Complete
In order to ensure that the U.S. List of Endangered and Threatened Wildlife and Plants reflects the true biological status of these species, the Endangered Species Act requires the Fish and Wildlife Service to conduct a review of all listed species at least once every 5 years. Accordingly, the Service has published a notice (F.R. 12/8/83) announcing the initiation of a review on all plants and animals added to the list in 1978. Any information that might document the need to change the classification under the Act of any of these species is requested, and should be sent to the appropriate office by April 6, 1984 (see BULLETIN page 2 for addresses). The names of those species under current review are included in the notice.

The Mona ground iguana (Cyclura stejnegeri) and Texas wild-rice (Zizania texana) are among the 21 animals and 18 plants whose listed status is now under review.

Recovery Plans Approved for Five Mullusk

Although mollusks are not the most famous examples of rare wildlife, there are 34 snails and clams on the U.S. List of Endangered and Threatened Species, and many more are candidates for future listing. Among the recovery plans that have been approved during 1983 for listed species are five new plans for mollusks—four snails and one clam or mussel. A brief summary of each plan follows:

The Chittenango ovate amber snail (Succinea chittenangoensis) is a terrestrial mollusk known only from the immediate vicinity of Chittenango Falls in New York State. Its common name refers to its habitat and to its ovate, amber-colored shell. S. chittenangoensis prefers cool, sunlit areas of lush herbaceous growth within the saturated spray zone of the falls, but it is found also in vegetation occurring in a nearby spring-fed area. As a Pleistocene relict, S. chittenangoensis is able to survive within its restricted range at the falls because the paraglacial habitat has characteristics that mimic the cool, moist conditions existing thousands of years ago when the snail was more widespread. It is particularly vulnerable to even subtle modifications in its environment, whether natural or human-related.

S. chittenangoensis was said to be “in great abundance” in 1905 when it was first collected. Although recent surveys have not yielded a firm population estimate, it has apparently experienced a significant decline within its restricted habitat. In 1977, the New York Depart-

Adult specimens of the Chittenango ovate amber snail have shells that are gently convex, laterally compressed, and about 21 mm in length.
the San Francisco Bay National Wildlife Refuge, in cooperation with the San Francisco Bay Bird Observatory, have initiated a long-term color banding study of the California clapper rail (Rallus longirostris obsoletus) in San Francisco Bay. The objectives of this study are to determine to what extent rails move between various marshes around the bay and to better define population trends of this subspecies. Clapper rails are being captured from airboats with long-handled nets during daytime high tides. Once captured, each rail is fitted with a unique combination of color bands and a variety of physical measurements are taken. A total of 95 individuals have been captured in 5 days afield from a total estimated population of 4,000-6,000.

A peregrine falcon (Falco peregrinus) which landed on a fishing boat 1,000 miles southeast of Hawaii recently had apparently been blown out to sea by a storm. It was cared for at the Honolulu Zoo and subsequently shipped to California for release by a member of the Peregrine Falcon Recovery Team.

National fish and wildlife refuge staff members participated in regulated AMTRACK (armored mechanized troop carrier) maneuvers at Kaneohe Marine Corps Air Station, O'ahu, Hawai'i, on November 7, 1983. The purpose of the exercise was to improve nesting habitat for Hawaiian stilts (Himantopus puniceus) in the Nuupia ponds complex. Four AMTRACKS were used to open dense vegetation and get water to nesting areas.

A subject of an investigation that originated in San Francisco regarding the take of an Endangered San Francisco garter snake has agreed to pay fines totalling $2,000.

Last October, a cooperative 3-year life history study of the Moapa dace (Moapa coriacea) was initiated with the Seattle Research Laboratory. Research efforts are aimed at providing essential information for carrying out the Moapa Dace Recovery Plan. This month, we established a field station at the Moapa National Wildlife Refuge in southern Nevada and completed a detailed study plan. We will compare the aquatic habitat that supports few dace to that habitat which supports a higher number. Our objective is to determine the environmental conditions that may restrict Moapa dace proliferation on the refuge.

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populations within a 20-mile radius of the original population.

Based on these findings, the Service reevaluated the jeopardy opinion. The new data indicates that the species is more abundant and widely distributed than previously known. Increased abundance does not itself reduce the threat to the species, but it does indicate that additional genetic material is available to the population, and it implies that the species may be more successful in existing habitats than earlier believed. A more widespread distribution indicates a more tolerant species, allowing additional options for habitat protection, and reduces the chances of a single catastrophic event eliminating the species. Because of the new data, on September 9, 1983, Region 2 issued a new opinion stating that the proposed action is not likely to jeopardize the survival of the species.

The Attwater's Greater Prairie Chicken Recovery Plan has been approved by the Regional Director. Recovery plans are directed toward implementing intensive management of coastal prairie habitat for this prairie chicken (Tympanuchus cupido attwateri). Habitat loss continues to be the main threat.

The highest whooping crane (Grus americana) count for the current wintering populations in Texas and New Mexico are 75 and 27, respectively. This represents an increase of 2 whoopers for the Wood Buffalo/Aransas population and 13 for the Grays Lake/Bosque del Apache flock over the high count in the winter of 1982/83. (Another 37 whoopers are in captivity, most of them comprising the Service's Patuxent Wildlife Research Center captive propagation flock.)

It appears that one of the wild female ocelots (Felis pardalis) being radio-tracked on Laguna Atascosa National Wildlife Refuge may have produced young in early November 1983. If so, this would be her third litter in 13 months. Ocelot #30 (the number of her radio collar) was first captured and radio-collared on October 1, 1982, and was observed to be nursing at the time. The fact that she was caring for young was confirmed when her female kitten was captured 18 days later. Female #30 has been recaptured a number of times and was observed to be nursing again in early June 1983; however, the presence of a kitten was never confirmed. Recaptures in November 1983 showed her to be nursing for yet a third time.

The ongoing endangered feline study on Laguna Atascosa NWR resulted in the capture of another female ocelot on December 11, 1983, bringing the total number of ocelots being radio-tracked on the refuge to three males and five females. Two additional males have been captured on private lands. As yet, the study has not been able to confirm the presence of jaguarundi (Felis yagouaroundi cacomiliti) in the area. Innovative means of locating and confirming the presence of jaguarundi are being explored.

Region 3—Regional endangered species staff members met recently with representatives of Minnesota, Wisconsin, Iowa, and the University of Minnesota's raptor rehabilitation project to discuss next year's releases of peregrine falcons. This will be the third year of the peregrine release program in Region 3.

Region 4—Personnel of the Jackson Endangered Species Field Office observed the Alabama cavefish (Speo- platyrhinus pullus) in a cave in northwestern Alabama on October 26 and November 17, 1983. This species, which had not been sighted since 1970, is the sole representative of its genus and is known from only the one cave. Prior to the recent sightings, concern was developing that chemical pollution of ground water due to spraying of pesticides on cotton fields overlying the cave may have led to the extinction of the species. On the November 17 visit, 10 individuals were observed, but no specimens were collected. No more than four individuals had previously been sighted at any one time.

A Jacksonville Endangered Species Field Office representative attended a symposium on the management of Torrey housefish (Florida torreya) on November 29. The symposium was sponsored by Florida's Department of Natural Resources (Division of Recreation and Parks). Topics discussed included the plant's current status, propagation techniques, techniques for disease control, Federal protection under the Endangered Species Act, and management procedures.

On November 20, 1983, a manatee (Trichechus manatus) was born at the Miami Seaquarium. The male calf was born after 44 hours of labor in the breaching position. (In aquatic mammals, the tail normally appears first.) It is the fourth time that this particular manatee, Julia, has given birth. The calf weighed in at 75 pounds and was 4 feet, 3 inches long. There are three other lactating female manatees at the Seaquarium with older calves, and they act as nursemaids to the newest addition.

Region 5—The Chesapeake Bay Bald Eagle Recovery Team met recently in Wakefield, Virginia. Among the topics discussed were: the current status of Caledon State Park (Virginia) and its beneficial effects on the bald eagle; the 1983-1984 eagle survey and banding work; the 5-year review on the status of the bald eagle; and briefings from the U.S. Fish and Wildlife Service (FWRS), a private entity that disseminates publications for a number of U.S. Fish and Wildlife Service programs under government contract, is now being operated by a new contractor, Informatics General Corporation. New orders should be addressed to the Fish and Wildlife Reference Service, 1776 E. Jefferson Street, 4th Floor, Rockville, Maryland 20852, or call collect at 301/468-1737. Information on which documents are available and on fees will be included in a quarterly FWRS newsletter, which will be sent free to those requesting it. Orders placed with the previous contractor will be forwarded to the new contractor.

The FWRS information retrieval system selectively covers the published and unpublished research reports resulting from the Endangered Species Program (including recovery plans), Cooperative Fish and Wildlife Research Units, Federal Aid in Fish and Wildlife Restoration Program (Pittman-Robertson and Dingell-Johnson Acts), and Anadromous Sport Fishing Conservation Program.

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Tax Check-off Funds Massachusetts Non-game and Endangered Species Program

by Bradford G. Blodget, Assistant Director for Nongame & Endangered Species Massachusetts Division of Fisheries & Wildlife

The Massachusetts Nongame and Endangered Species Program began in 1977; later, in 1979, the Massachusetts Division of Fisheries and Wildlife signed a Section 6 Cooperative Agreement with the U.S. Fish and Wildlife Service. The program is organized into three major parts: (1) Administration and Coordination, (2) Research and Management, and (3) Information and Education. Part 1 covers species reporting and documentation, permitting operations, monitoring of significant legislation, maintenance of listings on endangered, threatened, and other species for special consideration, and commenting on Federal rulemakings. Part 2 includes studies on recovery of endangered species, bald eagle restoration, Plymouth red-bellied turtle research, and status investigations of State-listed species. Preparation of articles, news, releases, and a slide presentation covering the program are included in Part 3.

In July 1983, the Massachusetts Natural Heritage Program, which had been operated since 1978 by The Nature Conservancy under contract to the Massachusetts Department of Environmental Management, was transferred into the Division. The Natural Heritage Program has developed an inventory and data storage system for records of uncommon and rare wildlife and wild plants in Massachusetts. In addition, the program services other agencies, private organizations, and citizens requesting technical assistance in environmental impact studies, assists in the planning stages of greenbelts and parks, and helps develop land management plans. The Natural Heritage Program is a logical extension of our own program, and will now be operated as a unit within it.

The long-term funding outlook for the Massachusetts Nongame and Endangered Species Program brightened on July 26, 1983, when Governor Michael Dukakis signed a law to set up a non-game wildlife income-tax checkoff system. It has been estimated that annual revenues from the checkoff will be about one-half million dollars. The priorities for funding will include bald eagle and Plymouth red-bellied turtle restoration studies, expanded status investigations on State-listed species, addition of a tern management program, and land acquisition.

Listings

In November 1978, a special advisory listing entitled "Nongame Wildlife for Special Consideration in Massachusetts" was published, primarily to serve as a guideline for identifying species thought to warrant special consideration. In addition, it serves as a reference list for other State and Federal agencies, conservation groups, planners, developers, and the general public. The list, which underwent substantial revision in 1983, contains 91 species broken down as endangered (16), threatened (3), State rare (23), State local (39) and peripheral (15). Massachusetts adopts the Federal definitions for the first two terms, but reserves the right to also list additional species occurring in the Commonwealth of Massachusetts that we believe may properly meet the Federal definitions. The terms "State rare," "State local," and "peripheral" include species that do not appear to meet the Federal definition, but happen to be reduced or declining within the Commonwealth.

Among the endangered and threatened species listed by the State are the shortnose sturgeon (not included in our project agreement), three marine turtles, Plymouth red-bellied turtle, bald eagle, peregrine falcon, Eskimo curlew (possibly extinct, but once a regular migrant in Massachusetts), Indiana bat, six cetaceans, and the small-whored pogonia. Threatened species include two marine turtles and the silverling. A companion listing, "Native Wild Plants for Special Consideration," was published in 1983. The Natural Heritage Program staff of five includes a botanist who worked with many groups since 1978 in the preparation of this list. Over 200 native plant species thought to be rare and/or severely declining in the Commonwealth are listed for advisory purposes.

Plymouth Red-bellied Turtle

Investigations into the distribution and the life history of the endemic Plymouth red-bellied turtle (Pseudemys rubriventris bangsi) have been conducted under contract since 1979. To date, 64 ponds have been checked for the presence of this chelonian with 15, all in Plymouth County, found to contain the species.

The total current population of the Plymouth red-bellied turtle is not believed to exceed 250 animals. From 1979...
to 1982, 202 specimens were marked by marginal notching of the shields and, more recently, by yellow disc tags. The largest population in any pond contains about 135 animals with a sex ratio skewed 2:1 in favor of females. Only 40 percent of the females appear to produce eggs in a given year, and the clutch sizes ranged from 10 to 18. The fertility rate is about 83 percent, and about 87 percent of those eggs have been hatching. Most nests are in sandy areas within 200 feet of a pond, often in or along a road. Predation at known nests appears to be a factor, with fox and raccoon implicated as major predators. Recently, a bullfrog was found that had eaten two young turtles approximately 30 mm in width. The turtle’s diet, on the other hand, consists of plant material with the aquatic Myriophyllum most frequently encountered.

A fifth year of basic data collection is planned, to be followed by implementation of management efforts, which may include land acquisition, predator control, public education, translocations, and artificial creation and management of nesting substrate. Also possible are more manipulative techniques of producing eggs, along with the trapping and moving of gravid females to penned laying areas. Nests may then be protected by predator exclosures. Eggs may be collected for laboratory hatching and overwintering for the purpose of “headstarting.”

**Bald Eagle**

The Nongame and Endangered Species Program has coordinated the annual Massachusetts midwinter bald eagle (Haliaeetus leucocephalus) survey since 1977, with statewide totals since 1977 of 13, 15, 7, 26, 19, 13, and 23 recorded. Most wintering eagles in Massachusetts are concentrated about the 25,000-acre Quabbin Reservoir in west-central Massachusetts.

Formal plans for hacking bald eagles were developed in late 1980 with cooperation from the New York Department of Environmental Conservation, but implementation of the project was delayed until 1982. In June 1982, two eaglets were secured from Michigan, with the assistance of the Michigan Department of Natural Resources, and were flown to the hack site. These birds fledged in late July 1982. In 1983, following complex negotiations with the States of New Jersey and Pennsylvania, the Manitoba Department of Natural Resources (Canada), the Canadian Wildlife Service, and the U.S. Fish and Wildlife Service (FWS), four eaglets were gathered in Manitoba and raised at the Quabbin Reservoir hack site. Funding for this project is partially provided by a grant from the Bank of Boston and Massachusetts Audubon Society, and grant money is held by the Commonwealth of Massachusetts in a special trust. The hack site attendant is a graduate student from the University of Massachusetts Cooperative Wildlife Research Unit.

Immediate plans call for the continued hacking of eaglets annually through 1986. The current capacity of six birds per year has never been attained due to the difficulty in securing an adequate supply of birds. It is hoped that with increasing production of bald eagle eggs at the FWS Patuxent Wildlife Research Center in Laurel, Maryland, we will eventually handle six or more birds per year.

**Special Species Investigations**

**Bats**—A literature survey on the Indiana bat (Myotis sodalis) in Massachusetts yielded 10 references. The major reported hibernaculum in Massachusetts was a complex of abandoned emery mines in Chester, Hampshire County, where a maximum of 60 bats was recorded during a visit in 1936. The Division obtained this property in 1974 as a gift, and has established restrictions on entry to the mines. In 1979-1982, late winter checks at this site resulted in an average capture of 177 bats of four species, and two summer checks averaged 422 bats of three species. The most frequent species has been the little brown bat (Myotis lucifugus). Investigations to
Adult great blue herons, a species of State interest

date have not revealed any Indiana bats. Small numbers of the small-footed bat (Myotis leibii leibii), listed as "State rare" for advisory purposes, have been encountered.

Amphibians and Reptiles—The Division is actively participating in a coordinated "Salamander Watch" for collection of data on ambystomatid salamanders. These data are being stored in the Natural Heritage Program computerized inventory system. Ongoing field investigations are also being operated in the hope of locating the bog turtle (Clemmys muhlenbergi), a State rare species.

Great Blue Herons—A statewide inventory of reported great blue heron (Ardea herodias) colonies was initiated in June 1979. During the remainder of that year, 28 active nests were confirmed at six heronries that ranged in size from one to eight nests. Known colonies and active nests have steadily increased through 1983, when 191 active nests were confirmed at 13 heronries that ranged in size from one to 40. Known production was at least 489 young, with a productivity mean of 2.9 young per nest. This startling increase seems to be accountable both to improved knowledge of remote heronries and actual growth of known heronries.

Seabirds—Annually, the Division coordinates a meeting of the Massachusetts Tern-Monitoring Network, a group of individuals and organizations bound together by their concern for colonial-nesting seabirds. Data are collected by the Nongame and Endangered Species Program on colony locations, numbers of pairs at each colony, and general information on production. Data compilation sheets are provided to all participants, who are then mailed the tabulated results. Population data are collected from the network for the common tern (Sterna hirundo hirundo), least tern (Sterna albifrons), roseate tern (Sterna dougallii dougallii), Arctic tern (Sterna paradisaea), and laughing gull (Larus aterricilla), although only the last three are State-listed species. In 1983, data have been collected on the piping plover (Charadrius melodus) from the same network. Although funds are not currently available to actively manage these species, the Nongame and Endangered Species Program seeks to maintain up-to-date data for use should funding become available. Since the early 1970s, private interests have voluntarily taken it upon themselves to post tern colonies, and this involvement has been a credit to the citizens of Massachusetts as well as a great benefit to the seabirds.

The results in 1983 included 7,909 pairs of common terns, 2,112 pairs of least terns, 1,502 pairs of roseate terns, and 18 pairs of Arctic terns. Numbers of both the Arctic and roseate terns have
remained generally stable since 1974; however, the concentrated distribution of the roseate tern is of management concern since 90 percent of the population is concentrated at a single colony. While tern numbers have remained generally stable, the laughing gull population has increased from 140 pairs in 1974 to 930 pairs in 1983. Piping plover survey results were 70+ pairs in 1983. The actual number of pairs is probably higher since the piping plover survey was conducted incidental to the tern survey work. A significant portion of the habitat for colonial beach-nesting seabirds is in public ownership and protected in one fashion or another from development, but pollution, human disturbance, huge gull populations, and other problems are of continuing concern.

The Massachusetts Nongame and Endangered Species Program has developed slowly over the years, but appears to have a bright future role in the conservation of our rich wildlife and plant heritage. We look forward to working with the many fine private conservation organizations here in the Commonwealth that have already established exemplary conservation records.

Regional Briefs
continued from page 3

of discussion at the special IGBC meeting scheduled for February 14, 1983. Since July 15, 1983, 7100 hours have been expended by Federal and State law enforcement officers patrolling backcountry areas in grizzly habitat. During this time, they have contacted 1,940 backcountry users. Numerous warnings and citations have been issued for such violations as dirty camps, unattended fires, hunting in parks, and trespassing in national parks. As a result, some camps have improved and many backcountry users seem to be getting the message about how to behave in grizzly country. These law enforcement patrols, coupled with States restricting black bear seasons, better prosecutions in the courts, and increased public awareness, have begun to show some success. To date, only 6 losses have been recorded in the Yellowstone Ecosystem, compared to 14 in 1982 (human-related losses).

State and Federal biologists met on December 20, 1983, in Casper, Wyoming, to review the draft Recommended Criteria and Procedures for Black-footed Ferret Surveys, and to develop acceptable survey standards. These survey standards, when completed, will be used for Section 7 clearance of Federally authorized or funded activities that may affect black-footed ferrets (Mustela nigripes) or their primary habitat, prairie dog towns.

Region 7—Although the short-tailed albatross (Diomedea albatrus) is listed as an Endangered foreign species, it once numbered in the millions and was so abundant in Alaskan waters that it was a common food item in the diet of native Aleut Indians. Plundered by plumage hunters on Torishima, its primary breeding island off Japan, the species was nearly extinct by the time World War II began. Torishima has been declared a nature reserve and national monument by the Japanese government, and the short-tailed albatross is staging a slow comeback. Until recently, sightings in Alaskan waters of this, one of the world’s rarest albatross species, have been few. This summer and fall, however, U.S. observers aboard foreign fishing vessels recorded nearly 30 observations of D. albatrus in the waters of the western Aleutian Islands and Gulf of Alaska. In comparison, only six observations were recorded in Alaskan waters in the preceding 6-year period (1976-1982).

Culminating 3 years of correspondence and difficult telephone communications, 18 Aleutian Canada geese (Branta canadensis leucopareia) were shipped last month to their new homes at the Yagiyama and Tama Zoos in Japan. The Japanese hope to breed Aleutian geese in captivity and release their progeny among wild white-fronted geese that winter in the Lake Izunuma area. Aleutian Canada geese formerly wintered in Japan, but this population has recently dwindled to a single individual.

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—The Editor
Five Mullusks
continued from page 1

The Virginia fringed mountain snail (Polygyrus virginianus) is listed by the Service as an Endangered species, and is considered one of the rarest and most unusual land snails in North America. Polygyrus is a monotypic genus in the family Helicodiscidae, all of which are burrowers or troglodytes. They occupy caves or lower layers of leaf litter, loose surface soil, or talus. Most, if not all, North American helicodiscids (including Polygyrus) are without pigment and probably blind.

The entire known range of P. virginianus consists of a 2.5 km strip of embankment, bluff, and limestone talus along the New River in Pulaski County, Virginia. Live individuals have been observed at only one site, in permanently damp ground at least 25 cm beneath the surface, which is shaded and overgrown with vines. Almost nothing is known about the numbers, population dynamics, or reproduction of P. virginianus, largely because of the difficulty inherent in conducting research on a burrowing snail. Further, the very act of surveying for living specimens can result in severe damage to the snail habitat areas.

The Virginia fringed mountain snail has a shell that is small, only 3.9 to 4.5 mm in diameter, with comb-like fringes.
The shell of the flat-spired three-toothed snail is flattened, light brown or reddish-brown, and 18 to 27 mm in diameter.
The Stock Island tree snail (Orthalicus platysayoides) is an arboreal hermaphroditic subspecies currently confined to a small site on Stock Island in Monroe County, Florida. Historically, this snail also occupied nearby Key West, but it has been extirpated from that island and other parts of its former range by real estate development in the Florida Keys. Because of its reduced population size, the potential threats from further habitat loss, the effects of hurricanes, and the possibility of overcollecting, *O. r. rese* was listed by the Service in 1978 as Threatened.

Although information on this snail's ecology and life history is scant, preliminary investigations indicate that it inhabits a variety of trees, both native species and introduced ornamentals. It feeds on lichens, fungi, and algae, and forages mainly at night during the rainy season. The snail estivates during drier months. Due to habitat loss, *O. r. rese* is confined to a 4.8 acre patch of hammock on a municipal golf course/botanical garden and on immediately adjacent private properties. A rough estimate puts the population at 200-800 individuals of all age classes. These numbers are presumed to have been relatively steady in the recent past because the snail's habitat has been stable in area and composition over the past 40 years; however, developments and renovations on the golf course are eliminating 1.6 acres of the 4.8 acres of essential habitat. Approximately 1,000 new hardwood trees were planted around the greens to offset this loss. (The work was completed by the developer, who has leased the golf course from the City of Key West.)

*O. r. rese* can be considered recovered when:

1) the Stock Island snail population exists in a normal, healthy density throughout at least 20 acres of protected habitat on the golf course; and

2) the population shows no consistent downward trend in more than 2 consecutive years of a monitoring program that would run at least 10 years; and

3) administrative agreements on habitat conservation are put in place to secure the cooperation of the Fish and Wildlife Service, the Florida Game and Fresh Water Fish Commission, the golf-course managers, and any other involved landowners or management agencies; and

4) a minimum of 30 additional stable populations within the snail's historic range on Key West are established, which may allow the snail to reoccupy other suitable parts of its former habitat.

The first three objectives involve protecting and monitoring the snails and their habitat on Stock Island. An evaluation of what constitutes a normal, healthy snail population would be a major part of an overall research effort on the species and its ecological needs. The plan emphasizes working with the landowners, particularly the operators of the golf course, to seek ways of conserving the snails while maintaining compatible land uses. One potential problem that requires monitoring is the possible use of pesticides or herbicides on the golf course and the effect of these chemicals on the snails. Overcollecting, another potential threat, could be addressed through public education, and the possible need for predator (rat) control would be studied.

A prerequisite to reestablishing *O. r. rese* on Key West is a thorough evaluation of the currently occupied habitat on Stock Island in order to determine the optimum conditions for the snail. A better knowledge of the reproductive biology of *O. r. rese* would be helpful in selecting the number and age-class of individuals for reintroduction, as well as in minimizing the impact of removals from the current population. Since many of the snails would be translocated to privately owned properties on Key West, subject to landowner approval, a public education effort might be valuable in gaining greater acceptance. However,
since recent surveys indicate a considerable decline in the Stock Island population, with malicious intent suspected, the plan states that it may be prudent to proceed with initiating at least one trial reintroduction based on the existing data alone. Some suitable habitat is available on Federal property on Key West.

Higgins' Eye Pearly Mussel
North America contains the richest and most diverse freshwater bivalve fauna in the world, much of it centered in the vast Mississippi River Basin. One of these mollusks, the Higgins' eye pearly mussel (Lampsilis higginsi), is an Endangered clam known to occur in the Upper Mississippi River and several of its larger tributaries. Degradation of its natural riverine habitat led to a serious decline in its distribution, and the Higgins' Eye Mussel Recovery Plan (approved July 29, 1983) describes the actions necessary to return this species to a secure status.

*L. higginsi* apparently was never abundant, and data currently available indicate a 53 percent reduction from its historical range. This mussel is now found at sites in the Upper Mississippi River from Brownsville, Minnesota, to Burlington, Iowa, and in the St. Croix River (Minnesota) between Prescott and Hudson. Its decline parallels that of a number of other clams found throughout the region. It is unlikely that any single factor is responsible for the decline, but rather a combination of factors.

Although the specific habitat requirements of *L. higginsi* are well known, the general alteration of the Upper Mississippi River has dramatically altered the ecosystem from a riverine to an impounded system and may have had an impact on this species.

Channel dredging to enhance navigation has been identified as a specific problem; not only are mussels physically removed from the river bottom by dredging, but the substrate is disrupted and the resulting increase in sedimentation can smother the mussel beds. It is also possible that the excessive commercial harvest of mussels in the Upper Mississippi River for mother-of-pearl during 1890-1920 could be responsible for reducing *L. higginsi*, which was already a comparatively rare species, below the levels necessary to maintain stable populations. Since mussels are filter feeders, they are affected by accumulations of pesticides, heavy metals, and other pollutants in their tissues. Additional factors, such as disease, changes in host fish distribution or density, or reductions in nutrients also may be responsible, at least in part, for the decline.

The Higgins' Eye Mussel Recovery Plan was developed to return this mollusk to a secure status by using two concurrent approaches: 1) maintaining the existing viable mussel populations (with their currently occupied habitat) and 2) enhancing and/or restoring viable populations to suitable habitat within the species' historical range. In order to adequately evaluate the success of the recovery effort, it is essential to determine what constitutes a "viable reproduction level" and "suitable habitat" for *L. higginsi*. Several of the proposed field and laboratory studies could accomplish this task, and are an integral part of the plan.

Once more is learned about the habitat requirements and reproductive biology of *L. higginsi*, the adverse impacts from human-related activities can be minimized. Among the management recommendations that may be implemented are measures to: control detrimental commercial clamming methods and sources of water pollution; develop nondetrimental navigational and channel dredging alternatives; and carry out a long-term monitoring program. Any relocation of mussels facing extirpation within their original habitat is to be considered only as a last resort.

The restoration of existing mussel colonies that are not known to constitute stable, viable reproductive populations is the second major approach. Large-scale rehabilitation of altered or destroyed historical habitat was discussed in the recovery plan but deemed impractical. However, once more information on mussel biology and limiting factors becomes available, it may be possible to enhance marginal populations by habitat management, transplanting additional specimens, or controlling competing species.

*L. higginsi* will be considered secure enough to propose for delisting when two criteria are met:

1) The existence of at least five distinct, viable reproductive populations should be established. This may be accomplished by verifying that such populations already exist, but it could require some translocation and/or artificial propagation. Each population shall then be monitored for a minimum of 10 years to ensure stability.

2) The five populations should be maintained in five separate navigation pools because intensive human use of the Upper Mississippi River, with the inevitable result of further impacts on the environment, will likely continue for the indefinite future. Having five separate populations will minimize the impact of any detrimental activity on the survival of the species as a whole.

Copies of these recovery plans, and all other approved plans, will be made available for purchase from the Fish and Wildlife Reference Service (FWRS). See page 3 of this BULLETIN for the address of the new FWRS contractor. A 4-6

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The Higgins' eye pearly mussel is a medium-to-large species; adults can exceed 100 mm in shell length. Shells range in color from yellow to brown, sometimes with green rays.

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month printing time should be allowed following the date a recovery plan is approved and signed before copies are available. A delay should be expected when ordering newly approved plans.

New Publications

Two new reports are now available from TRAFFIC (U.S.A.). 1980 U.S. Imports of African Mammal Trophies and Skins, developed by Nancy J. Roeper, may be purchased for $6.00. CITES Appendix I Species in Captivity, 1977-1981, by Lynn Gray-Schofield, contains maintenance and breeding data on captive mammals, birds, reptiles, and amphibians, and it costs $7.50. Orders for these reports should be addressed to TRAFFIC (U.S.A.), World Wildlife Fund-U.S., 1601 Connecticut Avenue, N.W., Washington, D.C. 20009.

The National Marine Fisheries Service also has published two new publications. A Manual of Sea Turtle Research and Conservation Techniques, Edition II, is available in either English or Spanish (please specify in order) for $10.00. Proceedings of the Western Atlantic Sea Turtle Symposium, also in English or Spanish, is available for $20.00. Orders should be addressed to F.H. Berry, WATS, National Marine Fisheries Service, 75 Virginia Beach Drive, Miami, Florida 33149 USA.

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**BOX SCORE OF LISTINGS/RECOVERY PLANS**

<table>
<thead>
<tr>
<th>Category</th>
<th>U.S. Only</th>
<th>U.S. &amp; Foreign</th>
<th>Foreign Only</th>
<th>U.S. &amp; Foreign</th>
<th>Foreign Only</th>
<th>SPECIES* TOTAL</th>
<th>SPECIES HAVING PLANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals</td>
<td>15</td>
<td>18</td>
<td>223</td>
<td>3</td>
<td>0</td>
<td>281</td>
<td>19</td>
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<tr>
<td>Birds</td>
<td>51</td>
<td>14</td>
<td>144</td>
<td>3</td>
<td>0</td>
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<tr>
<td>Reptiles</td>
<td>8</td>
<td>6</td>
<td>60</td>
<td>8</td>
<td>4</td>
<td>98</td>
<td>6</td>
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<tr>
<td>Amphibians</td>
<td>4</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>3</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Fishes</td>
<td>30</td>
<td>3</td>
<td>11</td>
<td>12</td>
<td>1</td>
<td>57</td>
<td>23</td>
</tr>
<tr>
<td>Snails</td>
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<td>0</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Clams</td>
<td>23</td>
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<td>2</td>
<td>0</td>
<td>0</td>
<td>25</td>
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<tr>
<td>Crustaceans</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Insects</td>
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<td>0</td>
<td>4</td>
<td>2</td>
<td>13</td>
<td>3</td>
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<tr>
<td>Plants</td>
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<td>2</td>
<td>0</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>71</td>
</tr>
<tr>
<td>TOTAL</td>
<td>280</td>
<td>43</td>
<td>449</td>
<td>49</td>
<td>8</td>
<td>785</td>
<td>124**</td>
</tr>
</tbody>
</table>

*Separate populations of species, listed both as Endangered and Threatened, are tallied twice. Species which are thus accounted for are the gray wolf, bald eagle, American alligator, green sea turtle, Olive ridley sea turtle, and leopard.

** More than one species may be covered by some plans.

Number of species currently proposed for listing: 34 animals 26 plants

Number of Species with Critical Habitats determined: 59

Number of Recovery Plans approved: 110

Number of Cooperative Agreements signed with States: 38 fish & wildlife 11 plants

December 31, 1983