

ENDANGERED SPECIES

Technical Bulletin

Department of Interior, Fish and Wildlife Service
Washington, D. C. 20240

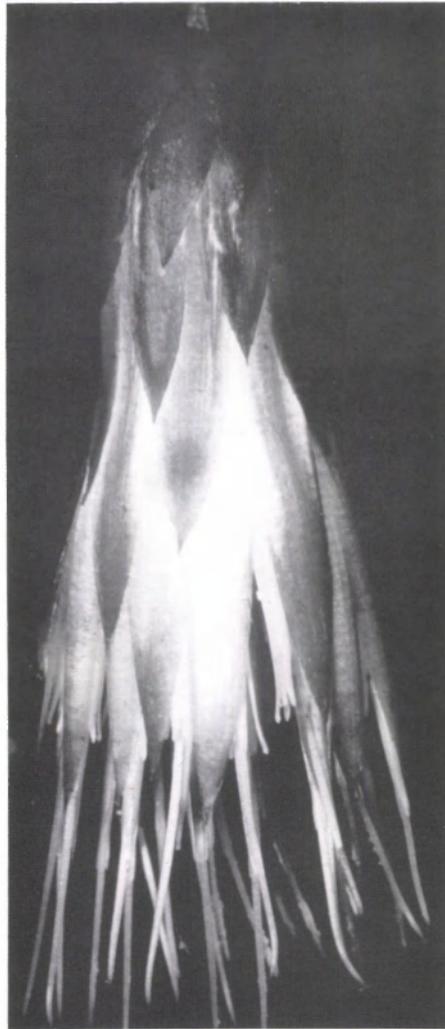
Forty-six Plants and Animals Proposed During September for Endangered Species Act Protection

Forty-six plants and animals were proposed by the Fish and Wildlife Service during September 1990 for listing as Endangered or Threatened species. These taxa—43 Hawaiian plants, 1 Puerto Rico plant, and 2 New Mexico snails—will receive Endangered Species Act protection if the following proposals are approved:

43 Hawaiian Plants

Under the terms of a settlement agreement reached with the Sierra Club Legal Defense Fund, which acted on behalf of the Conservation Council for Hawaii and other conservation groups, the Service announced in July that it would propose 186 Hawaiian plant taxa for addition to the Federal List of Endangered and Threatened Species during fiscal years 1990-1992, including at least 50 by September 30, 1990. These 186 taxa are all of the Hawaiian plants identified as Category 1 listing candidates in the Service's February 21, 1990, Notice of Review for Plants (see BULLETIN Vol. XV, No. 3). Because the Service now believes that 30 of these taxa are extinct, the number ultimately listed may be reduced to 156, in accordance with the terms of the agreement.

The settlement resulted from a December 1989 lawsuit charging that delays in the listing of these plants constituted a violation of the Endangered Species Act. With the publication this year of the *Manual of the Flowering Plants of Hawai'i* (see New Publications notice in this BULLETIN), which placed the



Hesperomannia lydgatei

list of candidate species on a firmer biological foundation, the Service agreed to hire more botanists and provide more funding to accelerate the listing program. In May 1990, the legal settlement was approved by the U.S. District Court in Hawaii.

Fifty-two Hawaiian plants were proposed for listing in fiscal year 1990, 43 of them in September. The latest proposals have been grouped by geographic area:

Wahiawa Drainage Basin, Island of Kaua'i (5 plants) - These plants are known only from the Wahiawa drainage basin, an area of high floristic endemism that includes bogs, permanent streams, ridge summits, and one of the most diverse montane wet forests in the Hawaiian Islands. On September 17, the Service proposed to list these species as Endangered:

- *Cyanea undulata* is an unbranched shrub in the bellflower family (Campanulaceae) that grows up to 12 feet (3.6 meters) tall with narrowly elliptic leaves and yellowish, hairy flowers. This species is currently known from a single population of three or four plants.

- *Dubautia pauciflorula* is a sprawling to erect shrub in the aster family (Asteraceae) that reaches about 10 feet (3 m) in height and has narrow leaves clustered at the ends of the branches. It produces open inflorescences that bear up to 500 flowering heads, each containing 2 to 4 yellow florets. Only three populations are known, totalling 30 to 40 plants.

- *Hesperomannia lydgatei*, another member of the aster family, is a small tree that rarely grows over 10 feet tall. Its nodding flower heads are composed of yellow, lobed florets enclosed by circles of overlapping bracts (the outer ones brown or purplish, the inner ones silver).

(continued on page 4)



in habitat occupied by the Endangered Stephens' kangaroo rat (*Dipodomys stephensi*) outside of proposed reserves for the species. The reserves will be financed by the county through a development tax on new home construction in the area.

* * *

Region 2 - Biologists have been concerned for some time about the effect of shoreline erosion along the Gulf Intracoastal Waterway in Texas on whooping crane (*Grus americana*) habitat. About a 30-mile (48-kilometer) stretch of the Waterway crosses designated Critical Habitat, including the Aransas National Wildlife Refuge. Freshwater ponds and marshes in this area provide a rich supply of invertebrates, frogs, clams, and crustaceans for the whooping cranes. However, traffic on the Waterway, wind-generated waves, and dredged material disposal operations are eroding the crane's habitat at an average rate of 2 acres (0.8 hectares) per year. Erosion of the shoreline also has enabled salt water to enter some freshwater ponds, which in turn have become less productive habitat for the cranes.

In 1989, 7,800 bags of concrete were placed along the shoreline of the Gulf Intracoastal Waterway to protect 800 linear feet (240 meters) of shoreline in the crane's Critical Habitat. On August 18-19, 1990, an additional 1,600 linear feet (490 m) of critical whooping crane habitat was protected through the use of 10,000 sacks of concrete. The concrete was unloaded from several barges at designated sites and then carried by about 125 volunteers to the Waterway. Steel reinforcing rods were then driven through the bags to anchor them to the shoreline.

Many groups have assisted in the Aransas shoreline preservation effort over the past 2 years. The Service's Corpus Christi, Texas, Ecological Services Field Office, Aransas National Wildlife Refuge, State resource agencies, and conservation groups provided personnel and equipment. All of the concrete, as well as lunches, supplies, barges, tugs, cranes, work barges, gloves, and other items,

(continued on page 12)

Region 1 - On August 3, the Fish and Wildlife Service issued a 2-year incidental take permit under Section 10(a) of the Endangered Species Act to Riverside

County, California, and 5 other cities in the county as part of a Habitat Conservation Plan. The permit allows development and other lawful activities to occur

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

- John Turner, Director
(202-208-4717)
- Ralph O. Morgenweck
Assistant Director for Fish
and Wildlife Enhancement
(202-208-4646)
- Larry R. Shannon, Chief,
Division of Endangered Species
(703-358-2171)
- William E. Knapp, Chief,
Division of Habitat Conservation
(703-358-2161)
- Marshall P. Jones, Chief,
Office of Management Authority
(703-358-2093)
- Jerry Smith, Acting Chief,
Division of Law Enforcement
(703-358-1949)

TECHNICAL BULLETIN

- Michael Bender, Editor
- Michael Rees, Assistant Editor
(703-358-2166)

Regional Offices

- Region 1**, Eastside Federal Complex, 911 N.S. 11th Avenue, Portland, OR 97232-4181 (503-231-6118); Marvin Plenert, *Regional Director*; Robert P. Smith, *Assistant Regional Director*; Bob Ruesink, *Endangered Species Specialist*.
- Region 2**, P.O. Box 1306, Albuquerque, NM 87103 (505-766-2321); Michael J. Spear, *Regional Director*; James A. Young, *Assistant Regional Director*; George Divine, *Acting Endangered Species Specialist*.

Region 3, Federal Bldg., Fort Snelling, Twin Cities, MN 55111 (612-725-3500); James C. Gritman, *Regional Director*; Gerald R. Lowry, *Assistant Regional Director*; William F. Harrison, *Acting Endangered Species Specialist*.

Region 4, Richard B. Russell Federal Bldg., 75 Spring Street, S.W., Atlanta, GA 30303 (404-331-3580); James W. Pulliam, *Regional Director*; Tom Olds, *Assistant Regional Director*; David Flemming, *Endangered Species Specialist*.

Region 5, One Gateway Center, Suite 700, Newton Corner, MA 02158 (617-965-5100); Ronald E. Lambertson, *Regional Director*; Ralph Pisapia, *Assistant Regional Director*; Paul Nickerson, *Endangered Species Specialist*.

Region 6, P.O. Box 25486, Denver Federal Center; Denver, CO 80225 (303-236-7920); Galen Buterbaugh, *Regional Director*; Robert E. Jacobsen, *Assistant Regional Director*; Larry Shanks, *Endangered Species Specialist*.

Region 7, 1011 E. Tudor Rd., Anchorage, AK 99503 (907-786-3542); Walter O. Stieglitz, *Regional Director*; Rowan Gould, *Assistant Regional Director*; Ron Garrett, *Endangered Species Specialist*.

Region 8, (FWS Research and Development nationwide), Washington, D.C. 20240; John D. Buffington, *Regional Director*; Al Sherk, *Endangered Species Specialist* (703-358-1710).

U.S. Fish and Wildlife Service Regions

Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and the 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 U.S. Virgin Islands. **Region 5:** Connecticut, Delaware, District of Columbia, 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. **Region 8:** Research and Development nationwide. **Region 9:** Washington, D.C., Office.

The Endangered Species Technical Bulletin is published on recyclable paper.

Reintroducing the American Burying Beetle

Michael Amaral and Linda Morse
New England Field Office

Since the American burying beetle (*Nicrophorus americanus*) was listed as Endangered (see BULLETIN Vol. XIV, No. 8 and BULLETIN Vol. XIII, Nos. 11-12), interest in reversing the catastrophic decline of this species has been growing.

Once inhabiting 32 States, the District of Columbia, and 3 Canadian provinces, the American burying beetle now survives in only 2 locations: a small island off the coast of New England and a site in eastern Oklahoma. Much research needs to be done to understand the reasons for its widespread decline and the reasons why the species survives in these last two sites.

Much of what is known about the life history of this curious insect stems from field and laboratory studies by Andrea Kozol, a doctoral candidate at Boston University. Individual beetles are attracted to carrion, and a single male and female will roll it into a ball and bury it below ground by gradually excavating soil out from under the dead animal. Then they work in unison to prepare the carcass. First, the fur or feathers are removed and the carcass is cleaned of any fly larvae or other organisms. Next, the beetles coat the carrion with secretions that slow decomposition and preserve the carcass in a semi-mummified state. The beetle eggs are then laid in a tunnel adjacent to the embalmed carrion, and their larvae hatch with ready access to food. Brood size appears to be directly related to carcass size, with a maximum number of young raised on carcasses from about 5.3 to 7.7 ounces (150 to 220 grams).

While researching the causes for its decline, concerned biologists have also been considering the feasibility of reintroducing the beetle on an Atlantic Coast island that was one of its historic locations. Because the species is known to exist at only two sites, successfully re-

establishing another population would afford the species a significant measure of security. It would also provide scientists an opportunity to closely monitor the beetle's life cycle and help to identify the factors influencing its survival.

A captive population of *N. americanus* that has been maintained at Boston University for several years provided a source of beetles for the reintroduction. Using laboratory-produced specimens has been an important consideration; if the reintroduction attempt fails, there will be no loss to the species in the wild.

During the week of June 25, 1990, biologists from five different private and public agencies visited the islands of Nashawena, Cuttyhunk, and Penikese in the Elizabeth Islands of Buzzards Bay, Massachusetts, to determine if any remnant populations of the American burying beetle existed there. Five days of beetle trapping resulted in the capture of over 3,300 carrion beetles of 8 different species, but no *N. americanus* were found. A similar trapping effort conducted by Dr. Tom French of the Massachusetts Division of Fisheries and Wildlife on Penikese during 1989 also demonstrated the apparent absence of *N. americanus* on the island. Thus, the stage was set for releasing laboratory-raised pairs of American burying beetles on Penikese. This island was chosen not only because it formerly supported the species but also because it is owned by the Massachusetts Division of Fisheries and Wildlife and is managed as a bird sanctuary. Furthermore, Penikese's relative accessibility would make monitoring the beetles' activity easier.

On July 3-4, Andrea Kozol, along with Anne Hecht of the Fish and Wildlife Service's Region 5 Office, journeyed to Penikese to release 25 pairs of *N. americanus* from the lab population. Pairs of beetles were placed on carrion of suitable size and covered with an inverted flower

pot. By the following day, the beetles had completely buried 15 of the 25 carcasses and had partially buried 9 of the remaining 10. If things were going well under the soil, the female would have laid eggs and small larvae would be visible within a few days. After feeding on the carcass for several days, the larvae would crawl off into the soil to pupate. From 45 to 60 days after burial of the carcass, the transformed larvae emerge as adult members of the largest carrion beetle species in North America.

On July 13, Andrea Kozol and Michael Amaral of the Service's New England Field Office returned to Penikese Island to monitor the reproduction attempt by exhuming some of the carcasses. Healthy larvae were found on 65 percent of the 17 carrion checked. (The eight carcasses not exhumed had been deeply buried.) Although these preliminary results are very promising, proof of success will come only when we can determine that enough young beetles are produced and survive the winter to reemerge and repeat the cycle in future summers.



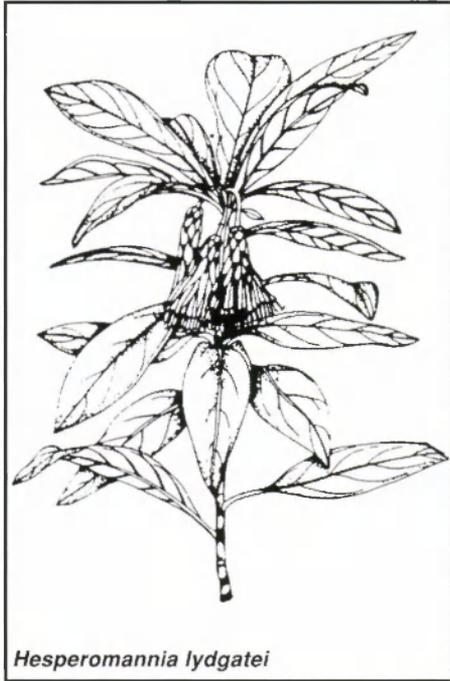
American burying beetle (*Nicrophorus americanus*)

photo by Andrea Kozol

46 Plants and Animals

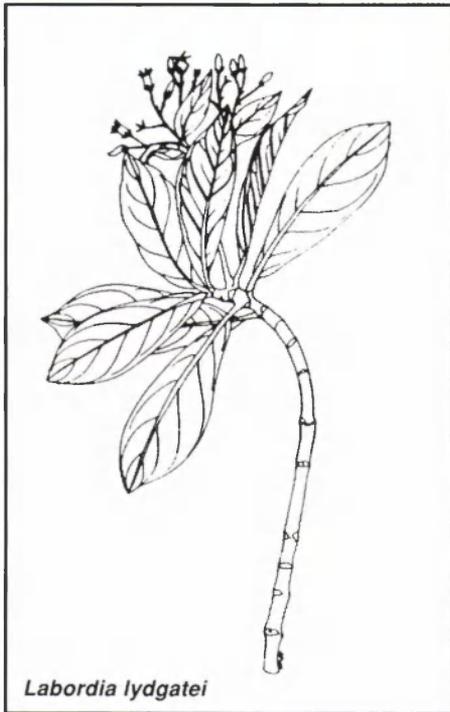
(continued from page 1)

Between 150 and 190 individuals are known to exist in 4 populations.



Hesperomannia lydgatei

• *Labordia lydgatei* is a highly branched shrub or small tree in the strychnine family (Loganiaceae) with elliptical, finely haired leaves and small, funnel-shaped, yellow flowers. Its Hawaiian name is *kamakahala*. This species currently is known from a single population of about three plants.



Labordia lydgatei

drawings by Yvonne Wilson-Ramsey, reprinted from Manual of the Flowering Plants of Hawaii, courtesy of the University of Hawaii Press

• *Viola helenae* is an erect, unbranched shrub in the violet family (Violaceae). This plant, which reaches only 2.5 feet (80 centimeters) in height, has small, pale lavender or white flowers and can be distinguished from similar species by its lance-shaped leaves. About 13 individuals are known from 2 populations.

Habitat degradation and competition from introduced species are the main threats to these plants. Most of the Wahiawa drainage basin is owned by a sugar company, with a small section belonging to the State. Although there has been relatively little disturbance to the basin in the past, several aggressive species of exotic plants have invaded the area. Their spread is being aided by feral pigs (*Sus scrofa*), which root up native plants and distribute the seeds of exotic species, and by typhoons that open up the habitat. Other non-native animals, such as rats, may threaten the rare plants by eating seeds and vegetative parts.

Koke'e Region, Island of Kaua'i (6 Plants) - Koke'e refers to a region of northwestern Kaua'i roughly 15 square miles (40 square kilometers) in size. It lies just above the northern reaches of Waimea Canyon, with the Alaka'i Swamp to the east, the high cliffs of the Na Pali coast to the north, and drier leeward ridges to the west. Because of the Koke'e region's abrupt topography and climatic gradients, the native vegetation of this area—primarily mesic to wet forests—is quite diverse with a high proportion of locally endemic species.

Six plant species restricted to the Koke'e region were proposed on September 26 for listing as Endangered:

• *Chamaesyce halemanui* is a climbing shrub in the spurge family (Euphorbiaceae) with stems up to 13 feet (4 m) in length, oval- to lance-shaped leaves, and compact, nearly spherical flower clusters. The 3 known populations of this species total fewer than 25 plants.



Chamaesyce halemanui

• *Dubautia latifolia* is a highly branched, woody vine in the aster family with stems up to 26 feet (8 m) long and 3 inches (7 cm) in diameter. It has oval, net-veined leaves and produces clusters of small, yellow flowered heads. An estimated 40 individuals of this species are known from 6 populations.



Dubautia latifolia

(continued on next page)

46 Plants and Animals

(continued from previous page)

- *Poa sandwicensis*, also called Hawaiian bluegrass, is a perennial grass in the family Poaceae with densely tufted stems growing to a height of 3.3 feet (1 m). Currently, this species is known to number 40 plants in 4 populations.

- *Poa siphonoglossa*, another perennial grass, grows taller, producing masses of stems up to 13 feet (4 m) long. Two populations of fewer than 30 individuals are known.



Poa siphonoglossa

- *Stenogyne campanulata* is a hairy vine in the mint family (Lamiaceae). Its flowers have a straight, white tube about 0.5 inch (13 millimeters) long with short, purple lobes. This species is known from only a single population growing on a cliff at the upper rim of Kalalau Valley.

- *Xylosma crenatum* is a tree in the family Flacourtiaceae that grows up to 46 feet (14 m) tall and has coarsely toothed, oval leaves. A dioecious (unisexual) species, this tree bears male and female flowers on separate plants. The three known historical populations have been reduced to one female individual, which poses obvious reproductive problems. Botanists hope that future searches will reveal

additional plants, including some males.

Feral cattle (*Bos taurus*), pigs, and goats (*Capra hircus*) have degraded the vegetation and habitats of the Koke'e region for over a century. Goats (which are managed by the State as a game species) and pigs are believed to pose continuing threats by eating the plants, eroding their fragile habitat, and promoting the spread of aggressive, non-native plants. Black-tailed deer (*Odocoileus hemionus columbianus*), which were introduced to the forests of western Kaua'i in 1961, are adding to these problems. Although the remaining populations of the rare Koke'e plants are on lands designated as State forest reserves, parks, and wilderness preserves, their habitat remains vulnerable to damage.

Lana'ihale Area, Island of Lana'i (6 Plants) - Lana'ihale, the highest point on Lana'i, gives its name to a ridge built by volcanic eruptions along the island's principal rift zone. On September 17, the Service proposed to list six plants endemic to Lana'i as Endangered. The only remaining populations of these species known are found on the summit, slopes, or valleys of Lana'ihale on private land.

- *Abutilon eremitopetalum* is a shrub in the mallow family (Malvaceae) with densely hairy, grayish-green, heart-shaped leaves. It produces flowers with bright green petals that are enclosed within the calyx (the leaves at the base of the flower). The distribution of this plant, which historically was widely scattered on the island, has been reduced to a single population of 30 to 70 individuals.

- *Cyanea macrostegia* var. *gibsonii* is a small, palm-like tree in the bellflower family with a single, unbranched trunk up to 23 feet (7 m) in height. This variety has elliptical or oblong leaves that grow to 31 inches (80 cm) long, and it bears inflorescences of 5 to 15 flowers that are blackish-purple externally and white or pale lilac inside. It is restricted to three gulches on Lana'ihale.

- *Gabnia lanaiensis* is a tall (up to 10 feet, or 3 meter), tufted, perennial, grass-

like plant in the sedge family (Cyperaceae). This species is known from a single population of 15 or 16 individual clumps.

- *Phyllostegia glabra* var. *lanaiensis* is a large, robust, perennial herb in the mint family. This plant has narrow, lance-shaped leaves that often have red veins or are otherwise tinged with red. Its flowers, borne in clusters of 6 to 10 per leaf axil, are white (occasionally with a touch of purple). The last sighting of this plant was that of a single individual in the late 1980's.

- *Tetramolopium remyi*, a small, densely branched shrub in the aster family, grows only to about 15 inches (40 cm) tall. The single flower produced per branch has yellow ray and white disk florets. One population of this species is known; it consists of only 35 plants within an area about 50 feet (15 m) square. It once also grew on west Maui but is believed to be extirpated from that island.

- *Viola lanaiensis*, another small shrub, is a sparingly branched plant in the violet family. It has lance-shaped leaves and small white flowers that are tinged with purple. Two small populations of this species are known, but their total numbers are uncertain.

Most of the native vegetation of Lana'i, which was once covered by forests and shrublands, has been destroyed by cattle and sheep ranching, feral livestock, the clearing of land for pineapple cultivation, and the introduction of exotic ungulates for recreational hunting. Over the years, the feral livestock have been removed, but the State still manages axis deer (*Axis axis*) and mouflon sheep (*Ovis musimon*) as game animals. Both threaten the island's rare plants by browsing and erosion. Invasions of exotic plants are another serious threat to native species on Lana'i, as well as those on the other Hawaiian Islands.

Almost the entire island of Lana'i, including all of Lana'ihale, is owned by a private company. The economic base of Lana'i is being converted from pineapple production to tourism, and it is antici-

(continued on page 6)

46 Plants and Animals

(continued from page 4)

ated that increased development will further modify the remaining natural habitat.

Wai'anae Mountain Range, O'ahu (26 species) - The island of O'ahu was created by two large shield volcanoes, the Wai'anae volcano and the younger Ko'olau volcano to the east. Their original shape has been lost as a result of extensive erosion. Today, the remains of these volcanoes form mountain ranges characterized by long, narrow ridges.

All 26 of the Hawaiian plant species proposed on September 28 for listing as Endangered are either endemic to, or have their largest or best populations in, the Wai'anae Mountains. Several also have restricted distributions in the Ko'olau Mountains of O'ahu and on the islands of Maui, Moloka'i, and Kaua'i. If approved, the Endangered listings would apply to these species throughout their ranges:

- *Abutilon sandwicense*, a member of the mallow family, is a shrub that grows up to 10 feet (3 m) tall with heart-shaped leaves and greenish, pendulous flowers. This species once occurred along almost

the entire length of the Wai'anae Mountains, but today only 7 populations with a total of 300 to 400 plants are known to remain.



Abutilon sandwicense

- *Alsinidendron obovatum*, a small shrub in the pink family (Caryophyllaceae) that reaches 3 feet (1 m) in height, has somewhat fleshy leaves and produces congested clusters of 7 to 12 white and green flowers. The two known populations total approximately 100 individual plants.

- *Alsinidendron trinerve* is similar in appearance to *A. obovatum* but grows in wetter habitat and has leaves with three prominent veins. *Alsinidendron trinerve*

is known to survive at only 2 locations containing a total of about 13 plants.



Alsinidendron obovatum

- *Centaurium sebaeoides*, known in Hawaiian as 'awiwi, is an annual herb in the gentian family (Gentianaceae). It grows to about 8 inches (20 cm) tall with small, rather fleshy leaves and white or pale pink flowers. Five populations, totalling fewer than 1,000 plants, are known to exist on 4 islands: Kaua'i (2), O'ahu (1), Maui (1), and Moloka'i (1).

- *Chamaesyce celastroides* var. *kaenana*, also called 'akoko, is a shrub in the spurge family (Euphorbiaceae). This plant, which can reach 5 feet (1.5 m) in height, drops its leaves in the dry season to conserve water. The 5 known populations that remain contain fewer than 300 individuals.

- *Chamaesyce kuwaleana*, another 'akoko, is smaller, growing only 36 inches (90 cm) tall. Its known range has been reduced to one site containing several hundred plants.

- *Cyanea pinnatifida*, known in Hawaiian as haha, is a member of the bellflower family. Its stem, usually unbranched, grows to about 10 feet (3 m) high and bears long, deeply lobed leaves. Clusters of 8 to 15 greenish-white flowers with purple stripes arise from the leaf axils. The single population known to remain consists of only three individuals.

- *Diellia falcata* is a fern in the family Polypodiaceae. Its fronds, which are up to 40 inches (100 cm) long by 3.5 inches (9 cm) wide, have as many as 45 divisions per side. Historically known from almost



photo by Derral Herbst

Viola lanaiensis

(continued on next page)

46 Plants and Animals

(continued from previous page)

the entire length of the Wai'anae Mountains, this species has been reduced to 7 populations with an estimated 3,000 individuals.



Cyanea pinnatifida

- *Dubautia herbstobatae*, or *na'ena'e*, is a spreading shrub in the aster family that grows to about 20 inches (50 cm) tall. Its leaves are shiny and leathery. There are as many as 15 flower heads in an inflorescence, each composed of up to 20 yellowish-orange, tubular florets. Currently, there are 8 known populations with a total of fewer than 100 individuals.

- *Gouania meyenii*, a shrub in the buckhorn family (Rhamnaceae), reaches approximately 7 feet (2.2 m) in height. Its broadly oval leaves are smooth and papery in texture, and the flowers may be functionally unisexual, with male and female flowers on the same plant. The 4 known populations of this species contain about 75 individuals.

- *Hedyotis degeneri*, a member of the coffee family (Rubiaceae), is a prostrate shrub with peeling, corky bark, clusters of small, trumpet-shaped flowers, and leaves that are quite variable in shape. The single known population of this species contains about six plants.

- *Hedyotis parvula*, a related species, is a heavily branched shrub that grows either upright or sprawling. It has small,

leathery leaves that are uniform in shape and clusters of tubular white flowers. Once known from the central and southern Wai'anae Mountains, this plant has not been seen for several years; however, because this species inhabits inaccessible cliffs, the chances that it survives somewhere in the area are considered good.

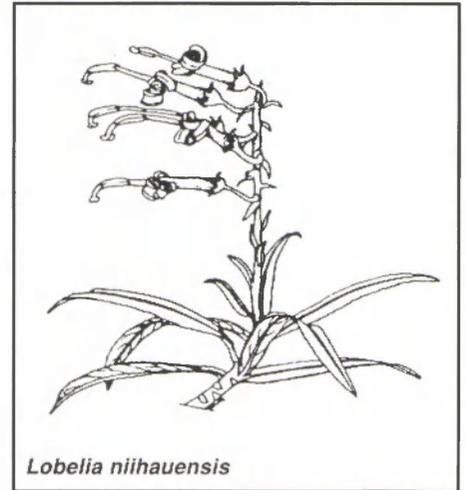
- *Hesperomannia arbuscula*, a small, shrubby tree in the aster family, grows to about 11 feet (3.3 m) in height. It bears clusters of erect flowering heads, each made up of many yellow to yellow-brown florets. There are 2 known populations on O'ahu and one on Maui, with a total of about 50 individuals.

- *Lipochaeta lobata* var. *leptophylla*, another member of the aster family, is a low and somewhat woody perennial herb with arched or nearly prostrate stems that can be up to 59 inches (150 cm) long. Its lanced-shaped leaves are closely spaced along the stem. This plant, called *nehe* in Hawaiian, produces flower heads with many yellow disk and ray florets. The two known populations contain 25 to 50 individuals.

- *Lipochaeta tenuifolia*, also called *nehe*, is another low-growing perennial herb. Its oppositely arranged leaves are divided into three lobes so deeply that they appear to be six leaves, and each lobe is further divided to the midrib into fine segments. This species also bears

flowering heads with numerous yellow disk and ray florets. The 400 to 600 known individuals are distributed over 7 populations.

- *Lobelia niihauensis*, as its name implies, was described from a specimen collected on the privately-owned island of Ni'ihau, where it is no longer known to occur. This member of the bellflower family is a low shrub that produces clusters of magenta flowers. Currently, 19 populations are known to survive on O'ahu and Kaua'i.



Lobelia niihauensis

- *Neraudia angulata*, a member of the nettle family (Urticaceae), is an erect shrub up to 10 feet (3 m) tall with separate male and female flowers growing on different plants. Once occurring along almost the entire length of the Wai'anae

(continued on page 8)



Gouania meyenii

photo by John Obata

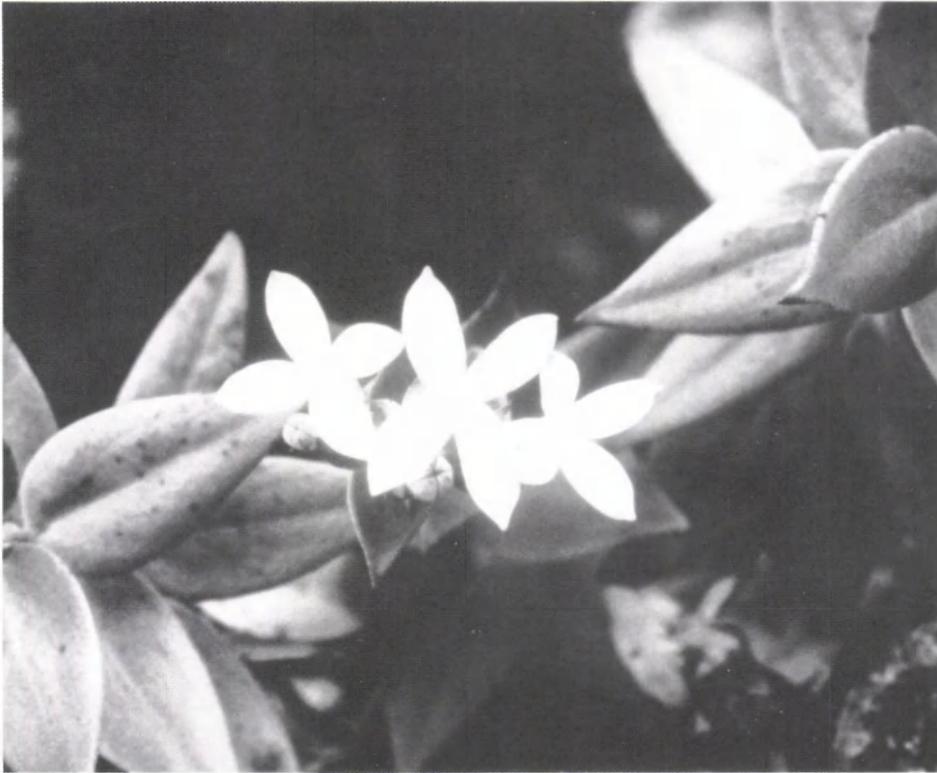


photo by John Obata

Hedyotis parvula



photo by Ken Nagata

Hesperomannia arbuscula

46 Plants and Animals

(continued from page 7)

Mountains, the known range of this plant has been reduced to 5 populations, which total fewer than 15 individuals.

- *Nototrichium humile*, or *kulu'i* in Hawaiian, is an upright to trailing shrub

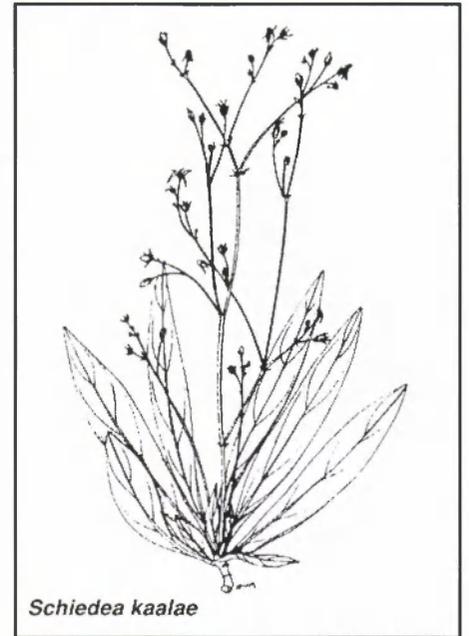
in the amaranth family (Amaranthaceae). The stems and young leaves of this plant are covered with short hairs, and its stalkless flowers are arranged in a spike at the ends of the stems. Historically, this species was found along the entire length of the Wai'anae Mountains and in east Maui. Eleven populations remain, one

on Maui and the others on O'ahu. They total 1,500 to 3,000 plants.

- *Phyllostegia mollis* is a densely hairy, non-aromatic, perennial herb in the mint family. It produces small, white flowers with fused sepals. This species once was found in both the Wai'anae and Ko'olau ranges on O'ahu, and on the islands of Moloka'i and Maui. Two populations are known to remain, both of them in the Wai'anae Mountains. They contain a total of fewer than 50 individuals.

- *Sanicula mariversa*, an herb in the parsley family (Apiaceae), produces a single, branched stem up to 28 inches (70 cm) tall. Its numerous leaves are leathery and have heart or kidney shapes. Each inflorescence contains a cluster of up to 20 yellow flowers. The two known populations contain fewer than 100 plants.

- *Schiedea kaalae* is a short-stemmed perennial in the pink family. It can be distinguished from related species by its stems and by its thick leaves, which have one conspicuous vein. The 7 known populations — 5 in the Wai'anae Mountains and 2 in the Ko'olau Mountains — contain a total of fewer than 100 individuals.



Schiedea kaalae

- *Silene perlmanii*, another perennial in the pink family, is heavily branched from its base and often forms clumps. Its stems are up to 20 inches (50 cm) long,

(continued on next page)

46 Plants and Animals

(continued from previous page)

the leaves are in the shape of a narrow ellipse, and the few white flowers are arranged in clusters at the ends of the stems. This species was not discovered until 1987. One population of 10 to 20 plants is known.

- *Tetramolopium filiforme*, a dwarf shrub in the aster family, grows to only 6 inches (15 cm) high. Its flower heads are composed of as many as 52 white or pale lavender ray florets in a circle around up to 30 maroon (or occasionally yellow) disk florets. The ray florets are female, while the disk florets function as male flowers. These separate male and female flowers on the same plant are one of this species' distinguishing features. The 5 known populations are estimated to contain fewer than 500 individuals.

- *Tetramolopium lepidotum* ssp. *lepidotum*, a related plant, is a larger shrub, reaching 14 inches (36 cm) in height. The florets of this subspecies are either female or bisexual, with both occurring on the same plant. Each flower head contains up to 40 white to pinkish-lavender ray florets and 11 maroon to salmon disk florets. Once found along almost the entire length of the Wai'anai Mountains, this taxon has been reduced in known range to 3 sites with a total of fewer than 100 individuals.



Ureva kaalae

- *Ureva kaalae*, a member of the nettle family, is known in Hawaiian as *opuhe*.



Silene perlmanii

It is a small tree, growing up to 23 feet (7 m) tall with pale green, thin, heart-shaped leaves. The flowers, which are either male or female, may grow on the same or different plants. This species has been reduced to 3 known populations with no more than 19 plants.

- *Viola chamissoniana* ssp. *chamissoniana*, or *pamakani* in Hawaiian, is a shrub in the violet family. This plant is distinguished by its small, triangular-oval to heart-shaped leaves and its white, purple-tinged flowers. The 3 known populations contain only about 16 individuals.

The native vegetation of the Wai'anai Mountains and adjacent areas has undergone extreme alteration as a result of certain land management practices, some of which continue. Among those most harmful to the native flora (and fauna) have been the deliberate introductions of non-native plants and animals, large-scale agricultural development, and military activities. At present, the greatest threats to the rare Wai'anai plants are the degradation of habitat by introduced animals (feral pigs and goats, free-roaming domestic cattle) and competition from aggressive exotic plants. The land inhabited by the recently proposed plants is a mixture of Federal (military), City and County of Honolulu, State, and private

property.

Like all species with severely reduced numbers and ranges, these native plants are vulnerable to rapid extinction from various natural events (e.g., typhoons, fires) as well as human-related activities. Those with a single population—such as *Cyanea pinnatifida* (3 plants), *Hedyotis degeneri* (6 plants), *Silene perlmanii* (10 to 20 plants), and *Chamaesyce kuwaleana* (several hundred plants)—are particularly at risk. A diminished gene pool also may depress their reproductive vigor.

Schoepfia arenaria

This small evergreen tree, a member of the olax family (Olacaceae), is endemic to the coastal forests of northern Puerto Rico. It grows up to 20 feet (7 meters) tall and has several trunks up to 4 inches (10 centimeters) in diameter that arise from the base. Industrial and urban development has eliminated the species from most of its former range, and it survives only at a few sites in low elevation evergreen and semi-evergreen forests on limestone hills. The tree is known to occur in the Isabela area (about 100 individuals), Pinones Commonwealth Forest (about 30 mature plants and numerous saplings and seedlings), and the Fajardo area (about 50 trees). One plant

(continued on page 10)

46 Plants and Animals

(continued from page 9)

was also reported in the Rio Abajo Commonwealth Forest in 1985.

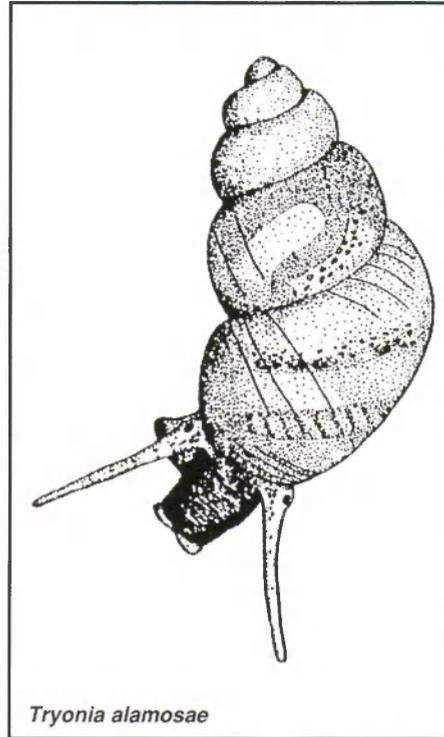
Loss of native habitat threatens the remaining *S. arenaria* populations. The Isabela site is in an area under intense pressure for tourism, urban, and rural development. Illegal acquisition of land for residential development also threatens the Pinones Commonwealth Forest population. Because plants of all sizes and ages have been observed and natural reproduction of the plant appears to be offsetting some losses, the Service has proposed that *S. arenaria* be listed as Threatened rather than Endangered (F.R. 9/17/90).

Two Springsnails

The Alamosa springsnail (*Tryonia alamosae*) and Socorro springsnail (*Pyrgulopsis neomexicana*) are two small aquatic mollusks that are known only from within Socorro County in central New Mexico. Both of these gill-breathing species are found in the slow-moving outflows of thermal springs. The Alamosa springsnail has a thin, translucent, broadly conical shell up to 0.1 inches (3.0 millimeters) long. It is known only from one thermal spring complex, which consists of five individual springs that flow together. The largest thermal spring is about 6 by 10 feet (2 by 3 meters) across and 1 to 2 feet (0.3 to 0.6 m) deep. The species occurs in all of the springs and in the outflows, close to the source.

The Socorro springsnail has an elongate-ovate shell that is light tan in color, short-spined, and up to 0.1 inch (2.5 mm) long. Currently, the species is known to occur in only one thermal spring system, where it was found in 1979. Although the principal source of the spring has been impounded, the Socorro springsnail continues to survive in another small source for the spring. Its

occupied habitat is a tiny spring less than 11 square feet (1 square meter) in size and about 8 feet (2.5 m) of an outflow ditch. The total number of Socorro springsnails is estimated to be 5,000.



drawing courtesy of New Mexico Bureau of Mines and Mineral Resources

Both springsnails are extremely vulnerable to loss or alteration of their habitat. Any reductions in water flow resulting from impoundments, pumping, or water diversions, or other changes in the stream environments (e.g., water pollution, channel modifications), could cause either species to become extinct. The Service therefore has proposed that the Alamosa and Socorro springsnails be listed as Endangered (F.R. 9/18/90).

Available Conservation Measures

Among the conservation benefits authorized for Threatened and Endangered plants and animals under the Endangered Species Act are: protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop

and carry out recovery plans; the authorization to seek land purchases or exchanges for important habitat; and Federal aid to State and Commonwealth conservation departments that have approved cooperative agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages other conservation efforts by State and local agencies, independent organizations, and concerned individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any Endangered or Threatened species. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are not legally binding.

Additional protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, the rules regarding "take" are different. It is unlawful to collect or maliciously damage any Endangered plant on lands under Federal jurisdiction. Removing or damaging listed plants on State and private lands in knowing violation of State law or in the course of violating a State criminal trespass law also is illegal under the Act. In addition, some States have more restrictive laws of their own specifically against the take of State or federally listed plants and animals.

Final Listing Rules Approved for 14 Species

During September 1990, the Fish and Wildlife Service published final listing rules for 14 species—2 plants, 1 mussel, 1 fish, 4 monkeys, and 6 birds. Endangered Species Act protection is now available to the following:

Barneby Ridge-cress (*Lepidium barnebyanum*)

This perennial herb, a member of the mustard family (Brassicaceae), is endemic to three ridgelines in northeastern Utah. It grows up to 6 inches (15 centimeters) tall, usually forms raised clumps or cushions up to 8 inches (20 cm) wide, and has cream-colored flowers. The species' total population, estimated at about 5,000 individuals, occupies fewer than 500 acres (200 hectares). Motorcycles and other off-road vehicles are damaging the habitat in which the Barneby ridge-cress occurs. Continued off-road vehicle use and development of oil and gas resources threaten the species' survival. The Service proposed to list the Barneby ridge-cress as Endangered in the November 27, 1989, *Federal Register* (see BULLETIN Vol. XIV, Nos. 11-12), and the final rule was published September 28, 1990.

Lyrate Bladder-pod (*Lesquerella lyrata*)

Another member of the mustard family, the lyrate bladder-pod is an annual that grows up to 12 inches (30 cm) high and has yellow flowers. Two populations of the plant are known to occur within disturbed cedar glades in northwest Alabama. Much of the habitat suitable for lyrate bladder-pod has been lost due to urban and agricultural development. Both of the remaining populations are on privately owned lands and have declined in recent years due to plant succession. (The species requires periodic disturbance of its surroundings, such as light grazing, to perpetuate the open habitat it needs.) The Service proposed on April 25, 1990, that the lyrate blad-

der-pod be listed as Threatened (see BULLETIN Vol. XV, No. 5), and the final rule was published September 28.

Inflated Heelsplitter (*Potamilus inflatus*)

The inflated heelsplitter is a medium-sized, freshwater mussel with a distinctive wing-like ridge where the two shells join. Historically, the mussel occurred in the Amite and Tangipahoa Rivers in Louisiana, the Pearl River in Mississippi, and the Tombigbee, Black Warrior, Alabama, and Coosa Rivers in Alabama. The construction of flood control levees and impoundments, river channelization, dredging, water pollution, and sedimentation from surface mining have extirpated the inflated heelsplitter from all but short stretches of the Amite, Tombigbee, and Black Warrior Rivers. Gravel mining, proposed flood control improvements, navigation dredging, and water pollution continue to threaten the species and its habitat. The Service proposed that the inflated heelsplitter be listed as a Threatened species in the October 27, 1989, *Federal Register* (see BULLETIN Vol. XIV, Nos. 11-12); the final rule was published September 28, 1990.

Pallid Sturgeon (*Scaphirhynchus albus*)

The pallid sturgeon is one of the largest fish found in the Missouri, Mississippi, and lower Yellowstone Rivers. This bottom-dwelling fish has a distinctive flattened, shovel-shaped snout. The species has experienced a dramatic decline throughout its approximately 3,550-mile (5,725-kilometer) range over the past 20 years. Almost all of the pallid sturgeon's habitat has been modified through river channelization, construction of impoundments, and related changes in flow regimes. These changes have blocked the pallid sturgeon's movements, destroyed or altered its spawning areas, reduced its food sources or its ability to obtain food, and altered water tempera-

tures and other environmental conditions necessary for the fish's survival. Commercial fishing also has probably played a role in the decline. Another threat to the species' survival is an apparent lack of reproduction. Potential threats include water pollution, interbasin transfers of water, hybridization of the species with the more abundant shovel-nose sturgeon (*Scaphirhynchus platorhynchus*), and continuing alteration of remaining spawning or nursery areas. The Service proposed the pallid sturgeon for listing as an Endangered species on August 30, 1989 (see BULLETIN Vol. XIV, Nos. 9-10), and the final rule was published September 6, 1990.

Six Foreign Birds

The Service proposed the following six foreign bird species as Endangered on January 16, 1990 (see BULLETIN Vol. XV, No. 2), and the final rule was published September 28. These species have all experienced significant declines in numbers and/or habitat in recent years, and are vulnerable to human exploitation and disturbance. They are all listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

- The northern bald ibis (*Geronticus eremita*) originally occurred across much of southern Europe, southwestern Asia, and northern Africa. However, climatic changes, hunting, disturbance of the ibis' nesting sites, habitat modification, and widespread applications of toxic pesticides have reduced its numbers to only a few small breeding populations in Morocco (which support a total of about 180 individuals) and possibly one breeding population each in Algeria and Turkey. Pesticide use is a primary threat to the remaining birds. Poaching and nest predation by ravens also are adversely affecting the species.

- The white-winged guan (*Penelope albipennis*) is endemic to a small part of northwestern Peru. This species' forest

(continued on page 12)

Final Listing Rules

(continued from page 11)

habitat is rapidly being destroyed for charcoal production. Hunting also is responsible for the guan's decline. The species was said to be locally common in the mid-19th century, but today only an estimated 300 individuals remain.

- Originally found in the Himalayan foothills of Pakistan, India, and Nepal, the cheer pheasant (*Catreus wallichii*) today occurs only in small, fragmented populations. Its decline has resulted in part from agricultural activity and other human modifications of the forests and meadows on which the bird depends. The pheasant has also been relentlessly hunted.

- The red-tailed parrot (*Amazona brasiliensis*) occurs only in the coastal forests of southeastern Brazil. Most of these forests have been destroyed in recent decades by human development. Today, no more than 4,000 individuals survive. The remaining birds are threatened by illegal collection for the pet trade.

- The Norfolk Island parakeet (*Cyanoramphus novaeseelandiae cookii*) is endemic to a 14-square mile (35-square kilometer) island between New Zealand

and New Caledonia in the southwestern Pacific. Once very common locally, it is now among the world's most critically endangered birds: there are only about 30 individuals in the wild and 10 in captivity. Its decline is due to destruction of forest habitat; competition with the crimson rosella (*Platycercus elegans*), an introduced bird species, for nest sites; avian disease; killing for agricultural pest control; and predation by introduced cats and rats.

- Only a few specimens have been collected of the Madagascar red owl (*Tyto soumagnei*), which inhabits the eastern rainforests of Madagascar. This area is being cleared for agriculture and is subject to other human disturbance.

Four Snub-nosed Monkeys

Four mammals native to China and Viet Nam have been listed as Endangered. The Sichuan or golden snub-nosed monkey (*Rhinopithecus roxellana*), Yunnan or black snub-nosed monkey (*R. bieti*), Guizhou or gray snub-nosed monkey (*R. brelichi*), and Tonkin snub-nosed monkey (*R. avunculus*) are among the most critically endangered primates

in the world. All four are on Appendix I of CITES. The Tonkin snub-nosed monkey is endemic to the mountain forests of northern Viet Nam, and the others are endemic to China's high mountain forests. The range and numbers of all four species have declined substantially in recent years, primarily due to habitat loss and modification. Slash-and-burn agriculture in particular has destroyed much of the forests where the monkeys occur. Hunting of the monkeys for food, pelts, and medicinal purposes also has contributed to their decline. Only about 10,000 to 15,000 Sichuan snub-nosed monkeys, 600 to 800 Yunnan snub-nosed monkeys, 200 to 670 Guizhou snub-nosed monkeys, and 880 Tonkin snub-nosed monkeys are thought to survive. The Service proposed to list the four snub-nosed monkey species as Endangered on January 16, 1990 (see BULLETIN Vol. XV, No. 2). (The Tonkin snub-nosed monkey was listed by the Service as Threatened in 1976, but was proposed for reclassification to Endangered, which more accurately reflects its current status.) The final rule was published in the September 27, 1990, *Federal Register*.

Regional News

(continued from page 2)

were donated, primarily by Conoco Incorporated, Hollywood Marine Incorporated, Texas Waterways Operator's Association, Raymond Dugat Company, and Mr. Harry Sloat and the "Lucky Day." This year, Mr. Ted Appell's boat and facilities at the Sand Dollar Pavilion Marina in Fulton Beach were also used. Mr. Tom Serota from the Service's Corpus Christi Field Office coordinated the project.

* * *

Increased efforts to protect the Endangered Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*) began recently. Conoco, Inc., and the National Fish and Wildlife Foundation have established an Attwater's Prairie-chicken Recovery Fund. Each has offered \$5,000 to match the first \$10,000 in contributions from individuals and corporations.

The new funds will be used to finance recovery actions such as habitat reclamation and a public awareness campaign. The idea for the fund was initiated by Conoco, which made \$5,000 contributions to the recovery program in 1988 and 1989. Those wishing to contribute may send checks payable to the National Fish and Wildlife Foundation/APC Recovery Fund to the APC Recovery Fund, P.O. Box 519, Eagle Lake, Texas 77434. All contributions are tax-deductible to the extent allowed by law.

The Texas Parks and Wildlife Department has signed management agreements with ranchers in Victoria and Austin Counties to remove cattle from two sites in order to restore Attwater's greater prairie-chicken habitat. The State is using Endangered Species Act (Section 6) funds to acquire limited grazing rights in these areas. Cattle were taken off the severely overgrazed Victoria County site

in July and by mid-September native prairie grasses had returned, which should increase the small population of prairie-chickens at this site. The other site, which is adjacent to Attwater's Prairie Chicken National Wildlife Refuge, is covered with McCartney rose (*Rosa bracteata*), an introduced plant that has invaded the area. The State will treat this site with herbicides, which should restore the prairie-chicken's habitat and increase the potential for grazing. Restoration of habitat on this site will link several disjunct prairie-chicken populations.

The Fossil Rim Wildlife Center in Glen Rose, Texas, has begun an Attwater's greater prairie-chicken propagation project. To identify appropriate propagation techniques, the Center will use greater prairie-chickens of a different, non-Endangered subspecies, *Tympanu-*

(continued on next page)

Regional News

(continued from previous page)

chus cupido pinnatus, as a surrogate for the Attwater's greater prairie-chicken. Dr. Nova Silvy from Texas A & M University is also using Section 6 funds to work on reintroduction techniques. It is hoped that these techniques eventually will be used to release the Center's captive-raised birds on unoccupied habitat.

An annual brood count conducted on the Attwater's Prairie-chicken National Wildlife Refuge from June 27 to July 10 suggests that production of young birds is down in spite of relatively favorable habitat conditions. Twenty-four adult birds and 8 young were flushed, indicating an average brood size of 2.7 birds. The reason for the poor production is not known, although rainfall patterns or fire ants (*Solenopsis invicta*) may be responsible. Smaller and fewer broods this summer probably mean that the Attwater's greater prairie-chicken population will be lower in 1991. The statewide estimated population for adult birds in the spring of 1990 was also revised downward from 494 to 470 birds.

* * *

Region 3 - Although the use of organochlorine pesticides was banned at least a decade ago, a recent study by the Missouri Department of Conservation confirmed that the pesticides are continuing to affect Endangered gray bats (*Myotis grisescens*) and their insect prey base in central and east-central Missouri. Gray bats do much of their foraging here in agricultural areas and are ingesting organochlorine pesticides and their by-products. Pesticide-induced mortality of gray bats has been documented in the past at several caves in Missouri. In the 1990 study, which was funded by the Fish and Wildlife Service's endangered species and contaminant programs, insects, gray bat guano, and bat carcasses were collected from five caves and the vicinity of a sixth cave in three counties. Two dead juvenile bats had levels of organochlorines that were high enough to cause their deaths. All of the guano samples contained detectable levels of at least two organochlorines, and several

had levels greater than one-half the concentration shown to be associated with mortality in an earlier study. Most aquatic and terrestrial insect samples also were contaminated with organochlorines.

* * *

Region 4 - During the Labor Day weekend, the Service's Asheville, North Carolina, Field Office, in cooperation with The Nature Conservancy and volunteers from the American Cave Conservation Association, built a gate at the entrance to Tennessee's Tabaccoport Cave to protect a population of gray bats. This cave is an hibernation site for the species and supports a bachelor colony of approximately 30,000 gray bats during the summer. The Nature Conservancy obtained permission from the landowner to build the gate and provided funds for construction. The Service provided equipment and miscellaneous material for the project, and reimbursed the Association's volunteers for their expenses.

The cave gate incorporates two large doors that can be left open during the summer while the bachelor colony is present. The doors will be closed during the winter to protect the hibernation colony from human disturbance. The doors were required because gray bats will not use summer caves with entrances that are completely covered by a gate.

* * *

Region 5 - Thirteen captive-bred peregrine falcons (*Falco peregrinus*) were released in West Virginia this summer at a hack site in the New River Gorge. Since 1987, 54 peregrine falcons have been released in West Virginia. Although no breeding pairs were documented in the State this year, biologists expect at least one breeding pair to be present by 1991.

* * *

West Virginia's two active bald eagle (*Haliaeetus leucocephalus*) nests produced a total of five eaglets this season. One of the nests, in Hampshire County, had not been used for several years.

* * *

The nine known colonies of Virginia big-eared bats (*Plecotus townsendii virginianus*) in West Virginia were censused

this summer using night-scoping techniques. For unknown reasons, the populations in these caves were down 1.7 percent from 1989 levels.

* * *

Over the past 3 years, the West Virginia Division of Natural Resources and the U.S. Forest Service have been building nest boxes for the Endangered northern flying squirrel (*Glaucomys sabrinus fuscus*) in the Monongahela National Forest. From July 1, 1989, to June 30, 1990, personnel from these agencies and students from West Virginia University captured, measured, tagged, and released 106 squirrels. The squirrels were captured at 21 sites, including 9 new localities for the subspecies.

* * *

Botanists from the West Virginia Natural Heritage Program surveyed the State's harperella (*Ptilimnium nodosum*) populations this summer. Funds for the survey were provided by the Fish and Wildlife Service under Section 6 of the Endangered Species Act. The only known populations of this Endangered biennial in the State occur along Sleepy Creek and the Cacapon River in Morgan County. The 1990 survey found that the Sleepy Creek population contained as many as one million individuals scattered along 20 miles (32 kilometers). The Cacapon River population contained approximately 100,000 individuals in 20 subpopulations distributed over 20 river miles. Both populations were as viable and vigorous as they were in 1988 when they were last surveyed. Twenty miles of potential habitat along the Cacapon River were searched for new populations, but none were found. The most serious threats to the harperella continue to be the loss of habitat due to siltation, changes in water level fluctuation patterns, and development.

* * *

Five new populations of running buffalo clover (*Trifolium stoloniferum*), an Endangered perennial, were discovered in West Virginia in June and July. This plant is believed to have been dependent to some extent on the buffalo (*Bison bison*)

(continued on page 14)

Regional News

(continued from page 13)

bison) herds that once migrated along trails in the eastern U.S. With Section 6 funding, the West Virginia Natural Heritage Program created a map of historic bison trails in the State in 1989 using historical references to bison, elk, and large mammal trails. With the map and ecological information, six botanists were sent out in search of the plant. All of the populations discovered this summer were along old roads on ridges or sides of mountains in Randolph County. The largest population contained 209 plants, none of which were found in flower; the other populations varied in size from 1 to 50 individuals. Despite extensive searches, no new populations were found in the Ohio, Little Kanawha, and Kanawha River valleys, or near Lewisburg where savannas were once reported. These areas have been heavily farmed since the 18th century, which may explain the absence of the plant.

* * *

Since the final rule listing the shale barren rock-cress (*Arabis serotina*) as Endangered was published in August 1989, five more populations have been discovered in shale barrens of West Virginia and Virginia. Thirty-one populations of this herb are now known, several of which have fewer than 10 plants. Botanists with the West Virginia Natural Heritage Program, who have been monitoring the shale barren rock-cress populations for 6 years, began two 5-year research projects in 1990. In cooperation with the Department of Defense and the Fish and Wildlife Service, the Heritage Program botanists are studying a population at the U.S. Naval Radio Station at Sugar Grove, West Virginia, to learn more about the species' life history. This population, one of the largest known, was discovered in 1989 after the final rule was published. A permanent 19,700 square yard (16,500 square meter) grid was erected to carry out this study. The other study is being conducted in cooperation with the West Virginia Division of Natural Resources, the Virginia Division of Natural Heritage, and the Service

on six shale barrens throughout the species' range. Its purpose is to examine the population dynamics of the shale barren rock-cress and assess the effects of deer browsing.

* * *

The Service's New England Field Office in Concord, New Hampshire, organized a meeting of nongame biologists involved with peregrine falcon and bald eagle recovery programs in Massachusetts, New York, New Hampshire, Vermont, and Maine early in September. This was the first time in recent years that biologists from all of these States have met to discuss problems and successes in the recovery efforts. The departure of the Peregrine Fund from the East and the need for the northeastern States to assume even greater responsibility in their peregrine recovery programs were noted. Although the number of territorial peregrine pairs in the Northeast continues to slowly increase (now up to 41 pairs), the productivity of the birds was only 1.1 young per pair—a level below that observed in many other recovering peregrine populations.

The results of the 1990 bald eagle breeding season were also discussed at the meeting. The bald eagle population in the Northeast is continuing to make progress toward recovery. In Maine, 123 pairs of eagles produced 98 young, a modest increase over 1989. However, Maine biologists suspect a contaminant problem may be lowering the productivity of the eagles. New Hampshire's single pair of eagles produced 2 chicks this year (see BULLETIN Vol. XV, No. 8), New York's 14 territorial pairs produced 15 chicks, and Massachusetts's 4 pairs produced 3 chicks.

* * *

Because of the number of inquiries regarding the dwarf wedge mussel (*Alasmidonta heterodon*), New England Field Office endangered species biologists hosted a "Meet the Mussel" educational field day on September 8 for the general public. This was an "in the river" presentation on the various fresh water mussel species of New England. Two sessions were held, one in the Connecti-

cut River in Vermont and the other in the Ashuelot River in New Hampshire. Chris Fichtel of the Vermont Natural Heritage Program and Larry Master of The Nature Conservancy led discussions on the natural history of the dwarf wedge mussel and other fresh water mussel fauna in New England.

* * *

Region 6 - Although over 1,000 bald eagles winter in Utah, only 4 birds are known to nest in the State at 2 sites along the Colorado River. One eaglet survived in one of the nests this summer. Wildlife enthusiasts and river expedition companies, under the supervision of the Utah Division of Wildlife Resources, helped the other pair of nesting eagles raise their three eaglets by bringing carp to the nest. Unfortunately, only one eaglet in this nest survived.

The Service's Salt Lake City, Utah, Fish and Wildlife Enhancement and Law Enforcement Offices, along with the Utah Division of Wildlife Resources, also worked with the private landowner to minimize disturbance of the second nest. The landowner had planned to dig a ditch line underneath the nest tree to prepare the land for cultivation, but agreed to delay construction until after the crucial egg hatching period. The landowner also has agreed to consider the eagles' presence when conducting future operations. In addition, the landowner has permitted the State to build an alternate nest for the eagles in a stronger tree. This nest is shaded, which will better protect the eaglets from the intense summer heat.

* * *

At least 14 Endangered least tern (*Sterna antillarum*) and Threatened piping plover (*Charadrius melodus*) nests on a sand bar in the Missouri River near Running Water, South Dakota, were destroyed by vandals this summer. Two research technicians from the South Dakota Cooperative Fish and Wildlife Research Unit discovered the devastation on July 16 during a routine check of the site. Although the island was posted to prevent public access, the technicians found signs of two people and a dog on

(continued on next page)

Regional News

(continued from previous page)

the island. The dog's tracks, which showed it was in pursuit of small birds, and the presence of new-born birds buried in the sand near the nests indicated that the nests had been intentionally destroyed. (Rising water levels in the river later removed this evidence.) A \$1,000 reward for information leading to the identity and conviction of the vandals was announced on local radio and TV stations.

* * *

Region 7 - The Aleutian Canada goose (*Branta canadensis leucopareia*) is continuing to expand its range in the western Aleutian Islands as a result of recovery activities. Surveys this past summer indicate that the Endangered goose now nests on eight islands in the Aleutian chain, up from three at the start of recovery efforts. An intensive translocation program has successfully reestablished nesting on islands formerly occupied by Aleutian geese prior to the fox farming era. Reestab-

lished nesting populations range from 2 pairs on the most recent translocation site at Little Kiska Island to over 50 pairs on Agattu Island. The results of the nesting survey support the Service's proposal to reclassify the Aleutian Canada goose from Endangered to Threatened (see BULLETIN Vol. XIV, Nos. 11-12).

* * *

Region 8 - In July, carcasses of three Endangered species, the Hawaiian coot or 'alae-ke'oke'o (*Fulica americana alai*), Hawaiian stilt or ae'o (*Himantopus mexicanus knudseni*), and Hawaiian duck or koloa (*Anas wyvilliana*), were found at Hanalei National Wildlife Refuge on the island of Kaua'i. Forty dead birds were found in the refuge, the majority of which were koloas. Carcasses of the dead birds and serum samples from the koloas were sent to the National Wildlife Health Research Center in Madison, Wisconsin. The koloas were determined to be positive for avian botulism. The cause of death of the other birds had not been determined as of October 19.

* * *

Region 9 - In September, the Fish and Wildlife Service published its Wetlands Action Plan. The Action Plan, which was prepared in response to President Bush's call for no net loss of the Nation's wetlands, provides a working definition of what "no net loss of wetlands" means and how the Service is going to pursue this goal. "No net loss" is defined as meaning that wetlands losses must be offset by wetlands gains in terms of actual acreage and, to the extent possible, ecosystem function. Drawing on the Service's existing legislative authorities, regulations, and directives, the Action Plan identifies the Service's current and future strategies for wetlands protection, restoration, enhancement, management, research, information, and education. Twenty-three appendices to the Action Plan address specific wetlands issues and Service wetland programs.

Copies of the Wetlands Action Plan can be requested from the Service's Publications Unit, Room 130 - ARLSQ, Washington, D.C. 20240.

New Publications

Manual of the Flowering Plants of Hawai'i, co-authored by Warren L. Wagner, Derral R. Herbst (a botanist with the Fish and Wildlife Service), and S.H. Sohmer, with the collaboration of more than 50 specialists, is the first complete manual of the flowering plants of Hawai'i produced since 1888. This 2-volume, 1,853-page work contains detailed information on the archipelago's native and naturalized plants, including: keys and physical descriptions; statements of geographical and ecological range; an evaluation of extinct

and rare species; literature citations; and nomenclatural and taxonomic synonyms. The 246 pages of plates illustrate all genera of flowering plants in Hawai'i and more than half of the species. The *Manual* also contains chapters on the project history and methods, geography and climate, and endangered and threatened plants (including an accurate census of all protected plants). The *Manual* is available for \$85.00 from the University of Hawaii Press, Order Department, 2840 Kolowalu Street, Honolulu, Hawaii 96822.

Indexed Bibliography on the Flowering Plants of Hawai'i, by Susan W. Mill, Donald P. Gowing, Derral R. Herbst, and Warren L. Wagner, was published in conjunction with the *Manual*. It is a comprehensive bibliography of the subject, covering worldwide publications from the 1784 accounts of Captain Cook's voyages through 1986. The *Index* is available from the University of Hawaii Press for \$25.00.

Include \$3.00 for shipping the first *Manual* or *Index*, and \$1.00 for each additional book or set.

BOX SCORE LISTINGS AND RECOVERY PLANS

Category	ENDANGERED		THREATENED		LISTED SPECIES TOTAL	SPECIES WITH PLANS
	U.S.	Foreign Only	U.S.	Foreign Only		
Mammals	53	248	8	22	331	29
Birds	74	153	11	0	238	69
Reptiles	16	58	17	14	105	25
Amphibians	6	8	5	0	19	6
Fishes	53	11	33	0	97	44
Snails	3	1	6	0	10	7
Clams	37	2	2	0	41	29
Crustaceans	8	0	2	0	10	5
Insects	11	1	9	0	21	12
Arachnids	3	0	0	0	3	0
Plants	179	1	60	2	242	120
TOTAL	443	483	153	38	1117*	351**
Total U.S. Endangered	443		(264 animals, 179 plants)			
Total U.S. Threatened	153		(93 animals, 60 plants)			
Total U.S. Listed	596		(357 animals, 239 plants)			

* Separate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, Nile crocodile, green sea turtle, and olive ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

** There are 276 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

Number of Cooperative Agreements signed with States and Territories: 53 fish & wildlife
39 plants

October 31, 1990

October 1990

Vol. XV No. 10

ENDANGERED SPECIES

Technical Bulletin

Department of Interior, Fish and Wildlife Service
Washington, D. C. 20240

FIRST CLASS
POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
PERMIT NO. G-77

