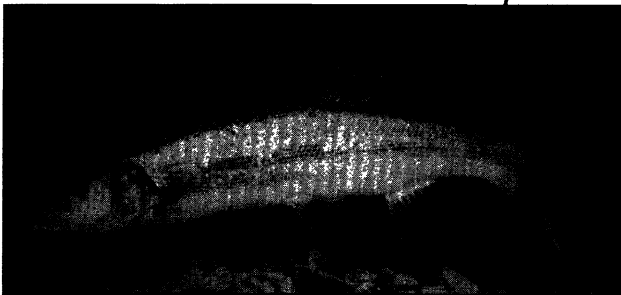
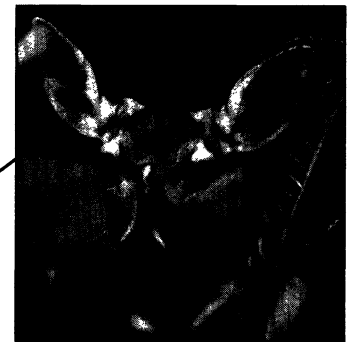
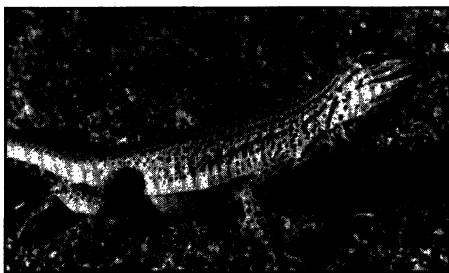
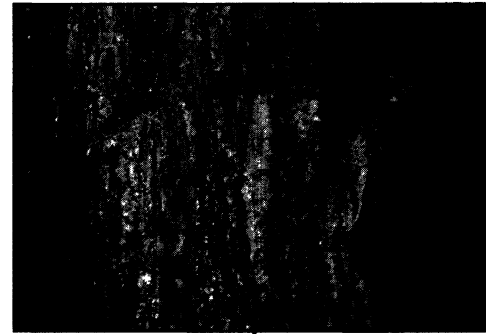
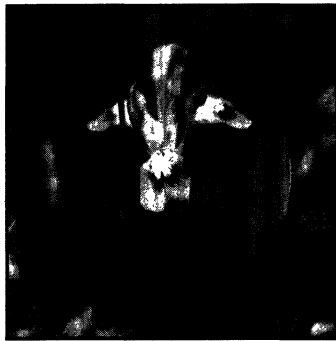


# Endangered Species UPDATE

Including a Reprint of the latest USFWS  
Endangered Species Technical Bulletin

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Could Increased  
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# The National Biological Survey: Bruce Babbitt's Tool for Ecosystem Management

by

Trudy Harlow

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Soon after taking office as Secretary of the Interior in January 1993, Bruce Babbitt met with employees to discuss his vision. Citing the conflicts between conservationists and industry groups that have caused "train wrecks" in dealing with threatened and endangered species, Babbitt proposed consolidating the biological research, inventorying, and monitoring programs of the Department into a new bureau—the National Biological Survey (NBS).

In describing NBS, Babbitt later told a House subcommittee, "In a world marked by growing demands for natural resources and increasing complexity and competition, we have to have sound and comprehensive science to make informed and timely decisions. The purpose of the NBS is to provide a road map to enable us to get ahead of the endangered species listing process and constructively solve environmental and economic conflicts."

Babbitt, who gained a reputation as an effective negotiator during his tenure as governor of Arizona, recognizes that the difficulty of bringing conflicting parties to the bargaining table is a problem inherent in the Endangered Species Act (ESA). "[The Pacific Northwest is] an example of where the players waited until the crisis was white hot and everyone backed into a corner," Babbitt said. "Let the science come first, keep it separate from regulatory, mission, and policy functions, and we'll have the cornerstone for more responsible natural resources public policy."

The Interior Secretary describes the ESA as a tool that should be used only as a last resort. Major functions of NBS will be the aggregation of data on our nation's plants, animals, and ecosystems, and the preparation of a biennial report on their status and trends. These efforts should provide anticipatory data that will allow resource managers to take

remedial actions to restore a species before its numbers become critically low, thus avoiding the necessity of listing the species as endangered. In addition, Secretary Babbitt expects the new bureau to provide "good science" that will cut across jurisdictional boundaries. This pool of reliable data will allow for the identification of troubled habitats

1845 had passed the House of Representatives, but the Senate had yet to move proposed legislation. Authorizing legislation would transfer the National Wetlands Inventory from the U.S. Fish and Wildlife Service (USFWS) to NBS. This legislation also would require the director of the Survey to be appointed by the President and confirmed by the Senate.

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***The purpose of the National Biological Survey is...to get ahead of the endangered species listing process and constructively solve environmental and economic conflicts.***

**Bruce Babbitt**

**Secretary of the Interior**

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and ecosystems at a time when many options are still available, conflicting interests may be reconciled, and tempers are cool. "I would like to see the Endangered Species Act become truly the safety net it was meant to be, rather than our first line of biological defense," Babbitt explained. "Rather than relying on the listing process as an eleventh hour cure-all, we should instead develop the biological knowledge that will allow us to manage effectively and keep the regulatory axe from falling."

## **Legislative History**

Congressional budget authorization was needed to create NBS. With the FY 1994 Interior budget stalled on Capitol Hill, there was uncertainty as to when the Survey could be established officially by Secretarial order. Babbitt created NBS in this manner on November 11, 1993; however, he also has asked Congress to enact authorizing legislation.

As the UPDATE went to print, H.R.

Until such legislation is passed, however, the Secretary has full authority to appoint a director without congressional confirmation. Babbitt has solicited nominations from a number of sources, including the National Academy of Sciences.

## **Organization and Budget**

NBS is grouped administratively with the National Park Service (NPS) and the USFWS under George Frampton, Jr., the Assistant Secretary for Fish and Wildlife and Parks. Small in comparison to its sibling bureaus, the Survey consists of approximately 1,800 scientists and other employees transferred primarily from the USFWS, NPS, and Bureau of Land Management. Research Centers formerly operating under the jurisdiction of the USFWS will continue ongoing research. NBS will make only gradual adjustments to their focus and direction. Transferred programs include the USFWS' Gap Analysis Program and NPS' ecosystem monitoring project.

NBS' internal organizational structure accommodates the needs of land and resource managers as well as other decision-makers through its four divisions: Administration, Research (consisting primarily of the Region 8 research and development wing of the USFWS), Inventory and Monitoring, and Information and Technology Services. In addition, four "ecoregions" will have small office staffs reporting directly to Washington, D.C. These offices will be established later in the 1994 calendar year.

NBS' FY 1994 budget is \$163.4 million, a small amount in comparison with that of some other bureaus in the Department of the Interior. Although monetary resources are limited, Secretary Babbitt and those assigned the responsibility of getting the new bureau off the ground have high hopes for the Survey. Babbitt brought Dr. Thomas Lovejoy, Assistant Secretary for External Affairs at the Smithsonian, to the Interior Department to serve as Science Advisor and to advise on the implementation process for NBS. A past president of the American Institute for Biological Sciences, Lovejoy says the new bureau will cut across bureaucratic lines to concentrate on sensitive ecosystems. "There

is a lot of science at Interior, but most of it is done within the confines of the bureaus," Lovejoy said.

To remedy the current disjointed nature of scientific information, Lovejoy expects that a major effort during NBS' first years will be compiling an "inventory of inventories." Future work will continue to focus on the development of standardized scientific models and protocols so that data from many sources will be compatible. Lovejoy's office already has begun the enormous task of surveying inventories and databases in both the public and private sectors. For example, The Nature Conservancy's Heritage Program collects data in all 50 states; other useful programs exist in state governments, the U.S. Environmental Protection Agency, and the U.S. Forest Service.

### Goals of the Survey

Dr. F. Eugene Hester, Associate Director of Natural Resources at the National Park Service, headed the NBS implementation effort. As Acting/Interim Deputy Director for the NBS Implementation Task Force, Hester managed a team of more than 25 full-time employees, plus numerous others on special focus teams. These additional employees were on loan from existing Interior bureaus and were tasked with the numerous details of creating a new government agency.

Now the permanent Deputy Director of NBS, one of Dr. Hester's chief goals is to keep the science responsive to the research needs of land and resource managers. "There is a concern that all the bureaus will put in their resources and then we'll use those resources for higher national and international needs, like studying the ozone hole," Hester says. "But I firmly believe that NBS will provide managers with better science than they are now getting from within their own bureaus." Hester notes that in a survey of bureaus' top research needs, there was much overlap, especially in the areas of wetlands research, exotic plants, and feral animals. "I feel NBS can more effectively meet these parochial needs and still be responsive to other priorities," says Hester.



Research Centers, such as the National Fisheries Contaminant Research Center in Missouri, conduct valuable studies that benefit conservation efforts. Photo courtesy of the National Biological Survey.

## Endangered Species UPDATE

*A forum for information exchange on endangered species issues*

November/December 1993  
Vol. 11 Nos. 1 & 2

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Kimberly Hall.....Editorial Assistant  
Ruth E. Polk.....Editorial Assistant

*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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While much of the public might expect NBS to, as Hester puts it, "send out squads of folks in hip boots with butterfly nets to collect specimens," inventorying will not be the Survey's only focus. NBS will have a broad science mission, including research, inventory and monitoring, and information transfer. As indicated above, an early effort will be directed at collecting information about existing inventories in order to reach some conclusions about gaps in current data.

Both Hester and Lovejoy note that the inventorying and monitoring function of NBS will be years in development. As Babbitt says, "I consider a survey to be a process that is never done, but is longitudinal and dynamic." The primary emphasis for the first years of NBS will be the continuation of research already under way, with an eye to coordinating efforts where possible and to making data more accessible to all clients, government and private sector alike.

The Survey also has committed itself to the biennial publication of a National Biological Status and Trends Report.

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***It is our job to pull the disparate research efforts together into a useful science composite on which everyone can rely.***

**Dr. F. Eugene Hester  
Deputy Director of NBS**

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**Expanding Traditional Research**

Another major effort of NBS will be the expansion of traditional single-species biological research to include both genetic and ecosystem level research activities. Both activities will be critical to the conservation of endangered species.

One of the first priorities of the new bureau will be to look at sensitive ecosystems such as South Florida, where

Hester has found that not even the Interior's own bureaus can easily share scientific data and technology. "The Everglades is a perfect example of the difficulties of managing an ecosystem in today's world," Hester says. "What happens 80 miles upstream from the park boundaries is surely more important to the future of the Everglades than the decisions made on a day-to-day basis within the park itself. It is our job to pull the disparate research efforts together into a useful science composite on which everyone can rely."

Another ecosystem that may be slated for special research attention is the Pacific Northwest. Issues relating to the declining salmon resource and the threatened northern spotted owl (*Strix occidentalis caurina*) have been controversial topics in this region in recent years.

In his testimony before the House Science Committee subcommittee members, Babbitt said, "[W]e are all learning

## Answers to Questions Frequently Asked

**Will the existing employees and projects of agencies within the Department of the Interior be transferred to NBS?**

NBS was created on November 11, 1993, when President Clinton signed the FY 1994 Interior Appropriations Act. As a result of that action, nearly 1,800 USFWS and other Interior employees were transferred administratively into NBS.

Whenever there is change, anxiety about the future accompanies it. However, no research currently under way will be disrupted, and no employee will be forced to make a geographic move. Under specific direction of the Secretary, every effort was made by the Implementation Task Force to ensure that the transfer would be "transparent" at the personal level. In most cases, the only sign of the transfer that will be apparent to employees will be a different agency

name on their paycheck. Some supervisory channels may be altered so that, for instance, scientists will be reporting to scientists.

With NBS leadership firmly committed to a diverse work force and less organizational stratification, the Survey may actually increase career advancement opportunities. Additionally, as a science agency dedicated to the continuing professional development of its scientists, employees may find a more positive atmosphere for obtaining permission to attend professional meetings and conferences.

**How will NBS affect private property rights? Will environmental laws such as the Endangered Species Act carry more stringent restrictions on economic activity as a result of the Survey?**

NBS will have no administrative authority for the Endangered Species

Act. Instead, the Survey will simply provide the science on which managers from other agencies may base their decisions. For years, the U.S. Geological Survey, USFWS, and other government agencies have obtained access to private lands through simple oral agreements with owners. Data thus collected have been used as the basis for many regulatory actions over the years. The creation of NBS will not change anything in this picture.

However, it is possible that data collected by NBS may actually prevent the listing of some species. Because there is such limited baseline data available, managers frequently must make vital decisions based on incomplete statistics. Through the comprehensive research conducted by NBS, it may well be that unknown populations or habitats will be discovered, making the listing process unnecessary.

Additionally, developers and oth-

that ecosystem management is the most effective and efficient natural resource management strategy, and we must organize our biological information on that basis. Ecosystems do not recognize political and bureaucratic boundaries, nor are they well served by disparate, single mission science. The NBS will be the biological underpinning that allows Interior to manage on an ecosystem basis."

The approximately 50 ecosystem scientists working directly at national parks under the supervision of park superintendents have been transferred administratively to NBS. These scientists will remain on site in the parks with the projects on which they have been working; however, over time their focus may be broadened to include research on similar problems in nearby parks and refuges.

### Attention to Clients

NBS is firmly committed to being client-conscious. As proof of this, a

Policy Board will be established to provide recommendations on overall NBS research directions. Composed of representatives of all the bureaus at Interior, the Policy Board will guarantee that the research needs of NBS' primary customers are met. Additionally, the Board will assist in establishing priorities for competing research requests.

A Science Council, composed of representatives from other federal agencies, states, and private organizations, will identify research needs and ensure that the science conducted by NBS is thoroughly coordinated with similar activities in other agencies.

### Conclusion

The National Biological Survey will be Bruce Babbitt's primary tool in reshaping the focus of Interior policy to ecosystem management. The Survey will result in dollar savings by coordinating and consolidating functions now spread across seven bureaus. Joining the family of federal science giants such

as the U.S. Geological Survey, National Weather Service, and Center for Disease Control, NBS is determined to be a world class, non-advocacy, non-regulatory, non-managerial science agency.

However, as Deputy Director Hester points out, the success of the new bureau must be determined in realistic terms. "If you ask me if we will be able to provide for *all* the research needs of *all* the bureaus in Interior in a year, I'd have to say you'd be disappointed," he said. "But I am more than willing to be judged on the basis of whether a manager's research needs are being met *better* at this time next year than they are today. I believe we can and will meet that goal."

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Trudy Harlow is the Acting Chief of Public Affairs at the National Biological Survey. Ms. Harlow can be contacted at the National Biological Survey, Public Affairs Office, Mail Stop 3070-Main Interior Building, 1849 C St. NW, Washington, D.C. 20240.

## About the National Biological Survey

ers in the public will find the data collected by NBS to be useful to the planning process, as so many already have found the data in The Nature Conservancy's State Heritage Program databases to be useful.

### Will the information collected by NBS be both relevant and accessible to USFWS employees?

Deputy Director Gene Hester is firmly committed to seeing that the research, inventory and monitoring, and information transfer conducted by NBS is responsive to its primary customers—the various bureaus of the Department of the Interior. USFWS employees have been deeply involved in the development of NBS priority-setting strategies and information transfer systems to ensure this responsiveness. Sharing an administrative berth in the office of the Assistant Secretary for Fish and Wildlife and

Parks ensures that the two bureaus will operate in synch. NBS may have its Policy Board in operation once authorizing legislation is passed. This Board would assist in assigning research priorities for all of the Interior.

### How will NBS disseminate information it collects?

A tremendous amount of effort is being invested in plans for making data aggregated by NBS accessible to government managers, university researchers, and the public. While many options are still under consideration and specifics have not been worked out yet, the system probably will be most like a computerized card catalogue that will enable a diverse public to find precisely the information it needs with the least amount of difficulty. Due to the technology involved and the complexity of the data, it will be some time before the system has moved to final design.

### What will be the relationship between NBS and agencies such as the U.S. Forest Service that are not under the Interior Department's jurisdiction?

Currently, detailees from the U.S. Forest Service, National Oceanic and Atmospheric Administration, and the U.S. Environmental Protection Agency are posted at NBS and are working actively as liaisons with their home agencies as well as in NBS program development. These staff members bring with them vital professional resources that will enable NBS to be inclusive and extroverted in its approach. During the Implementation Task Force stage, Interior staffers actively sought to network with other government agencies at the federal, state, and local levels, as well as with organizations in the private sector. Networking will remain a high priority activity for all NBS programs.

—T.H.

# Maryland's Approach to Nongame and Endangered Species Conservation

by

Glenn D. Therres

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*Editor's Note: This is the final article in our Special Series on State Nongame/Endangered Wildlife Programs. The Endangered Species UPDATE would like to thank both the International Association of Fish and Wildlife Agencies and all the writers who contributed articles on their State programs for making this Series possible.*

Maryland is a small state, totaling only 10,460 square miles, but its population exceeds 4.8 million people. Because Maryland was one of the original 13 colonies, its landscape has undergone over 350 years of habitat alterations and human impacts. These changes resulted in the known extirpation of 205 plants and animals since statehood.

The same factors that caused these extirpations (e.g., habitat loss and degradation, human exploitation, and introduction of exotics) also are responsible for the state listing of 412 threatened and endangered species as of 1991. Plants account for 75 percent of the state listed species. The animals listed include 34 invertebrates, 5 fish, 8 amphibians, 9 reptiles, 25 birds, and 19 mammals.

The Maryland Department of Natural Resources (DNR) is the state agency responsible for the conservation of these species and Maryland's other wildlife resources. Within the Department, these responsibilities fall on the shoulders of the Fish, Heritage, and Wildlife Administration. Our Natural Heritage Program and the Nongame and Urban Wildlife Program, both within the Fish, Heritage, and Wildlife Administration, are the principal players in Maryland's nongame and endangered species efforts, and are the focus of this article.

## Historical Overview

As with most state endangered spe-

cies efforts, Maryland's program originated in the 1970s. The Maryland Endangered Species Act of 1971 was the first piece of state legislation to protect endangered species. The first list of endangered species, compiled in 1972, included 35 animals. A revision of the Act in 1973 authorized the creation of the Nongame and Endangered Species Program within DNR's Wildlife Administration. This one-person program, supported by general tax dollars (money from the state general treasury, primarily from state income tax and sales tax), was the beginning of our commitment to endangered species conservation.

In 1975, the state passed the Nongame and Endangered Species Conservation Act. By mandating the investigation, management, and protection of both nongame wildlife and threatened and endangered species in the state, this piece of legislation strengthened the program's ability to deal with nongame and endangered species issues. By 1979, the staff had increased to three full-time biologists, all of whom concentrated most of their efforts on endangered species projects. In 1980, the state list of endangered species was revised. With this revision came the addition of new species to the list, as well as a new category called "Special Concern."

In late 1979, the Maryland Natural Heritage Program was established in a cooperative effort between the DNR and The Nature Conservancy. The Natural Heritage Program became part of the state government when it was transferred in 1981 to DNR's Capital Programs Administration. Since then, the Natural Heritage Program has been the DNR's primary database for rare species.

In 1981, the DNR lost funds due to a statewide budget shortfall. This loss of general funds resulted in a reduction of the Nongame and Endangered Species

Program staff to one full-time biologist. The program was supported by revenues from hunting license sales and federally allocated funds under Section 6 of the 1973 Endangered Species Act (ESA). While the Nongame and Endangered Species Program was experiencing financial problems, the Natural Heritage Program was expanding. This expansion was due in part to outside contracts and grants.

In 1985, the DNR established a Threatened and Endangered Species Committee to develop listing criteria, recommend revisions to the state list, and draft regulation changes when necessary. The Committee was chaired by the head of the Natural Heritage Program and included representatives from the Nongame and Endangered Species Program and various other agencies. The official state list subsequently was revised in June 1987. This revision brought the total number of plants and animals under state protection to 187.

In July 1986, the lead authority on endangered species was transferred from the Nongame and Endangered Species Program to the Natural Heritage Program by executive order of the Secretary of Natural Resources. At the same time, the Natural Heritage Program was transferred within the DNR to the Forest, Park, and Wildlife Service, the same agency housing the Nongame and Endangered Species Program. The two programs remained distinct; the Nongame and Endangered Species Program retained responsibility for the threatened and endangered wildlife species it had been actively involved with over the years, while the Heritage Program assumed responsibility for all plants and most of the newly listed animals, including all the invertebrates.

Once the Natural Heritage Program assumed the lead for endangered species, the Nongame and Endangered Spe-

cies Program was able to expand its efforts with nongame wildlife. In July 1988, the program's name was changed to the Nongame and Urban Wildlife Program in recognition of the expanding attention given to urban wildlife issues. Also in 1988, a significant funding mechanism was established through the enactment of tax checkoff legislation. After eight years of attempts to pass a tax checkoff for nongame and endangered species, the Maryland General Assembly created the Chesapeake Bay and Endangered Species Fund. This joint checkoff provides funds for Chesapeake Bay restoration efforts and for nongame and endangered species conservation.

In 1991, the state again revised its endangered species list. Another 225 species were listed under this most recent revision, bringing the total to 412. These new species are found mainly in the central and western parts of the state—the 1987 revision concentrated primarily on coastal plain species.

In 1992, a reorganization in the DNR resulted in the dismantling of the Forest, Park, and Wildlife Service, and the creation of the Fish, Heritage, and Wildlife Administration. This new Administration houses both the Natural Heritage Program and the Nongame and

Urban Wildlife Program.

### Organization and Funding

The Natural Heritage Program is staffed with eight permanent employees, including the director, database manager, database botanist, four regional ecologists, and a secretary. In addition, there are ten contractual ecologists working on specific projects. Funding for the Heritage Program comes primarily from general tax dollars. Tax checkoff funds and monies from Coastal Zone Management grants and federal Section 6 dollars account for the remainder of the budget.

As the state's lead agency on endangered species, the Natural Heritage Program focuses on inventory and protection efforts. The Heritage database serves as the center of the program's activities, with rare species inventory data maintained for 920 plants and 246 animals.

The Nongame and Urban Wildlife Program's permanent staff consists of a supervisor and three biologists. Two contractual biologists, two contractual technicians, and various seasonal employees round out the staff. Currently, tax checkoff dollars account for 75 percent of the budget. The remainder comes from hunting license revenues and fed-

eral Section 6 funds. Until a recent statewide budget shortfall, some general tax dollars had been available.

With most of the state's endangered species responsibilities under the Natural Heritage Program's jurisdiction, the Nongame and Urban Wildlife Program is able to direct more of its efforts toward nongame species. However, the program is still DNR's primary authority on bald eagles (*Haliaeetus leucocephalus*), Delmarva fox squirrels (*Sciurus niger cinereus*), and peregrine falcons (*Falco peregrinus*) (all state and federally listed as endangered), and a few other state listed endangered species. Because Maryland is such a highly urbanized state, the urban and nonconsumptive wildlife components of the program are receiving increased attention.

Currently, when new wildlife species are added to the state list, the program with the expertise for that species becomes DNR's lead authority. This approach fosters cooperation between the programs and places responsibility for that species with the best qualified program.

### Conservation Strategies

Maryland's Endangered Species Act is similar to the federal Act in its ability to protect habitats for endangered species. The state Act mandates that projects on state lands and permits issued by the DNR insure endangered species protection. The Act is weak beyond state lands. In a state where most of the land is privately owned, this can be a drawback. However, the existence of an official list of state endangered species, a result of the Act, has enabled the DNR to utilize other processes for habitat protection.

One such process was initiated with the enactment of the Chesapeake Bay Critical Area Law of 1984. The Critical Area encompasses all tidal waters of the Chesapeake Bay and its tributaries, and all lands within 1,000 feet (305m) of mean high tide. This represents approximately ten percent of the state's land. The Act is important for endangered species because it authorizes regulations mandating that local jurisdic-



DNR wildlife biologists marking an endangered Delmarva fox squirrel prior to release. (Photo by Maryland DNR.)

tions within the Critical Area develop programs for the protection of endangered species habitat. For the first time in Maryland's history, a mechanism exists to invoke habitat protection for endangered species and certain other wildlife (e.g., colonial waterbirds, forest interior breeding birds, and waterfowl) through the local planning and zoning process.

In order to ensure endangered species habitat protection, the DNR provides technical assistance to the county planning and zoning offices on a project-by-project basis. This working relationship has allowed for local considerations of endangered species habitat protection within the Critical Area, as well as beyond. Some counties are now incorporating endangered species conservation into their comprehensive zoning plans.

An environmental review process within the Fish, Heritage, and Wildlife Administration facilitates the review of numerous permit applications, planning and zoning applications, highway projects, and other land alteration proposals. Mapped locations of all endangered species and certain wildlife species of management concern are used to screen the various proposals. If a project comes within a certain distance of known species locations, the proposal is forwarded to either the Natural Heritage Program or the Nongame and Urban Wildlife Program (depending on the species) for technical assistance. Annually, over 2,000 reviews are conducted.

Another process for habitat conservation was initiated with the establishment of the Heritage Conservation Fund. Created by legislation in 1986 and administered by the DNR's Open Space Program, the Fund provides general tax dollars for the acquisition of properties for the protection of rare and endangered species. In the past few years, approximately 1,400 acres (567ha) have been purchased. The Natural Heritage Program identifies high-priority sites for acquisition by these funds.

### Endangered Species Projects

With 412 species listed by the state, the types of projects and amount of



DNR wildlife biologist Glenn D. Therres reintroducing an endangered Delmarva fox squirrel into suitable habitat on Maryland's Eastern Shore. (Photo by Maryland DNR.)

effort expended per species varies greatly. Because additional funding is available for federally listed species, these generally receive more attention than species listed only by the state. The federal species that have received intensive protection and that are the focus of ongoing recovery projects include the following: swamp pink (*Helonias bullata*), Canby's dropwort (*Oxypolis canbyi*), harperella (*Ptilimnium nodosum*), sandplain gerardia (*Agalinis acuta*), sensitive joint-vetch (*Aeschynomene virginica*), dwarf wedge mussel (*Alasmidonta heterodon*), northeastern beach and puritan tiger beetles (*Cicindela dorsalis* and *C. puritana*, respectively), Maryland darter (*Etheostoma sellare*), bald eagle, peregrine falcon, piping plover (*Charadrius melodus*), and Delmarva fox squirrel. The type of projects range from inventorying and monitoring to habitat restoration and reintroductions.

Our Delmarva fox squirrel recovery efforts serve as an example of the types of activities undertaken by the DNR. The Delmarva fox squirrel's historical range included the eastern shores

of Maryland and Virginia, the entire state of Delaware, and southeastern Pennsylvania. By the time the fox squirrel was federally listed as endangered in 1967, its range had contracted to portions of four counties in Maryland. Initial efforts focused on documenting the distribution of the species and learning about its biology.

In 1979, reintroduction efforts for the Delmarva fox squirrel began with the goal of establishing populations of this species in suitable, but unoccupied, habitat within its former range. Fox squirrels were live-trapped from the remaining natural populations and translocated to suitable release sites. Fourteen such releases have occurred to date, with many fox squirrels successfully establishing small populations. The monitoring of both released and natural populations by the Delmarva Fox Squirrel Recovery Team helps establish a gauge for fox squirrel recovery. Work with the timber industry and private landowners to conserve Delmarva fox squirrel habitat also has been an important part of this project.

Though our efforts with other en-



dangered species (both state and federally listed) may not be as intensive as with the Delmarva fox squirrel, certain elements are common throughout. Inventory is the first step in all of our efforts. Habitat protection, through whatever mechanism available, is then pursued. If the species lends itself to reintroduction or habitat restoration, these practices also are employed.

### Nongame Projects

The beauty of our approach to endangered species protection is that it has allowed for expanded efforts with our nongame wildlife species. To a degree, this allows Maryland to assume a more active role in preventative management (i.e., managing species such that their populations do not become endangered).

Since the lead authority for endangered species was transferred to the Heritage Program, and because increased funding has been made available through tax checkoff dollars, the Nongame and Urban Wildlife Program has been able

to implement intensive projects on a variety of nongame wildlife. Species that have received this attention include the following: timber rattlesnakes (*Crotalus horridus*), bog turtles (*Clemmys muhlenbergii*), barn owls (*Tyto alba*), saw-whet owls (*Aegolius acadicus*), northern harriers (*Circus cyaneus*), forest interior breeding birds, colonial waterbirds, nocturnal marsh birds, bats, small mammals, and urban wildlife. Our conservation efforts for two nongame resources will serve to illustrate this increased opportunity to work on the conservation of nongame species.

**Colonial Waterbirds.** In 1989, a colonial waterbird project was established within the nongame program as a result of a general fund appropriation. Colonial waterbird nesting sites receive special habitat protection within the Chesapeake Bay Critical Area. This protection is facilitated by general funds allocated by the General Assembly. These funds enabled the DNR to hire a full-time colonial waterbird biologist.

Intensive inventories of all colony sites, initiated under a University of Maryland contract in 1984, are now conducted by program staff; over 100 colonies are monitored annually. Intensive banding efforts are employed for certain rare or endangered colonial waterbird species. Colony site protection is incorporated through various permitting or planning and zoning processes. In 1992, actions were taken to restrict boating traffic from sites with certain sensitive colonies in the Ocean City area, the state's largest summer resort.

**Barn Owls.** The barn owl is a species of management concern in the northeastern United States. The Nongame and Urban Wildlife Program began working

with barn owls in 1988. Our efforts have concentrated on determining the status of this species in Maryland, and on implementing management strategies for population enhancement. An analysis of population trends indicates that barn owls have declined in the state, but not to a level that warrants state listing. We are now working with members of the farming community to educate them on the value of barn owls and are promoting the use of nest boxes in suitable areas. We also developed a nest box for use on the extensive salt marshes of Maryland's Eastern Shore. Currently, 50 boxes have been placed on marshes administered by the Wildlife Division; barn owls have used these boxes extensively.

### Future Outlook

The human pressures on Maryland's landscape will continue to threaten its flora and fauna. Certain threatened and endangered species will recover, but the best we can hope for is the continued existence of our remnant populations. An increasing human population, with its associated urban sprawl, will continue to make endangered species protection a necessity.

However, our citizens are becoming more environmentally conscious and will demand that further actions be taken to benefit endangered species and other wildlife resources. The DNR and the state of Maryland must capitalize upon this increasing public awareness.

Adequate funding for endangered species and nongame programs will be a major challenge for the DNR. The tax checkoff is a definite asset, but we cannot rely on it to sustain our efforts in the future. More general tax dollars are needed to insure the continued success of Maryland's nongame and endangered species efforts. Only with adequate funding can we insure the protection of our valued wildlife resources.



Governor William Donald Schaefer assisting the DNR with the monitoring of Maryland's only brown pelican (*Pelecanus occidentalis*) colony. (Photo by Maryland DNR.)

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# Technical Note

## Could Increased Connectivity Be More Than We Bargained For?

by George Hess

Can increasing the movement of individuals among populations ever *increase* extinction rates? If a contagious disease enters the population, the answer may be "Yes." Disease may play an important role in determining the outcome of conservation efforts (e.g., Scott 1988). As available habitat decreases, organisms are crowded into reserves where disease occurrence and transmission often increase. Facilitating movement among populations could further enhance the spread of disease.

### Corridors for Conservation

Corridors are intended to increase the movement of individuals among populations. Corridor proponents argue that increased movement will rescue threatened populations from extinction, reestablish locally extinct populations, prevent inbreeding, and maintain genetic variation within populations (e.g., Noss 1987). Critics argue that corridors may enhance the spread of disease and reduce genetic variation among populations (e.g., Simberloff et al. 1992).

Much support for corridors comes from metapopulation modeling. A metapopulation is a set of populations distributed over a number of patches connected by dispersal movements. Results from such models suggest that corridors, which increase connectivity, reduce metapopulation extinction rates (e.g., Hanski 1991). However, few models incorporate any potentially negative effects of corridors. Instead, they focus on the benefits of increased dispersal among patches.

### Adding Diseases to the Models

I have developed deterministic and stochastic metapopulation models that include a fatal disease spread by contact between individuals. In my deterministic models, the metapopulation goes extinct if there is little or no connectivity. Increasing connectivity produces a progression of equilibrium states: (1) all

populations uninfected; (2) a mixture of infected and uninfected populations; and, (3) all populations infected. Both the beginning and endpoints of this sequence and the size of the metapopulation at equilibrium depend upon the values of other model parameters, including the severity of the disease and the probability of infection.

My stochastic model includes simulations of random events (Hess 1994). In this model, a landscape of connected patches generally suffers fewer metapopulation extinctions than one of isolated patches. However, under a narrow range of conditions, results suggest that corridors may dramatically increase the probability of metapopulation extinction. This occurs when disease-induced mortality is low enough to allow infected individuals to spread the disease, but high enough to reduce population levels to the point that random demographic and environmental events cause frequent extinctions.

### Disease/Corridor Relationships

Diseases have decimated populations in the past. A 1985 canine distemper epidemic extirpated the black-footed ferret (*Mustela nigripes*) in the wild (Thorne and Williams 1988). In Africa, rinderpest moved along major cattle trade routes, entered wildlife populations, and spread widely through naturally connected landscapes (Lowe 1942). Attempts to stop the disease from spreading southwest from Tanzania focused on blocking a natural corridor between Lakes Tanganyika and Nyasa. A sanitary area was established between the lakes by inoculating livestock, destroying all wild animals, and constructing over 160km of brush fence across the most travelled portion of the corridor.

Connectivity also is increased when people move individuals among populations. During the 1985 distemper epidemic, a captive breeding program for black-footed ferrets was threatened after an infected individual from the wild

was introduced into the captive population. Captive tortoises, which frequently are returned to the wild, often harbor an upper respiratory tract disease that now threatens wild populations. Oyster populations from the Gulf of Mexico to the Chesapeake Bay have been decimated by a protozoan parasite. Translocation of oysters by people is the primary means by which the parasite is spread among populations.

### Conclusion

Conservation biologists often are faced with the challenge of synthesizing conflicting information to make management recommendations. While corridors and translocation programs may be valuable conservation tools, history hints that disease will influence the success of conservation efforts. It is important that we consider the full implications of increased connectivity—both the good and the bad—when planning conservation programs.

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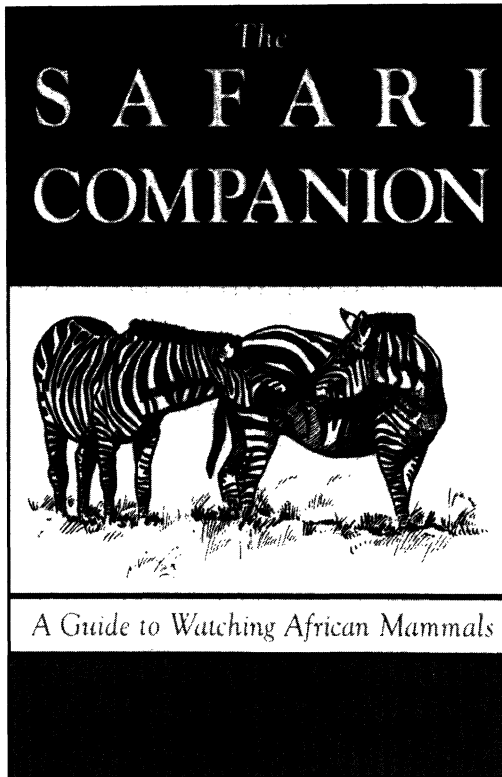
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# Book Review

## The Safari Companion: A Guide to Watching African Mammals

By Richard D. Estes. 1992.

Chelsea Green Publishing Co., Post Mills, Vt. \$25.00. 461 pp.



*The Safari Companion: A Guide to Watching African Mammals* is a less technical version of Dr. Estes' earlier book on animal behavior, entitled *The Behavior Guide to African Mammals*. *The Safari Companion* is designed for those who have not studied animal behavior, but it is by no means a coffee table work, full of pictures and no text. In fact, the book is just the opposite. The drawings are minimal and the text voluminous. Readers will have had a good introduction to the topic of animal behavior after finishing this work.

*The Safari Companion* addresses eighty-six species of mammals, essentially all of which are found in East and South Africa—the typical tourist trail. Maps in the front of the book show the location of parks and reserves where travellers to these parts of Africa typically can find these animals.

Dr. Estes describes the mammals in various levels of detail. The groups are organized systematically, and the be-

havioral characteristics are described at family, genus, and species levels. Although such detail may seem overdone, Estes effectively synthesizes the information.

Each animal description includes information on the animal's type (e.g., herbivore, carnivore, etc.), location and habitat, and ecology, including social and mating behaviors, reproductive characteristics, and predators. This information is followed by what is usually a lengthy description of the species' behaviors. A series of silhouettes and symbols serve as codes to describe the ways the animals behave. The symbols are easily understood and the silhouettes of animal behavior are outstanding, not only for their simplicity, but also for their easy interpretation. This is

the crux of the book's importance to the reader. After becoming familiar with the interpretation of the symbols and silhouettes, the rest is easy.

If you have ever traveled the "tourist route" in Africa, you immediately will recognize the importance of this book. Too often, the tourist vehicle rushes to an animal, sits for a few pictures to be taken, and then rushes off to the next star of the African drama. Meanwhile, the real show—a mother giving birth, a predator stalking its prey, etc.—is missed. The information in Dr. Estes' book will give the potential "shoot-and-run" game viewers reason to stay and observe. The result will be a far more rewarding safari for the tourist.

Although *The Safari Companion* is a valuable tool to anyone planning an African safari, it was not intended as a substitute for a good field guide, but rather as a complimentary resource. For instance, this book is not designed to help readers tell the difference between

Reviewed by Richard Lattis

a Grant's and Thomson's gazelle (*Gazella granti* and *G. thomsoni*, respectively). Because the illustrations in *The Safari Companion* are very simple and only illustrate several behavioral postures, I would advise readers to consult a good mammal identification guide for information on species of special interest. In particular, I would suggest further reading on hyenas (*Crocuta crocuta*), savanna baboons (*Papio cynocephalus*), and some of the common antelope.

In spite of all my accolades, there are places where *The Safari Companion* could have been improved. The index is difficult to find—one must pass through many pages of Personal Field Notes (essentially blank pages) before the index is located. Also, there is generally a need to compare both the familial and species accounts to get all the information from the silhouettes. Another criticism is that the section on savanna baboons provides less information than I would have liked. These primates are one of the most easily watched and appreciated African animals. The facial expressions, so important to baboon behavior, were covered adequately for chimpanzees (*Pan troglodytes*), but were missing for this baboon.

There is never one book for an African safari, but I would not want to venture into the forest and savanna without this one. It provides the means for a far more rewarding and educational trip. Anyone who has traveled to Africa knows there is a limit to how much can be carried. Leave something else, but do not leave this book.

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Richard Lattis, a zoologist who has led many trips to Africa, is Vice-President of Conservation Parks for the Wildlife Conservation Society (formerly the New York Zoological Society). Mr. Lattis can be contacted at the New York Zoological Society, Central Park Wildlife Center, 830 Fifth Avenue, New York, NY 10021-7095.

# Bulletin Board

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## Aquatic Fauna Conference

On March 31 and April 1, 1994, the Tennessee Aquarium will host a symposium entitled "Aquatic Fauna in Peril: The Southeastern Perspective" in Chattanooga, TN. This conference is designed to provide a thorough historical review of the imperiled aquatic animals of the southeastern United States, as well as a review of the management efforts aimed at conserving and restoring these faunas. Presentations also will address the management of aquatic ecosystems in the southeast, the roles of government and the public in aquatic conservation, and the formulation of a unified practice of resource management. To obtain a registration form and receive further information, please contact: Tennessee Aquarium, Attn: Janet Allen, P.O. Box 11048, Chattanooga, TN 37401-2048, or call 1-800-262-0695.

## Errata

The July/August 1993 issue of the UPDATE (Vol. 10 Nos. 9 & 10) contains two mistakes. The first is located in David F. Ross' article entitled "Conservation of Endangered Wildlife and Wildlife Diversity in Ohio." On page 6, column 2, the first sentence in the first

full paragraph reads, "During the 1992 fiscal year, the Division [of Wildlife] received \$5,040,000 in donations via the tax checkoff." While the Ohio Division of Wildlife most certainly would be elated if this were the money donated in 1992 alone, the amount actually refers to the money received via the tax checkoff from FY 1984 (the year the checkoff went into effect) through 1992. Our apologies to Mr. Ross and our readers for the error.

The second mistake is located in Dr. Joel Heinen's review of Dr. William S. Brown's monograph, *Biology, Status, and Management of the Timber Rattlesnake* (*Crotalus horridus*): *A Guide for Conservation*. The review concludes by stating that the monograph failed to mention the possibility of federal listing for the species, when in fact this was discussed briefly in Dr. Brown's summary. Dr. Heinen regrets the oversight.

Dr. Brown's monograph can be ordered from Robert D. Aldridge, Society for the Study of Amphibians and Reptiles, Department of Biology, St. Louis University, St. Louis, MO 63103 (price \$8.00 plus \$1.00 handling and postage). For more information on proposals for federal listing of the timber rattlesnake, contact: Dr. William S. Brown, Skidmore College, Department of Biology,

Saratoga Springs, NY 12866-1632.

## Cover Photo Credits

Credits for the photos on the cover of this issue of the UPDATE are as follows (clockwise from top left): dwarf lake iris (*Iris lacustris*) by The Nature Conservancy; red-cockaded woodpecker (*Picoides borealis*) by Reed Noss; Key deer (*Odocoileus virginianus clavium*) by Tom Wilmers; Texas snowbell (*Styrax texana*) by the San Antonio Botanical Center; Colorado squawfish (*Ptychocheilus lucius*) by Buddy Jensen, Dexter National Fish Hatchery and Technology Center; and Coachella Valley fringe-toed lizard (*Uma inornata*) by Paul Selzer.

## USFWS Endangered Species Technical Bulletin

The latest Technical Bulletin was published in the September/October 1993 issue of the Endangered Species UPDATE. The next Technical Bulletin will be included in the UPDATE as soon as it becomes available.

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Announcements for the Bulletin Board are welcomed.

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# Endangered Species UPDATE

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