

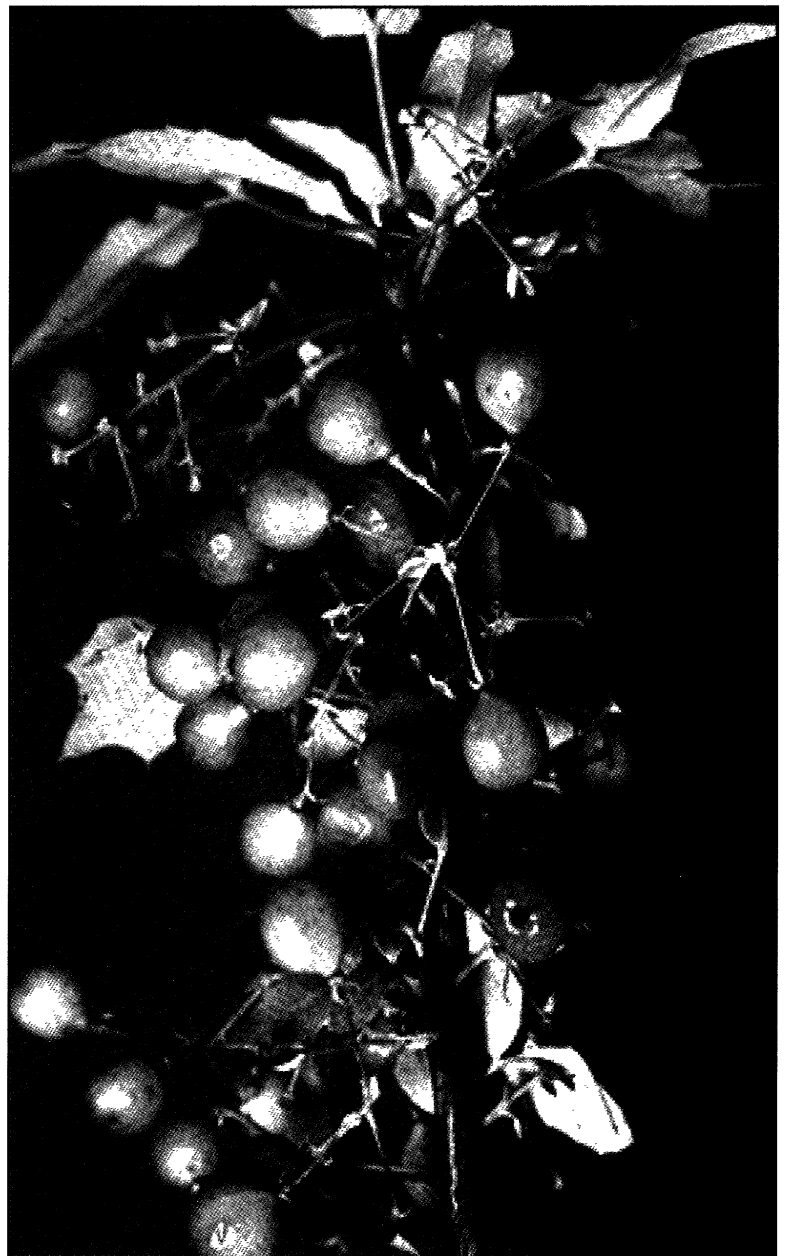
# Endangered Species UPDATE

---

March/April 2000  
Vol. 17 No. 2  
pages 25-48

School of Natural Resources and Environment  
THE UNIVERSITY OF MICHIGAN

- 26 *Opinion*  
Tenth Circuit Court  
Upholds Wolf  
Reintroductions  
Michael J. Bean
- 28 The Western Riverside  
County Multiple Species  
Habitat Conservation  
Plan: A study in the  
evolution of HCPs  
James E. Sullivan and  
Thomas A. Scott
- 35 *Marine Matters*  
Kemp's Ridley Sea Turtle  
Teri Shore
- 38 The Clouded Leopard:  
The "Littlest" Big Cat  
Kirk Johnson
- 42 *Conservation Spotlight*  
The Spix's Macaw  
Natasha Schischakin
- 45 News from Zoos
- 46 News & Events



Insert: September/October 1999 U.S.  
Fish and Wildlife Service Endangered  
Species Bulletin

## Tenth Circuit Court Upholds Wolf Reintroductions

---

**Michael J. Bean**

Environmental Defense Fund, 1875 Connecticut Avenue, NW Suite 1016, Washington, D.C. 20009; mb@edf.org

### Abstract

*A recent federal appellate court decision has upheld the introduction of "experimental populations" of wolves in two areas of the Northern Rockies. The court held that the fact that a few naturally occurring wolves may be present in the areas designated for the experimental releases does not bar the government from using the authority of Section 10(j) of the Endangered Species Act. The decision removes potential uncertainty about the government's authority to establish experimental populations of other species.*

---

The United States Court of Appeals for the Tenth Circuit has clarified the authority of the U.S. Fish and Wildlife Service to establish "experimental populations" of endangered species under Section 10(j) of the Endangered Species Act. The clarification came in a January 13 decision upholding the actions of the Service in establishing experimental populations of gray wolves (*Canis lupus*) in the Yellowstone area of Wyoming and Montana and in central Idaho (*Wyoming Farm Bureau Federation et al. v. Babbitt*). The court's decision overturns a 1997 district court decision that found the Service's actions unlawful and ordered the removal of the reintroduced wolves and their offspring. As a result of the appellate court decision, the wolves can stay and will continue to receive the protection under which their numbers have steadily grown to more than 250 animals. The decision also removes a potential obstacle to the establishment of experimental populations of a number of other endangered species.

The principal issue in the case was whether the government could use the authority of Section 10(j) to establish "experimental populations" of wolves in the two areas, given that

there was some evidence that individual, naturally-occurring wolves may also occur in those areas from time to time. "Experimental populations" of endangered species are subject to less stringent protection than are endangered species generally. Because of the differing levels of protection afforded experimental and nonexperimental populations, Section 10(j) requires that experimental populations be "wholly separate geographically from nonexperimental populations of the same species." The Service contended that it had the authority to proceed under Section 10(j) because there was no "population" of wolves in either Yellowstone or central Idaho. In the Service's view, the occasional wolf that may occur there from time to time did not constitute a population. Instead, a population required the presence of at least two successfully breeding pairs.

Two sets of interests disagreed. One was composed of the American Farm Bureau Federation and several of its state affiliates. They alleged that the presence of occasional wolves in central Idaho and Yellowstone meant that the government had acted unlawfully in reintroducing wolves there under Section

10(j). The remedy, they argued, was to declare the reintroduction unlawful and to remove the wolves.

Four groups represented by Earthjustice Legal Defense Fund, including the National Audubon Society and three small local groups, also challenged Interior's action. The Earthjustice groups alleged that there were naturally occurring wolves in central Idaho and that the government's action in establishing an experimental population of wolves there stripped native wolves of the greater protection to which they were entitled. Because the government could not treat these as part of an experimental population under Section 10(j), they sought an order declaring the government's action unlawful, but allowing the naturally occurring wolves to receive the full protection of endangered species.

The two cases were eventually consolidated. Two groups that had devoted significant resources to the wolf reintroduction effort, Defenders of Wildlife and the National Wildlife Federation, intervened in support of the Service's position. However, the district court agreed with the Farm Bureau and Earthjustice premise that Section 10(j) could not be utilized wherever any naturally occurring in-

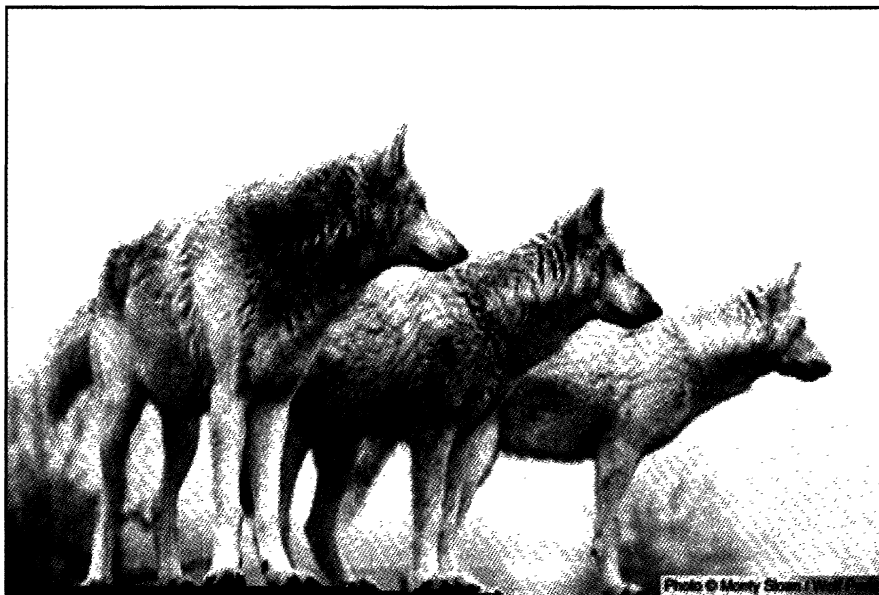
dividual wolves might be. Moreover, it ruled that the appropriate remedy was to remove the unlawfully introduced wolves. It stayed that order, however, pending an appeal.

The National Audubon Society reconsidered and reversed its position shortly after the district court decision. Represented by new counsel, it filed a motion seeking permission to realign itself with the government's position and to join the briefs of the Service and a number of other environmental organizations that supported the Service's position. By virtue of switching its position, Audubon enjoys the rather unusual distinction of being the only party to prevail in both the district court and court of appeals. The remaining Earthjustice clients pressed ahead with the position they had taken below.

The court of appeals decision unanimously disposed of the various arguments against the Service's action. The court held that the restrictive interpretation advocated by the Farm Bureau and the Earthjustice group "could actually undermine the Department's ability to address biological reality ... and thus handicap its ability to effectuate species recovery." In so ruling, the court has re-

moved a cloud of uncertainty that has hung over other possible reintroduction efforts, including one being considered in New Mexico for the northern aplomado falcon (*Falco femoralis septentrionalis*). This, the rarest of North American's falcons, has not recently bred in New Mexico, but occasional individuals are sighted in the state. The Tenth Circuit decision thus makes it very likely that a reintroduction of falcons there can proceed under Section 10(j). The court decision also likely removes a potential obstacle to the use of Section 10(j) to reintroduce grizzly bears (*Ursus arctos*) to the Selway-Bitterroot area of Idaho.

Expanded use of Section 10(j) may hasten the recovery of these and other species. Although the provision has been used sparingly, and some experimental reintroduction efforts have failed, species for which experimental populations have been established are generally doing much better than others. In its most recent (1996) report to Congress, the Service concluded that fewer than ten percent of then-listed species were improving in status. Of the species for which experimental populations have been established, however, more than 70 percent are improving.



Looking ahead—FWS reintroductions upheld under Section 10(j) of the Endangered Species Act. (Photo Courtesy of Wolf Park.)

## Endangered Species UPDATE

A forum for information exchange on endangered species issues  
March/April 2000 Vol. 17 No. 2

M. Elsbeth McPhee ..... Managing Editor  
Chase M. Huntley..... Associate Editor  
Jemifer MacKay..... Editorial Assistant  
Christine Smith..... Editorial Assistant  
Noelle McKenzie..... Subscription Coordinator  
Saul Alarcon..... Web Page Coordinator  
Hwee Ming Tay..... Research Coordinator  
Terry L. Root ..... Faculty Advisor

### Advisory Board

Richard Block  
Santa Barbara Zoological Gardens  
Susan Haig  
Forest and Rangeland Ecosystem  
Science Center, USGS  
Oregon State University  
Chris Howes  
Chicago Zoological Society  
Norman Myers  
International Consultant in  
Environment and Development  
Patrick O'Brien  
Chevron Ecological Services  
Hal Salwasser  
U.S. Forest Service,  
Boone and Crockett Club

Instructions for Authors: The *Endangered Species UPDATE* welcomes articles, editorial comments, and announcements related to species protection. For further information contact the editor.

Subscription Information: The *Endangered Species UPDATE* is published six times per year by the School of Natural Resources and Environment at The University of Michigan. Annual rates are \$28 for regular subscriptions, and \$23 for students and senior citizens (add \$5 for postage outside the US). Send check or money order (payable to The University of Michigan) to:

*Endangered Species UPDATE*  
School of Natural Resources and Environment  
The University of Michigan  
Ann Arbor, MI 48109-1115  
(734) 763-3243; fax (734) 936-2195  
E-mail: [esupdate@umich.edu](mailto:esupdate@umich.edu)  
<http://www.umich.edu/~esupdate>

Cover: Endangered Nevin's barberry (*Berberis nevinii*), found in western Riverside County, CA. Photographer Charles Webber. Photo courtesy Berkeley Digital Library.

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

The *Endangered Species UPDATE* was made possible in part by the David and Lucile Packard Foundation, Turner Foundation, Boone and Crockett Club, Chevron Corporation, and the U.S. FWS Division of Endangered Species Region 3.



printed on recycled paper

# The Western Riverside County Multiple Species Habitat Conservation Plan: A Study in the Evolution of HCPs

---

**James E. Sullivan**

Department of Earth Sciences, University of California, Riverside, CA 92521; jims@citrus.ucr.edu

**Thomas A. Scott**

Department of Environmental Science, Policy, and Management, University of California, Berkeley, CA 94720, and Center for Conservation Biology, University of California, Riverside, CA 92521; tomscott@citrus.ucr.edu

## Abstract

*The Endangered Species Act (ESA) has evolved into a federal land-use regulation, capable of taming the sprawl of western cities and operating as a tool to force communities into resolving growth conflicts. In Riverside County, the ESA has brought interest groups together in an ambitious effort to fully integrate habitat conservation planning into the traditional land use planning process. After decades of environmental conflict, multiple species conservation planning will now serve as one part of an integrated plan that also includes a new County General Plan and a Transportation Corridor Plan. The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) proposes to cover 160 species on 1.25 million acres of land in a rapidly urbanizing area. No plan, however, could succeed until all the elements were in place: (1) homeowner anger over land development, (2) new ESA strength and enforcement, (3) regulatory uncertainty for land developers, (4) a credible source of biological data, (5) interest groups experienced with negotiation, (6) existing HCPs and preserves, and (7) political leadership. The role of science in this negotiated process is to provide a database that is accepted by all participants and to provide rigorous review of the science used to make policy decisions, without creating policy. The ultimate challenge is not so much the selection of preserves, but the development of management techniques for preserves within an urban landscape.*

---

## Introduction

No one in 1973 would have predicted that the legacy of Endangered Species Act (ESA) would include urban growth management. The Act, however, has evolved into the only federal land-use regulation capable of taming the sprawl of western cities; a tool that brings communities together to resolve growth conflicts. No where is this more evident than in Riverside County, California. The fastest growing county in the nation during the 1980s, Riverside has one of the highest rates of species endemism/rarity in the contiguous United States. After decades of conflict over land-use, land developers and conservationists are attempting to end species-by-species and project-by-project battles with a comprehensive, regional plan. This coalition is supporting the ambitious Riverside

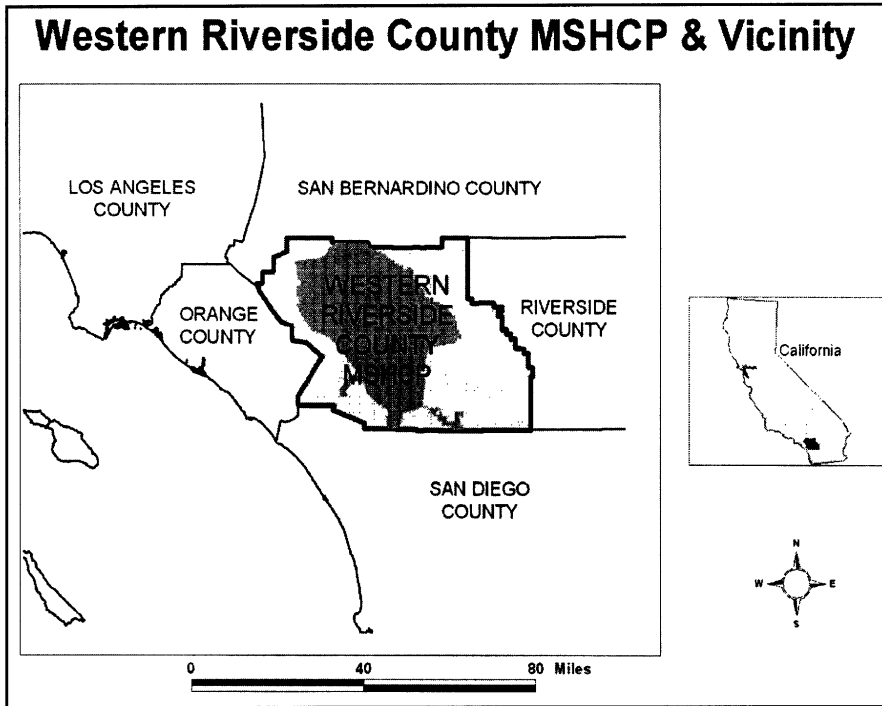
County Integrated Plan (RCIP) which integrates habitat conservation with a new general land use plan and a regional transportation corridor plan. The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) proposes to cover 160 species on 1.25 million acres of land in the most rapidly urbanizing section of the County (Figure 1).

## The regional setting

Riverside County (7,300 sq. mi.) ranges from sea level to over 10,000 ft, encompassing elements of most major biomes of North America. It straddles the convergence zone between Mediterranean and Monsoon rainfall, with rugged topography created by San Andreas and numerous other faults. As a result, narrow-range endemic species occur across hundreds of pockets of unique habi-

tats, unremarkable on an individual basis (Scott et al. 1995) but in total producing a global hotspot of biodiversity (Dobson et al. 1997). Individual habitat patches have low numbers of species; however, a high proportion of these species are rare endemics. This pattern of occurrence increases the likelihood of damage by land development projects and elevates the relative importance of individual habitat patches in the preservation of biodiversity (Scott et al. 1995). As such, the region needs to conserve a large acreage over a wide range of locations to comply with guidelines of habitat conservation planning under Section 10(a) of the ESA.

California's regulatory landscape is as complex as its natural environment. Cities and counties are required to develop general plans that



**Figure 1. The Western Riverside County MSHCP Planning Area, the area of the Stephens' Kangaroo Rat HCP is the darker interior portion.**

serve as the "constitution" for land use regulation (Curtin 1995). Zoning ordinances provide the specifications that implement broad policy statements of the general plans. A general plan would designate the land use for an area, such as commercial use, then zoning ordinances define exactly which types of business qualify as commercial, and specific details to the point of defining the number of parking spaces per square foot of office space. California law further requires that the general plan and zoning ordinances be consistent with state law and each other. Achieving consistency among these complex documents is difficult and discretionary, so general plans frequently face legal challenges by those dissatisfied with local governments' land use policy (Fulton 1991). The ESA adds another layer of complexity since it can be invoked at any scale, from individual project to the general plan.

Southern California survives on an infrastructure of imported water, freeways, and other extended facilities for its widely dispersed popula-

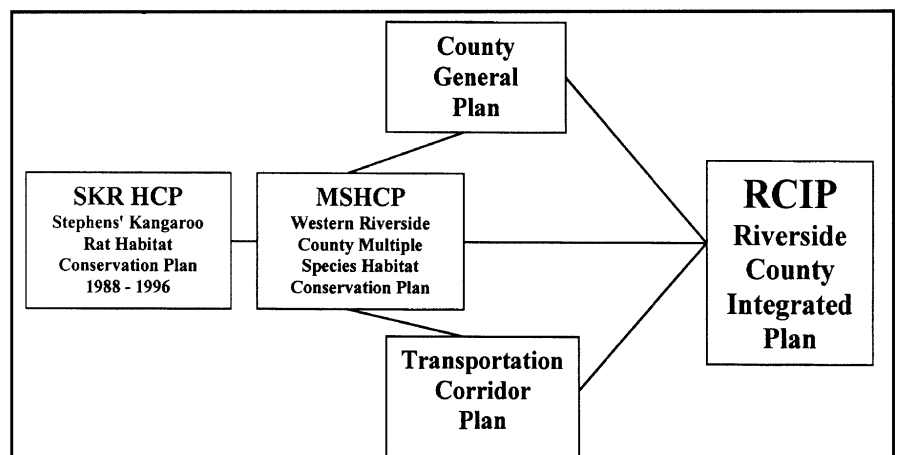
tions. Infrastructure projects, in particular roads, are critical for local planning but induce growth. As a result they become flash-points of ESA conflict, which in turn jeopardizes capital improvements and bond financing because local governments must comply with the ESA both when building these public works projects and when approving private development.

Riverside County supervisors have sought a comprehensive solution to these problems by ambitiously combining multiple species

habitat conservation with land-use and transportation planning (new County General Plan and Transportation Corridor Plan) in the Riverside County Integrated Plan (RCIP, see Figure 2). The result has been innovative and unanticipated: habitat conservation planning has the potential to become a full partner with traditional elements of urban planning in the RCIP.

It often appears that these planning breakthroughs spring forth fully developed, but in reality they are the products of elements that coalesce over a number of years. Riverside County staff anticipated the need for multiple-species planning as early as 1989 (County of Riverside 1991), and began work on at least three multiple-species habitat conservation plans (1991, 1993, and 1995) (Western Riverside County Habitat Consortium 1995). However, no plan could succeed until the following elements were in place:

- 1) Rapid development became a significant local issue
- 2) The ESA had evolved into land use regulation
- 3) Land developers began to seek regulatory certainty
- 4) A credible source of biological information was created
- 5) Interest groups became experienced in HCP negotiations



**Figure 2. Components of the Riverside County Integrated Plan.**

- 6) Preserves for a single species provided a basis for a more comprehensive plan
- 7) Leadership and the involvement of local politicians

### Conflicts over rapid development

As the Los Angeles basin was consumed by development, construction of single family homes moved into outlying areas such as Riverside County. The county offered large tracts of easily developed agricultural land and pro-growth politics. During the 1980s, the western section of the county grew by more than 500,000 people (80 percent increase). Developments leap-frogged along major roadways from metropolitan Los Angeles consuming lowland habitats (scrub and native grasslands), fragmenting the remaining natural areas, and creating an enormous edge between natural and urbanized areas (Figure 3). More important to local politics, the rate of development lowered the quality of life for educated, politically active residents leading to increasing conflict

over development.

The current integrated planning effort had its origins in this conflict. In 1984, environmental groups began a long-running legal battle over the County General Plan. In 1988, a Riverside County growth-management initiative, although defeated, signaled a growing opposition to unrestricted development. Widespread concern over the loss of open space is likely to continue in the future, as the region is projected to gain over 2-million new residents in the next 20 years.

### The ESA becomes a federal land use regulation

The 1973 ESA passed with nearly unanimous support for two reasons: (1) it had an almost theological appeal by stating that man did not have the right to cause the extinction of a species, and (2) there seemed to be little political or actual costs associated with this pronouncement. The Act forbid the "taking" of listed species, which was generally thought to be limited to killing of individual animals, particularly charismatic

megafauna such as grizzly bears. However by the late 1970s, courts began to interpret "taking" to include the destruction of the habitat of a listed species (Houck 1993). Thus the ESA was transformed into the most stringent and controversial federal land use regulation (Batt 1995). The 1973 ESA allowed federal agencies to obtain permission to destroy habitat of a listed species but was mute with regard to non-federal activities. In response, Congress amended section 10(a) of the Act in 1982 to allow the taking of listed species "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" on non-federal land. In order to receive a 10(a) permit, a habitat conservation plan (HCP) had to be developed and funded. Development could not proceed until the HCP has been approved, theoretically allowing some habitat destruction while not jeopardizing the species (Thornton 1991).

Riverside County was one of the few locations nationally in which HCPs were attempted in the 1980s. The second HCP ever developed was for the Coachella Valley fringe-toed lizard (*Uma inornata*) in the Palm Springs area of the county (Beatley 1992). The listing of the Stephens kangaroo rat (*Dipodomys stephensi*) in 1988 forced the County to start the first regional HCP, involving thousands of private landowners (Feldman 1995; Chiang 1999). Two other species, the Delhi Sands flower-loving fly (*Rhaphiomidas terminatus*) and the California gnatcatcher (*Polioptila californica californica*) were listed under the ESA in 1993, revealing the potential for dozens of species listings. Oversight of building permits by the United States Fish and Wildlife Service (USFWS) became part of the land use regulatory process in Riverside County.

The Clinton administration greatly expanded the use of 10(a)

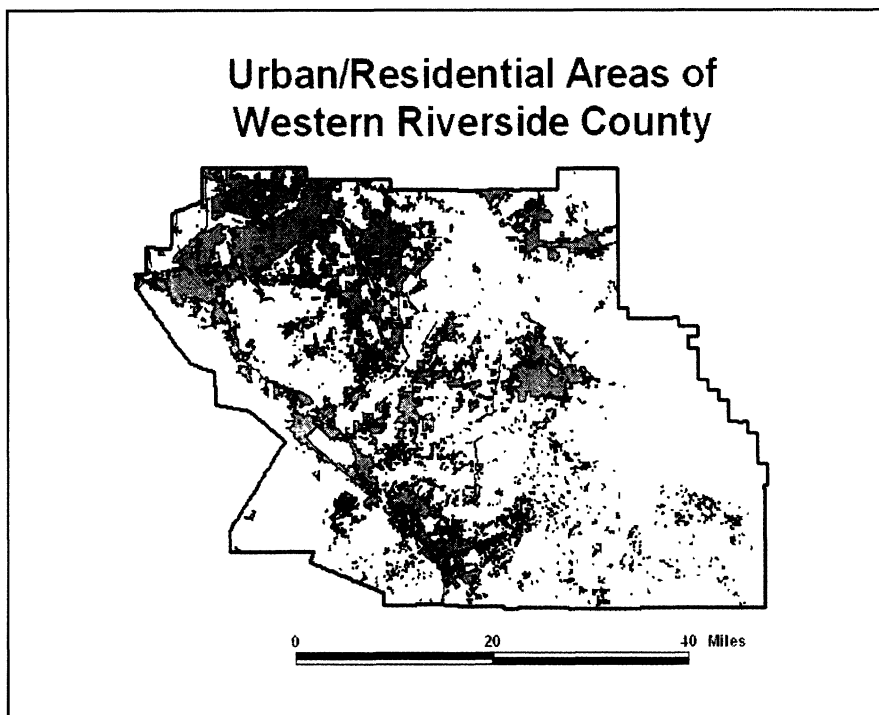


Figure 3. Urbanized areas scattered throughout the planning area create an enormous urban/wildland edge.

permits by encouraging habitat (vegetation) based multiple species plans that provided coverage for large numbers of both listed and potentially endangered species. Those entering into HCPs were given assurances that they would not face any future liability with regard to species covered in the agreement (the "no surprises" policy). These policy adjustments made the ESA less controversial and less likely to be weakened by Congress. Any hope of judicial relief for ESA opponents ended in 1995 when the Supreme Court ruled that the ESA did, indeed, provide broad protection to the habitat of listed species (*Babbitt v. Sweet Home Chapter of Communities for a Great Oregon* 1995). The growing resolve of the USFWS on ESA enforcement became clear in southern California. In 1982 the USFWS had fewer than 10 biologists working in the region, today the number is about 120.

### Regulatory uncertainty

The ESA can stop a development project at any stage, regardless of local permits and agreements. With hundreds of species qualifying for listing under the ESA, southern California developers feared that species could be listed in series to delay or stop projects. Developers labeled this scenario the "species of the month club" (Mann and Plummer 1995). Real estate markets are notoriously cyclical (Figure 4); and success depends on completing projects during market upswings. The timing of these cycles is unpredictable, creating the opportunity for large gains or losses. The possibility of delays induced by species listings magnifies this uncertainty. The ability of the ESA to stop permitted projects created uncertainty for land-developers, and their need to re-establish certainty became a critical factor in the formation of the MSHCP.

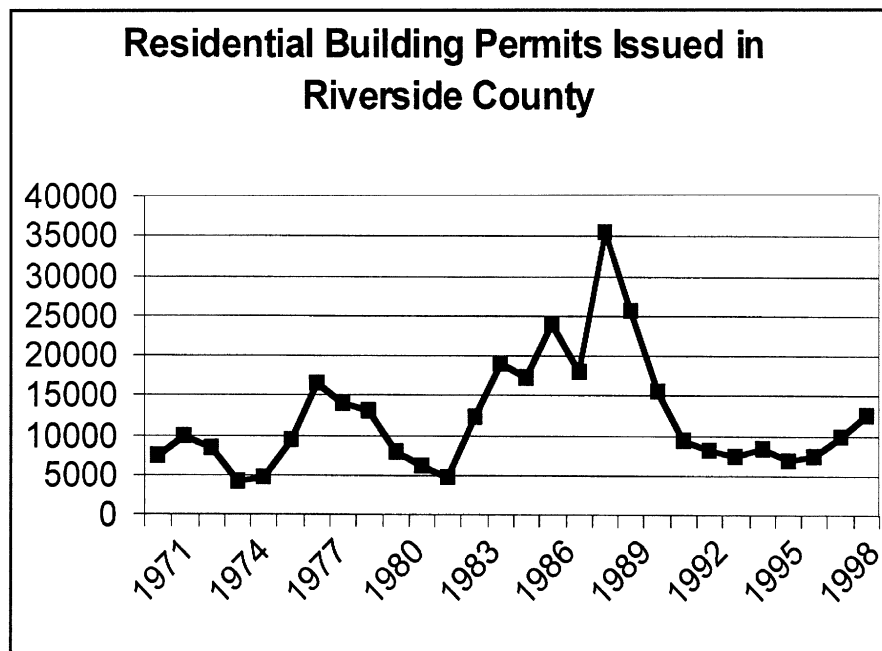


Figure 4. Total building permits for residential units issued per year in Riverside County.

### Developing a credible information base

In 1989, a coalition of the Audubon Society, the Sierra Club, and other local groups proposed four goals for the environmental review process of Riverside County: (1) environmental biologists would be certified, (2) proponents would contract biological surveys through the County, (3) the biological science of environmental documents would be peer-reviewed, and (4) all biological information would be housed at a public trust institution. The first two goals were partially instituted but quickly succumbed to legal and logistical problems. At the request of stakeholder groups, the University of California Cooperative Extension (Riverside and Berkeley) agreed to serve as a clearinghouse for biological information in 1990 (Pratini 1995). Stakeholders endorsed the concept of an environmental database housed at a public trust institution because of their general mistrust of information developed by interest groups or regulatory agencies. At the start of the MSHCP, all stakeholders agreed that this non-biased dataset was essential to the process. While the review of

the science in environmental documents was logistically impossible within the context of permit processing, it became feasible in the context of a regional plan.

### The listing of Stephens' kangaroo rat

The worst case scenario for land development began with the proposal to list the Stephen's kangaroo rat (SKR) as endangered in 1986. The SKR is endemic to Riverside and San Diego Counties, with sparse populations inhabiting some of the most desirable land for tract home development. Over 100,000 building permits were outstanding in western Riverside County when the SKR was listed as endangered in 1988. Individual applications for affected projects would overwhelm the already under-staffed, under-funded USFWS permit process and bring development to a halt. Faced with this problem, Riverside County formed a joint powers authority with local cities and began the most ambitious HCP to date. It became the longest, most litigious HCP process on record, and includes the only settlement of an inverse condemna-

tion lawsuit (public agency taking of private property without compensation) involving the Endangered Species Act that the authors have been able to verify (Selzer 1999; Hood 2000).

In the end, growth proponents were frustrated because the permit covered only the SKR, conservationists were frustrated because a large number of sensitive species remained unprotected outside of the SKR reserve system, and local officials were frustrated because ESA conflicts continued to threaten the County's future. But the development of the SKR HCP provided two more elements necessary for the creation of the MSHCP. First, the SKR plan brought interest groups to the negotiating table and the antagonists gradually adapted to a process of political compromise. Second, it created one of the first administrative systems to translate the demand for open space into a preserve system. Stakeholders' acceptance of the preserve system was equivocal at best, but the process used to create it and the lands it protected became the core of the MSHCP.

### **Start of the MSHCP and Integrated Plan**

County supervisors stressed pragmatism over ideology in supporting the MSHCP. Although the ESA was a federal intervention into county governance it was nevertheless a law demanding compliance. Two regional habitat conservation planning processes were already under way in the sparsely populated eastern part of the county. The SKR HCP had shown the problems inherent in developing a regional conservation plan apart from comprehensive land use planning. The County was legally required to make extensive changes to its general plan, and traffic congestion had become a major problem. In an integrated planning process, the

MSHCP could guide development of the general plan and transportation corridor plan. An integrated process could provide a range of benefits such as open space protection, efficient development of infrastructure, enhanced recreational opportunities and a regulatory climate favorable to business. It would also be more likely to receive broad public support.

County government sought to design the MSHCP as a national model. This intention stems not only from a desire to learn from past mistakes but also from practical considerations—a model plan is more likely to attract federal funds and less likely to end in litigation. The integrated plan was put on a fast track; County government set a goal of three years for the completion of the MSHCP. Ten months into the process, the MSHCP is on schedule.

The MSHCP will respect private property rights. It promises to obtain private property only through purchase from willing sellers. Landowner incentive programs will seek to encourage conservation. Features such as conservation easements, the transfer of development rights, and a habitat transaction system are expected to be part of the final plan.

Addressing concerns over the lack of opportunity for public participation in the SKR and other HCP processes, the RCIP is to be developed from the bottom up. Public outreach and input through newspaper advertisements, workshops, surveys, and presentations to community groups is a priority. As part of this outreach effort, the County maintains a web site on the RCIP (<http://www.rcip.org/>). The University of California, Riverside (UCR) has a web site that provides information on the over 200 species that have been considered for inclusion in the MSHCP and access to the GIS and literature databases (<http://ecoregion.ucr.edu/mshcp/>).

### **Role of science**

In 1991, the state of California created the Natural Community Conservation Plan (NCCP), which championed the use of science in habitat conservation planning. The state developed a conceptual framework for "front-loading" science (Noss et al. 1997), that is guidelines for plan development. In contrast, environmental groups such as the Endangered Habitats League of southern California organized panels of scientists to review completed NCCP documents. The difference of opinion remains unresolved; whereas front-loaded science failed to insure the quality of individual plans, post facto reviews judged policy as well as science and typically came too late in the process to overcome plan inertia.

Because of the problems created by front-loaded and post facto science, Riverside County staff developed the concept of a scientific advisory panel that would serve as a data repository and provide independent critical review of the science used to support policy decisions. The Science Advisory Committee (SAC), coordinated through UCR, was designed to provide research-based information and review throughout the process. The County planned to use the SAC to help stakeholders focus on issues of policy and implementation instead of questions of data quality and scientific methods.

Critics often contend that habitat conservation planning has generally lacked scientific credibility (National Research Council 1995; Jasny et al. 1997; Noss et al. 1997; Hood 1998; Kareiva et al. 1998). For the MSHCP, County government is committed to independent scientific advice and review. First, it has contracted with the UCR to serve as a repository for information collected during the process, this includes georeferenced data and text information from published literature, museum



records, environmental impact reports, agency documents, and the field notes of local naturalists. The system currently contains 10,000 location records of sensitive species and over 7,000 references related to the MSHCP (both can be referenced at <http://ecoregion.ucr.edu/mshcp/>). Second, the SAC has given rise to a scientific review panel (SRP) at the newly formed Center for Conservation Biology at UCR, and continues to provide formal academic review of the science in the MSHCP consultant's work. Rarely have HCPs been the subject of formal review by scientists who are independent of the process; never has there been formal independent scientific scrutiny throughout the process.

The science used in the MSHCP will receive independent review at each step of the process, including: (1) the consultant's proposed methods to identify preserves and species to be covered, (2) the science created in the consultant's report on the MSHCP policy strategies (the draft plan), and (3) the science used to describe EIR/EIS impacts and mitigation. At present, the review of project methods (Step 1, above) has been completed and is available online at <http://ecoregion.ucr.edu/srp>. These procedures provide the most formal and comprehensive use of independent science ever undertaken in developing a HCP.

The County of Riverside must make a series of policy decisions in their application for a multiple species 10 (a) permit. These decisions depend on an enormous amount of biological information, much of which is unavailable. The primary tasks in the MSHCP are to report all information supported by existing science, to identify the extent of the gap between what is known and what should be known to complete the plan, and to find ways to bridge the unknown in a manner that creates

certainty for all stakeholders. All parties agree that now is the time to create conservation strategies and preserve land, as each passing year means fewer options for everyone.

The solution has been to move forward with a plan while recognizing that policy decisions will be made without complete information. This requires the plan to build in strategies for dealing with unknown and unforeseen circumstances. To complete the MSHCP in three years, the County intends to utilize existing data to the maximum extent possible. But the plan will need to address ways to resolve information gaps within the framework of management created under the 10(a) permit. The ultimate role of scientific advice and review is to insure that the permit and its subsequent management actions define what is known about MSHCP conservation strategies and develop structured mechanisms to deal with problems created by uncertainties, unknowns, and the unforeseen.

### **Persistence not polygons**

The pattern of suburban development in western Riverside County challenges current tenets of preserve design. Preserve features, such as large size, proximity, and connectedness are often absent from urban landscapes (Scott and Sullivan, in press).

The region's natural areas can be subdivided into three arbitrary sections in a land development continuum: (1) habitat remnants in human landscapes, (2) a broad range of habitat patches inter-digitated with suburban land-uses, and (3) suburban enclaves in large, often publicly owned wildlands (natural areas). Many of the region's sensitive species occur in the first two categories: hence species and habitat preservation must be fitted into an existing pattern of urban influences, in a manner that preempts many of the published tenets and assumptions of pre-

serve design (see Noss et al. 1997). Thus habitats of interest are often relegated to isolated remnants; linkages become gauntlets or peninsulas and urban enclaves diffuse edge effects across wildlands. Western Riverside County has thousands of kilometers of wildland/urban edge, and over 300 pockets of "stealth cities" [urbanized areas that are not political entities (Jonas 1997; Scott et al. 1995)].

Conservation planning has become an exercise in using geographic information systems (GIS), with resources depicted by map polygons (units of area). HCPs typically link conservation actions to these GIS units, which are static representations of vegetation and habitat. The problem is that any map unit constrains the set of possible solutions or creates a bias towards some biological resources while minimizing the conservation of others. At the core of this issue is the question of management. Polygons emphasize decisions between geographic locations but seldom define conservation and management actions.

In western Riverside County, mounting evidence points to a dynamic, directional change in coastal sage scrub and riparian vegetation types. Air pollution in the MSHCP area has increased the soil nitrogen to levels seen in fertilized agricultural fields (Allen et al. 1996). This effect combined with the invasion of exotic grasses and the fires created by seasonal drought has led to the conversion of native vegetation to annual grasslands (Minnich and Dezzani 1998). Hence, the conservation value of any sage scrub or riparian area may be changing over time. The issue goes beyond the limits of polygon mapping and shows why MSHCP planners must make more sophisticated use of GIS. The selection of MSHCP preserve areas is not as critical as de-

veloping mechanisms to deal with management problems created by preserve configuration.

Conservation scientists lack the basic information necessary to manage the majority of species and ecosystems considered in HCPs. As first described by Holling (1978), management in the absence of information can only be carried out with an adaptive strategy. This does not mean haphazard trial and error. Rather, adaptive management means creating management experiments and learning from the outcomes. This implies that MSHCP strategies must fund the management as well as the acquisition of conservation areas. Allocating funds for management and developing dedicated sources of contingency funding will be among the most challenging aspects of the MSHCP.

Despite the enormous effort to get to this point, the real work has just begun. The emphasis to date (January 2000) has been on reaching consensus on the general outline of the plan and building the momentum necessary to carry the process through the inevitable difficulties ahead. Now the MSHCP must adopt specific conservation strategies, deciding which species will be covered by the plan and how it will be financed.

It is an unfortunate outcome of land development that areas with high species endemism like Riverside County now coincide with the most rapidly urbanizing regions of the nation. If these plans fail, we face an odd legacy of ESA-induced urban planning and open space devoid of the biodiversity we hoped to pass on to our children. Riverside County stands on the threshold, hoping to integrate species and ecosystem conservation with urban growth.

## Literature cited

- Allen, E.B., P.E. Bytnerowicz, and R.A. Minnich. 1996. Nitrogen deposition effects on coastal sage vegetation of southern California. Proceedings of the International Symposium on Air Pollution and Climate Change Effects on Forest Ecosystems. U. S. Forest Service General Technical Report 164.
- Babbitt v. Sweet Home Chapter of Communities for a Great Oregon. 115 S. Ct. 2407, 515 U.S. 687, 132 L.Ed.2d 597 [U.S. Dist. Col. 1995].
- Batt, K.D. 1995. Above all, do no harm: *Sweet Home* and section nine of the Endangered Species Act. Boston University Law Review 75(4):1177-1231.
- Beatley, T. 1992. Balancing urban development and endangered species: The Coachella Valley Habitat Conservation Plan. Environmental Management 16(1):7-19.
- Chiang, K. 1999. Lessons learned in habitat conservation planning: The Stephen's Kangaroo Rat HCP. Unpublished paper.
- Curtin D.J. 1995. California Land Use and Planning Law. 1995 (fifteenth ed. Point Arena, California: Solano Press Books.
- Dobson, A.P., J.P. Rodriguez, W.M. Roberts, and D.S. Wilcove. 1997. Geographic distribution of endangered species in the United States. Science 275:550-3.
- Feldman, T.D. 1995. Local solutions to land use conflict under the Endangered Species Act: habitat conservation planning in Riverside County. University of California, Riverside. Unpublished dissertation.
- Fulton W. 1991. Guide to California Planning. Point Arena, California: Solano Press Books.
- Holling, C.S. 1978. Adaptive environmental assessment and management. in Conference Proceedings for the United Nations Environment Programme/Workshop on Adaptive Assessment of Ecological Policies. International Institute for Applied Systems Analysis. Wiley Publications. New York.
- Hood, L.C. 1998. Frayed safety nets: conservation planning under the Endangered Species Act. Defenders of Wildlife. Washington, D.C.
- Hood, L.C. 2000. Personal communication.
- Houck, O.A. 1993. The Endangered Species Act and its implementation by the U.S. Departments of Interior and Commerce. University of Colorado Law Review 64:277-370.
- Jasny, M. J. Reynolds, and A. Notthoff. Leap of faith: Southern California's experiment in natural community conservation planning. Natural Resources Defense Council. 1997.
- Jonas, A.E.G. 1997. Regulating suburban politics: 'Suburban-defense transition,' institutional capacities and territorial differentiation in southern California. in Lauria M, ed. Reconstructing urban regime theory: Regulating urban politics in a global economy. Sage Publications.
- Kareiva, P.M., S.J. Andelman, D.F. Doak, B. Eldard, M. Groom, J. Hoekstra, L. Hood, F. James, J. Lamoreux, C. McCullough, J. Regetz, L. Savage, M. Ruckelshaus, D. Skelly, H. Wilbur, and K. Zamudio. 1998. Using science in habitat conservation plans. American Institute of Biological Sciences, Washington, D.C.
- Mann, C.C. and M.L. Plummer. 1995. California vs. Gnatcatcher. Audubon 97(1):38-54.
- Minnich, R.A. and R.J. Dezzani. 1998. Historical decline of coastal sage scrub in the Riverside-Perris plain, California. Western Birds 29(4):366-91.
- National Resource Council. 1995. Science and the Endangered Species Act. National Academy Press, Washington, D.C.
- Noss, R.F., M.A. O'Connell, and D.M. Murphy. 1997. The science of conservation planning: habitat conservation under the Endangered Species Act. Island Press, Washington, D.C.
- Riverside County. 1991. Multiple Species Habitat Conservation Plan. County of Riverside, Riverside, California. January, draft.
- Pratini, N. 1995. UCR's Biological Resources Information Unit: local conservation planning backed by UC expertise. California Agriculture 49(6):50-4, 57.
- Scott, T.A. R. Standiford, and N. Pratini. 1995. Private landowners critical to saving California biodiversity. California Agriculture 49(6):50-4, 57.
- Scott, T.A and J.E. Sullivan. In press. The selection and design of multiple species habitat preserves. Environmental Management.
- Selzer, P. 1999. Personal communication.
- Thornton, R.D. 1991. Searching for consensus and predictability: habitat conservation planning under the Endangered Species Act of 1973. Environmental Law 21(605):604-55.
- Western Riverside Council of Governments. 1993. Western Riverside Subregional Comprehensive Plan: Executive Summary. County of Riverside, Riverside, California. September, draft.
- Western Riverside County Habitat Consortium. 1995. Western Riverside County Multi-Species Habitat Conservation Plan: Phase I- Information collection and evaluation. Western Riverside County Habitat Consortium, Riverside, California.

# Marine Matters

## Creating A Kemp's Ridley Marine Reserve in Texas: The Missing Link In A Proven Protection Strategy

---

Teri Shore

Sea Turtle Restoration Project, P. O. Box 400, Forest Knolls, CA 94933; turtlesafe@igc.org, www.seaturtles.org

### Abstract

*The Kemp's ridley is the most critically endangered sea turtle in the world. Less than 2,000 nesting females remain of a population of at least 40,000 that once nested annually in the Gulf of Mexico. Protection of nesting beaches and use of Turtle Excluder Devices on shrimp vessels as required under the Endangered Species Act have failed to stop these endangered sea turtles from drowning in shrimp nets and washing up dead on Texas beaches in large numbers year after year during the shrimp season. Added protection is urgently needed to assure the survival of Kemp's ridley sea turtles in the U. S. At the primary Kemp's ridley's nesting beach in Rancho Nuevo, Mexico, beach protection and use of Turtle Excluder Devices have been enhanced by the creation of a no commercial fishing zone (marine reserve) along the coastline. This three-tiered conservation strategy has resulted in the slow increase of Kemp's ridley nesting population there. The Kemp's ridley's only consistent U.S. nesting site is in the vicinity of Padre Island in South Texas. However, this is also the place where more dead adult Kemp's ridleys wash up dead than anywhere else in the U. S. A Kemp's Ridley Marine Reserve along Padre Island, Texas, that is permanently off-limits to commercial fishing would protect critical nesting, foraging and migrating habitat for the Kemp's ridley in the U. S. By following Mexico's successes in Texas by adding a marine reserve to existing conservation practices of beach protection and use of Turtle Excluder Devices, we can help assure the Kemp's ridley recovery and also provide benefits to other sea turtle species and marine life, the shrimp fishery, and the communities along the coastline.*

---

### Profile of the Kemp's ridley

The Kemp's ridley (*Lepidochelys kempii*) is the smallest of the five species of sea turtles that regularly swim U. S. waters [others being the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and hawksbill (*Eretmochelys imbricata*)]. The Kemp's ridley was listed as endangered on December 2, 1970, and received additional protection under the Endangered Species Act (ESA) in 1973. Just over 50 years ago in 1947, an estimated 40,000 females were filmed nesting in one day on their primary nesting beach in Rancho Nuevo, Mexico, south of the Texas border. Today fewer than 2,000 females lay eggs each year (National Marine Fisheries Service 1996). The Kemp's ridley can be considered for

downlisting to threatened only after a population of 10,000 nesting females in a season is attained (US Fish & Wildlife Service and National Marine Fisheries Service 1992). The recovery plan for the species estimates that this goal may be achieved by 2020.

The Kemp's ridley is known for the mass nesting behavior known as the "arribada" or arrival. This behavior is shared only with the olive ridley (*Lepidochelys olivacea*) found in Central America and India. The large 1947 arribada could have only been produced by a very large adult population, possibly in the millions. The Kemp's ridley is the only sea turtle that nests during daylight hours, leaving it most vulnerable to predation at its nesting beaches. The species reaches sexual maturity at age 10 years or

more. Like all sea turtles, Kemp's ridleys return to their natal beach to nest.

Kemp's ridleys usually live in shallow coastal areas, bays and lagoons, preferring waters less than 50 meters deep (USFWS and NMFS 1992). On average, adults weigh 90 pounds with a top shell length of two feet, ranging in color from olive to gray-green. Kemp's ridleys' primary food is crab. While these sea turtles nest and forage primarily in the Western Gulf of Mexico, they migrate south to the Yucatan and east to the Atlantic Coast of the U. S. and are found occasionally as far east as Africa and the Mediterranean.

The Kemp's ridley was not identified as a separate species until 1991 and for many years it was thought to be a hybrid of other sea turtles (USFWS and NMFS 1992). Its primary nesting

beach at Rancho Nuevo, Mexico, was not discovered by U. S. biologists until after the 1947 nesting film was recovered in the early 1960s. In the U. S. the Kemp's ridley nests primarily in Texas.

### **Decimation of Kemp's ridley populations**

The Kemp's ridley has been decimated by commercial exploitation of sea turtle eggs, meat and skin for leather, and development and destruction of nesting beaches. Incidental catch in shrimp fishing nets, however, remains the number one human-caused death of the Kemp's ridley and other sea turtles in the U. S. and around the world (National Research Council 1990). Not until last century did the Kemp's ridley and other sea turtle populations in the Gulf begin to decline. The devastation began with a commercial sea turtle fishery, followed by poaching of eggs at its nesting beaches, and, finally, incidental capture in the shrimp fishery.

Sea turtles were so abundant in the 1800s that the Texas coast had a thriving sea turtle fishery (USFWS and NMFS 1992). Thousands of sea turtles were harvested and processed at four or more canneries, until there were almost no sea turtles left on this coast. The sea turtle fishery collapsed in Texas due to unregulated overharvesting.

Intense exploitation of Kemp's ridley eggs at the species' primary nesting beach in Rancho Nuevo occurred during the 1940s through the 1960s until Mexico protected the beach in 1966. While egg harvesting certainly reduced the population, the most important factor affecting the more reproductively valuable larger juveniles and adults was the growing shrimp trawl industry after World War II. During the 1950s, as many as 45 to 55 sea turtles were caught annually by each fishing boat. Tens of thousands of sea turtles were killed as the Gulf shrimp fleet grew to more than 10,000 vessels and boats.

Sea turtles are caught in long, funnel-shaped shrimp trawl nets as the nets

are dragged along the ocean floor behind fishing boats. Once trapped in the nets, the sea turtles struggle until they run out of air and drown. Despite beach protections, the Kemp's ridley nesting population dropped to less than 500 females by the mid-1980s and the species nearly went extinct (USFWS and NMFS 1992).

### **Recovery efforts**

In an urgent effort to save the Kemp's ridley, Mexico and the U.S. initiated recovery efforts. Mexico acted first by establishing a sea turtle preserve at the primary nesting beach at Rancho Nuevo in 1966. Since then, sea turtle nests have been protected and populations monitored. As a result, poaching of adult sea turtles there has been drastically reduced. In recent years, the conservation program expanded to neighboring beaches so that more nests are protected and counted (Marqu ez et al. 1999).

In 1978, the U. S. joined Mexico's efforts in Rancho Nuevo. This same year a no-shrimp-fishing-zone was established along the coastline at Rancho Nuevo that is maintained today. The zone is off limits to all shrimp fishing during the Kemp's ridley nesting and mating season, March to August. In the late 1980s and early 1990s, Turtle Excluder Devices (TEDs) were introduced in the U. S. and Mexico to protect sea turtles and reduce bycatch.

This three-tiered conservation approach utilizing beach protection, TEDS, and a protected marine area along the nesting beach has resulted in the slow recovery of the Kemp's ridley in Mexico. The mean annual increase in nesting at Rancho Nuevo between 1988 and 1998 has been 8 percent (Marqu ez et al. 1999).

### **Recovery efforts in Texas**

In response to the demise of the Kemp's ridley, the United States spent millions of dollars and thousands of hours on the Kemp's Ridley Head Start Experiment in an attempt to establish a nesting colony at

a historic nesting area in Padre Island, Texas. The program was organized to provide a safety net for the Kemp's ridley in the event of a natural disaster at the primary nesting beach, or changes in the political situation in Mexico that might allow development of Rancho Nuevo (USFWS and NMFS 1992).

From the late 1970s to the early 1980s, thousands of Kemp's ridley eggs were taken from Mexico, hatched and released at Padre Island National Seashore, then recaptured and raised in captivity. After two years, the young sea turtles were released offshore from research vessels into the Gulf of Mexico. More than 10 years later, sea turtles from this project have returned to nest at Padre Island. A record 16 Kemp's ridley nests were laid in South Texas in 1999, both from returning and wild stock. Most were on Padre Island National Seashore.

This is also the place where more dead adult Kemp's ridleys wash up dead than anywhere else in the U. S. (Shaver 1999). In fact, nearly half of all adult dead Kemp's ridley sea turtles found stranded in the United States during the past five years were located at Padre Island; and considerably more Kemp's ridleys may have nested if these deaths had not occurred (Shaver 1999). The stranding-to-nesting ratio for adult Kemp's ridley sea turtles in 1998 was 620 times higher at Padre Island National Seashore than at the main nesting beach at Rancho Nuevo (Shaver 1999).

Recovery efforts in Texas were abandoned when the Kemp's Ridley Headstart Experiment was discontinued in 1988. Currently, the state of Texas has no sea turtle biologists on staff and does not fund sea turtle recovery, monitoring, or education. This is unlike other important sea turtle states which operate and fund active sea turtle programs, such as South Carolina, Georgia and Florida. In fact, Florida's coastline is protected by a three-mile net ban.

### **Kemp's ridley strandings**

The continued strandings of sea turtles during the shrimp season in Texas indicate that TEDs have not solved the problem of endangered sea turtles drowning in shrimp nets. Enforcement of TEDs laws by government agencies and compliance by shrimp vessels have been inconsistent. Insufficiently large TED openings and repeated capture of sea turtles in TEDs may also be contributing to the shrimping-sea turtle stranding problem.

In the years immediately after TEDs implementation, sea turtle strandings dropped (U.S. Sea Turtle Stranding and Salvage Network). In 1994, however, sea turtle deaths soared along the Texas coast, totaling more than 500 sea turtles (about half of them Kemp's ridleys). Since then, Texas has remained a hot spot for sea turtle strandings during the shrimping season. In fact, shrimping effort remains closely correlated with sea turtle deaths along the Texas Coast and the entire Northwestern Gulf. This has been scientifically shown to be the case before and after the implementation of laws requiring TEDs (Caillouet 1996).

Since 1994, the year that sea turtle strandings in Texas reached unprecedented highs, more than 2,700 sea turtles have washed up dead or dying along Texas beaches. Of these, more than 900 were Kemp's ridleys. Every year, sea turtle strandings drop to nearly zero during the annual Texas shrimp closure from May 15 to July 15 (Shaver 1999). Many, if not most, of the sea turtles that drown in shrimp nets never wash up on land, suggesting that the death toll is actually much greater than documented. Last year more than 450 sea turtles died along the Texas coast, 95 of them Kemp's ridleys. Also, July 1999 saw the highest number of sea turtles die off the Texas coast in a single week after the summer opening of shrimp season since 1994 (Texas Sea Turtle Stranding and Salvage Network).

Not only are Texas sea turtles be-

ing killed in the nets of the Texas shrimp fleet, but protected Mexican sea turtles also must run a gauntlet of shrimp nets while migrating through Texas and returning to Rancho Nuevo to nest. The continued strandings of Kemp's ridleys in Texas is even more alarming when you consider the fact that the federal government's Marine Turtle Expert Working Group concluded in 1998 that due to lack of scientific data available on the species, the maximum number of Kemp's ridley sea turtles that can be killed in the shrimp fishery without harming their recovery cannot be determined (NMFS 1996). So until recovery is complete, there are no acceptable stranding levels.

### **Turtle excluder devices**

In the late 1980s and early 1990s, two decades after the Kemp's ridley was listed as endangered, use of TEDs by the U. S. shrimp fleet was phased in. U.S. industry resistance fought off mandatory use of TEDs until 1991. The standard was not applied to other nations that sell shrimp to the U. S., including Mexico, until 1996.

The TED is a rigid barrier that is sewn into the bag-end of the large, funnel shaped shrimp net. It was first invented in the 1960s by Georgia fishers to exclude unwanted horseshoe crabs, other bycatch and debris from their nets. The most common TEDs look very much like a large oval barbecue grill. Vertical bars spaced three-to-four inches apart allow shrimp to pass through and into the net end. Simultaneously, the TEDs push sea turtles and other marine life that do not fit between the opening out through an escape hatch in the nest below the TED. The opening is basically a hole in the net that opens under pressure and is kept shut by the force of the movement of the shrimp vessel as it drags the net behind its stern.

Properly installed TEDs have been proven to be as much as 97 percent effective in releasing sea turtles. The de-

vice has been viewed as the best compromise for allowing shrimp fishing while preventing the drowning of sea turtles in shrimp nets. A new study by the National Marine Fisheries Service, however, has determined that TEDs openings approved by the agency are too small for the larger species of sea turtles to escape (NMFS 1999). In addition, there are questions as to whether sea turtles are being repeatedly captured in TEDs and then drowning. While TEDs indeed save many sea turtles from dying in shrimp nets, they are not the complete solution that so many had hoped, considering the large number of shrimp vessels that continue to trawl the Texas coast—at least 2,000.

### **TEDs enforcement**

Despite federal and state agency reports that *observed* compliance among shrimp vessels with TEDs laws is nearly 100 percent, this effort has been largely inconsistent. "Observed" is emphasized because compliance numbers are based only on direct observation by occasional random boardings, mainly by the Coast Guard. An undercover investigation by the Humane Society of the United States determined that compliance is closer to 60 percent (Humane Society 1997).

The Coast Guard has been the lead enforcement agency. In most cases, the shrimp fleet knows well in advance when a Coast Guard cutter or other official vessel is approaching. A shrimp fisher can easily open the TEDs hole if it is tied shut or otherwise disabled. Not until 1998 did NMFS dispatch a team of agents on two small boats of its own to monitor the entire Gulf of Mexico shrimp fleet. Boardings of Texas shrimp vessels found non-compliance of 20 to 25 percent in 1999, according to enforcement agents. Never before has the federal government made public such low compliance rates.

Full page ads placed in the *New York Times* calling for the marine reserve prompted Texas Governor

George W. Bush to authorize the Texas Parks & Wildlife Department (TPWD) to enforce the ESA on behalf of sea turtles for the first time in Texas history. On June 25, Gov. Bush announced that 65 state game wardens would join federal enforcement agents in inspecting shrimp vessels for TEDs along the Texas coast when the summer shrimp season opened July 15. Previously, state officials said the Texas Constitution prohibited state enforcement of federal TEDs laws.

None of these efforts, however, have stopped sea turtle strandings during the shrimp season. On the contrary, more sea turtles died in Texas that year than in the previous year when no state agents were involved. So, while few violators of TEDs laws are ever apprehended, conservationists believe that "cheating" is widespread as the following examples illustrate.

In early 1999, NMFS issued a \$4,000 fine against a shrimp vessel for capturing a live Kemp's ridley in its broken TED. The *Master Jimmy's* captain was arrested by federal and state agents near San Jose Island and his catch seized (NMFS April 13, 1999).

Another vessel was found with one shrimp net without a TED and a live Kemp's ridley caught in a TED that was not properly installed. The turtle was released, and the trawler fined \$5,000 (NMFS May 6, 1999). Yet another vessel was fined for shrimping with all four TEDs tied shut.

These and numerous other violations and continued sea turtle deaths indicate that enforcement and laws requiring TEDs have not effectively protected endangered sea turtles. Due to the problems with TEDs enforcement, compliance, design, and effectiveness, an additional approach is desperately needed to protect and enhance the recovery of Kemp's ridleys in the U.S.

### **Beyond TEDs: a marine reserve**

As Mexico has demonstrated, a three-tiered conservation approach that in-

cludes beach protection, TEDs, and a marine reserve along the nesting beach is destined to achieve positive results.

A marine reserve is the "missing link" in sea turtle recovery efforts in Texas for the Kemp's ridley. To take this final step, the Sea Turtle Restoration Project originated the concept and has been working for two years towards creating a Kemp's Ridley Marine Reserve (KRMR) that is closed to commercial shrimp fishing (but open to recreational fishing) along the Texas coast. STRP is also committed to forwarding a vision of a linked network of sea turtle swimways throughout the U. S. and the world that ties into national and global efforts to create Marine Protected Areas.

The KRMR, as proposed, would extend along the coast of North and South Padre Island and vicinity (about 100 miles) and out to 20 fathoms or 17 nautical miles. The state of Texas has jurisdiction out to 9 miles, and NMFS has control from 9 miles to the 200-mile Exclusive Economic Zone.

The proposed KRMR boundaries are based on tracking of Kemp's ridley sea turtles by radio telemetry. The proposed marine area represents 90 percent of the locations of nesting Kemp's ridleys that were tracked off Padre Island National Seashore using radio telemetry in 1998 (Shaver 1999). About 54 percent of the movements were located within 10 fathoms or about five nautical miles. Other studies confirm that Kemp's ridleys regularly utilize the Texas coastline and Gulf nearshore waters. In 1995, four Kemp's ridleys were tracked in waters off Texas, Florida and North Carolina (Renaud 1995). These ridleys frequented waters in depth from 1 to 140 meters, but mostly in waters of 18 meters (10 fathoms) or less. Another Kemp's ridley tracked from Louisiana to its nesting site at Rancho Nuevo in 1994 and 1995 utilized waters from one to more than 50 fathoms (Renaud et al. 1996).

The proposed KRMR would provide a safe haven along the nesting

beach in Padre Island and a safety corridor for migrating sea turtles from Rancho Nuevo. The waters here are also migrating and foraging habitat for loggerheads, leatherbacks, hawksbills and green turtles and such a reserve would give these species added protection.

In addition to protecting endangered sea turtles, the proposed marine reserve offers the promise of enhancement and restoration of fishery yields, maintenance of biological diversity, and increased economic opportunities from eco-tourism (Dugan et al. 1993). The National Research Council recommends in its 1998 report "Sustaining Marine Fisheries" that 20 percent of our oceans should be set aside in permanent marine protected areas (National Research Council 1998). A new coalition of marine scientists is also calling on the U. S. government to create a network of Marine Protected Areas around the U. S. (Marine Conservation Biology Institute 2000).

The KRMR will, for the first time, protect a representative zone of marine biodiversity in the neritic zone of the Gulf of Mexico. This is not represented in any type of Marine Protected Area in the United States. Creating a marine reserve that is off-limits to commercial shrimp fishing would also protect the region from constant trawling. Trawling is under greater scrutiny by the scientific community. A recent series of reports concluded that bottom trawling is one of the most serious physical disturbances to the world's continental shelves. The effect of bottom trawling was likened to forest clearcutting and the reports suggested that trawling was a major reason why so many fisheries are declining (Marine Conservation Biology Institute 1998).

The Texas commercial and sport fishery could also benefit from a marine reserve along North and South Padre Island. Shrimp could grow larger and more valuable before dispersing into the larger fishery in an area that is free from bottom trawling and other intensive fishing activity. The commer-

cial finfish and sport fishery would also benefit from an area that is not commercially trawled, protecting desirable species that often are caught, killed and discarded in shrimp nets, such as protected red drum (*Sciaenops ocellatus*), red snapper (*Lutjanus campechanus*), king fish (*Menticirrhus littoralis*), Spanish mackerel (*Scomberomorus maculatus*), and the still abundant sea trout (*Cynoscion nebulosus*) and Atlantic croaker (*Micropogon undulatus*).

Both fisheries could ultimately benefit from increased fish numbers and size. In fact, one study suggests that increased productivity due to protection in a marine reserve could more than compensate fishers excluded from closed areas (National Research Council 1998). The science is already beginning to mount that marine reserves that are off limits to all or some types of fishing activity result in the almost immediate return of depleted species. In addition, these marine reserves create opportunities for increased eco-tourism and scientific research.

The turtles of Texas can draw large numbers of tourists, similar to the success of the Birding Trail of Texas. Padre Island National Seashore is already an area that draws tourists. Hatchling releases bring many people with a minimum of advertising. A no-commercial-fishing zone would enhance existing attractions and relieve visitors of the sight of endangered sea turtles dead on the beach.

### Progress and support

Pressure is mounting to create the KRMR in South Texas as sea turtles continue to wash up dead in large numbers during the shrimping season. As a result of growing public support, strategically placed newspaper ads, and increased media coverage, Texas wildlife officials—for the first time—increased enforcement of sea turtle protection laws in 1999 and began to discuss the marine reserve.

TPWD is reviewing shrimp management regulations and considering

new shrimp closures, gear restrictions, and a marine reserve at Padre Island that would protect the sea turtles and also aid shrimp management. Agency officials, however, indicated that any new protections would be granted no sooner than the summer of 2001.

A resolution passed by the participants at the 19th Symposium on Sea Turtle Conservation and Biology in March 1999 supports the reserve (Plotkin 1999). Sea turtle and environmental groups including The Humane Society of the United States and Caribbean Conservation Corp have joined Sea Turtle Restoration Project and HEART (Help Endangered Animals—Ridley Turtles) in support of the KRMR. Thousands of emails and letters from across the United States and outside the country continue to pour into the office of Gov. Bush. Major national and Texas newspapers have published editorials or op-ed pieces supporting the marine reserve.

### Conclusion

Creating a Kemp's Ridley Marine Reserve along the South Texas coast would provide the "missing link" in a three-tiered conservation strategy that has already achieved proven results in Mexico. Beach protections and use of Turtle Excluder Devices alone have not solved the problem of endangered Kemp's ridleys dying in large numbers along the Texas coast. Such a marine reserve would not only protect sea turtles, but other marine life. It could also enhance the shrimp fishery, provide new economic opportunities in the form of eco-tourism and provide a model for marine protected areas around the United States.

### Literature cited

Caillouet, C. W., JR., D. J. Shaver, W. G. Teas, J. N. Nance, D. B. Revera & A. C. Cannon. 1996 Relationship between sea turtle stranding rates and shrimp fishing intensities in the northwestern Gulf of Mexico: 1986—1989 versus 1990-1993. *Fishery Bulletin* 94 (2): 237-249.

Dugan, Jenifer E., and Davis, Gary 1993 Applications of Marine Refugia to Coastal Fisheries Management, *Canadian Journal of Fish and*

*Aquatic Science*.

Humane Society of the United States, 1997. Report of the Investigation into Violations of Turtle Excluder Device Regulations by Texas Shrimp Fisherman, Washington DC.

Marine Conservation Biology Institute, American Oceans Campaign, News Release December 14, 1998, Scraping Bottom.

Marine Conservation Biology Institute and the Cousteau Society, February 16, 2000. A Call for Presidential Action: Safeguarding America's Seas: Establishing a National System of Marine Protected Areas, <http://www.mcibi.org>.

Marqu ez, Ren e, Juan D az, Manuel S anchez, Patrick Burchfield, Alma Leo, Migual Crasco, Jaime Pena, Carmen Jim enez, Rafael Bravo, Results of the Kemp's Ridley Nesting Beach Conservation Efforts in Mexico, *Marine Turtle Newsletter*, No. 85: 2-4.

National Marine Fisheries Service, 1999. Epperly, Shery and Wendy G. Teas, Evaluation of TED Opening Dimensions Relative to Size of Turtles Stranding in the Western North Atlantic, 31 pp.

National Marine Fisheries Service, 1996. A Report of the Turtle Expert Working Group: Results of a Series of Deliberations Held in Miami, Florida, June 1995-June 1996

National Marine Fisheries Service Press Release, April 13, 1999.

National Marine Fisheries Service Press Release, May 6, 1999.

National Research Council, 1998, Sustaining Marine Fisheries.

National Research Council, 1990. Decline of the Sea Turtles: Causes and Prevention, National Academy Press, Washington DC.

Plotkin, P. 1999 Resolutions of the Participants at the 19th Annual Symposium on Sea Turtle Biology and Conservation. *Marine Turtle Newsletter* No 85: 20-24

Renaud, Maurice L., 1995 Movements and Submergence Patterns of Kemp's Ridley Sea Turtles (*Lepidochelys kempii*). *Journal of Herpetology*, Vol. 29, No 3: 370-374.

Renaud, Maurice L., James A. Carpenter, Jo A. Williams, and Andre M. Landry, Jr. 1996 Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) Tracked by Satellite Telemetry from Louisiana to Nesting Beach at Rancho Nuevo, Tamaulipas, Mexico. *Chelonian Conservation and Biology*, Volume 2, No. 1.

Shaver, D. J. 1999 Padre Island National Seashore Kemp's Ridley Sea Turtle Project and Texas Sea Turtle Strandings 1998 Report. Department of the Interior, U. S. Geological Survey, 58 pp.

Texas Sea Turtle and Stranding Network, Weekly Narratives.

USFWS and NMFS. 1992. Recovery Plan for the Kemp's Ridley Sea Turtle. Department of Commerce, National Marine Fisheries Service, 40 pp.

U.S. Sea Turtle Stranding Network, Weekly Narratives.

# The Clouded Leopard: The "Littlest" Big Cat

---

**Kirk Johnson**

Turkish World Outreach, 508 Fruitvale Court, Grand Junction, CO 81504; TWOKirk@onlinecol.com

## **Abstract**

*Over the past one hundred years, environments in central and southern Asia have seen isolated populations of large felids such as the tiger (*Panthera tigris*), the Asiatic lion (*Panthera leo persica*), and the Asiatic cheetah (*Acinonyx jubatus*), extirpated from over 90 percent of their former range. These cats were endemic in diverse habitats until the advent of firearms led to their extirpation over large areas by 1900. The clouded leopard (*Neofelis nebulosa*), the smallest "big cat," has in recent decades suffered extensive losses in southeast Asia and China due to habitat loss and poaching. Immunological studies place *Neofelis* within the larger Pantherine sub-family. Very few studies have been attempted of the clouded leopard in the wild due to inaccessibility of the predator's tropical forest habitat. Zoos around the world have had difficulty breeding the felid, and studies are underway to determine stress factors in captive populations. The protection of habitat in Borneo and elsewhere in southeast Asia is likely to be the most significant factor in maintaining viable wild populations.*

---

## **Decline of large Asian felids**

Over the past hundred years, large felids such as the tiger (*Panthera tigris*), the Asiatic lion (*Panthera leo persica*), and the Asiatic cheetah (*Acinonyx jubatus*), have been extirpated from over 90 percent of their original range across central and southern Asia. The sole remaining population of the Asian cheetah, for example, is in northern Iran and numbers less than 50 individuals, in decline from poaching and a fragmented, degraded habitat (Nowell and Jackson 1996). The smallest big cat, the clouded leopard (*Neofelis nebulosa*) may face a similar fate in some areas of southern Asia, although scientists can only estimate the true extent of the cat's numbers and range (Dinerstein 1998).

## **Range and habits of *Neofelis nebulosa***

Clouded leopards, or "*baghs*," as they are known in Nepal, were thought to have been extirpated in that country until the capture of four individuals in 1987-1988 (Dinerstein 1989). One was even caught raiding chickens in

a village hundreds of miles west of the known limits of the species' range. This is surprising because the last published record for the clouded leopard in Nepal dates from 1863 (Dinerstein 1989). This beautiful cat derives its scientific name, *Neofelis nebulosa*, from the dark cloud-like ellipses, ovals, and swirling stripes that trace upon a background of golden or silvery fur.

The clouded leopard's highly secretive existence in remote tropical forests and its relatively small size (compared to other large felids) has caused it to be largely overlooked by wildlife researchers. Because little field data exists about this predator, opinions differ among researchers whether it spends most of its time in trees or on the ground, and whether it demonstrates nocturnal, diurnal, or crepuscular foraging behaviors (American Zoo and Aquarium Association 1997; Guggisberg 1975). Two remarkable distinguishing characteristics of the clouded leopard are its plush tail (nearly the length of a large male's 94 centimeter-long body) and sharp

canine teeth that can reach 4.5 cm in length, proportionately the longest fangs of any living cat (Nowell and Jackson 1996).

Some researchers have speculated that a kinship may exist between extinct sabertooth cats and the clouded leopard because of the similarity in tooth structure, but no fossil linkage has been shown. The length of the tail (up to 90 cm) might favor the argument that the cat prefers environments where it can maneuver quickly through trees with the tail acting as a balance, performing the same function as that of a monkey's. Research in Thailand and in Borneo has confirmed that clouded leopards hunt fast-moving arboreal monkeys and gibbons (Nowell and Jackson 1996).

## **The morphology of the clouded leopard**

The short-legged and stocky clouded leopard, standing between 45-55 cm at the shoulder, has a build reminiscent of the much larger jaguar (*Panthera onca*). Such a relationship may be more



than just coincidence. Most scientists now class *Neofelis nebulosa* in its own genus within the larger "pantherine" subfamily because of recent DNA studies (Wayne et al. 1989). This grouping includes the *Panthera* genus [tiger (*Panthera tigris*), lion (*Panthera leo*), jaguar, and other big cats such as the snow leopard (*Uncia uncia*), puma (*Felis concolor*), and cheetah]. Other surprising pantherines include the marbled cat (*Pardofelis marmorata*), a miniature "look-alike" of the clouded leopard and the lynx (*Felis lynx*) (Wayne et al. 1989).

### Geographical location and prey base

Researchers note that while the canine teeth of the clouded leopard reach big cat dimensions, there is not a corresponding increase in the size of the skull (Nowell and Jackson 1996). This would suggest that this medium-sized hunter is able to successfully fill a large cat role in regions devoid of its larger cousins, the tiger and the leopard. One such location is the island of Borneo in southeast Asia. Researchers such as Alan Rabinowitz of the Wildlife Conservation Society indicate that Borneo may harbor the healthiest populations of clouded leopards in Asia. This may be partly due to the absence of tigers and leopards that sometimes prey on clouded leopards (Nowell and Jackson 1996). Undoubtedly, the fact that Borneo has until recently contained undisturbed habitats with a small human population has aided the cat's cause. Observers have recorded clouded leopards, called in Malay the *machan dahan* (tree tiger), taking relatively large prey such as muntjac barking deer (*Muntiacus muntjak*) and wild boar (*Sus salvanius*) (Guggisberg 1975).

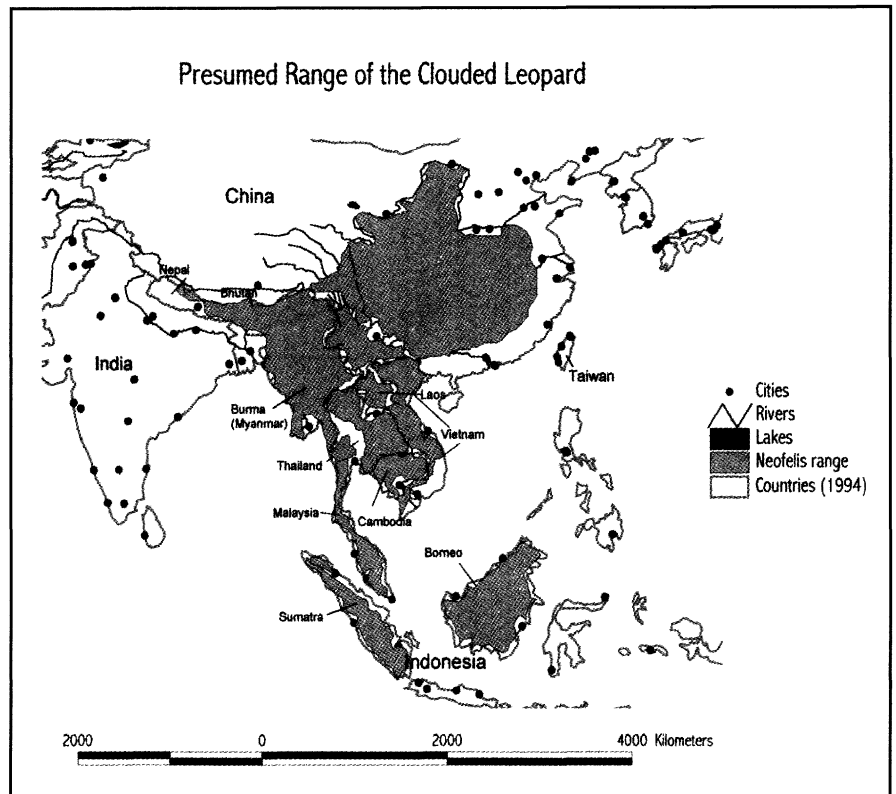


Figure 1. The presumed range of the clouded leopard stretches throughout Southeast Asia, China, and into the Indian subcontinent. Courtesy of the author, adapted from Nowell and Jackson (1996).

The clouded leopard exhibits characteristics distinctive of other large pantherines: long lifespan, relatively large size (weighing 11-22 kg on average in the wild), pre-dating species at least half its own body weight, and broad territory ranges with correspondingly low population densities (Nowell and Jackson 1996). Researchers also speculate that on Borneo the *machan dahan* may be less nocturnal than in other areas of its range where tigers and leopards are present. Dinerstein (1989) noted that in habitats where the cat spent most of its time on the ground, its natural enemies, the tiger and leopard, might be absent.

### Clouded leopard research in the wild

Tigers and leopards exist in the region where Dinerstein and his colleagues released a captured sub-adult male with a radio-collar into

the Churia Hills of Nepal's Royal Chitwan National Park in 1988. They were able to track him for two weeks before losing the signal, marking the first time biologists had ever electronically monitored the movements of a clouded leopard in the wild (Dinerstein 1989). According to Dinerstein, the Smithsonian Institution in cooperation with the government of Nepal maintains the "Terai Ecology Camp" in Sauraha, within Royal Chitwan National Park.

Dinerstein was director of the Ecology Camp Project from 1984-88, and still visits the Ecology Camp twice a year (Dinerstein 1998, pers. comm). Nepalese biologists are beginning to restore degraded habitat around the park, with the goal of restoring up to 430 square kilometers as a buffer zone for wildlife around the park. Additionally, local villagers within the buffer zone are now earning much

needed income from managing the area for ecotourism and turning public opinion against poaching (Dinerstein 1998, pers. comm).

Two other clouded leopard cubs had been captured by villagers in the Terai lowland forests of eastern Nepal in 1987 and turned over to the Kathmandu Zoo (Dinerstein 1998, pers. comm). The clouded leopard has been seen traveling on roads within logged forests in Borneo, and lives in relatively open, dry tropical forests in central Burma (Dinerstein 1989). Such adaptability, combined with studies of captive populations in zoos, may be critical in saving declining populations of this carnivore over the long term.

### **Neofelis research in captivity**

Zoos and other volunteer organizations have discovered that in captivity the clouded leopard often exhibits destructive stress-related behaviors, such as males killing female mates, or individuals plucking most of the fur from their tails through excessive grooming (Bratcher 1998, pers. comm). Some of these behaviors may also be traceable to inbreeding.

The American Association of Zoos and Aquariums (AZA) "species survival plan" states that all captive clouded leopard populations can be traced back to only four different bloodlines. The captive gene pool originated with a small group of clouded leopards termed the "Bawdy line" in Florida that seeded all

captive populations worldwide (Ziegler 1998, pers. comm).

The Carnivore Preservation Trust (CPT), a volunteer grassroots organization located in Pittsboro, North Carolina, houses approximately 260 rare and endangered animals at their sixty-acre facility, with the aim of preserving viable populations of rare mammalian species and restoring them to their original ecosystems (The Carnivore Preservation Trust 1998). They have ongoing work in several developing countries, including prime clouded leopard habitat in Laos.

CPT and "Bolisat Phathana Khet Phoudoi" (BPKP), a Lao State Enterprise Company, have created a 3,000 hectare (7,500 acre) center close to three newly protected areas in the Laotian provinces of Bolikhamxay and Khammaoune (Carnivore Preservation Trust 1998). These areas of high diversity are still virtually unsurveyed, and recently several new vertebrate species were discovered. CPT

hopes to create a research facility in cooperation with BPKP and the Laotian government that will integrate conservation benefits not only for the clouded leopard, tiger, and other endangered wildlife, but also provide direct economic and educational benefits to the local people. As of late 1999, work in Laos was still continuing in spite of the rather uncertain political situation (M. Tunstall 1999, pers. comm).

Due to extreme poverty and black market trading, uncontrolled poaching has decimated wildlife populations, including those of the clouded leopard. An education program to train Laotian nationals in domestic animal husbandry techniques is being implemented to offset the excessive consumption of local wildlife. Laotians are also being trained by CPT staff in species survey methods, captive breeding programs for rare species, and sustainable conservation projects (Carnivore Preservation Trust 1998).



**Figure 2. Captive clouded leopards at rest. Photo courtesy of the Carnivore Preservation Trust.**

## Captive breeding of clouded leopards

Clouded leopards are considered one of the most difficult large cats to breed in zoological facilities (AZA 1997). Two zoos with captive breeding programs for *Neofelis* in the United States have focused on artificial insemination experiments rather than natural reproduction due to such difficulties in breeding. Such difficulties can include a pronounced sexual dimorphism: males in zoos sometimes exceed 27 kg, more than double the weight of an average female. Such pronounced size differences can potentially endanger the females when mating (Bratcher 1998, pers. comm).

In 1992, an artificially inseminated female clouded leopard at the Nashville Zoo bore a pair of cubs; the male of the litter still resides at the zoo. The zoo terminated its artificial insemination program in 1994 due to a lack of funding (Sara Bratcher 1998, pers. comm). The National Zoo in Washington, D.C., maintains a Conservation and Research Center (CRC) in Front Royal, Virginia, that currently conducts research on clouded leopards.

In April of 1998 a fecal hormone study on the clouded leopard commenced to determine the levels of stress hormones present in the droppings of clouded leopards (Lang 1998, pers. comm). One hypothesis under investigation is that clouded leopards exposed to the viewing public may exhibit higher levels of stress than those not exposed to humans. Up to twenty clouded leopards in two control groups may be compared using various hormone dosages; one control group may include those cats most accustomed to human contact, versus highly stressed cats that shy away from people. Another purpose of the study is to determine the effect of hormone application on female

clouded leopards receptive to breeding.

If detrimental levels of stress hormones can be determined in captive populations, similar studies may be beneficial in analyzing what effect the stress of logging and poaching has on endangered clouded leopard breeding populations in the wild (Lang 1998, pers. comm). Due to limited funds, however, the National Zoo also terminated an earlier captive breeding program (Lang 1998, pers. comm).

## The future of *Neofelis* in southern Asia

While captive breeding programs may yield valuable clues about clouded leopard behaviors, efforts must be made to curb poaching and habitat destruction in key southern Asian tropical forests. Clouded leopard populations are thought to be declining because of the high numbers of pelts for sale at fur markets and fewer sightings of the cats by native peoples. *Neofelis* pelts are worth over \$2,000 on the black market in southeast Asia (American Zoo and Aquarium Association 1997). In China, where the clouded leopard was widely distributed south of the Yangtze River, the most common big cat pelts sold on the black market are clouded leopards (Nowell and Jackson 1996). The main customers are Taiwanese, which may account for the probable extinction of a *Neofelis* subspecies on that island.

Tropical forests throughout southern Asia are in peril due to destructive logging practices and rapid population growth. If large areas of intact forest can be preserved, healthy populations of the clouded leopard may have a future into the next century (Dinerstein 1998, pers. comm). The devastating poaching of ungulate species in southeast Asia may be curbed with educational programs in villages

that warn of the loss of native wildlife, and include the introduction of economically viable alternative employment, including the raising of livestock. Detailed scientific surveys are also needed to pinpoint the location and size of scattered clouded leopard populations in various south Asian countries. If educational programs can succeed, and forests within Laos and Borneo are protected, the *bagh* may long remain in its niche as the "littlest" big cat.

## Literature cited

- American Zoo and Aquarium Association. 1997. "Clouded Leopard 1995 Report," web page. (<http://www.aza.org/aza/ssp/clodleo.html>).
- Bratcher, Sara. 1998. Carnivore Keeper, Nashville, TN, Zoo: personal communication.
- Carnivore Preservation Trust. 1998. "CPT Lao Project Summary." Pittsboro, NC.
- Dinerstein, Eric. 1998. Wildlife Biologist, World Wildlife Fund: personal communication.
- Dinerstein, Eric. 1989. "The Clouded Leopard in Nepal." *Oryx* 23(4): 199-201.
- Guggisberg, C.A.W. 1975. "Clouded Leopard," pp. 125-130 in *Wild Cats of the World*. New York: Taplinger Publishing Company.
- Lang, Ken. 1998. Carnivore Keeper, Conservation and Research Center (National Zoo), Ft. Royal, VA: personal communication.
- Nowell, Kristin, and Peter Jackson. 1996. "Clouded Leopard," pp. 66-69 in *Wild Cats: Status Survey and Conservation Action Plan*. Gland, Switzerland: The World Conservation Union.
- Tunstall, Margaret. 1999 (December). Director, Carnivore Preservation Trust, Pittsboro, NC: personal communication.
- Wayne, Robert et al. 1989. "Molecular and Biochemical Evolution of the Carnivora," pp. 465-494 in *Carnivore Behavior, Ecology and Evolution*, ed., John L. Gittleman. Ithaca, New York: Cornell University Press.
- Ziegler, Sharon. 1998. Former General Curator, Carnivore Preservation Trust, Pittsboro, NC: personal communication.

# Conservation Spotlight

## The Spix's Macaw

---

### Natasha Schischakin

Conservation Coordinator, Houston Zoo Conservation and Research Office, Houston Zoological Gardens, 1513 North MacGregor, Houston, Texas 77030; phone/Fax: 713-284-1386; conservation@prodigy.net

### Abstract

*The Spix's Macaw (Cyanopsitta spixii) is one of the world's most endangered species with one remaining in the wild and a captive population of only 60 birds. These population numbers, although still critically endangered, actually signify progress in the last 10 years of conservation efforts to recover this species. The program, coordinated by the Brazilian Institute for the Environment and Natural Renewable Resources (IBAMA), is becoming a model for international public and private sector partnership and includes the participation of government officials, ornithologists, zoo specialists and the holders of the birds in captivity. This article briefly describes species' status and recovery efforts, which include field research, community-based outreach, habitat restoration, captive-breeding and reintroduction.*

---

Last fall, the Houston Zoo (Houston, Texas) hosted a symposium and workshop to design conservation strategies for the Spix's macaw (*Cyanopsitta spixii*), one of the world's most critically endangered psittacines. This is a priority conservation species for the American Zoo and Aquarium Association (AZA) Brazil Conservation Action Partnership (BCAP), which has provided technical support and funding for this international effort. Participants from seven countries met to organize a multi-faceted international conservation strategy for this species. The symposium reviewed the last ten years of the Spix's macaw recovery program, while the workshop focused on the management of the captive population, which is coordinated through the Houston Zoo.

The Spix's Macaw is endemic to an arid region of savanna scrubland in Northeastern Brazil known as the "caatinga." By the early 1900's, less than sixty birds were left in the wild. The loss of habitat from five centuries of human colonization likely con-

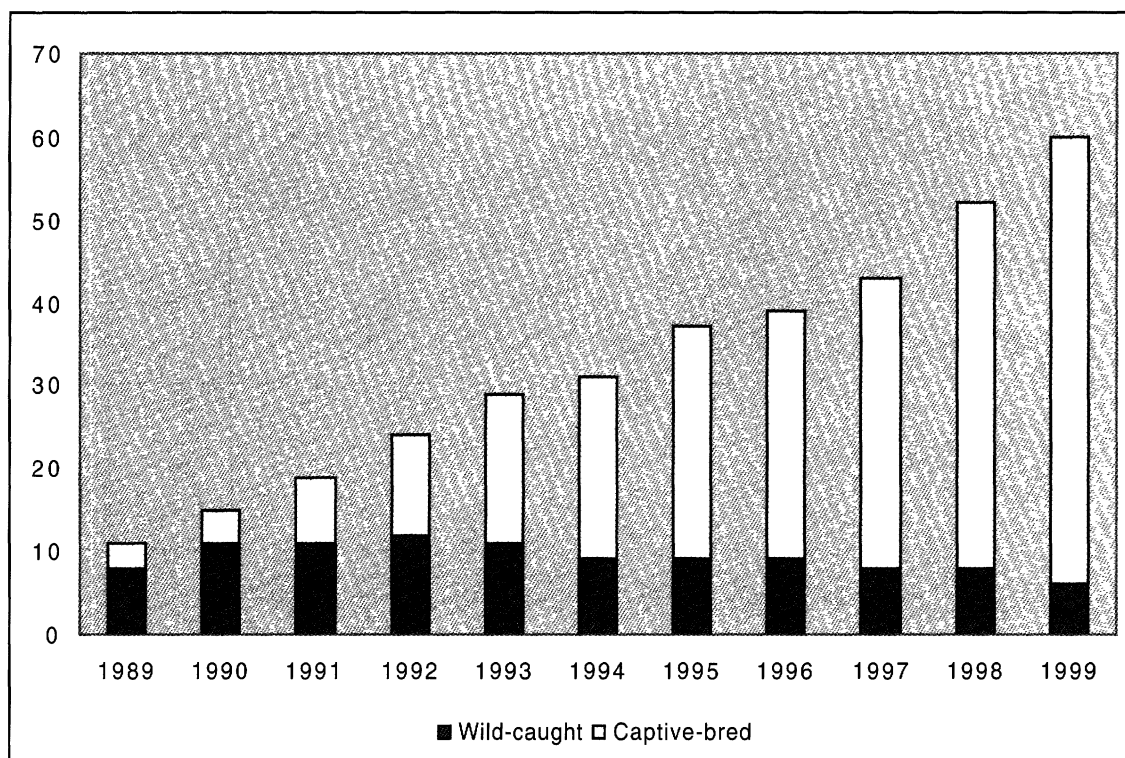
tributed to its decline (Juniper and Yamashita 1991). Its rarity and beauty made this small blue macaw a prized species for collectors, creating a demand in the illegal wild bird trade (both national and international) that eventually decimated this vulnerable population. By 1989, the species was believed to be extinct in the wild, and only 11 birds were confirmed in captivity worldwide (although more were rumored to exist). Some ornithologists considered the last few captive birds mere relics and the species extinct. The wildlife authorities of the Brazilian Institute for the Environment and Natural Renewable Resources (IBAMA),



Figure 1. Spix's Macaw in captivity. Photographer Natasha Schischakin.

---

Information for Conservation Spotlight is provided by the American Zoo and Aquarium Association.



**Figure 2. Spix's Macaw numbers from 1989 to 1999. Data from Schischakin, N. 1999. The Spix's Macaw (*Cyanopsitta spixii*) Studbook and Population Management Plan of the IBAMA Permanent Committee for the Recovery of the Spix's Macaw. Houston Zoological Gardens, Houston.**

however, decided to attempt a last minute conservation initiative that resulted in formation of the Permanent Committee for the Recovery of the Spix's Macaw. The mission of this diverse group, which included government officials, ornithologists, zoo specialists, as well as national and international holders of birds in captivity, was to save the Spix's macaw. The result has been a program that is becoming a model of international public and private sector partnership.

In 1990, a single Spix's Macaw was re-discovered in the wild, adding a field component to the recovery program. Extensive searches of the region for other Spix's Macaws proved unsuccessful. Studying this single bird, field biologists collected critically important data of previously unknown details about its range, diet, habitat utilization and seasonal patterns. From DNA extracted from molted feathers, scientists determined that it was a male.

Of the birds then in captivity, a female that had been captured as an adult (the last known bird taken from the wild) was chosen as a viable potential mate for the last wild male. In 1995, after acclimatization in a newly constructed reintroduction facility, she was released. She readapted quickly to the wild and eventually joined the male. Two months later, she disappeared and the cause was unknown until recently, when the field team received credible evidence that she died in a collision with a high-tension power line that crosses the area.

Despite the loss of this female, scientists are testing reintroduction methods utilizing the Illiger's Macaw (*Ara maracana*) as a model species. The first project tested the avicultural technique of egg fostering. In a futile attempt, the solitary male paired with an Illiger's macaw, a species that also occurs in this region. As the Spix's and Illiger's Macaw pair at-

tempts to nest every year, the non-viable eggs from their nest were replaced with viable eggs from a nearby Illiger's Macaw nest. They proved to be excellent foster parents, successfully raising and fledging the two Illiger's Macaw chicks (Barros 1999). If the reproductive cycles between this pair and a captive Spix's Macaw pair can be synchronized, the fostering of Spix's Macaws to the wild might be an option. The second project used captive-bred Illiger's Macaws from Loro Parque, Spain, to evaluate reintroduction techniques of captive-bred birds to this region. After health screening, quarantine and acclimatization, nine birds were released. Seven of these macaws have survived and are doing well a year after release to the wild. These projects are providing important data on psittacine reintroduction techniques that will be used to optimize the survivability of captive-bred, reintroduced Spix's Macaws to the wild.



Figure 3. Spix's Macaw chicks hatched in captivity. Photograph courtesy of Birds International, Inc.

Another essential component of the field program in this economically distressed region is a community-based outreach program that incorporates local needs with the conservation effort. Projects have included the building of rural schoolhouses, a hunger relief campaign during a severe drought, range and livestock management extension courses, and even the restoration of a century old theater (now the cultural centerpiece of the nearby town of Curaçá). The Spix's Macaw now symbolizes the region, making its capture a cultural taboo. The community support for the program provides a security net for the species that could never be achieved with guards or fences.

With only a single bird in the wild, the recovery of the Spix's Macaw has always depended on the success or failure of the captive breeding program. Through collaboration among program participants, the population has steadily increased to 60 birds of which 54 are captive-hatched (Schischakin 1999). The program is administered as a single global population for genetic and demographic management and to facilitate transfers of birds between breeding

facilities located in Brazil, Spain, Switzerland and the Philippines. As the breeding program is reaching sustainability, it is now possible to utilize offspring for reintroduction purposes. The lengthy process of re-establishing birds in the wild will begin this year with the transfer of five captive-bred birds to the reintroduction facility for eventual release. This milestone in the conservation program is reason for cautious optimism for the recovery of a species that 10 years ago, was presumed lost.

For additional information contact: Natasha Schischakin, Conservation Coordinator, Conservation and Research Office, Houston Zoo, 1513 N. MacGregor, Houston, Texas, 77030, USA; telephone and fax 713-284-1386; email [conservation@prodigy.net](mailto:conservation@prodigy.net) or Maria Iolita Bampi, IBAMA, SAIN – Av. L4 Norte, Brasilia, DF, 70.800-200, Brasil; telephone: 55-61-225-8150 and fax: 55-61-316-1067; email [mbampi@sede.ibama.gov.br](mailto:mbampi@sede.ibama.gov.br).

#### Acknowledgements

Major funding for this program has been provided by the Brazilian Institute for the Environment and Natural

Renewable Resources (IBAMA) and the Fundacion Loro Parque. Support is also provided by the Houston Zoo, Ó Boticario Foundation; ASHOKA Foundation; Herbert Levy Institute; WWF-Brazil; Birds International, Inc.; BirdLife International; AZA Brazil Conservation Action Partnership; Fundação Parque Zoológico de São Paulo; Santa Ana Zoo and many individuals involved in the program.

#### Literature cited

- Barros, Y. M. (1999) Conservation and Management of Spix's Macaw: Successful Experience of Parental Care in a Hybrid Couple. Book of Abstracts, VI Neotropical Ornithological Congress, October 4-10, 1999. Monterrey and Saltillo, Mexico.
- Collar, N.J., Gonzaga, L.P., Krabbe, N., Madroño-Nieto, L.G., Naranjo, T.A., Parker & Wege, D.C. (1992) Threatened birds of the Americas. The ICBP/IUCN Red Data Book, Cambridge: ICBP.
- Juniper, A.T. and Yamashita, C. (1991) The habitat and status of Spix's Macaw *Cyanopsitta spixii*. *Bird Conservation International* 1: 1-9.
- Schischakin, N. (1999) The Spix's Macaw (*Cyanopsitta spixii*) Studbook and Population Management Plan of the IBAMA Permanent Committee for the Recovery of the Spix's Macaw. Houston Zoological Gardens, Houston.

# *News from Zoos*

## **Zoo Gets Funds to Study Effects of Captivity on Threatened Hawaiian Birds**

The Honolulu Zoological Society received a \$7,241 grant from the Institute of Museum and Library Sciences for research examining the role of stress as a compromising factor in the captive propagation of Hawaiian honeycreepers. The 41 existing endemic honeycreeper species are all endangered, scarce or declining, and the results of this research will provide vital information on conservation strategies for Hawaii's native forest birds. Captive management is one of the conservation strategies identified by the United States Fish and Wildlife Service, but is not a viable option at this time. Six U.S. zoos hold at least one species (apapane, amakihi or i'iwi), but only five pairs have produced chicks, most of which did not survive beyond fledging. In addition, the captive population has been susceptible to Aspergillus, a stress-related infection.

## **Domestic House Cat is Surrogate Mother to Endangered Wildcat**

In what is being hailed as a breakthrough in the effort to save endangered species, a domestic house cat gave birth to an endangered African wildcat after being implanted with a frozen embryo. It marked the first time that two major techniques of reproductive science were combined to produce an animal: the freezing, then thawing, of an embryo, and the transfer of the embryo to a surrogate mother of a different species. The key breakthrough is the ability to use animals that are commonly available, such as house cats, as surrogate mothers for endangered animals that have been preserved through the freezing of embryos.

The kitten, named Jazz, was born at the Audubon Institute Center for Research of Endangered Species in New Orleans. The institute houses a "frozen zoo" of embryos from about 100 species of animals which are stored in cylinders of liquid nitrogen that are chilled to minus 373 degrees Fahrenheit. The wildcat's birth was the result of work by Dr. Betsy Dresser, the senior vice president for research at the institute, and Dr. C. Earle Pope, the institute's senior scientist.

## **Aquarium Comes to the Rescue Of Stranded Turtles**

An unprecedented number of endangered sea turtles washed ashore on Cape Cod beaches this winter, requiring emergency treatment from veterinarians and biologists from the New England Aquarium and Wellfleet Bay Sanctuary. Due to space limitations at those facilities, some turtles were flown to Florida by a Coast Guard jet, and distributed to other rehabilitation sites there. The turtles were mainly Kemp's ridley sea turtles, the rarest of all sea turtles, but a few green sea turtles and loggerhead sea turtles were recovered as well.

Every year, a number of sea turtles strand on the Cape Cod beaches. This occurs when the turtles get swept north with the warm Gulf Stream and then become trapped when the water quickly turns cold in early winter. Frigid water temperatures reduce the turtles' body temperatures below normal, and they wash ashore in a condition called "cold-stunned". During the 1998-99 season, a total of 25 sea turtles were found stranded on Cape Cod, but at only one week into the 1999-00 season, more than 100 cold-stunned turtles had already been found.

*Information for News from Zoos is provided by the American Zoo and Aquarium Association.*

# News & Events

---

## Galapagos Implements Conservation Law

The government of Ecuador has approved regulations to implement a special conservation law for the Galapagos Islands passed 2 years ago. The Galapagos are home to one of the highest concentrations of endemic species in the world. The new law, crafted in part by World Wildlife Fund, the Charles Darwin Foundation, and other conservation organizations, creates a marine sanctuary that bans industrial fishing around the islands out to a 40-miles. The law uses proceeds from tourism to support conservation. The law will also establish an inspection and quarantine system and tighten restrictions on tourism and immigration to the islands. More information on the Galapagos Islands can be found at [www.worldwildlife.org](http://www.worldwildlife.org).

## Biodiversity Support Program Online

The Biodiversity Support Program (BSP), a USAID-funded consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute, announces its new Web site, <http://BSPonline.org>. The site highlights findings from BSP's 12-plus years of work to identify the conditions necessary for biodiversity conservation. The site includes overviews of the regional and crosscutting programs and an electronic library of downloadable BSP publications, which will expand in coming months.

## Symposium on Biodiversity and Sprawl

The American Museum of Natural History's Spring Symposium "Na-

ture in Fragments: The Legacy of Urban Sprawl" concerns the effects of sprawl on the environment at the national level. The conference will be held April 13 and 14 at the Museum in New York, NY. This is the first time the connection between biodiversity and sprawl will be addressed in such a forum. The program will explore in detail how to integrate biodiversity conservation with all levels of decision making. For more information, please call 212/769-5200 and refer to program code SPRAWL2K.

---

*Information for News & Events is courtesy of the Biological Conservation Newsletter and the Society for Conservation Biology's bulletin board. Announcements for News & Events are welcomed.*

---

---

# Endangered Species UPDATE

Non-Profit  
Organization  
U.S. POSTAGE  
PAID  
Ann Arbor, MI  
Permit No. 144

---

School of Natural Resources and Environment  
The University of Michigan  
Ann Arbor, MI 48109-1115