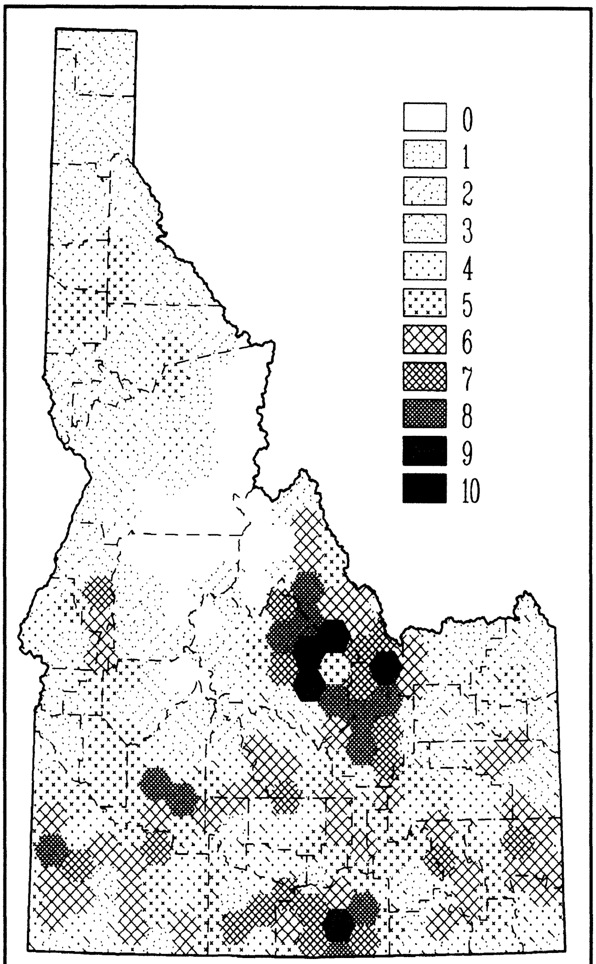
biodiversity at landscape scales (thousands of hectares) rather than at particular sites (tens of hectares).

Other critical data layers include land ownership, the location of areas managed primarily for the maintenance of populations of native species and natural ecosystem processes, and the locations of rare, endangered, and locally distributed (endemic) species. Natural Heritage Program data bases are consulted for locations of rare plant and animal species.

Good data exist on the distribution of many species, particularly terrestrial vertebrates and trees. For most common species, gap analysis uses the relationship between animals and their habitats to predict the occurrence of terrestrial vertebrate species within their known distributional limits (Morrison et al. 1992). The resulting distribution maps can be superimposed in the GIS to locate areas rich in unprotected species. Non-native species and those that have adapted to human-altered environments are not used to identify priority conservation areas (Murphy 1989). Areas rich in selected groups of species, such as those dependent on forest interior habitat, neotropical migratory birds, and populations of declining species, are targeted for more intensive field investigation.



Number of unprotected (i.e., less than 10,000 hectare occurring in a reserve, wilderness area, etc.) vegetation types in each EMAP hexagon (see White et al. 1992 for details of hexagon grid) in Idaho. Map courtesy of Bart Butterfield, Idaho Department of Fish and Game.

Approaches to Selecting Representative Reserve Networks

While unprotected multiple-use wildlands can also play an important role in maintaining many elements of biodiversity (Scott et al. 1990), one application of gap analysis will be to identify the locations of potential nature reserves. Unlike the endangered forest bird survey in the Hawaiian Islands, regional or continental data sets deal with hundreds to thousands of species whose distributions reflect their biogeographic affinities and history. The locations of areas capturing all elements of biodiversity are not obvious by inspection. Identifying a set of areas in which all species and vegetation types are represented therefore requires quantitative analysis. For this, gap analysis has adopted recent advances in reserve selection procedures developed in Australia. These procedures involve the use of iterative algorithms to select minimum sets of complementary sites that fully represent all species and vegetation types (see Pressey et al. 1993, for a review). The simplest algorithm first selects sites with unique features (e.g., species, communities, environments), then selects the site with the next rarest feature remaining in the data base that also has the largest number of other features not already represented, and so on. New sites need not necessarily be the richest. In fact, a site may be relatively species-poor, but if it adds the most species not already represented, then it has maximum complementarity. The algorithms can be modified to incorporate both biological constraints and physical factors. Two examples of modifications include maximizing the phylogenetic diversity captured at each step (Vane-Wright et al. 1991) or proximity to previously selected sites (Nicholls and Margules 1993).

As Pressey et al. (1993) note, many combinations of areas will meet the goal of complete representativeness. Some elements will be quite rare, occurring on only one or a few sites. These areas are irreplaceable; thus, they will be included in all possible reserve networks. Most species and vegetation types will occur in several areas, any one of which could be included in a combination of reserves that would be completely representative. The reserve selection process can therefore be flexible. Gap analysis addresses the issue of flexibility by using exact set coverage algorithms to compare all possible combinations of areas that meet the requirement of representing all unprotected species and vegetation types.

In Idaho, gap analysis investigators used a grid of 635 km^2 hexagons developed for the Environmental Protection Agency (White et al. 1992) to sample the state for areas rich in unprotected species. There were 119 ways to select four hexagons, one from each of four regions, which were predicted to contain 96 percent of all unprotected species. One region of four hexagons fell in the part of the Snake River Plain of southwestern Idaho that includes the Snake River Birds of Prey Wilderness Study Area. These preliminary results were used to argue for permanent wilderness status for this area—its richness in unprotected species added to its importance for raptorial birds.

The implementation of a conservation strategy itself is iterative, because increasing the level of protection in one area reduces the urgency to protect nearby areas with similar sets of species or similar vegetation cover. It is therefore important to retain the ability to reanalyze conservation priorities following additions or deletions to the existing reserve network.

Future Directions: Environmental Gap Analysis?

Many regions of the world have received even less biological survey attention than the U.S. What practical alternatives are there to biological surveys for determining the distribution of biodiversity in these areas? One solution may be to apply models using environmental variables to predict distribution patterns of vegetation types and species (Mackey et al. 1988, Belbin 1993). The BIOCLIM program (Busby 1991) has successfully used weather station data to identify environments within which vegetation types or individual species can be expected to occur. Climatic data are among the most widely available, and these models offer promise in classifying and mapping biological variation in remote areas. Hunter et al. (1988) argue that it is more important to insure that variation in the physical environment is captured in nature reserves, because species will respond differently to the physical environment in the face of environmental change.

Most habitat protection activities in the U.S. remain focused on the presence of endangered species or are driven by opportunism. The costs of such actions can be high because, with a limited amount of land available solely for nature conservation, reserve networks may not be fully representative by the time options for protection are exhausted (Pressey 1990). Gap analysis provides a geographic framework within which current information on the distribution of ecosystems and still unendangered species can be analyzed in the context of future threats due to habitat loss and fragmentation. Gap analysis complements the ESA by providing managers the option of avoiding "national train wrecks" by taking remedial action to maintain healthy ecosystems and populations.

Gap analysis is now a part of the Department of the Interior's National Biological Survey (NBS). Mapping ecosystems using satellite imagery and consolidating existing information on species distributions in relation to those ecosystems can provide NBS a jumpstart on the distribution of the nation's biodiversity. As more detailed information is gathered from NBS field studies, it can be incorporated into gap analysis data layers.

Acknowledgments

This article is based on a paper presented by Dr. Lee A. Graham, second author and Arizona Gap Analysis Director, to the International Wildlife Management Congress in San Jose, Costa Rica on September 23, 1993.

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Opinion

What the Endangered Species Act Procedural Reform Amendments of 1993 (H.R. 1490 and S. 1521) Would Have Meant for the Bald Eagle

by Michael J. Bean

H.R. 1490, the "Endangered Species Act Procedural Reform Amendments of 1993," was introduced in the House of Representatives in March of 1993 by Congressman Billy Tauzin (D-LA) and has 108 cosponsors. Its Senate counterpart, S. 1521, was introduced by Richard Shelby (D-AL) in September 1993 and has 14 cosponsors. An understanding of the practical significance of the various "reforms" these bills would make can be gained by examining their impact on conservation efforts for the bald eagle (*Haliaeetus leucocephalus*) had they been part of the original Endangered Species Act (ESA) in 1973.

Since receiving protection, eagle numbers have increased nationwide from 791 nesting pairs in the Lower 48 states in 1974 to over 3,000 in 1992. As a result of this recovery, the U.S. Fish and Wildlife Service is expected to issue a proposal in the next few months to reclassify the eagle from "endangered" to "threatened" throughout most of the U.S.

Recovery of the bald eagle, if it had occurred at all, would have taken far longer and cost far more than it otherwise did if the "reforms" proposed in H.R. 1490 and S. 1521 had been part of the original ESA. The reasons for this conclusion are as follows:

Recognition of the eagle's endangered status in the Lower 48 states would have been delayed.

Protection of the eagle in the Lower 48 states is possible only because the ESA allows an imperiled "population" to be listed and protected in one area while other, non-imperiled populations remain unprotected. The eagle remained relatively healthy in Alaska and Canada while its numbers plummeted in the Lower 48 states. Thus, what the ESA protects is the "Lower 48 population" of bald eagles. While H.R. 1490 and S. 1521 allow for the listing of "populations," these bills also require that they be given the lowest priority for listing. Thus, listing of the eagle would have been postponed until the status of many other species was determined.

Nearly 3,000 local public hearings would have been required before the government could even begin to implement a recovery plan for the eagle.

The great improvement in the status of the eagle over the last two decades has been guided by a series of recovery plans. Under H.R. 1490 and S. 1521, a recovery plan cannot be implemented until two public hearings, one when a draft plan is prepared and another when a final plan is completed, are held in each county affected by the plan. The eagle currently occurs in 1,495 counties, nearly half the counties of the Lower 48 states. Thus, nearly 3,000 local public hearings would have been required before a recovery plan for the eagle could be implemented. The average cost of a local public hearing exceeds $3,000. Thus, more than $10 million that might have gone to eagle conservation would have been expended just to comply with procedural requirements for public hearings.

Landowners could have cut down trees with bald eagle nests in them, provided only that the eagles were away from the nest at the time.

Much of the eagle's recovery is due to the successful protection of its habitat, including roosting and nesting areas. Current guidelines require landowners to leave a modest buffer around known nesting sites. Removal of a nesting tree or trees within the buffer is considered a prohibited "taking" of an eagle. Under H.R. 1490 and S. 1521, only activities that cause direct physical injury to an animal would constitute a prohibited "taking." Thus, removing all buffer trees around an eagle nest would be allowed. In addition, the nest tree itself could be cut down, provided only that the eagles happened to be away from the nest at the time. Mr. Tauzin denies that his bill would have this result, but its narrowing of the "take" prohibition cannot be squared with his denial.

The government's ability to use the ESA to force the banning of hazardous pesticides like DDT, or the cleanup of lands contaminated with such chemicals, would have been hindered.

The recovery of the eagle could not have occurred without the banning of DDT, which caused widespread reproductive failure in eagles. DDT was banned in 1972 largely because of its impacts on bald eagles and other birds. If DDT or a similar pesticide were to threaten the bald eagle today, H.R. 1490 and S. 1521 would impede the government's ability to take prompt action against it under the ESA. This is because these bills require the government to compensate property owners for property substantially diminished in value as a result of any ESA requirements. Thus, owners of property used to manufacture or store chemicals and landowners forced to clean up contaminated lands could insist on compensation for loss of property value caused by these requirements. The result would be government reluctance to act against such threats.

From the above analysis, it is clear that the "reforms" proposed in H.R. 1490 and S. 1521 would almost certainly have impeded, rather than advanced, recovery of the Nation's symbol. What is true for the bald eagle is no less true for the rest of the country's imperiled species. Rather than continuing the commitment to the effective protection of endangered species, H.R. 1490 and S. 1521 would cripple existing protection under the disingenuous guise of "reform." While neither these nor any other ESA bills are likely to be enacted in 1994, the "reforms" will surely be reintroduced in the new Congress in January.

Michael J. Bean is an environmental lawyer with the Environmental Defense Fund, 1875 Connecticut Ave., N.W., 10th Fl., Washington, D.C. 20009.

Book Reviews

A Guide to Michigan's Endangered Wildlife

Reviewed by Michael F. Burger

By David C. Evers. 1992. University of Michigan Press. Ann Arbor, MI. $12.95. 103 pp.

Recent well-publicized conflicts involving endangered species, such as the Northern Spotted Owl and the California Gnatcatcher, as well as the battle to reauthorize the federal Endangered Species Act, have piqued the public's interest in endangered wildlife. Not only is there greater concern for diminishing biological diversity, but also increased curiosity over which animals are threatened, why they are threatened, and what their future holds. Covering nearly one hundred past and present Michigan species, *A Guide to Michigan's Endangered Wildlife* was written in response to that interest. Not intended as a field identification guide or a technical biological/management bulletin, this book consists of informative profiles of species currently endangered or threatened in the state, as well as a brief overview of the state's extirpated and extinct species.

Profiled species are grouped taxonomically into mammals, birds, reptiles and amphibians, fish, insects, and mollusks. Typical profiles begin with a status summary, which lists the species' scientific name, federal and state status (endangered or threatened), Michigan population trend during the 1980s (increasing, declining, etc.), and the estimated Michigan population in 1989. This summary is followed by short sections on identification, range, habitat and habits, and limiting factors responsible for the decreased populations. A "how to help" section also is included, with suggestions ranging from reporting all sightings of endangered species to managing endangered species habitat on private land. In addition, both a photograph and distribution map (presence or absence by county) for each species are included. The book concludes with sections on extinct and extirpated Michigan species, selected references, a listing by taxonomic group and status of species covered in the book, and a map of Michigan counties.

A Guide to Michigan's Endangered Wildlife provides substantial information for mammals and birds. However, although there is an attempt to maintain this format in the treatment of the other taxonomic groups, they are, as a rule, treated only superficially as groups. Additionally, the "how to help" sections are sometimes vague. Nonetheless, nature lovers, outdoor sports enthusiasts, landowners, and other concerned individuals will find *A Guide to Michigan's Endangered Wildlife* to be both a satisfying source of general information and a reference by which to judge future conservation progress.

Michael F. Burger, a Ph.D. student at the School of Natural Resources and Environment, University of Michigan, is supported by a Department of Energy Fellowship for Global Change.

Tropical Deforestation and Species Extinction

Reviewed by Otto J. Gonzalez

Edited by T.C. Whitmore and J.A. Sayer. 1992. Chapman and Hall. London. $29.95. +153 pp.

As the contributors to *Tropical Deforestation and Species Extinction* show, there has been some uncertainty over how much tropical forest is being lost, and even more over how this loss affects rates of species extinctions. In the first of seven chapters (all from an IUCN-World Conservation Union workshop), editors T.C. Whitmore and J.A. Sayer provide a worthwhile review of estimates of tropical deforestation rates (recently estimated at 15.4 million hectares per year for 1981-1990 by the U.N. Food and Agricultural Organization). Whitmore and Sayer suggest that under continuing deforestation, the preservation of forest sites known for high species diversity and endemism should be a conservation priority.

Andrew Johns, writing on species conservation in managed tropical forests (Chap. 2), concludes that "many species of vertebrates are able to persist in logged-over forests," yet the information presented does not support such a general statement. Species presence in forests after logging is offered as evidence of survival; however, the question of long-term viability is not addressed. Nevertheless, K.S. Brown and G.G. Brown (Chap. 6) report no documented extinctions in the Atlantic forests of Brazil, despite extensive forest loss. R.J. Johns (Chap. 7) suggests that in Papua New Guinea, selective logging did not appear to diminish plant species diversity; however, the reader is provided with no data to support such a finding.

Using species-area curves to predict extinction rates due to tropical deforestation, Walter Reid (Chap. 3) estimates a 17-35 percent species decline in tropical forests by the year 2040. However, Daniel Simberloff (Chap. 4) suspects that species-area approaches underestimate extinction by not considering the effects of forest fragmentation. Similarly, V.H. Heywood and S.N. Stuart (Chap. 5) suggest that instead of extinction rates, we should focus on the problem of reduced species numbers, population size, and genetic variability due to forest fragmentation. Brown and Brown (Chap. 6) provide a good discussion of the problem of forest loss and fragmentation in Brazil, along with underlying reasons for deforestation, and the need to identify sites of high biodiversity.

Although some chapters lack relevant data, this slim volume provides a useful introduction to the problems of forest and species loss in the tropics, and the difficulties of quantifying both.

Otto J. Gonzalez, a past editor of the UPDATE and current AAAS Science and Engineering Fellow, recently completed his Ph.D. on tropical dry forests at the School of Natural Resources and Environment, University of Michigan.

Bulletin Board

Federal Court Sets Aside Listing of Bruneau Hot Springsnail

The first successful challenge of an animal or plant listing under the Endangered Species Act (ESA) occurred on December 14, 1993, in Idaho's Federal District Court. On that date, Federal District Court Judge Harold Ryan set aside the final rule listing the Bruneau hot springsnail (*Pyrgulopsis bruneauensis*) as endangered because of his finding that the U.S. Fish and Wildlife Service (USFWS) had committed "serious due process violations" in its original listing decision. Procedural errors included publishing the final listing rule after ESA's deadline for making final listing decisions, and failing "to allow public review of critical data," including site-specific locations of springsnail colonies.

The Bruneau hot springsnail, found in 128 hydraulically connected thermal springs along a 4.5 mile reach of the Bruneau River in southwestern Idaho, continues to be threatened due to loss of its thermal spring habitats from groundwater pumping for agricultural purposes. The USFWS has received and is responding to a new petition by the Land and Water Fund of the Rockies to re-list the species. The Land and Water Fund also has filed an appeal of Judge Ryan's ruling with the Ninth Circuit Court of Appeal. For further information, please contact Steve Duke, USFWS biologist, at (208) 334-1931.

Endangered Species Act Conference

CLE (Continuing Legal Education) International is holding a National Endangered Species Act (ESA) Conference from August 18-19, 1994, in Denver, Colorado. CLE's distinguished faculty consists of attorneys, governmental agency staff, consultants, and association representatives from throughout the nation. Topics to be discussed and debated include recent ESA developments, the listing process, takings issues, recent cases, project approval, enforcement, reauthorization, and the role of governmental agencies. Lawyers, government officials, city planners, consultants, developers, and landowners will greatly benefit from the information provided in this conference. For registration information, please call (800) 883-7130.

Endangered Species Act Hearings

The U.S. Senate is holding hearings on the Endangered Species Act throughout the summer. Tentative dates and topics for upcoming hearings are as follows: August 9—Recovery Planning; September 18—Prevention of Endangerment. For more information, please contact the Endangered Species Coalition at (202) 547-9009.

The Lincoln Park Zoo Scott Neotropic Fund

The Lincoln Park Zoo Scott Neotropic Fund supports field research in conservation biology throughout Latin America and the Caribbean. The fund emphasizes support of graduate students and other young researchers, particularly those from Latin America. Since 1986, the fund has awarded over 45 grants in 13 countries. Between five and 15 projects are supported each year. Awards are seldom greater than $7,500 (US), with most awards ranging between $3,000 and $5,000. Initial support is for up to 12 months from the date of the award; maximum duration of support is two years. Deadline for receipt of proposals is September 1, 1994. For additional information and application procedures, write: Lincoln Park Zoo Scott Neotropic Fund, c/o Director of Conservation and Science, Lincoln Park Zoological Gardens, Chicago, IL 60614-3895.

Bulletin Board information provided in part by Jane Villa-Lobos, Smithsonian Institution; the Endangered Species Coalition; and Steve Duke, USFWS. Announcements for the Bulletin Board are welcomed.

Endangered Species UPDATE

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