

ENDANGERED SPECIES

Technical Bulletin Department of Interior, U.S. Fish and Wildlife Service
Endangered Species Program, Washington, D.C. 20240

Emergency Protection Approved for Two Ash Meadows Fishes

An emergency rule listing as Endangered two fishes that occur only in Ash Meadows, Nevada, was published in the May 10 *Federal Register* and took effect immediately. The Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*) and Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*) depend on maintenance of their fragile spring habitat in the Mohave Desert. A large residential and agricultural development in the area poses an imminent threat to the species' survival. Under the temporary listing, protection for the fishes and their habitats will extend for 240 days (until January 5, 1983), giving the Service time to proceed with a permanent rulemaking.

Unique and Diverse Ecosystem

Ash Meadows, an intermontane valley located about 110 kilometers northwest of Las Vegas, is a unique and diverse desert wetland ecosystem made up of several dozen springs and seeps dotting an irregular north-south contour line for approximately 16 km. During the Pleistocene Epoch, the area was covered by an extensive system of interconnecting rivers and lakes. As the climate changed and the surface waters gradually receded, the fishes and other aquatic species of the region were left stranded in the remaining springs and their associated outflows. These springs were isolated in three stages. Devil's Hole, located at the highest elevation, was isolated first, followed by a series of small middle-elevation springs. The larger, lower-elevation springs were isolated last, and it is these springs that provide habitat for the two fishes covered by the emergency rule. All of these wetlands are fed by a local aquifer consisting of "fossil water" that entered the ground-water system more than 10,000 years ago.

The organisms of the region evolved in isolated waters, adapting to their individual habitats and undergoing a high degree of speciation. Despite the dam-

age that has occurred to the fragile area in recent years, Ash Meadows is still considered a relatively lush oasis in what is now one of the most arid regions of the world (average annual rainfall 70 mm). Hundreds of plant and animal species, many of them endemic to the area, are associated with the wetlands and depend on them for survival.

Both the Ash Meadows speckled dace and Ash Meadows Amargosa pupfish are restricted to the area's larger warmwater (24° to 30°C) springs and related outflows. Unfortunately, many of the area's aquatic habitats have been degraded or lost altogether in recent years. Another Ash Meadows species, the Devils Hole pupfish (*Cyprinodon diabolis*), is endemic to a water-filled limestone cavern and was listed as Endangered in 1967. Three years later, the Warm Springs pupfish (*Cyprinodon nevadensis pectoralis*), which inhabits the small middle-elevation springs, joined it on the Endangered list. Listing the Ash Meadows Amargosa pupfish and Ash Meadows speckled

dace as Endangered therefore extends protection to all three levels of springs.

Protection did not come in time, however, for the Ash Meadows killifish (*Empetrichthys merriami*), which is now extinct. The Ash Meadows killifish was restricted to the same lower-elevation springs that contain the two emergency-listed fishes, but it was eliminated by predation from exotic species. Other members of the genus *Empetrichthys* have also been extirpated from their Nevada spring habitats. The Pahrump killifish (*Empetrichthys iatos iatos*), also an Endangered species, is the only surviving member of the genus. Development of Pahrump Valley, which is next to Ash Meadows, caused the failure of the only spring containing the Pahrump killifish and it now exists only in refugia.

The Ash Meadows region also has an extraordinarily diverse freshwater mollusk fauna, which is currently being studied by Dr. Dwight Taylor of Tiburon, California. Of special interest are two species complexes of snails which are

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House and Senate Pass Reauthorization Bills

Two bills which further amend and reauthorize the Endangered Species Act of 1973 were passed by the U.S. House of Representatives and the U.S. Senate on June 8 and 9, 1982, respectively. H.R. 6133 and S.2309 will next go to a Congressional Joint Committee for resolution of differences.

Both bills contain amendments to:

- speed up the listing process,
- allow for "experimental populations;"
- provide for more involvement of permit and license applicants in the consultation process;

- streamline the exemption process;
- establish new criteria for the export of Appendix II species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora; and
- reauthorize the Act for 3 years.

A complete analysis of the final 1982 Amendments of the Endangered Species Act will be given in a future issue of the BULLETIN. For background information on the amendments listed above, consult the January, March, and May 1982 issues of the BULLETIN.



REGIONAL BRIEFS

Endangered Species Program regional staffers have reported the following activities for the month of May:

Region 1—The California condor (*Gymnogyps californianus*) is in the news again. After witnessing the loss of two eggs this season from one breeding pair, biologists with the Condor Research Center have confirmed the presence of a chick produced by a second

pair, and are optimistic about nesting behavior exhibited by a third pair some 45 miles away that indicates the possible existence of another chick. The nest of the third pair is in a cave and cannot be seen well from the observation post, but the biologists hope to be able to confirm the possible chick in the future.

The Service has published a notice of intent to prepare an Environmental Assessment on the San Bruno Mountain

Habitat Conservation Plan and Endangered Species Section 10(a) Permit, San Mateo County, California (F.R. 4/6/82). The proposed Federal permit would be for taking of Endangered mission blue butterflies (*Plebejus incarioes missionensis*) incidental to implementation of a conservation plan, which includes construction of residential housing on San Bruno Mountain. The habitat conservation plan is incorporating various commitments from private landowners, local governments, and the Federal Government. It is designed to conserve and enhance as much of the remaining habitat as possible for the mission blue and other species of concern in the area, while allowing limited development that would not have significant adverse effects on the species. Key elements of the plan will set aside habitat favored by the butterfly, foster the growth of the butterfly's host plants, reverse the invasion of competing brush species, alter the initial construction plans, and establish research/monitoring programs.

On April 26th, the Fish and Wildlife Service and University of California-Berkeley botanists and pedologists (soil scientists) inspected the China Hat formation north of Merced in Merced County. This formation contains some of the oldest soils in California, nearly 3 million years in age. Moreover, China Hat has a multitude of mima mounds and vernal pools; the latter are seasonally wet depressions that harbor a unique flora. Approximately 15 pools contained succulent owl's clover (*Orthorcarpus campestris* var. *succulentus*), a Federal candidate for listing and a State-listed endangered plant species. This discovery significantly increased the known range of the plant. U.C.-Berkeley researchers are attempting to preserve a portion of this unique area.

Region 2—For the second time in 2 years, the captive female Mexican wolf (*Canis lupus baileyi*) at the Wild Canid Survival and Research Center at St. Louis, Missouri, has produced a litter of pups. This year's litter includes 2 females, bringing the total number of Mexican wolves in captivity to 12, half of which are females.

The red wolf (*Canis rufus*) captive breeding program has produced three more litters of pups this year, bringing the total number in captivity to 56.

Region 4—The Florida Game and Fresh Water Fish Commission, in cosponsorship with the U.S. Forest Service, Gulf Coast Community College, and the U.S. Fish and Wildlife Service, will host a red-cockaded woodpecker (*Picoides [=Denrocopus] borealis*) symposium, January 27-29, 1983, in Panama City, Florida. Those

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U.S. Fish and Wildlife Service Washington, D.C. 20240

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U.S. Fish and Wildlife Regions

Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, and Pacific Trust Territories. **Region 2:** Arizona, New Mexico, Oklahoma, and Texas. **Region 3:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. **Region 4:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, and the Virgin Islands. **Region 5:** Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. **Region 6:** Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. **Region 7:** Alaska.

The ENDANGERED SPECIES TECHNICAL BULLETIN is published monthly by the U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240.

RECOVERY PLANS

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Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couperi*) historically occurred throughout the southeastern United States coastal plain, from South Carolina to Florida and west to southern Louisiana. After habitat loss and overcollection for the pet trade, however, only southeastern Georgia and peninsular Florida are thought to support sizeable populations. Both States give the snake full protection, and it was listed by the Service in 1978 as a Threatened species.

One of the major recommendations of the recovery plan is to conduct additional field studies to locate eastern indigo populations and delineate their habitat. In Georgia, the snake is strongly associated with xeric sandridge habitat, and depends on gopher tortoise (*Gopherus polyphemus*) burrows for refuge and overwintering sites. Once suitable habitat is located, the plan calls for acquisition and/or management of areas necessary to maintain viable populations. Additional legal protection on the State level for both the eastern indigo snake and the gopher tortoise is advocated.

Captive propagation and monitored reintroduction efforts are another important part of the plan. The Alabama Cooperative Wildlife Research Unit is already in the fourth year of an eastern indigo propagation/restocking program. [For details regarding the unit's activities on the eastern indigo, see the November 1981 BULLETIN.]

Copies of recovery plans are available from the Fish and Wildlife Reference Service, Unit 1, 3840 York Street, Denver, Colorado 80205.

BOX SCORE OF SPECIES LISTINGS

Category	ENDANGERED			THREATENED			SPECIES* TOTAL
	U.S. Only	U.S. & Foreign	Foreign Only	U.S. Only	U.S. & Foreign	Foreign Only	
Mammals	15	17	224	3	0	21	281
Birds	52	14	144	3	0	0	213
Reptiles	7	6	55	8	4	0	80
Amphibians	5	0	8	3	0	0	16
Fishes	28	4	11	12	0	0	55
Snails	3	0	1	5	0	0	9
Clams	23	0	2	0	0	0	25
Crustaceans	2	0	0	0	0	0	2
Insects	7	0	0	4	2	0	13
Plants	52	2	0	7	1	2	64
TOTAL	194	43	445	45	7	24	758

* Separate populations of a 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, and Olive ridley sea turtle.

Number of species currently proposed: 10 animals
8 plants

Number of Critical Habitats listed: 50

Number of Recovery Teams appointed: 69

Number of Recovery Plans approved: 54

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

May 31, 1982

New Publications

"Rare Plants of New York State," by Richard S. Mitchell and Charles T. Sheviak, 1981, is available for \$8.00. This New York State Museum publication (Bull. 445) has 96 pages and 55 illustrations. To order, make your check payable to New York State Library and mail to Gift and Exchange Department, New York State Library, Albany, New York 12230.

A cumulative index of the *Endangered Species Technical Bulletin* (July 1976–December 1981) is now available. Copies may be requested by writing the Office of Endangered Species, U.S. Fish and Wildlife Service, 18th and C Streets, N.W., Washington, D.C. 20240.

"International Trade in Plants—Focus on U.S. Exports and Imports," by Thomas Gibson, Niall McCarten, Faith Thompson Campbell, and Linda McMahan is now available from Traffic (U.S.A.) for \$9.50. Order a copy by sending a check (payable to World Wildlife Fund-U.S.) to Traffic (U.S.A.), 1601 Connecticut Avenue, N.W., Washington, D.C. 20009.

"Amphibians and Reptiles in Pennsylvania Checklist, Bibliography, and Atlas of Distribution," by C.J. McCoy, March 1982, is available for \$4.00. This Special Publication of Carnegie Museum of Natural History (No. 6) has 91 pages and 74 maps. Order copies from the Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213.

June 1982

Vol. VII No. 6

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POSTAGE AND FEES PAID
US DEPARTMENT OF THE INTERIOR

Int 423

Rulemaking Actions—May 1982

Blue Pike and Longjaw Cisco Proposed for Deregulation

The Service has proposed to remove the blue pike (*Stizostedion vitreum glaucum*) and the longjaw cisco (*Coregonus alpenae*) from the U.S. List of Endangered and Threatened Wildlife and Plants (F.R. 5/25/82). Available data indicate that both species are extinct.

Historically, the blue pike was found in Lakes Erie and Ontario, and the Niagara River. They were abundant in the commercial fishery of the late 1800's but by 1915 landings began to fluctuate extensively. Populations declined in the late 1950's and never recovered, the last confirmed specimens being taken in the late 1960's.

In a 1977 survey, the Blue Pike Re-

covery Team contacted all State fish and game agencies in an effort to determine the species' status. After all parties responded negatively regarding the pike's presence in their State, the team concluded that the fish was extinct and recommended its deregulation. Over-intensive fishery, which disrupted self-stabilizing mechanisms within the blue pike's population, is probably the cause of the extreme fluctuations and ultimate crash of the fishery. Deterioration of water quality during the late 1950's and early 1960's contributed to the decline of the species.

The longjaw cisco was indigenous to the Great Lakes basin and occurred only in Lakes Michigan, Huron, and

Erie. It was one of several species of deepwater ciscos utilized by the smoked fish trade and was a very important species of the fishery of the Great Lakes. This fish has not been seen in Lakes Erie and Huron since the late 1950's. The most recent collection of this species was in 1967 in Lake Michigan. The decline of the longjaw cisco and the cisco fishery in general is usually attributed to fishery and environmental problems.

Comments and materials concerning this proposal should be sent by July 26, 1982, to the Regional Director, U.S. Fish and Wildlife Service, Federal Building, Fort Snelling, Twin Cities, Minnesota 55111.

ASH MEADOWS

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found within a 5-mile radius in Ash Meadows, and contribute to the area containing the highest concentration of endemic animal species in the continental United States. Most of these mollusks have not been scientifically described and named. The same factors that jeopardized the desert fishes, primarily groundwater pumping and the introduction of exotic species, led the Service in 1976 to propose the Ash Meadows turban snail (*Fluminicola erythropoma*) as Threatened. In 1979, the proposal was withdrawn because of the listing schedule deadlines specified in the 1978 Amendments to the Endangered Species Act. Current evidence indicates that *F. erythropoma*, as proposed, comprised more than one species. The Service is now evaluating the status of at least 12 Ash Meadows snail species, and expects to include them in a general Notice of Review on animals which will be published in the *Federal Register* later this year.

Another Ash Meadows endemic that may appear on the same Notice of Review is the Point of Rocks Spring naucorid (*Ambrysus amargosus*); unfortunately, this insect may already be extinct because of the diversion of water from its single spring habitat. The Ash Meadows riffle beetle (*Stenelmis calidae calidae*) also is restricted to only one aquatic habitat, Devil's Hole, but it benefits from the habitat protection given to the Devils Hole pupfish.

Seven plant species endemic to Ash Meadows are considered candidates for future listing, and were included in the general Notice of Review on plants published in the December 15, 1980, *Fed-*

eral Register. These species are the spring-loving centaury (*Centaureum namophilum* var. *namophilum*), Amargosa niterwort (*Nitrophila mohavensis*), Ash Meadows gum plant (*Grindelia fraxinopratensis*), Ash Meadows stickleaf (*Mentzelia leucophylla*), Ash Meadows milk-vetch (*Astragalus phoenix*), King ivesia (*Ivesia eremica*), and Corrugated sunray (*Enceliopsis nudicaulis* var. *corrugatum*). Two other candidate plants included in the Notice of Review occur in Ash Meadows and elsewhere; these species are the Tecopa bird's-beak (*Cordylanthus tecopensis*) and the alkali mariposa lily (*Calochortus striatus*). The *Astragalus* and *Mentzelia* are currently listed by the State of Nevada as threatened with extinction.

One small endemic mammal once found in the area, the Ash Meadows

vole (*Microtus montanus nevadensis*), has not been reported in over 20 years and is probably extinct because of habitat disturbance. In 1980, the Service published a separate Notice of Review on a related mammal, the Amargosa vole (*Microtus californicus scirpensis*). This candidate for listing is thought to inhabit the general region just southwest of Ash Meadows.

Threats to the Habitat

Although early attempts at agricultural in Ash Meadows failed because of the area's salty, clay soils, there was renewed interest in the late 1960's and early 1970's. Large tracts of land were plowed, and groundwater pumps and diversion ditches were installed to support an agricultural operation. This activity

A view of Point of Rocks Springs, Ash Meadows, before (below) and after (right) development. The pool and its outflow once were habitat for both of the recently listed fishes.



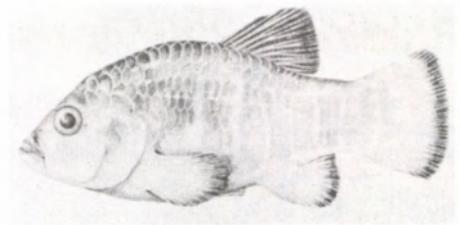
Photos by D. W. Sada

destroyed many plant and animal populations, along with their wetland habitat, by altering the land surface and lowering the water table. In 1976, a series of negotiations and court cases culminated in a landmark U.S. Supreme Court decision limiting the amount of groundwater pumping in the Devil's Hole area of Ash Meadows to protect vital water levels in the only known habitat of the Devils Hole pupfish. The Supreme Court saved the habitat of the Devils Hole pupfish by recognizing the prior water right of the 40-acre disjunct portion of Death Valley National Monument surrounding Devil's Hole. The court decision was not based on endangered species protection, but instead on water rights. Although the Ash Meadows wetlands are interconnected by the same aquifer that feeds Devil's Hole, the effects of groundwater pumping on the water table vary according to location; therefore, the 1976 Supreme Court decision did not necessarily preclude pumping in other areas of Ash Meadows.

In 1977, the agricultural interest sold approximately 14,000 acres of land in Ash Meadows to a real estate developer, Preferred Equities Corporation (PEC). The imminent threat to the existence of the Ash Meadows species is the proposed development of the area by PEC for residential, recreational, industrial, and agricultural purposes, all of which would require great quantities of water. Although the Bureau of Land Management is the principal landowner in the 40,000-acre Ash Meadows area, PEC owns the majority of surface water rights. A recent report prepared for the Attorney General of Nevada (*The Status and Future of Ash Meadows, Nye County, Nevada*; Sid F. Cook and Cynthia D. Williams, 1982) estimates that 368.4 percent of the total discharge water available in Ash Meadows would be necessary if the development was completed.

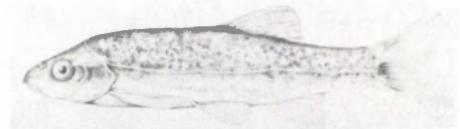
Construction activities in Ash Meadows would clear large tracts of essential habitat, extirpate many plant and animal populations, and alter surface drainage patterns. Utilization of surface water from springs, along with pumping the aquifer, would eliminate most surface flows, lower the water table, and interfere with the very slow groundwater recharge, all of which would destroy downgradient wetlands. The initial development phase has already begun, and some habitat has been modified. PEC has constructed roads in the area, several of which connect different springs, and it has substantially altered surface flows and spring hole morphology at these sites. Several springs have been excavated by heavy equipment. (PEC has applied for permission from the State of Nevada to divert water from many of the other Ash Meadows springs.) In addition, approximately 1,000 acres of cotton have been planted. These events complement the destruction of habitat which has occurred since the advent of agricultural activities at Ash Meadows.

Habitat loss is not the only factor jeopardizing the Ash Meadows endemic species. As is the case with many other "island" ecosystems, the introduction of exotic organisms has had a serious impact. Competition from the mosquito fish (*Gambusia affinis*) and sailfin molly (*Poecilia latipinna*), as well as predation by bullfrogs (*Rana catesbiana*) and crayfish (*Procambarus clarki*), were at least partially responsible for the extinction of the Ash Meadows killifish, and continue to threaten the Warm Springs pupfish, Ash Meadows Amargosa pupfish, and Ash Meadows speckled dace. An introduced aquatic snail (*Melanooides*) has reduced populations of native snails in several springs. The introduced species may also be having an impact on other aquatic endemics in the area.



Subspecies of the Amargosa pupfish (above) and speckled dace (below), occurring only in a few Ash Meadows springs, were listed in the emergency rule.

Illustrations by Carol Mortensen



Effects of the Rule

In its emergency rule, the Service determined that "development of the Ash Meadows residential community will cause the extirpation of the Ash Meadows biological community." To help forestall further damage, the listing of the Ash Meadows Amargosa pupfish and the Ash Meadows speckled dace became effective immediately upon the date of the *Federal Register* publication, May 10, 1982. This action gives protection to the habitat most immediately jeopardized by development, and is expected to help conserve other endemic species in the area.

A formal designation of Critical Habitat for the fishes was not included in the emergency rule because vandalism of the restricted and very vulnerable habitats could occur if detailed maps of the springs were published. The emergency rule carries the full protection of the Endangered Species Act, including the prohibition of "taking" and of adverse habitat modification by Federal agencies. During the 240-day course of the temporary listing, the Service will prepare a proposal to extend permanent protective status to the two fishes, and Critical Habitat might be included at that time if it is shown to be beneficial to the species' survival. The condition of the other Ash Meadows endemic species also will be evaluated to determine the need for including them in the proposal for a final rule.



NOTE

Since June 1981, free distribution of the BULLETIN has been limited to Federal employees only. This note is to assure you that the Service intends to continue free distribution to all who are now receiving the BULLETIN, and to any Federal employee who might wish to receive it in the future.

REGIONAL BRIEFS

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interested in attending or participating should contact Don Wood, Division of Wildlife, Florida Game and Fresh Water Fish Commission, 620 South Meridian Street, Tallahassee, Florida 32301 (telephone 904/488-3831).

Bald eagles (*Haliaeetus leucocephalus*) have nested for the first time in over 30 years in Arkansas. The nest is located on the White River National Wildlife Refuge; the pair of eagles using this nest laid two eggs and both have hatched, although only one hatchling has survived as of May 26.

One of the Florida panthers (*Felis concolor coryi*), radio collared in February 1982 has been found dead. Daily aerial monitoring since the date of capture indicated that the animal had been stationary since early April. A ground search was made, and on April 16 the remains of the male panther were found with the radio collar. The cause of death has not been determined. The skeletal remains have been deposited at the Florida State Museum, University of Florida, at Gainesville. This is the first radio collared panther that has died. It was estimated to have been about 7 years old and was known to be alive as recently as late March.

Region 5—On May 19, the Director approved the Chesapeake Bay Bald Eagle Recovery Plan, commending the recovery team, headed by Gary Taylor of the Maryland Department of Natural Resources, and the regional endangered species staff on the accomplishment. The plan is the first approved of five regional recovery plans being developed

on bald eagles in the lower 48 States.

New York State's endangered species unit plans to return to Alaska in July to obtain 21 more bald eagle chicks. All 21 collected last year and taken to the hacking site at Oak Orchard, New York, fledged successfully.

Region 6—In October 1981, during fall migration, a group of four whooping cranes (*Grus americana*) were observed at Ouivira National Wildlife Refuge in central Kansas. One week later, after the group of four had migrated further south, the refuge was visited by a group of six whoopers. These 10 birds represent 13 percent of the population of 79 birds that started the migration south from the breeding grounds in Wood Buffalo National Park, Northwest Territories, Canada, to the wintering grounds along the coast of southern Texas. Because of past use of whooping cranes, the refuge was designated as Critical Habitat on May 15, 1978.

The March 1982 BULLETIN reported on the recovery plan that was approved for the grizzly bear (*Ursus arctos horribilis*). The plan has been printed, and copies are available from the Denver Regional Office or the Billings Area Office.

The May 1979 BULLETIN related that the Bureau of Reclamation (BR) and the Service had agreed to a study of the endangered Colorado squawfish (*Ptychocheilus lucius*) and humpback chub (*Gila cypha*). Later, the August 1981 issue reported that additional studies were being conducted and that the bonytail chub (*Gila elegans*) was also being studied. The Colorado River Fishery Project (CRFP) completed field studies in the fall of 1981, and is

completing a final report. Although significant information on the life history requirements of the species was collected, certain conclusions and recommendations made in the report are preliminary and warrant further refinement or verification. In order to obtain the additional information that is needed, BR and the Service have entered into a Memorandum of Understanding to carry out a Colorado River Fishery Monitoring Program (CRFMP) until March 31, 1985. The three objectives of the CRFMP are (1) to expand information on the distribution and movement of adult squawfish to and from spawning site locations with the use of radio-tagging, (2) to verify flow requirements of adult squawfish in relation to spawning success and survival of larval squawfish, and (3) to determine effects of flow fluctuation at Flaming Gorge Reservoir on the survival and rearing of young-of-the-year and juvenile squawfish. Dr. Bill Miller, the Service biologist at Salt Lake City, Utah, who was project leader for CRFP, will also head the CRFMP.

Intensive night spotlight surveys conducted in the Meeteetse, Wyoming, area last November by the Service resulted in at least nine different black-footed ferrets (*Mustela nigripes*) being sighted. Extensive snow tracking efforts this past winter by Idaho State University/Biota Research and Consulting, Inc., biologists resulted in evidence that indicated there may be 11 or more additional individuals in the area. Work will continue on the ferrets this summer, and probably next winter, to determine the number of individuals and their distribution.

Recovery Plans Approved for Clay Phacelia and Eastern Indigo Snake

The Director of the Service has approved two additional plans to aid in species recovery: the Clay Phacelia (*Phacelia argillacea*) Recovery Plan, signed April 12, 1982, and the Eastern Indigo Snake Recovery Plan, signed April 22, 1982.

Clay Phacelia

The clay phacelia (*Phacelia argillacea*) is a winter annual whose known current distribution consists of one small population of about 200 plants along a railroad right-of-way in Utah County, Utah. It was first collected in 1883, but there was little knowledge of the species until its rediscovery by N.D. Atwood in 1971. The plant was described and named as a new species by Atwood in 1973, and was listed by the Service as Endangered in 1978.

Destruction of portions of the *P. argillacea* population and modification of habitat within its very restricted distri-

bution have jeopardized the species. Both the railroad and its maintenance road bisect the only known *P. argillacea* population, and most of the plants are situated on privately owned land which could be further modified in the future. Sheep have moved through the population area, trampling some of the plants, and rock squirrels have chewed branches on some of the remaining individuals.

The objective of the recovery plan is to establish a self-sustaining population of 2,000–3,000 individuals on 120 acres of protected habitat, and possibly to establish at least one additional population. An initial recovery phase will be to give the existing population more direct protection; this may be accomplished through better control of animal damage and through acquisition of a portion of the habitat by a private conservation organization, The Nature Conservancy. Liaison with the railroad company and

the Utah Department of Transportation, both of which manage parts of the site, will encourage each to assist in conserving the habitat.

Since *P. argillacea* historically was known from two locations, an intensive survey of similar habitat in the region is recommended to locate any additional existing populations. The plants and their habitat are to be monitored periodically to insure adequate conservation. Another part of the plan outlines studies needed on the species' biology and habitat requirements. Careful harvest of a small portion of the annual seed production could enable experimentation on germination, substrate needs, and survival techniques. Long-term storage of seeds at the USDA-National Seed Storage Laboratory in Fort Collins, Colorado, is mentioned in the plan as a possibility to preserve the plant's gene pool.

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