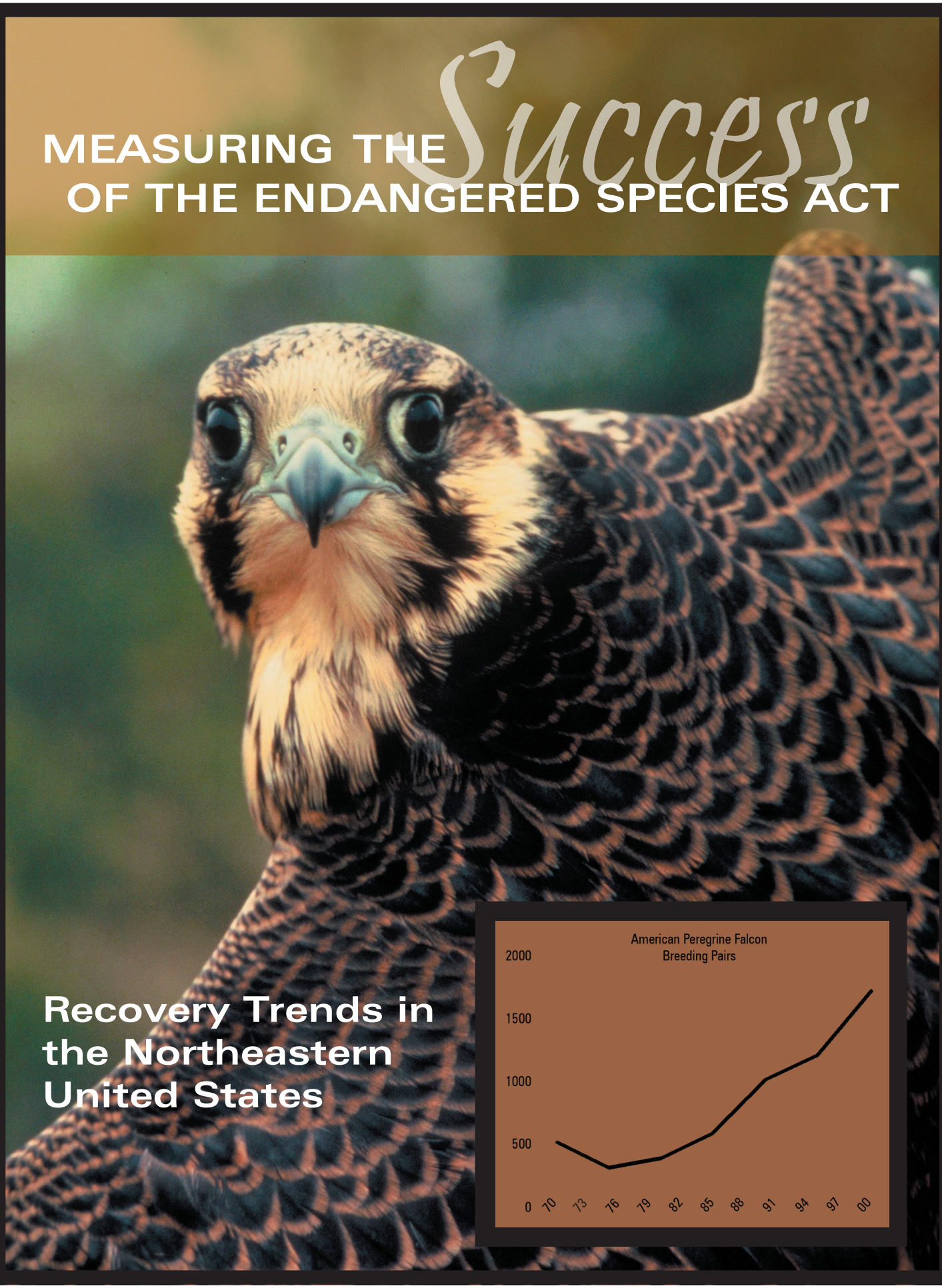
MEASURING THE *Success* OF THE ENDANGERED SPECIES ACT



Recovery Trends in the Northeastern United States

Measuring the Success of the Endangered Species Act: Recovery Trends in the Northeastern United States

A Report by the Center for Biological Diversity

Author:
Kieran Suckling, Policy Director: ksuckling@biologicaldiversity.org, 520.623.5252 ext. 305

Research Assistants
Stephanie Jentsch, M.S.
Esa Crumb
Rhiwena Slack

and our acknowledgements to the many federal, state, university and NGO scientists who provided population census data.

The Center for Biological Diversity is a nonprofit conservation organization with more than 18,000 members dedicated to the protection of endangered species and their habitat through science, policy, education and law.

CENTER FOR BIOLOGICAL DIVERSITY
P.O. Box 710
Tucson, AZ 85710-0710
520.623.5252
www.biologicaldiversity.org

Cover photo: American peregrine falcon
Photo by Craig Koppie
Cover design: Julie Miller

Table of Contents

Executive Summary

The Endangered Species Act is America's foremost biodiversity conservation law. Its purpose is to prevent the extinction of America's most imperiled plants and animals, increase their numbers, and effect their full recovery and removal from the endangered list. Currently 1,312 species in the United States are entrusted to its protection. Historically, 1,350 have been listed.

Opinions abound on whether and to what degree the Act has accomplished its goals. Most are politically driven, some are anecdotal, and a few attempt to wring long-term implications from short-term data. None, however, ask or answer the questions most fundamental to measuring the Act's effectiveness: Are species increasing or decreasing in number since being placed on the endangered species list? Are they progressing toward recovery in a timeline consistent with their federal recovery plans?

In this report we present population trend data, recovery plan reviews, and narrative accounts for all endangered species that historically or currently occur in eight northeastern states: Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, and New Jersey. We find that the Endangered Species Act has been remarkably successful in the region.

Measures of Success:

- Preventing extinction: 100% successful
- Stabilizing and moving species toward recovery: 93% successful
- Meeting recovery timelines: approximately 82% successful

Time Needed for Recovery:

- On average, federal recovery plans expected recovery to take 42 years, while species have been listed for an average of only 24 years.
- Only 11 federal recovery plans expected recovery by 2005. In practice, nine species were downlisted, under review, formally proposed, or completely delisted due to achieving recovery by 2005.

Methods

Species. Our initial sample included all species that were historically or currently present in Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York or New Jersey. These included species that breed (e.g. Atlantic piping plover), migrate through (e.g. Arctic peregrine falcon), forage in (e.g. green sea turtle), or appear as wanderers (e.g. Florida manatee) in the Northeast. Some of these species no longer occur in the Northeast, including the Great Lakes piping plover, Eastern gray wolf, and whooping crane. Species' ranges were determined by examination of federal recovery plans, endangered species listing rules, and published accounts. One species, Houghton's goldenrod *Solidago houghtonii = Oligoneuron houghtonii* was not included because recent research indicates that the single disjunct population in the Northeast likely belongs to a separate taxon.

Of the 56 species meeting the above criteria, we excluded three (i.e. Atlantic salmon, Canada lynx, and smalltooth sawfish) from most analyses because they have received protection under the Endangered Species Act for fewer than six years. We considered six years of conservation work to be the minimum necessary to have a meaningful effect on recovery trends. Four additional species were either extinct, last seen, or extirpated from the United States prior to being placed on the endangered species list (i.e. blue pike, longjaw cisco, eastern cougar, and Eskimo curlew). They were excluded from most analyses. This left a total of 49 extant species listed for at least six years.

Expected Time to Recovery. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service are required to develop recovery plans outlining the goals, methods, costs, and the length of time expected to recover each endangered species. Most federal recovery plans provide an estimated timeline to achieve recovery of the species, usually contingent upon the achievement of recovery criteria delineated in the recovery plan. These criteria often include not only a specific population size or number of populations, but also the subsequent maintenance and monitoring of those populations over a specific number of years. In almost all cases, these timelines were provided as minimum estimates under the best possible conditions and under the assumption that the recovery actions would be undertaken immediately following the publication of the recovery plan.

If a recovery plan specified an expected number of years to recovery, we calculated the time from the date of publication of the plan. If a plan based its recovery criteria on maintaining a particular biological status for a certain number of years, we presumed that it would take ten years to reach the required status, then added the required monitoring time to this. We chose ten years because this figure was frequently used by recovery plans themselves. If the expected time to downlisting from endangered to threatened (but not delisting) was specified, we multiplied the projected time by 1.5 to calculate an estimated time to recovery/delisting. If no plan existed, or the plan included no temporal horizons, we excluded the species from this portion of our analysis. Using the above method, we were able to identify an expected time to recovery for 42 of the 56 northeastern species. The average expected time to recovery was 42 years.

Population Trend Data. By consulting recovery plans, listing rules, monitoring reports, published studies, and data collected and maintained by federal, state, academic and NGO scientists, we obtained sufficient data to determine population trends since listing for 40 plants and animals. Care was taken to avoid comparing data from incompatible survey methodologies and to account for increases attributable to survey effort and/or discovery of new populations that presumably existed at the time of listing. Experts, typically those who provided some of the data, were asked to review most of our species accounts for accuracy. Quantitative range-wide data were entirely lacking, inconsistently gathered, or otherwise insufficient to determine the trends for eight species in our sample.

Trend Scores. For the 40 species for which adequate population data was available we determined whether the species had increased, decreased, or remained stable since listing. These determinations were based exclusively on quantitative census data, except for the northern red-bellied cooter, small whorled pogonia, Mitchell's satyr butterfly, dwarf wedgemussel, and northern wild monkshood.[1] For these five species, census data were not available, but there was a consensus among the experts that the first two have increased in number and the latter three have remained relatively stable since listing.

Trend scores were based on the status of the species throughout its range, rather than in each state or in the Northeast. The Puritan tiger beetle, for example, has improved since listing at its two sites in the Northeast, but has declined significantly in its larger Chesapeake Bay populations and is therefore scored as "declined." Conversely, the eastern gray wolf is scored as "increased" because of strong recovery trends in the Great Lakes region although it remains extirpated from the Northeast.

The determination that a species has remained stable or increased since listing is not meant to imply that the population levels have been static or increased steadily over the years. In fact, the population sizes of many species fluctuate greatly over time due to environmental factors. For example, the northeastern beach tiger beetle populations can increase by as much as 500% in a single year and decline by a similar amount the next year. Jesup's milk-vetch and the seabeach amaranth have a similar potential for explosive increases and declines. For such species, we examined the long-term overall trend. Thus, stable species may fluctuate greatly from year to year but appear to be generally stable within a range of population levels, and increasing species may decrease in some years, but in general continue to increase over the long term.

Nine species (=17%) were scored as "unknown" due to lack of adequate data. It is important to note that "unknown" is a measure of survey adequacy and effort, not conservation status. Some critics of the Endangered Species Act have misleadingly combined large unknown scores with small declining scores in order to create the false impression that large numbers of species have "negative" trends.[2] There is no indication that the "unknown" species in our data set are more

[1] All discussion of species' status in this section is drawn from the Technical Species Accounts section and is not separately annotated here.

[2] Thus Congressman Richard Pombo (R-CA): "According to the FWS's most recent Report to Congress, the recovery status of 60 percent of listed species is either 'uncertain' or 'declining'". Pombo, R. 2005. Pombo Releases

imperiled or doing more poorly than those with known scores. Indeed, several of them have fairly large populations and are likely unknown because wildlife agencies are directing their resources toward more precarious species.

Oversight Report on ESA Implementation: Review of agency data shows little evidence of progress in species recovery. House Committee on Resources Press Release, May 17, 2005.

Results and Discussion

Preventing Extinction

Endangered species are at high risk of extinction and require considerable conservation effort simply to remain in existence. The mere saving of species from extinction, therefore, is one important measure of the Endangered Species Act's effectiveness. Four of the 56 endangered species that occur in the Northeast are extinct. But all of them became extinct or extirpated from the United States *prior* to their placement on the endangered species list. The eastern cougar was listed under the Endangered Species Conservation Act (the precursor to the Endangered Species Act) in 1973 and listed as an endangered species under the modern Endangered Species Act in 1974, but the last verified individual was captured in 1938 and died in captivity several years later. The Eskimo curlew was listed under the Endangered Species Conservation Act in 1967 and listed as an endangered species in 1974, but was last documented in the United States in 1962 and in the world in 1963. The longjaw cisco was last seen in U.S. waters in 1967, the same year it was listed under the Endangered Species Conservation Act. It was listed as an endangered species in 1974 and was seen only once again, in 1975 in Canada. The blue pike, listed under the Endangered Species Conservation Act in 1967, was last seen in 1971, three years before it was listed as endangered under the Endangered Species Act.

The pike and cisco were removed from the endangered list as extinct in 1983. The cougar and curlew remain on the list in the hope that they, like the ivory-billed woodpecker, will be rediscovered. Occasional sightings of these two species are still reported, but none have been documented in decades.

The Endangered Species Act has been 100% successful in preventing the extinction of endangered species in the Northeast.

Full Recovery: What is a reasonable expectation?

Critics of endangered species conservation have seized on the fact that only 14 of the 1,350 species have been removed from the endangered species list due to recovery. This is variously described as a one or zero percent success rate.[3] While full recovery and delisting are obviously important, it is illogical to hold them up as a primary, or even a remotely adequate, measure of the Act's success. Such a rationale declares all improvement short of complete recovery a failure. Under this measure, the spectacular increase in bald eagle numbers (417 pairs in the Lower 48 in 1963 grew to 7,280 in 2003; 21 in the Northeast in 1967 grew to 562 in 2005) would be declared a failure, as would the increases in the shortnose sturgeon (12,669 Hudson River spawning fish in 1979 grew to 56,708 in 1994-1996) and the Atlantic piping plover (550 pairs in 1986 grew to 1,423 in 2004).

[3] Pombo, op. cit., Pombo, R. 2005. "ESA has a zero percent success rate". Commentary published by California Farm Bureau Federation, April 6, 2005

Additionally, this argument presumes without justification that it is reasonable to expect all species to have recovered by 2005. However, the recovery of endangered species is guided by federal recovery plans that establish goals, benchmarks, processes, and timelines, based on each species' status and needs. In particular, the timelines estimate the length of time necessary to achieve recovery. The average length of expected recovery time for species in our sample is 42 years. Currently, these species have been listed for an average of just 24 years. Consider the Atlantic salmon: It has only been on the endangered list for five years and only received a recovery plan in November 2005. The plan explains that recovery will require decades of intensive, difficult work. Or consider the North Atlantic Right Whale Recovery Plan: it suggests that this long-lived, slow reproducing species will require 150 years just to qualify for downlisting to "threatened" status.

A more sensible measure of recovery would be to examine the number of actual recoveries in relationship to the number predicted by federal recovery plans. Northeast recovery plans identify only eleven species that were expected to recover by 2005 (table 1). Seven of these species have indeed been delisted, proposed for delisting, or downlisted. Two species not expected to have recovered by 2005 have been recommended for down or delisting in whole or in part.

Table 1. Predicted vs. Actual Recovery Trends

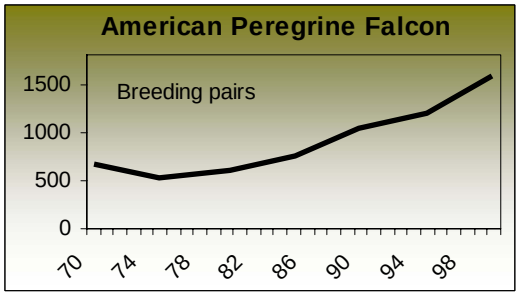
Species	Expected Recovery Date	Current Status
American Hart's-tongue fern	1999	Declined since listing, primarily due to NY trend; great majority of plants occur in Canada and are apparently stable.
American peregrine falcon	2000	Delisted
Arctic peregrine falcon	1995	Delisted
Bald eagle (Continental U.S. DPS)	2000	Proposed for delisting
Brown pelican (Southeastern DPS)	1985	Delisted
Dwarf cinquefoil	2003	Delisted
Gray wolf (Eastern DPS)	2005	Proposed for delisting
Knieskern's beaked-rush	1997	Trend unknown
Northeastern beach tiger beetle	2005	Stable; large Virginia populations; introductions occurring in NJ and MA
Small whorled pogonia	2003	Downlisted to threatened in 1994
Swamp-pink	2002	Trend unknown, but relatively populous
Northeastern bulrush	2014	Recommended for down or delisting by biologists
Shortnose sturgeon	2024	Connecticut, Delaware, Hudson, and Kennebec River System populations recommended for down or de-listing

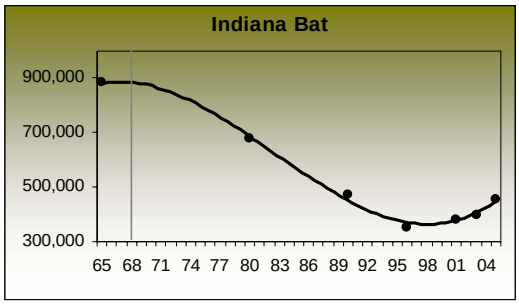
The delisting of eleven species by 2005 is a reasonable expectation given full funding of recovery plans. Nine species have reached or are near to recovery, indicating that the Endangered

Species Act has performed well by this measure, especially considering the chronic underfunding of the conservation actions needed to effect recovery.[4]

Progress Toward Recovery

As few species were expected to fully recover by 2005, the most pertinent measure of success is whether species are progressing toward recovery. The datasets typically used to approach this question scientifically are the U.S. Fish and Wildlife Service and National Marine Fisheries Service recovery reports to Congress.[5] These reports categorically score all endangered species as improved, declined, or stable over a specific two-year period. While useful for some purposes, these scores are not quantitative and do not intend to indicate long-term population trends or total trends since listing. For example, the California least tern is correctly rated as having declined during 2001-2002,[6] but it nonetheless has experienced an impressive and nearly constant increase from 225 nesting pairs in 1970 when it was listed to 6,561 pairs in 2004. The Atlantic leatherback sea turtle is also correctly rated as declining in 2001-2002, but it too increased significantly between its 1978 listing and the present day. Going the other direction, the Hawaiian monk seal did indeed increase in 2001-2002, but it is merely a blip in an otherwise long and precipitous decline. Finally, the Puritan tiger beetle is correctly rated as being stable in 2001-2002, but from a broader perspective it clearly declined since its 1990 listing due to a population crash in Chesapeake Bay.





While most researchers are careful not read too much into these short-term trends, others have improperly cited them as conclusive evidence that the Endangered Species Act is failing to put species on the road to recovery. Thus Congressman Pombo declares "…government data makes it clear the vast majority of these species have not improved under implementation of current law."[7] That conclusion can not be drawn from the federal data and is strongly contradicted by other data which does directly address long-term recovery trends.

The primary contribution of this paper is the compilation of long-term, quantitative data demonstrating the population trend of Northeastern species since they were placed on the endangered species list. Our analyses show that the populations of 93% of listed species increased or remained stable (65% increased, 28% were stable).

[4] Miller J.K., J.M. Scott, C.R. Miller and L.P. Waits. 2002. The Endangered Species Act: Dollars and sense? BioScience 52: 163–168; Restani, M. and J.M. Marzluff. 2002. Funding extinction? Biological needs and political realities in the allocation of resources to endangered species recovery. BioScience 52:169–177.

[5] See for example, Miller et al., op. cit., Restani and Marzluff, op. cit., and Taylor, M.F.J, K.F. Suckling, and J.J. Rachlinski. 2005. The Effectiveness of the Endangered Species Act: A Quantitative Analysis. BioScience 55(4):360-367

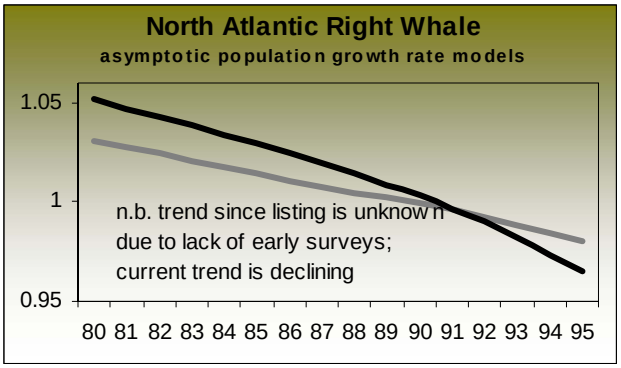
[6] U.S. Fish and Wildlife Service. 2004.Recovery Report to Congress: Fiscal Years 2001–2002.Washington, D.C.

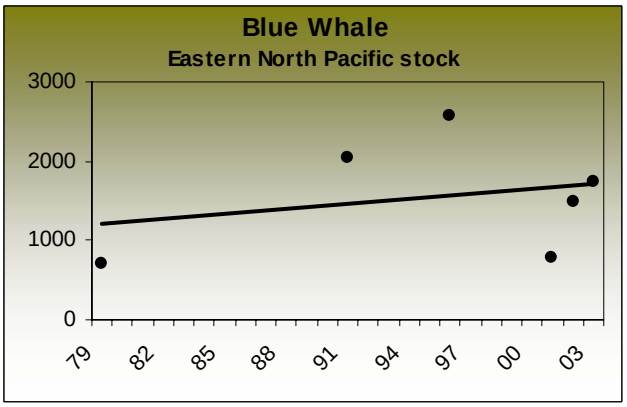
[7] Pombo, op. cit.

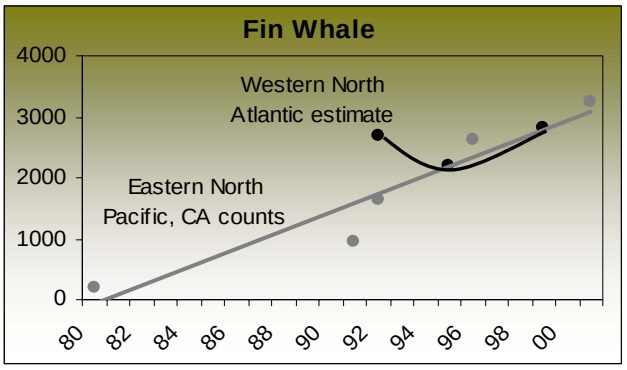
Improving species include the bald eagle, American peregrine falcon, Arctic peregrine falcon, Atlantic piping plover, roseate tern, humpback whale, fin whale, Delmarva fox squirrel, shortnose sturgeon, American burying beetle, dwarf cinquefoil and many others. Only three species declined: the Indiana bat, Puritan tiger beetle, and the American Hart's-tongue fern.

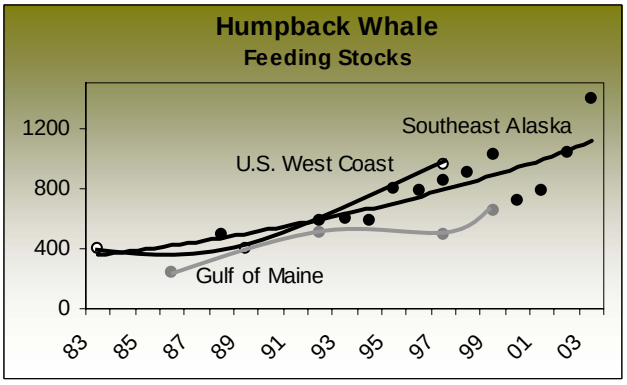
The next section, *Photos and Population Graphs,* provides a visual overview of the trend since listing for each species. *Highlighted Species* provides a simple one page summary of the management and trends of ten species. *Technical Species Accounts* give a longer, cited review for each species. The report ends with state by state list of species and their overall population trends.

Photos and Population Trend Graphs


North Atlantic Right Whale
asymptotic population growth rate models
1.05
1
0.95
n.b. trend since listing is unknown
due to lack of early surveys;
current trend is declining
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95

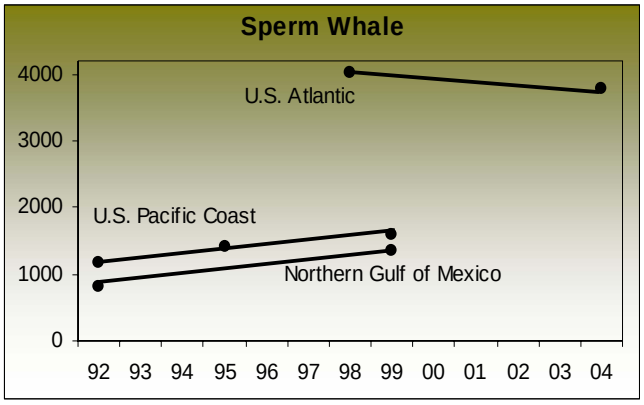

Blue Whale
Eastern North Pacific stock
3000
2000
1000
0
79 82 85 88 91 94 97 00 03

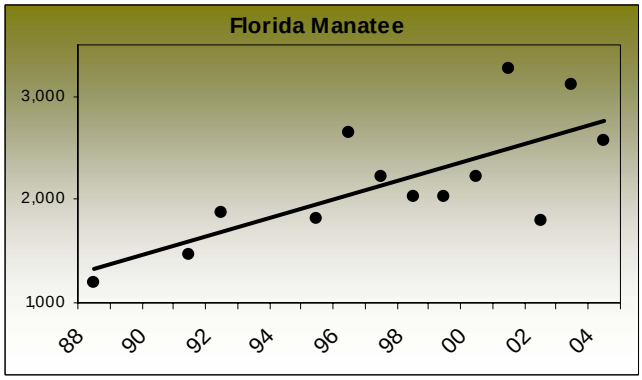

Fin Whale
4000
3000
2000
1000
0
Western North
Atlantic estimate
Eastern North
Pacific, CA counts
80 82 84 86 88 90 92 94 96 98 00

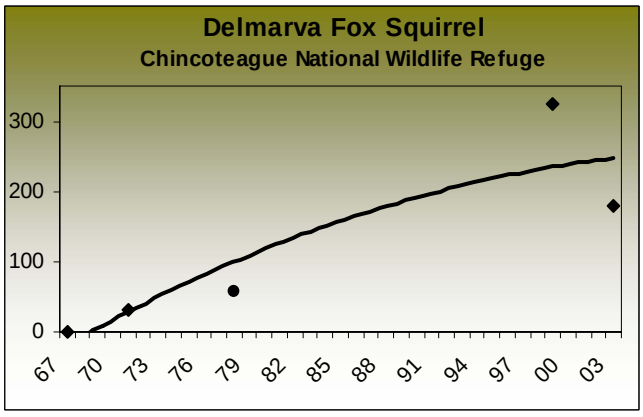

Humpback Whale
Feeding Stocks
1200
800
400
0
Southeast Alaska
U.S. West Coast
Gulf of Maine
83 85 87 89 91 93 95 97 99 01 03

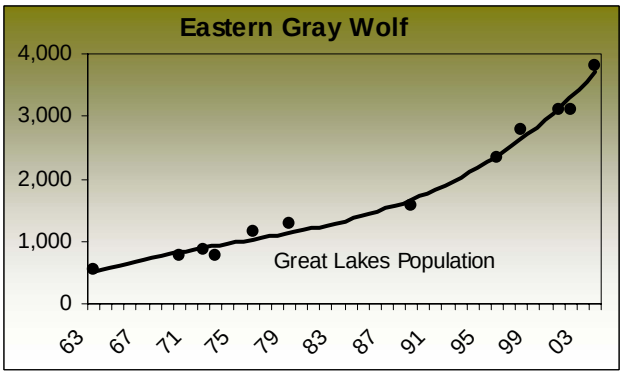
Sei Whale

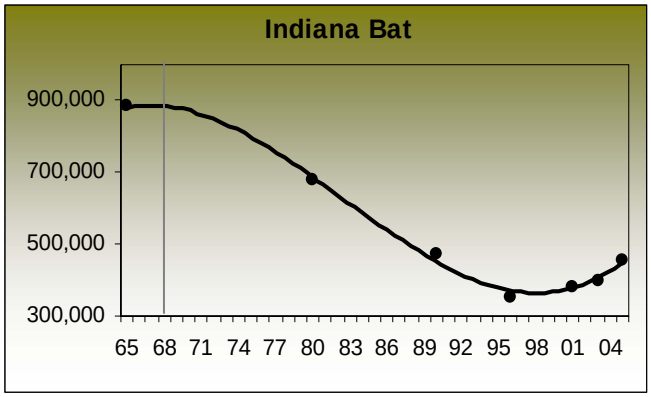
Population trend since listing is unknown. The Sei whale is poorly studied and rarely seen.





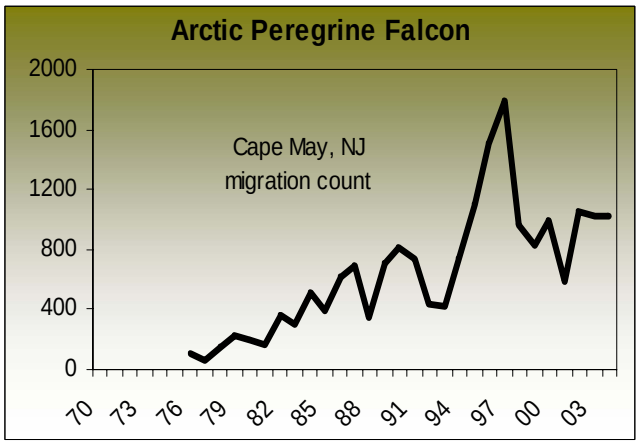


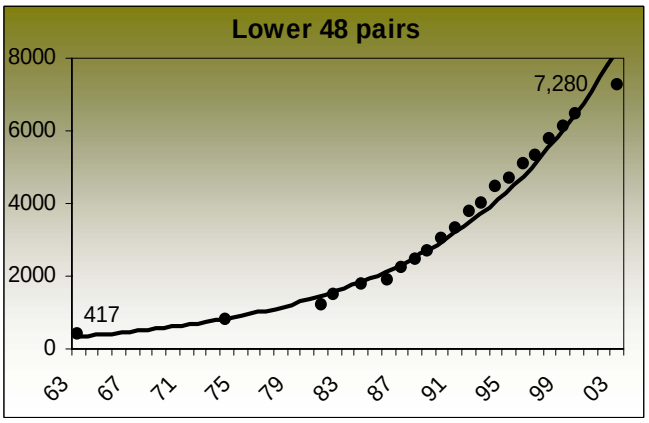


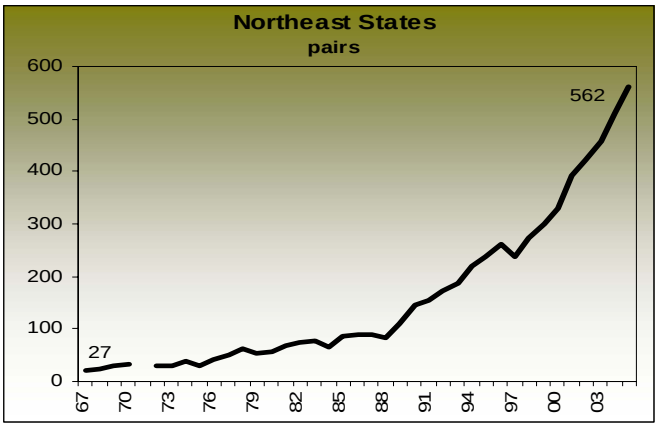


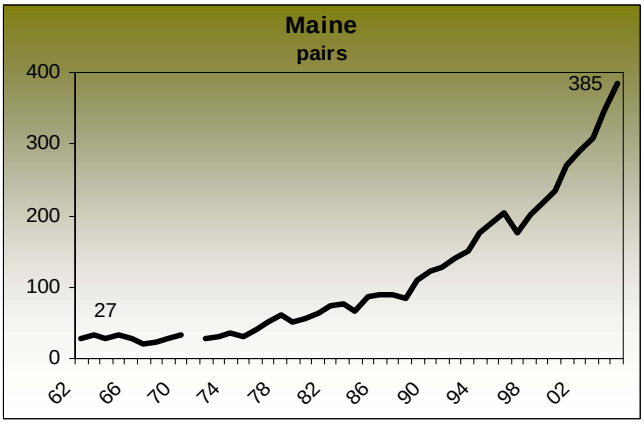
Eastern Cougar

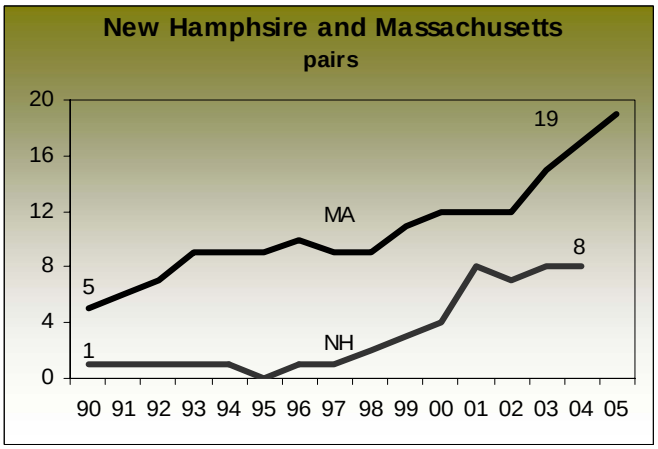
Probably extinct. The last known cougar died in captivity in the early 1940s. Sporadic but unverified sightings continue to this day in southeast Canada and Northeast United States.

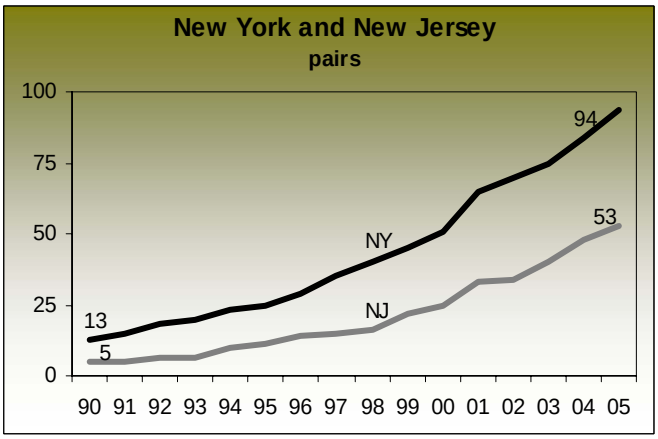


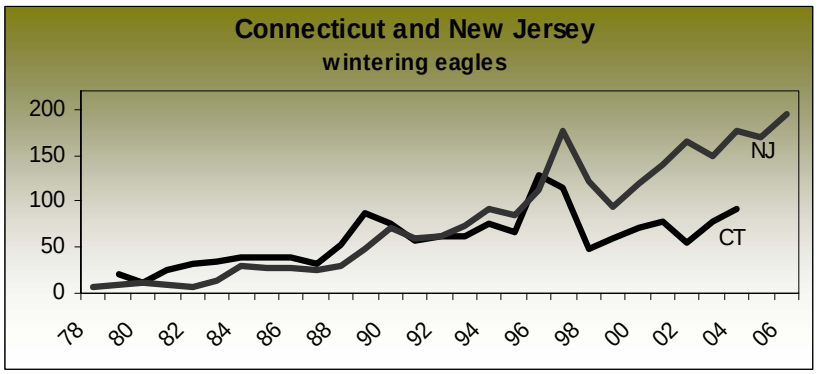

Lower 48 pairs
8000
6000
4000
2000
0
417
7,280
63 67 71 75 79 83 87 91 95 99 03

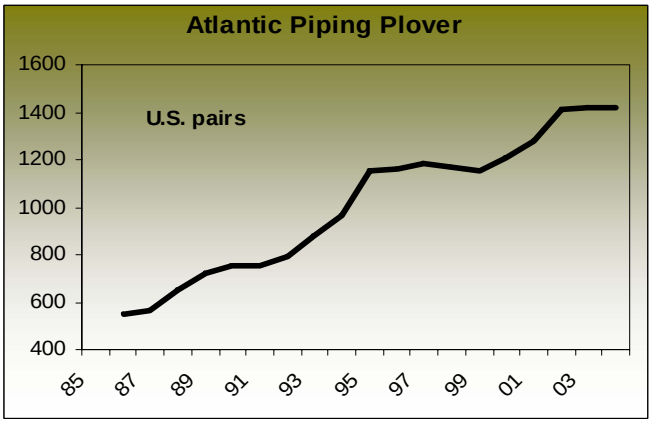

Northeast States
pairs
600
500
400
300
200
100
0
27
562
67 70 73 76 79 82 85 88 91 94 97 00 03

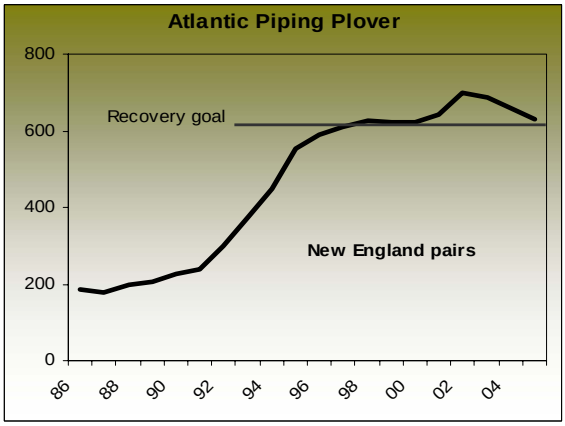

Maine
pairs
400
300
200
100
0
27
385
62 66 70 74 78 82 86 90 94 98 02

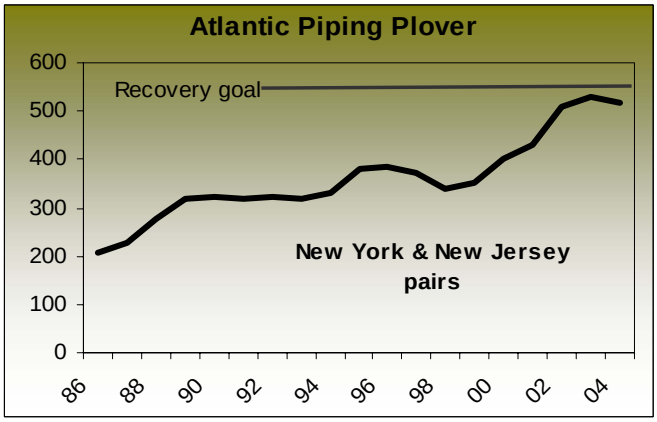

New Hamphsire and Massachusetts
pairs
20
16
12
8
4
0
19
MA
8
5
1
NH
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05

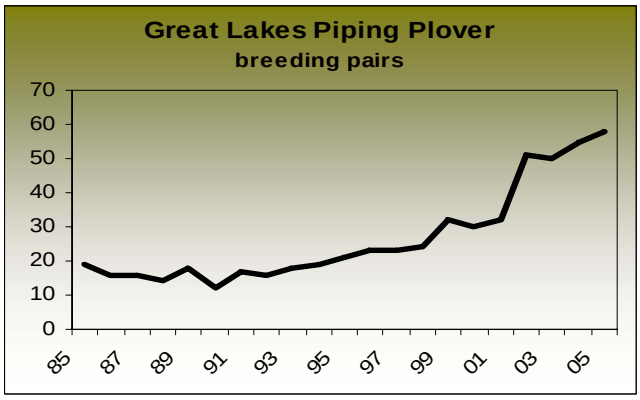

New York and New Jersey
pairs
100
75
50
25
0
94
NY
53
NJ
13
5
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05

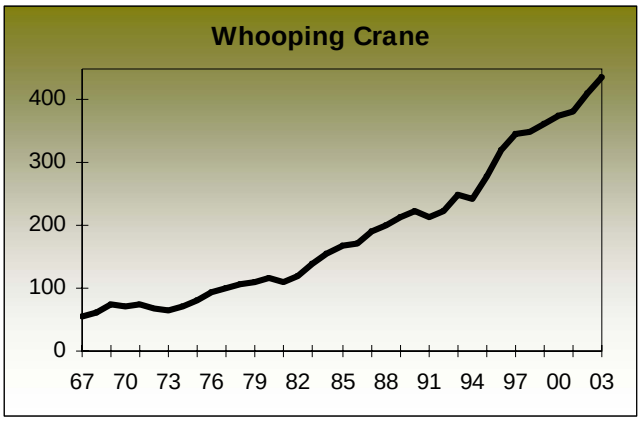

Connecticut and New Jersey
wintering eagles
200
150
100
50
0
NJ
CT
78 80 82 84 86 88 90 92 94 96 98 00 02 04 06


Atlantic Piping Plover
U.S. pairs
1600
1400
1200
1000
800
600
400
85 87 89 91 93 95 97 99 01 03


Atlantic Piping Plover
Recovery goal
New England pairs
800
600
400
200
0
86 88 90 92 94 96 98 00 02 04

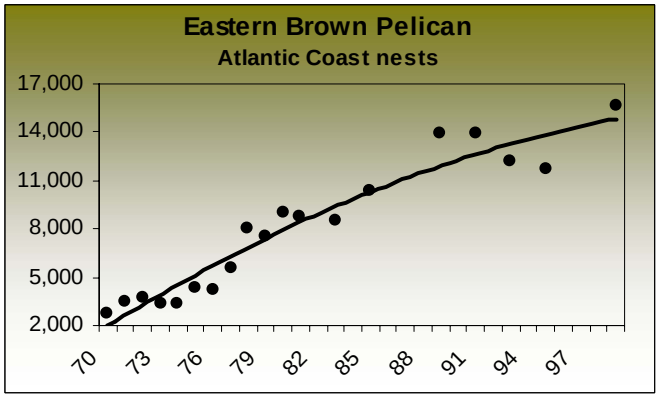

Atlantic Piping Plover
Recovery goal
New York & New Jersey pairs
600
500
400
300
200
100
0
86 88 90 92 94 96 98 00 02 04

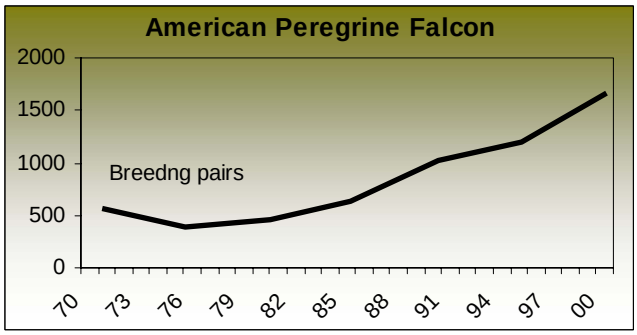

Great Lakes Piping Plover
breeding pairs
70
60
50
40
30
20
10
0
85 87 89 91 93 95 97 99 01 03 05

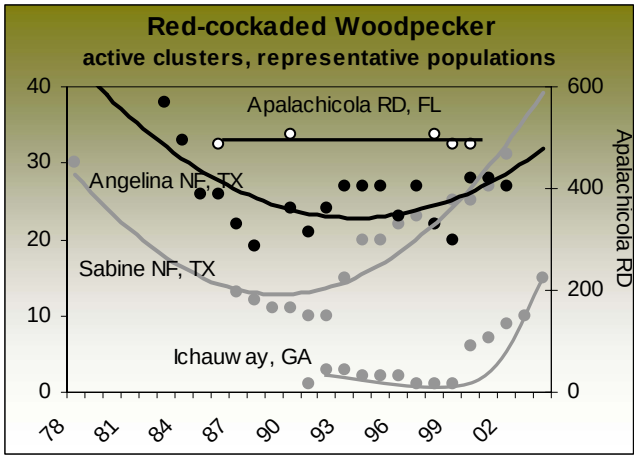

Whooping Crane
400
300
200
100
0
67 70 73 76 79 82 85 88 91 94 97 00 03

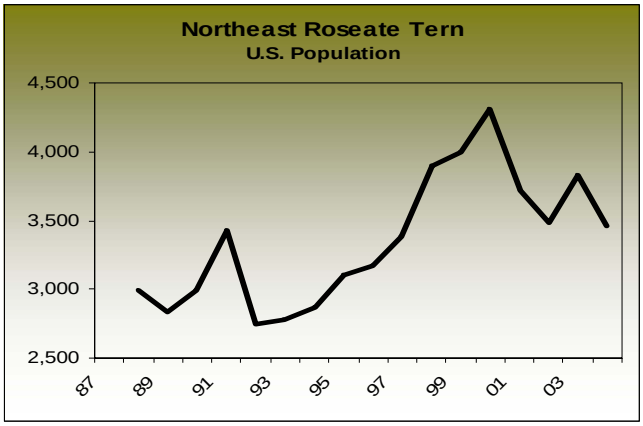
Eskimo Curlew

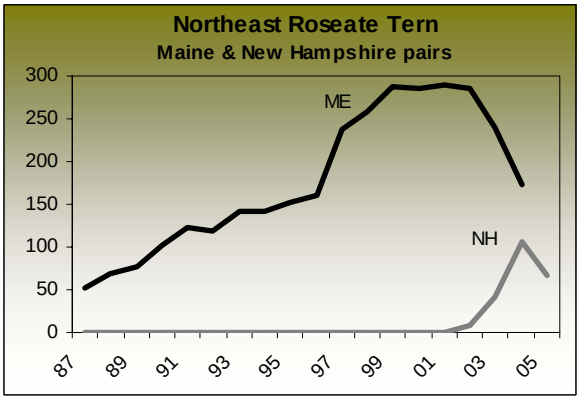
May be extinct. The Eskimo curlew was last documented in the U.S. in 1962 and outside the U.S. in 1963. It was not listed as an endangered species until 1967. Intriguing, but undocumented sightings are made every few years, the last being on Martha's Vineyard, Massachusetts in 2002.

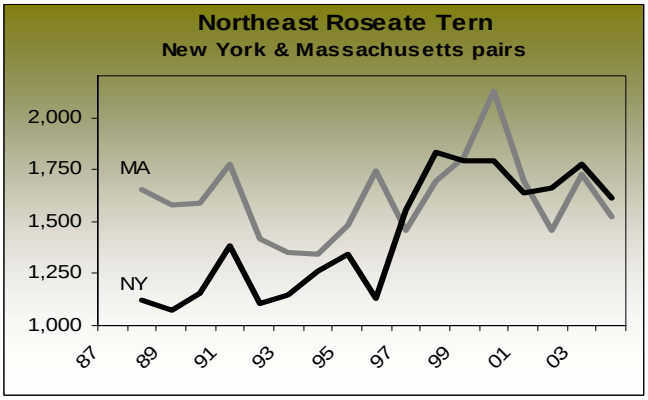


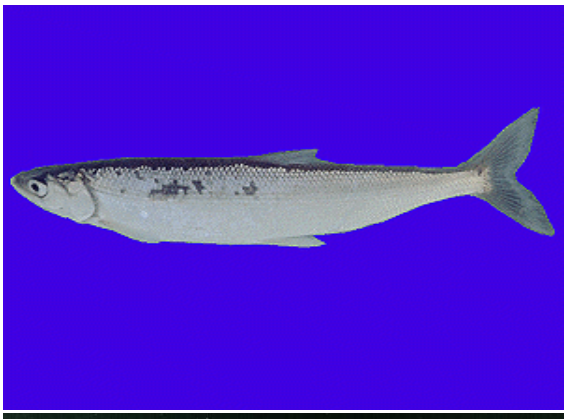






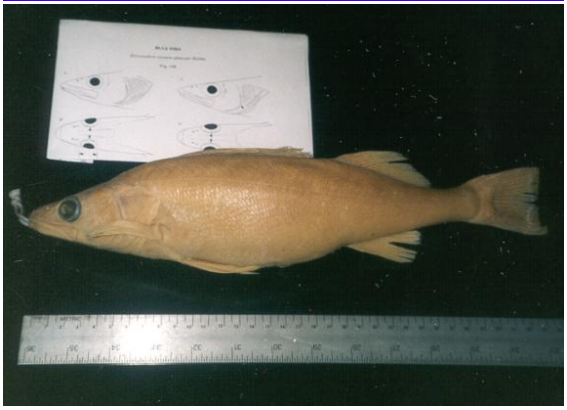






Longjaw cisco

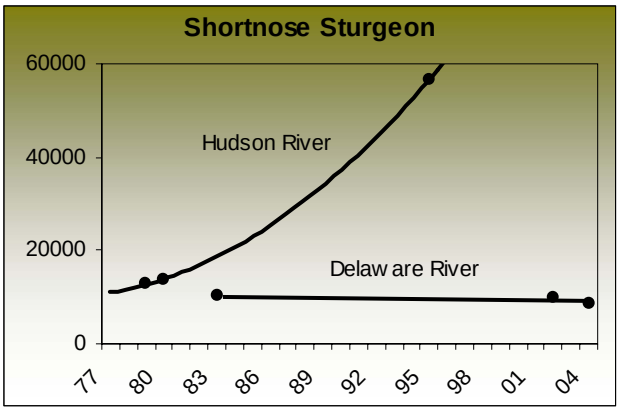
Extinct. The longjaw cisco was extirpated from U.S. waters in 1967, listed as endangered in 1967, and last seen in Canada in 1975.

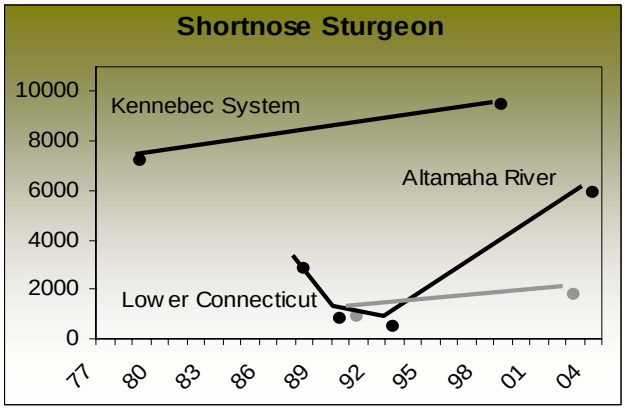


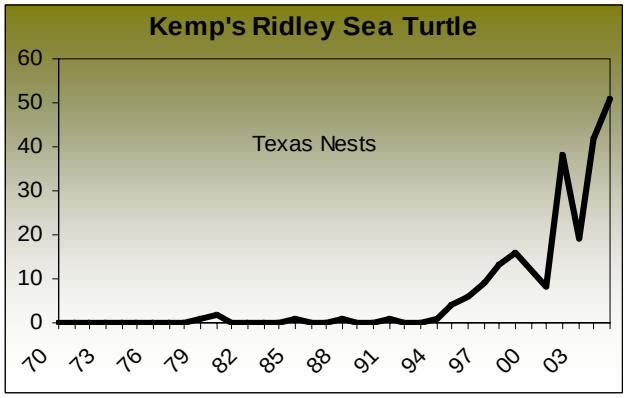
Blue Pike

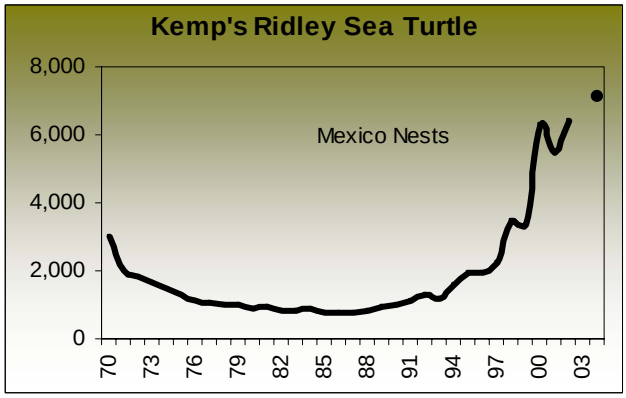
Extinct. The blue pike was protected under a precursor to the Endangered Species act in 1967, was last seen in 1971, and protected under the modern Endangered Species Act in 1974.

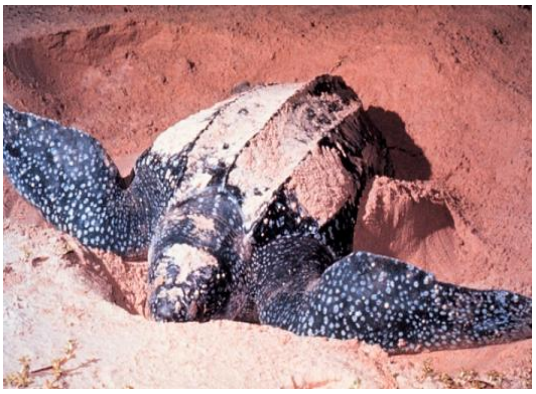

Photo credit: Noel Burkhead

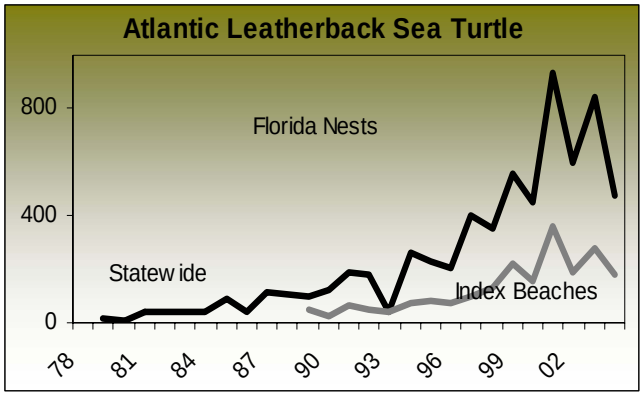

Shortnose Sturgeon
60000
40000
20000
0
Hudson River
Delaware River
77
80
83
86
89
92
95
98
01
04

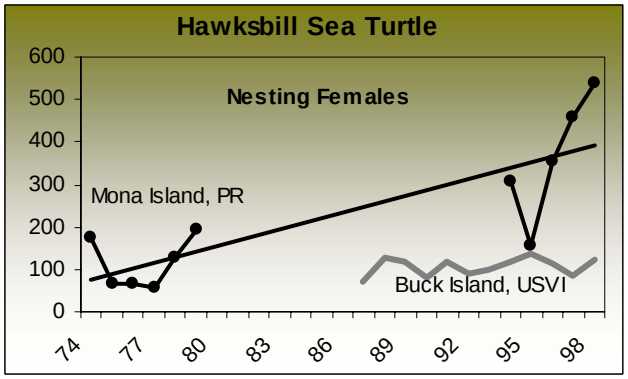

Shortnose Sturgeon
10000
8000
6000
4000
2000
0
Kennebec System
Altamaha River
Lower Connecticut
77
80
83
86
89
92
95
98
01
04

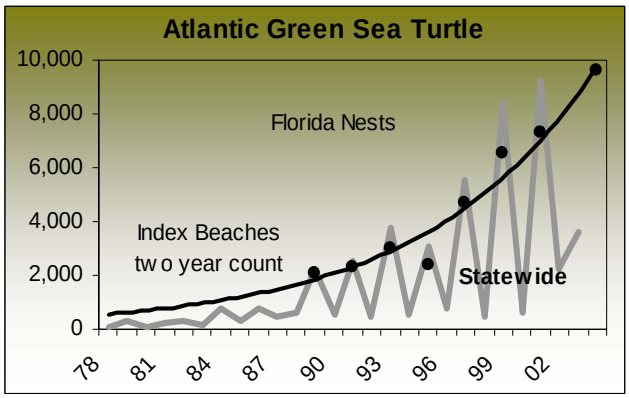

Kemp's Ridley Sea Turtle
60
50
40
30
20
10
0
Texas Nests
70
73
76
79
82
85
88
91
94
97
00
03

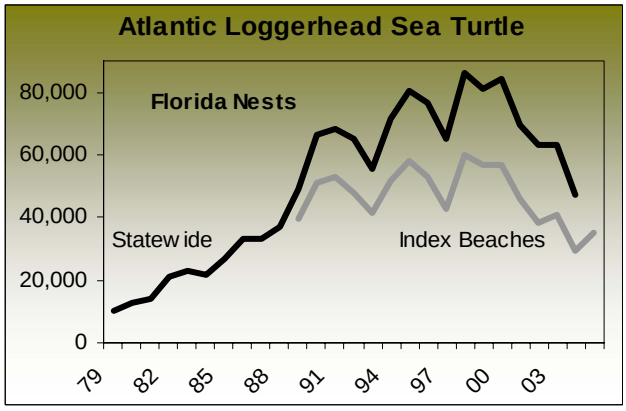

Kemp's Ridley Sea Turtle
8,000
6,000
4,000
2,000
0
Mexico Nests
70
73
76
79
82
85
88
91
94
97
00
03

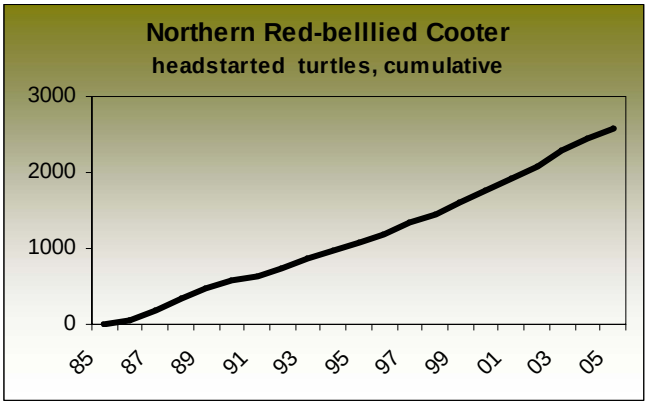



Atlantic Leatherback Sea Turtle
800
400
0
Florida Nests
Statewide
Index Beaches
78
81
84
87
90
93
96
99
02


Hawksbill Sea Turtle
600
500
400
300
200
100
0
Nesting Females
Mona Island, PR
Buck Island, USVI
74
77
80
83
86
89
92
95
98

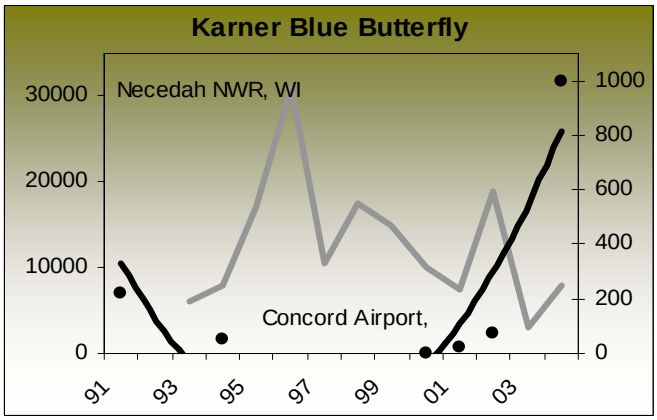

Atlantic Green Sea Turtle
10,000
8,000
6,000
4,000
2,000
0
Florida Nests
Index Beaches
two year count
Statewide
78
81
84
87
90
93
96
99
02


Atlantic Loggerhead Sea Turtle
80,000
60,000
40,000
20,000
0
Florida Nests
Statewide
Index Beaches
79
82
85
88
91
94
97
00
03



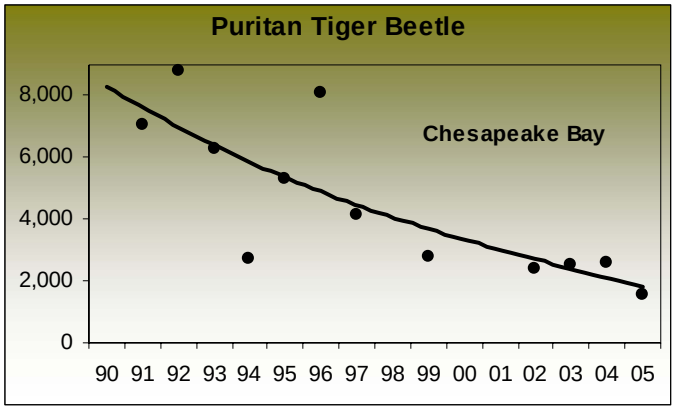
Bog Turtle

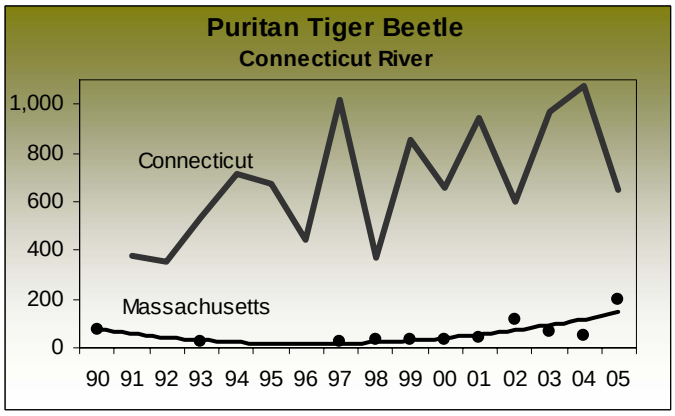
The population trend since listing is unknown due to lack of rangewide surveys.

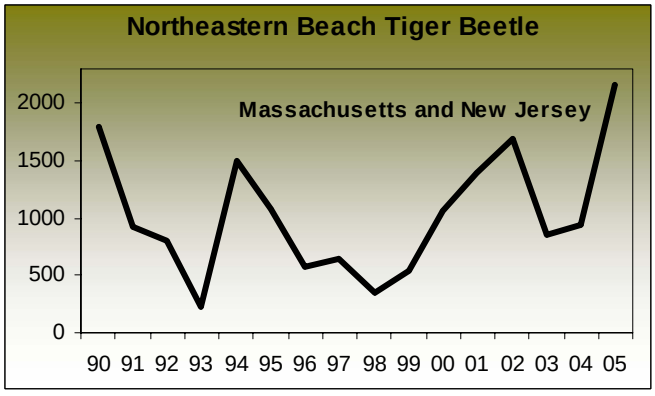


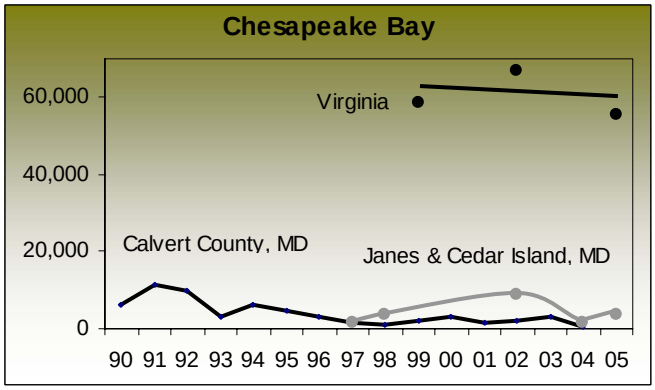
Mitchell's satyr butterfly

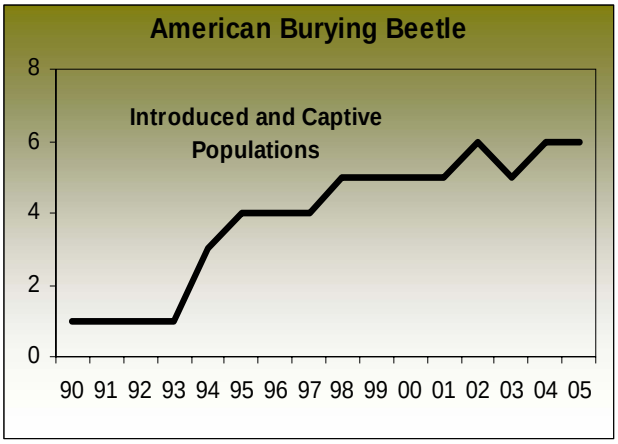
Graphable population data are not available, but the species is known to be relatively stable since being listed.

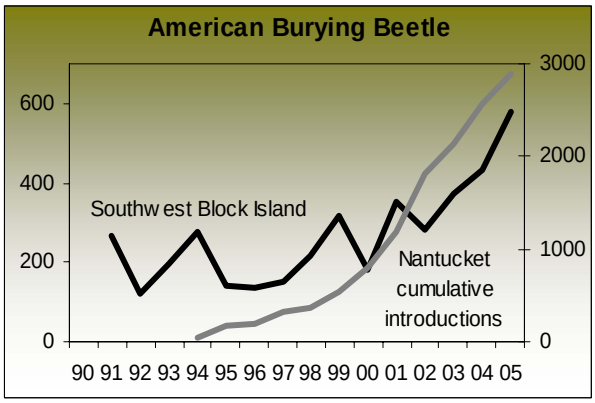

Puritan Tiger Beetle
8,000
6,000
4,000
2,000
0
Chesapeake Bay
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05

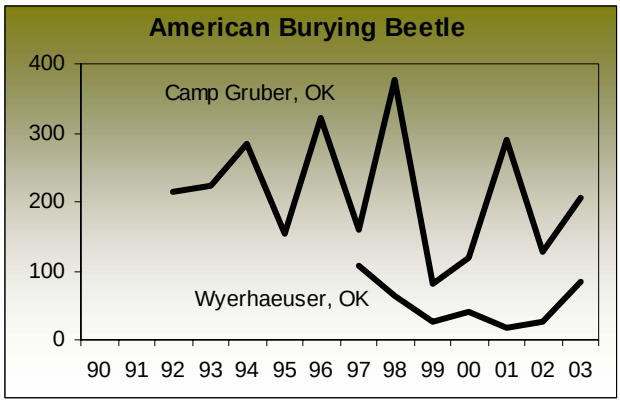

Puritan Tiger Beetle
Connecticut River
1,000
800
600
400
200
0
Connecticut
Massachusetts
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05

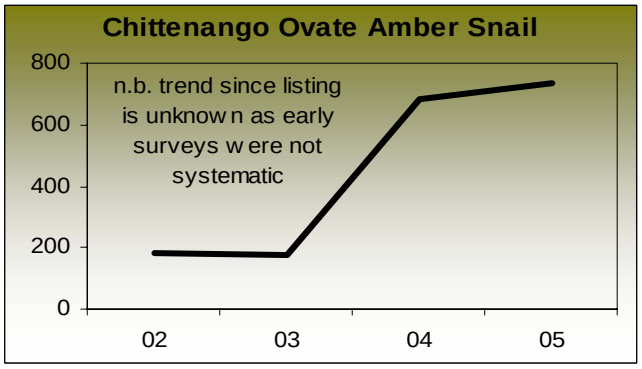

Northeastern Beach Tiger Beetle
2000
1500
1000
500
0
Massachusetts and New Jersey
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05


Chesapeake Bay
60,000
40,000
20,000
0
Virginia
Calvert County, MD
Janes & Cedar Island, MD
90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05



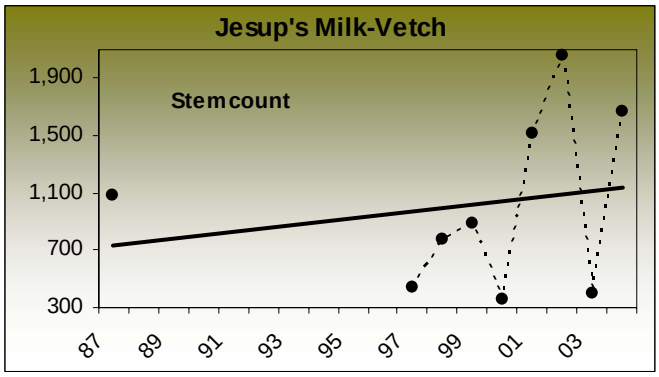


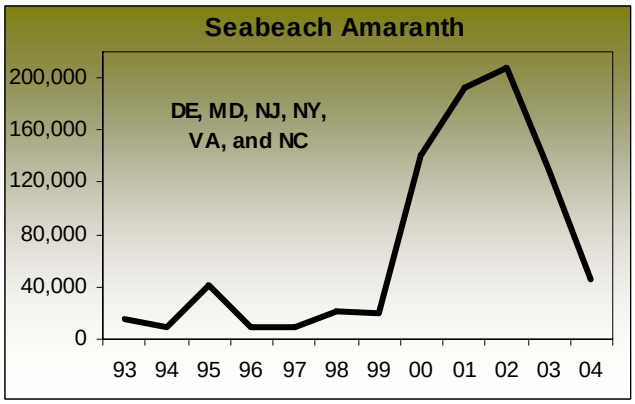


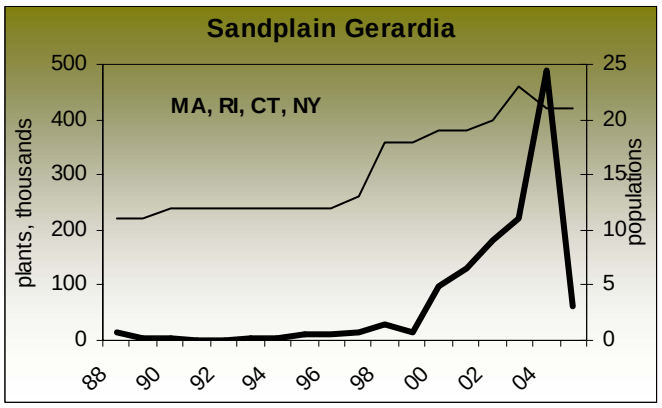


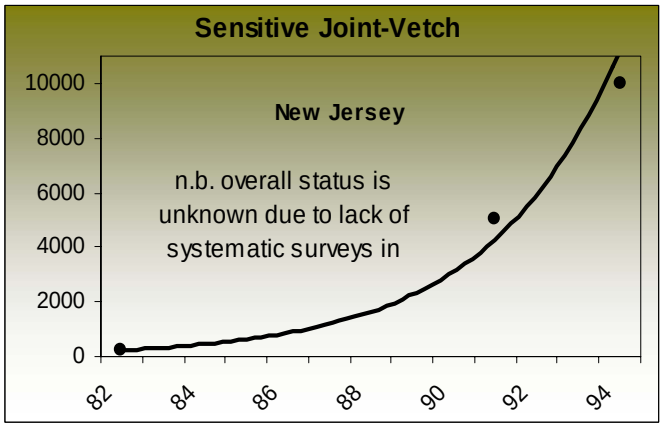
Dwarf Wedge Mussel

Due to the difficulty of surveying for this secretive mussel, discovery of significant new populations, and lack of funding, there are no quantitative data on its trend since listing. However, It is considered stable, relatively healthy in recent years, and generally better off than most listed mussels.


Jesup's Milk-Vetch
Stemcount
1,900
1,500
1,100
700
300
87
89
91
93
95
97
99
01
03

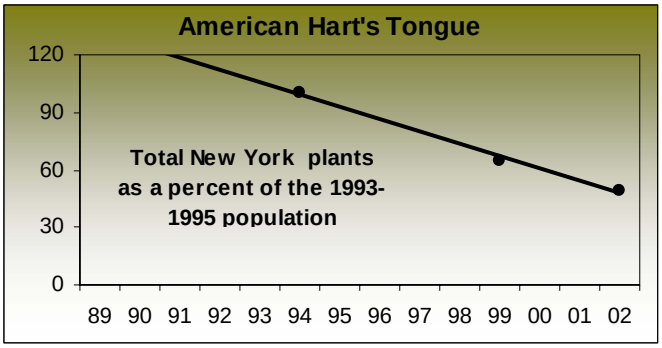

Seabeach Amaranth
DE, MD, NJ, NY,
VA, and NC
200,000
160,000
120,000
80,000
40,000
0
93 94 95 96 97 98 99 00 01 02 03 04

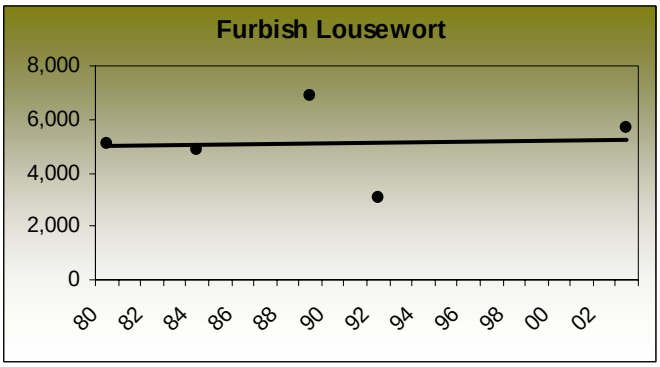

Sandplain Gerardia
MA, RI, CT, NY
plants, thousands
populations
500
400
300
200
100
0
25
20
15
10
5
0
88
90
92
94
96
98
00
02
04

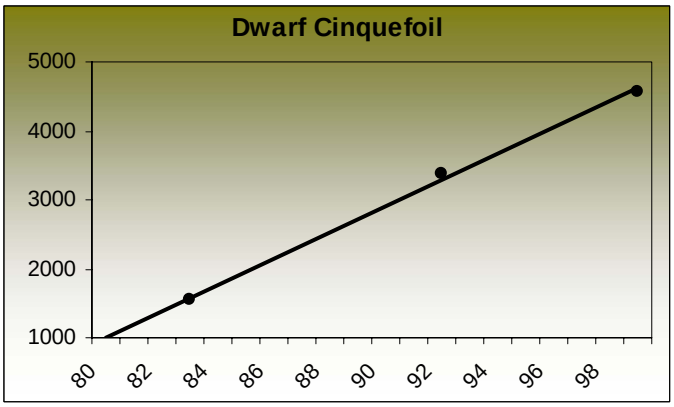

Sensitive Joint-Vetch
New Jersey
n.b. overall status is
unknown due to lack of
systematic surveys in
10000
8000
6000
4000
2000
0
82
84
86
88
90
92
94

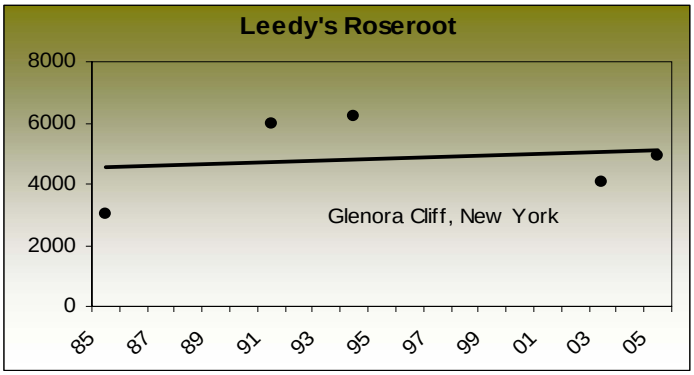
Northern wild monkshood

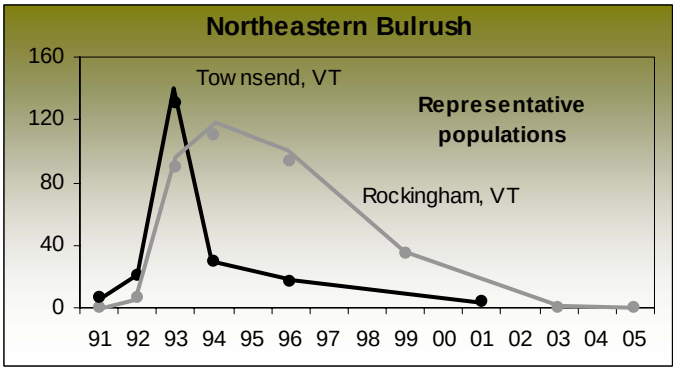
Graphable population data are not available, but the species is known to be relatively stable since at least 1992.











American chaff seed

Population trend since listing is unknown due to lack of systematic, rangewide surveys; however, it appears well-managed and may in fact have remained stable or increased since listing. Additional trend research is needed.

Small whorled pogonia

Graphable population data are lacking, but the species is classified as having increased because the 1994 downlisting to “threatened” status unambiguously describes its improved state, independent of newly discovered populations.

Eastern prairie white-fringed orchid

Population trend since listing is unknown due to lack of consistent, rangewide surveys. A rangewide recovery assessment will be completed in 2006.

Knieskern's beaked-rush

Population trend since listing is unknown due to lack of systematic rangewide surveys.

Swamp-pink

Population trend since listing is unknown due to lack of consistent, rangewide surveys.

American burying beetle
- Amaral, M. 2005. Personal communication with Michael Amaral, U.S. Fish and Wildlife Service, Concord, NH, November 28, 2005.
- Dabeck, L. 2006. The American Burying Beetle Recovery Program: Saving nature's most efficient and fascinating recyclers. Roger Williams Park Zoo. Website (www.rogerwilliamsparkzoo.org/conservation/burying%20beetle%20program.cfm) accessed January 29, 2006.
- Homer, P. 2005. Missouri's Threatened and Endangered Species Accomplishment Report: July 1, 2004 - June 30, 2005. Missouri Department of Conservation.
- Raithel, C. 2005. American burying beetle population estimate for southwest Block Island, mark-recapture and Lincoln-Peterson index with Bailey corrections for small population size. Unpublished data provided by Christopher Raithel, Rhode Island Division of Fish and Wildlife, November 23, 2005.
- Mckenna-Foster, A., W.T. Maple, and R.S. Kennedy. 2005. American Burying Beetle (Nicrophorus americanus) survey and reintroduction on Nantucket 2005. Unpublished report.
- Mckenna-Foster, A.A., M.L. Prospero, L. Perrotti, M. Amaral, W.T. Maple, and R.S. Kennedy. 2005. American burying beetle (Nicrophorus americanus) survey and reintroduction to Nantucket, MA, 2004-2005. Abstract presented at the First Nantucket Biodiversity Initiative Conference, September 24, 2005, Coffin School, Egan Institute of Marine Studies, Nantucket, MA.
- Ohio Department of Natural Resources, Division of Wildlife. 2004-2005 Wildlife Population Status and Hunting Forecast.
- Perrotti, L. 2006. Roger Williams Park Zoo American Burying Beetle Project Statistics. Spreadsheet provided by Lou Perrotti, American Burying Beetle project coordinator, Roger Williams Park Zoo, Providence, RI, February, 2006.
- U.S. Fish and Wildlife Service. 1991. American burying beetle (Nicrophorus americanus) recovery plan. Newton Corner, MA.
- U.S. Fish and Wildlife Service. 2006. American Burying Beetle (Nicrophorus americanus). U.S. Fish and Wildlife Service. Website (www.fws.gov/ifw2es/Oklahoma/beetle1.htm) accessed January 29, 2006.
- Wayne National Forest. 2004. Schedule of Proposed Action, 10-01/04-12/31/04.

American peregrine
Connecticut Department of Environmental Protection. 2001. Connecticut's Peregrine Falcon Story. Website (http://dep.state.ct.us/burnatr/wildlife/special/peregrine/pfstory.htm) accessed October, 2005.

Arctic peregrine
- Cape May Bird Observatory. Cape May Hawkwatch, New Jersey Audubon Society. Website: (http://www.njaudubon.org/Sightings/cmhw25.html) accessed January 2005.

Atlantic green sea turtle
- Fish and Wildlife Research Institute. 2005. Florida's Index Nesting Beach Survey Data. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission. Available at (http://research.myfwc.com/features/view_article.asp?id=10690).

Atlantic hawksbill sea turtle
- Meylan. 1999. Status of the Hawksbill Turtle (Eretmochelys imbricata) in the Caribbean Region. Chelonian Conservation and Biology, 1999, 3(2):177–184.
- Meylan, A.B. and M. Donnell. 1999. Status Justification for Listing the Hawksbill Turtle (Eretmochelys imbricata) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals.

Atlantic leatherback sea turtle
- Fish and Wildlife Research Institute. 2005. Florida's Index Nesting Beach Survey Data. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission. Available at (http://research.myfwc.com/features/view_article.asp?id=10690).

Atlantic loggerhead sea turtle
- Fish and Wildlife Research Institute. 2005. Florida's Index Nesting Beach Survey Data. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission. Available at (http://research.myfwc.com/features/view_article.asp?id=10690).

Atlantic piping plover
- Garrity. P. 2005. 2005 Piping Plover and Least Tern Report. Maine Audubon's Piping Plover & Least Tern Recovery Project, Maine Birding Net. Available at (http://www.mainebirding.net/news/stories/20.htm)
- Delaware Department of Natural Resources and Environmental Control. 2005. DRNEC News Vol 144. Available at (http://www.dnrec.delaware.gov/NR/rdonlyres/A6B32CA8-0E2D-49CE-A3B7-BCC633BCDD95/14/dnrecnew144.pdf)
- Hecht, Anne. 2006. Personal communication with Anne Hecht, U.S. Fish and Wildlife Service, Sudbury MA, February 14, 2006.
- Kisiel, C. 2006. Enhancing piping plover habitat in New Jersey. New Jersey Division of Fish and Wildlife, Endangered and Nongame Species Program.

- Mass Wildlife News. 2005. 2005 Piping Plover Numbers down. Available at (http://www.mass.gov/dfwele/dfw/mwnews/dfw_mwnews_1005.htm#itemb)
- New Hampshire Fish and Game Department. 2005. Newsroom Aug 11, 2005. Website (http://www.wildlife.state.nh.us/Newsroom/News_2005/News_2005_Q3/Plover_release_081105.htm) accessed January, 2006.
- U.S. Fish and Wildlife Service. 2004. 2002-2003 status update: U.S. Atlantic Coast piping plover population, Sudbury, MA. 8pp.
- U.S. Fish and Wildlife Service. 2005. Preliminary 2004 Atlantic Coast Piping Plover Abundance and Productivity Estimates. Sudbury, MA. 1p.
- U.S. Fish and Wildlife Service. 1993. Piping Plover (Charadrius melodus) Atlantic Coast Population Revised Recovery Plan. Hadley, MA.
- Victoria, J. 2005. 2005 piping plover/least tern nesting results. Connecticut Wildlife, November/December 2005:9

Bald eagle

[6]- Connecticut Department of Environmental Protection. 2005. 2005 Midwinter Bald Eagle Survey Results. Website (http://dep.state.ct.us/whatshap/press/2005/050505.htm) accessed February, 2006.
[12]- Connecticut Department of Environmental Protection. 2004. Connecticut Wildlife, July/August 2004. p16. Available at (dep.state.ct.us/burnatr/wildlife/pdf/cwja04.pdf).
[13]- Connecticut Department of Environmental Protection. 2005. Connecticut Wildlife. July/August 2005. p4. Available at (dep.state.ct.us/burnatr/wildlife/pdf/cwja05.pdf).
- Environmental Defense. 2004. The Eagle is Back. Environmental Defense, New York. Website (http://www.edf.org/article.cfm?contentid=3720) accessed February, 2006.
[2]- Maine Department of Inland Fisheries and Wildlife. Regional Wildlife Biologist's Weekly Reports. Website (http://www.maine.gov/ifw/hunttrap/weeklyreportold.htm). Accessed, February, 2006.
[3]- Maine's Comprehensive Wildlife Conservation Strategy. 2005. Available at (http://www.state.me.us/ifw/wildlife/compwildlifestrategy/tableofcontents.htm).
[5]- MassWildlife. 2006. Personal communication with MassWildlife News communication department, February 16, 2006.
[7]- Natural Heritage and Endangered Species Program. 1995. Massachusetts Endangered Species, Bald Eagle. Division of Fisheries and Wildlife, Westborough, MA. Available at (http://www.mass.gov/dfwele/dfw/nhesp/nhfacts/halleu.pdf).
[8]- New Hampshire Game and Fish Department. Bald Eagle Profile. Website (http://www.wildlife.state.nh.us/Wildlife/Wildlife_profiles/profile_bald_eagle.htm) accessed February, 2006.
[14]- New Hampshire Game and Fish Department. 2004. Wildlife Report from N.H. Fish and Game, August 24, 2004 Available at (http://www.wildlife.state.nh.us/Wildlife/Wildlife_Reports/Wildlife_Reports_2004/wildlife_report_082404.htm#raptor).
[15]- New York State Department of Environmental Conservation. 2004. New York State bald Eagle Report 2004. Available at (www.dec.state.ny.us/website/dfwmr/wildlife/endspec/baea2004.pdf)
[16]- New York State Department of Environmental Conservation. 2005. Conservationist, December 2005 Available at (http://www.dec.state.ny.us/website/dpae/cons/1205eagle.html).
[9] Northern States Bald Eagle Recovery Team, adapted by E. Weber. 1996. Eagle Recovery Plans in the Northeastern States Region from The Northeastern States Bald Eagle Recovery Plan 1983. Available at (http://www.eagles.org/vueaglewebcs/recov_plans_nstates.htm).
[10]- Smith L., C.E. Clark, and L.J. Niles. 2005. New Jersey Bald Eagle Management Project 2005. New Jersey Department of Environmental Protection, Division of Fish and Wildlife. Available at (http://njedl.rutgers.edu/ftp/PDFs/4195.pdf).
[11]- Smith, L. 2006. Spreadsheet provided by Larissa Smith, New Jersey Endangered & Nongame Species Program, Woodbine, NJ, February 14, 2006.
[4]- Todd, C.S. 2004. Bald eagle assessment. Maine Department of Inland Fisheries and Wildlife, Wildlife Division, Wildlife Resources Assessment Section, January 30, 2004.
[17]- Vermont Fish and Wildlife. 2005. Press Release: Bald Eagles Build Nest in Connecticut River Valley. April 15, 2005. Available at (http://www.vtfishandwildlife.com/Detail.CFM?Agency__ID=827).
- U.S. Fish and Wildlife Service. 2001. Bald eagle pairs, lower 48 states, 1963-2000. Washington, D.C. Website (http://www.fws.gov/midwest/eagle/population/2000chtofprs.html) accessed February, 2006.
[1]- U.S. Fish and Wildlife Service. 2001. Bald Eagle Breeding Pairs, 1990-2003. Washington, D.C. Website (http://www.fws.gov/midwest/eagle/population/nos_state_tbl.htm) accessed February, 2006.

Blue whale
- Barlow, J. 1994. Abundance of Large Whales in California Coastal Waters: a comparison of ship surveys in 1979/80 and in 1991. Report to International Whaling Commission 44, SC/45/O 15.
- Barlow, J. 2003. Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991-2001 Southwest Fisheries Science Center Administrative Report LJ-03-03.
- Calambokidis and Barlow. 2004. Abundance of Blue and Humpback Whales in the Eastern North Pacific Estimated by Capture-Recapture and Line-Transect Methods. Marine Mammal Science 20(10):63-85.
- NOAA Fisheries. 2002. Stock Assessment Report. Blue Whale (Balaenoptera musculus): Western North Atlantic Stock. Revised Jan. 2002. National Oceanic and Atmospheric Administration, Washington, D.C
- NOAA Fisheries. 2004. Stock Assessment Report. Blue Whale (Balaenoptera musculus): Western North Pacific Stock. Revised March 2005. National Oceanic and Atmospheric Administration, Washington, D.C.

Brown Pelican
- Shields, M. 2002. Brown Pelican (Pelecanus occidentalis). *In* The Birds of North America, No. 609 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Chittenango Ovate Amber Snail
- Whiteleather, K. 2004. Mark-Release-Recapture Study of the Chittenango Ovate Amber Snail (Novisuccinea chittenangoensis Pillsbury), June-October 2004. Final Report to New York Department of Environmental Conservation Endangered Species Unit.
- Whiteleather, K. 2005. Chittenango ovate amber snail 2005 field season report as of September 7, 2005. Available at (http://members.aol.com/whiteleath/COAS_2005/2005_journ11.html).

Delmarva fox squirrel
- Kulynycz, E. 2003. Research on fox squirrel reaps rewards. Endangered Species Bulletin XXVIII(1):22-23.
- U.S. Fish and Wildlife Service. 1993. Delmarva Fox Squirrel (Sciurus niger cinereus) Recovery Plan, Second Revision. Hadley, Massachusetts. 104 pp.
- U.S. Fish and Wildlife Service. 1999. The Delmarva Peninsula fox squirrel, fact sheet. Website (http://training.fws.gov/library/Pubs/foxsquirrel.pdf) accessed November 2005. 2003

Dwarf cinquefoil
-- U.S. Fish and Wildlife Service. 2002. Removal of Potentilla robbinsiana (Robbins' cinquefoil) from the federal list of endangered and threatened plants. U.S. Fish and Wildlife Service, August 27, 2002 (67 FR 54968).

Fin whale
- Barlow 1994. Abundance of Large Whales in California Coastal Waters: a comparison of ship surveys in 1979/80 and in 1991. Report to International Whaling Commission 44, SC/45/O 15.
- Barlow, J. 2003. Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991-2001 Southwest Fisheries Science Center Administrative Report LJ-03-03.
- NOAA Fisheries. 2004. Stock Assessment Report. Fin Whale (Balaenoptera physalus): Western North Atlantic stock. Revised Dec. 2004.

Florida Manatee
- Florida Fish & Wildlife Conservation Commission. Synoptic aerial surveys (1991-2004). Available at (http://www.savethemanatee.org/population4a.htm).

Furbish lousewort
- U.S. Fish and Wildlife Service. 1991. Revised Furbish Lousewort Recovery Plan. Newton Corner, Massachusetts, 62 pp.
- U.S. Fish and Wildlife Service.2005. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To Delist Pedicularis furbishiae (Furbish lousewort) and Initiation of a 5-Year Status Review. Federal register Vol 70(153).

Gray wolf
-Great Lakes Wolves: Regional Overview: Wolf Recovery and Management in the Upper Midwest. Website (http://seaborg.nmu.edu/WOLF/2Regional_wolf_status.html) accessed 1/18/06.
- International Wolf Center. 2005. Gray Wolf Population Trends in the Contiguous United States. Updated September, 2005. Available at (www.wolf.org).

Great lakes piping plover
- University of Minnesota Great Lakes Piping Plover Research Program. 2006. Summary of Great Lakes piping plover reproductive success 1984-2005. Spreadsheet provided by Francie Cuthbert, University of Minnesota, February 6, 2006**.**

Humpback whale
-Calambikidis and Steiger. 1995. Population estimates of humpback and blue whales made through photo-identification from 1993 surveys off California. Report to Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, California. 36pp.

-Calambokidis and Barlow. 2004. Abundance of Blue and Humpback Whales in the Eastern North Pacific Estimated by Capture-Recapture and Line-Transect Methods. Marine Mammal Science 20(10):63-85.
- NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae):
Gulf of Maine Stock, revised Dec. 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
- NOAA Fisheries. 2001. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae):
Eastern North Pacific Stock. National Oceanic and Atmospheric Administration, Washington, D.C.
- NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae):
Central North Pacific Stock, revised Feb 12, 2005. National Oceanic and Atmospheric Administration, Washington, D.C.
- NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae):
Western North Pacific Stock, revised Feb 5, 2005. National Oceanic and Atmospheric Administration, Washington, D.C.
-NOAA Fisheries. 1991. Recovery Plan for the Humpback Whale (Megaptera novaeangliae). Prepared by the Humpback Whale Recovery Team for the Silver Spring, Maryland. 105pp.

Indiana bat

- Currie, R.S. 2000. USFWS Federally Listed Threatened and Endangered Species of Importance to Mining in Proceedings of Bat Conservation and Mining: A Technical Interactive Forum, Airport Hilton, St. Louis, Missouri, November 14-16, 2000.
- Harvey, M.J., R. Redman and C.S. Chaney. 2004. Endangered Bats of Arkansas: Distribution, Status and Ecology (2003-2004). Annual Report to Arkansas Game and Fish Commission, Project Number W-56-R.
- Harvey, M.J., R. Redman and C.S. Chaney. 2001. Endangered Bats of Arkansas Distribution, Status and Ecology (2000-2001). Annual Report to Arkansas Game and Fish Commission, Project Number W-56-R.

Jessup's milk-vetch

- Cairns, S. and H. Herrmann. 2005. 2005 Astragalus robbinsii var. jesupii (Jesup's milk-vetch) Recovery Activities in New Hampshire. Prepared by the NH Natural Heritage Bureau for the U.S. Fish & Wildlife Service, Hadley, MA

Karner blue

- King, R. 2006. Graph provided by Richard King Necedah National Wildlife Refuge, U.S. Fish and Wildlife Service, WI. January, 2006.
- U.S. Fish and Wildlife Service. 2003. Final Recovery Plan for the Karner Blue Butterfly (Lycaeides melissa samuelis). U.S. Fish and Wildlife Service, Fort Snelling, MN.

Kemp's Ridley sea turtle

- Padre Island National Park. 2005. Current sea turtle nesting season. U.S. National Park Service website (www.nps.gov/pais/myweb2a/current_season.htm) visited December 11, 2005.
- Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

Leedy's roseroot

- Young, S. 2065. Personal communication with Steve Young, Program Botanist
New York Natural Heritage Program, Albany, NY. January, 2006.

North Atlantic right whale

- Fujiwara, M. and H. Caswell. 2001. Demography of the endangered North Atlantic right whale. Nature 414:537-541. (graph visually reconstructed from figure 5c).

Northeastern beach tiger beetle

- Bogart, J. 2006. Population changes in Northeastern Beach Tiger Beetles on Horseneck Beach and Westport Town Beach from 1994-2005. Spreadsheet provided by Jamie Bogart, The Lloyd Center for the Environment, February 10, 2006.
- Knisley, C.B. 2005. A survey of the northeastern beach tiger beetle (cicindela dorsalis dorsalis) at all western and selected eastern shoreline sites of the Chesapeake Bay, 2004. Final draft report to the U.S. Fish and Wildlife Service, Virginia Field Office, Gloucester, VA, January 9, 2005;
-Knisley, C.B. 2005. Northeastern beach tiger beetle census data, Calvert County, Maryland and Eastern Shore of Chesapeake Bay, Virginia. Spreadsheet provided by C. Barry Knisley, Department of Biology, Randolph-Macon College, November, 2005.
- Knisley, C.B., J.M. Hill, and A.M. Scherer. 2005. Translocation of threatened tiger beetle Cicindela dorsalis dorsalis (Coleoptera: Cicindelidae) to Sandy Hook, New Jersey. Ann. Entomol. Soc. Am. 98(4): 552-557.
- Simmons, T. 2006. Northeastern tiger beetle trends on Marthas Vineyard, 1990-2005. Spreadsheet provided by Tim Simmons, Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA on February 11, 2006.
-Traxler, C. 2005. VAFO Completes Northeastern Beach Tiger Beetle Comprehensive Survey. U.S. Fish and Wildlife Service news advisory, August 18, 2005.
- U.S. Fish and Wildlife Service. 1990. Determination of threatened status for the Puritan tiger beetle and the northeastern beach tiger beetle. Federal Register (55:32088).

- U.S. Fish and Wildlife Service. 1993. Puritan tiger beetle (Cicindela puritana) recovery plan. Northeast Region, Hadley, MA.

Northern red-bellied cooter

- Amaral, M. 2006. Released northern red-bellied cooters, 1985-2003. Spreadsheet provided by Michael Amaral, U.S. Fish and Wildlife Service, Concord, NH, February 7, 2006.
- French, T. 2006. Personal communication with Tom French, Massachusetts Natural Heritage and Endangered Species Program, Westborough, MA, February 7, 2006.

Puritan tiger beetle

- Babione, M. 2003. Bringing tiger beetles together. Endangered Species Bulletin XXVIII(1):28-29.
- Babione, M. 2006. Puritan tiger beetle population trend in New England 1991-2005. Data provided by Michelle Babione, U.S. Fish and Wildlife Service, Silvio O. Conte National Fish and Wildlife Refuge, Turners Falls, MA, January 13, 2006.
- Knisley, C.B. 2005. Puritan tiger beetle population trend in Maryland, 1986-2005. Spreadsheet provided by C. Barry Knisley, Randolph-Macon College, Ashland, VA, November, 2005.
- U.S. Fish and Wildlife Service. 1990. Determination of threatened status for the Puritan tiger beetle and the northeastern beach tiger beetle. Federal Register (55:32088).
- U.S. Fish and Wildlife Service. 1993. Puritan tiger beetle (Cicindela puritana) recovery plan. Northeast Region, Hadley, MA.

Red-cockaded woodpecker

- Conner, R.N. and Rudolph, C.D. 1989. Red-Cockaded Woodpecker Colony Status and Trends on the Angelina, Davy Crockett, and Sabine National Forests. USDA Forest Service, Southern Forest Experimental Research Station. Research Paper SO-250. New Orleans, LA.
- James, F.C. 1991. Signs of trouble in the largest remaining population of red-cockaded woodpeckers. The Auk 108:419-423.
- Rudolf, C.D, R.N. Conner, R.R. Schaefer, D. Saenze, D.K.Carrie, N.R. Carrie, R.W. Maxey, W.G. Montague, J. Neal, K. Moore, and J. Skeen. 2004. Red-cockaded Woodpecker Status and Management: West Gulf Coastal Plain and Interior Highlands. In Costa, Ralph; Daniels, Susan J., eds. Red-cockaded woodpecker: Road to recovery. Blaine, WA: Hancock House Publishers: 283-291.
- Stober, J.M., Spivey, P., J. Ozier, S.B. Jack, B.E. Bass, C. Parks, J. Borgo, and L.M. Conner. 2005. Red-cockaded Woodpecker Restoration on Ichauway 2005: Present Condition and Future Goals. Joseph W. Jones Ecological Research Center at Ichauway. Available at (www.jonesctr.org/conservation/monitoring_mapping/rcw_restoration_on_ichauway.html)

Roseate tern

- Anonymous. 2005. Nesting terns at Falkner Island. Connecticut Wildlife, November/December 2005:6
- Boyne, A. 2005. Nesting roseate tern pairs in Canada, 1985-2005. Personal communication with Andrew Boyne Wildlife Biologist, Canadian Wildlife Service, Environment Canada, November 22, 2005.
- De Luca, D. 2005. Personal communication with Diane De Luca, Senior Biologist, New Hampshire Audubon Society, November 27, 2005.
- Roseate Tern (Northeast Population) Recovery Team. 2005. Numbers of nesting pairs (peak/total) and productivity in chicks fledged per pair of Roseate Terns in the Northeastern United States, 1998-2004 (January 18, 2005 version). Unpublished data provided by Carolyn Mostello, Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program.
- U.S. Fish and Wildlife Service. 1998. Roseate tern recovery plan, northeastern population, first update. Hadley, MA.

Sandplain gerardia

- Jordan, M. 2005. Agalinis acuta monitoring data, Long Island, New York. Spreadsheet provided by Marilyn Jordan, The Nature Conservancy, Cold Spring Harbor, New York, November, 2005.
- Murray, N. 2005. Personal communication with Nancy Murray, Connecticut Department of Environmental Protection, Wildlife Division, November 22, 2005.
- Raithel, C. 2005. Personal communication with Christopher Raithel, Rhode Island Division of Fish and Wildlife, Endangered Species Program, Providence, RI, November, 2005.
- Somers, P. 2005. Agalinis acuta data summaries, 1980-2005. Spreadsheets provided by Paul Sommers, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, Westborough, MA, November 2005.

Seabeach amaranth

- McAvoy, W. 2005. Personal communication with William McAvoy, Botanist, Delaware Natural Heritage Program, November 7, 2005.
- Pepper, M. 2004. 2004 Amaranthus pumilus (Seabeach amaranth) Survey Results. Unpublished report, Delaware Division of Fish and Wildlife, Natural Heritage and Endangered Species Program.

- Staples, J.C. 2005. Personal communication with John C. Staples, U.S. Fish and Wildlife Service, New Jersey Field Office, November 21, 2005.
- Strand, A. 2005. Seabeach Amaranth 2004 census and seed rain estimates. Unpublished report, College of Charleston, Charleston, S.C.
- Sturm, M. 2005. Personal communication with Mark Sturm, Assateague Island National Seashore, November 14, 2005.
- Suiter, D. 2005. Personal communication with Dale Suiter, U.S. Fish and Wildlife Service, Raleigh, NC, December 7, 2005.
- Young, S. 2005. Amaranthus pumilus Counts on Long Island 1990-2005. New York Natural Heritage Program Information.

Senstive joint-vetch

- U.S. Fish and Wildlife Service. 1995. Sensitive Joint-Vetch (Aeschynomene virginica) Recovery Plan. Hadley, Massachusetts. 55 pp.

Shortnose sturgeon

- Bain, M.B, N. Haley, D.L. Peterson, K.K. Arend, K. Mills, and P. Sullivan, 2000. Shortnose sturgeon of the Hudson River: an endangered species success story. EPRI-AFS Symposium: Biology, Management and Protection of Sturgeon, 2000 Annual Meeting of the American Fisheries Society, St Louis, MO, August 23-24, 2000.
- Connecticut Department of Environmental Protection. 2003. Working with Nature: Shortnose Sturgeon. Website (http://dep.state.ct.us/whatshap/press/2003/mf0730.htm) Accessed January 31, 2006.
- DeVries, R.J and D.L. Peterson. 2006. Population dynamics and spawning habitat of shortnose sturgeon in the Altamaha River, Georiga. Georgia Chapter of the American Fisheries Society, 2006 Annual Meeting, Gainesville, GA, January, 2006.
- National Marine Fisheries Service. 1998. Recovery Plan for the Shortnose Sturgeon (Acipenser brevirostrum). Silver Springs, Maryland. 104 pages.
- National Marine Fisheries Service. 2002. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2000-September 30, 2002.Washington (DC): Department of Commerce.
- National Marine Fisheries Service. 2004. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2002-September 30, 2004.Washington (DC): Department of Commerce.
- Smith, T. I. J., M. C. Collins, W. C. Post, and J. W. McCord. 2002. Stock enhancement of shortnose sturgeon: a case study. Pages 31-44 in W. VanWinkle, P. Anders, D. H. Secor, and D. Dixon, editors. Biology, management, and protection of North American sturgeon. American Fisheries Society, Symposium 28, Bethesda, Maryland.

Sperm whale

- Barlow, J. 2003. Preliminary estimates of the abundance of cetaceans along the U.S. west coast: 1991-2001. Southwest Fisheries Science Center Administrative Report LJ-03-03.
- NOAA Fisheries 2003. Sperm whale (*Physeter macrocephalus*): California/Oregon/Washington Stock.. Stock Assessment Report. National Oceanic and Atmospheric Administration, Washington, D.C.
- NOAA Fisheries 2003. Sperm whale (*Physeter macrocephalus*): Northern Gulf of Mexico Stock.. Stock Assessment Report. National Oceanic and Atmospheric Administration, Washington, D.C.
- NOAA Fisheries 2005. Sperm whale (*Physeter macrocephalus*): Northern Gulf of Mexico Stock. Draft Stock Assessment Report, Revised November 2004. National Oceanic and Atmospheric Administration, Washington, D.C.

Whooping crane

-ICF. 2005. Historic Whooping Crane Numbers. International Crane Foundation, Baraboo, WI. Available at (http://www.savingcranes.org/pdf/whooper_table.pdf).

Photo Credits (in order of appearance):

North Atlantic Right Whale: Armin Maywald, Greenpeace / Blue Whale: / Fin Whale: / Humpback Whale: National Oceanic and Atmospheric Administration (NOAA) / Sei Whale: / Sperm Whale: NOAA / Florida Manatee: United States Fish and Wildlife Service (USFWS) / Delmarva Fox Squirrel: USFWS / Eastern Gray Wolf: USFWS / Indiana Bat: USFWS / Eastern Cougar: Lavonda Walton, USFWS / Arctic Peregrine Falcon: USFWS / Bald Eagle: USFWS / Atlantic Piping Plover: Sidney Maddock, USFWS / Great Lakes Piping Plover: Nebraska Game and Parks Commission / Whooping Crane: Robin Silver / Eskimo Curlew: USFWS / Eastern Brown Pelican: USFWS / American Peregrine Falcon: / Red-Cockaded Woodpecker: Florida Department of Environmental Protection / Northeast Roseate Tern: USFWS / Longjaw Cisco: credit unavailable / Blue Pike: / Shortnose Sturgeon: / Kemp's Ridley Sea Turtle: USFWS / Atlantic Leatherback Sea Turtle: NOAA / Hawksbill Sea Turtle: NOAA / Atlantic Green Sea Turtle: USFWS / Atlantic Loggerhead Sea Turtle: NOAA / Northern Red-Bellied Cooter: NOAA / Bog Turtle: USFWS / Karner Blue Butterfly: / Mitchell's Satyr Butterfly: USFWS / Puritan Tiger Beetle: (no copyright) / Northeastern Beach Tiger Beetle: / American Burying Beetle: South Dakota Game, Fish and Parks / Chittenango Ovate Amber Snail: USFWS / Dwarf Wedge Mussel: USGS / Jesup's Milk-Vetch: Robert G. Popp, New England Wild Flower Society / Seabeach Amaranth: / Sandplain Gerardia: / Sensitive Joint-Vetch: NPS / Northern Wild Monkshood: / American Hart's Tongue: Will Paddock, USFWS / Furbish Lousewort: USFWS / Dwarf Cinquefoil: / Leedy's Roseroot: USFWS / Northeastern Bulrush: / American Chaff Seed: / Small Whorled Pogonia: Nora Murdock, USFWS / Eastern Prairie White-Fringed Orchid: U.S. Forest Service / Knieskern's Beaked-Rush: USFWS / Swamp-Pink: USFWS / Houghton's Goldenrod.

Highlighted Species

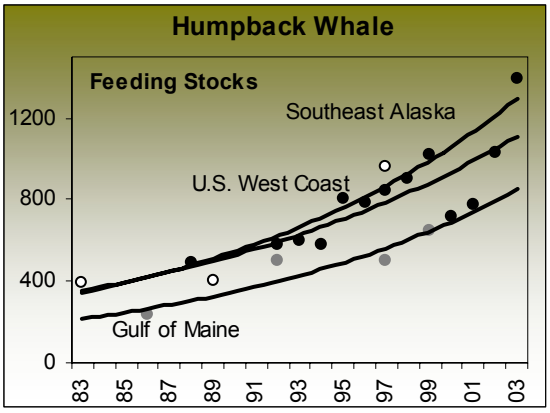
Humpback whale
Bald eagle
American peregrine falcon
Atlantic piping plover
Shortnose sturgeon
Atlantic green sea turtle
Karner blue butterfly
American burying beetle
Seabeach amaranth
Dwarf cinquefoil

Humpback Whale

***Range**:* found in all oceans of the world. A western North Atlantic stock summers in the waters of New England and winters in the West Indies. The summer range of humpbacks in the North Pacific includes coastal and inland waters along the U.S. west coast from California to the Gulf of Alaska.

***Endangered species listing**:* 1970
Federal recovery plans: 1991

Humpback whale (*Megaptera novaeangliae*) populations were greatly depleted by commercial whaling in the nineteenth century and first half of the twentieth. American whalers alone killed between 14,164 and 18,212 humpbacks between 1805 and 1909. The species' recovery began with a prohibition on whaling in the North Atlantic in 1955 and the North Pacific in 1965. The feeding aggregation of humpback whales that inhabits the Gulf of Maine in summer increased from at least 240 whales in 1986 to at least 647 whales in 1999. In 1992, it was estimated that the North Pacific population numbered 6,000-8,000, up from an estimated 1,200 in 1966. Although humpback whales are still threatened by ship strikes and entanglement in fishing gear, efforts are underway to minimize and prevent these events. In 1995, a marine mammal disentanglement program was established. In 1996, an "Atlantic Large Whale Take Reduction Team" was formed to reduce mortality and injury of whales in offshore fisheries. In 1998, a similar team was established for the Eastern North Pacific.



Northeast Highlight: The Provincetown Center for Coastal Studies (PCCS) coordinates a coast-wide network to rescue whales that become entangled in fishing gear. First Responders quickly get to the site, monitor and standby the animal until the primary rescue team arrives, or if possible, frees the animal themselves. The Disentanglement Network's first response teams are located at strategic sites along the east coast of the United States and Canadian Maritimes. The network includes Cetacean research organizations, Universities, government agencies, and individual fishermen and their associations, such as the Atlantic Fish Spotters Association. In 2004 two humpbacks were disentangled off Cape Cod and one off Newport, Rhode Island. Although PCCS's long-term goal is to find ways to keep whales from becoming entangled, the whale rescue team provides a necessary, emergency service for the interim.

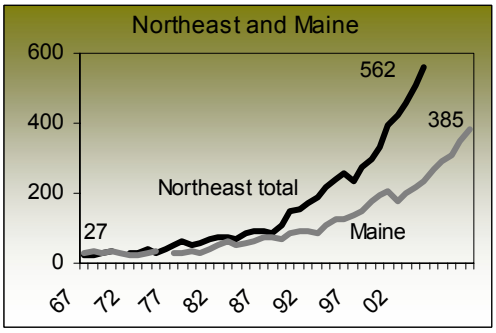
Bald Eagle

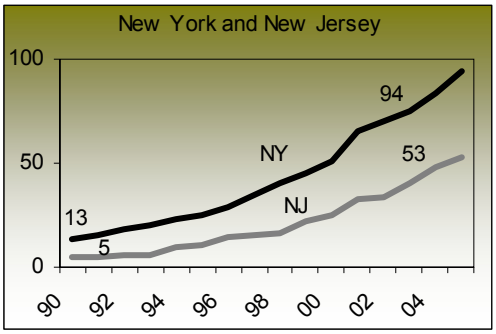
***Range**:* Continental United States

***Endangered species listing**:* 1967
Federal recovery plans: 1986
Downlisted to "threatened": 1995
Proposed for delisting: 1998, 2006

Status since listing: Increased

The bald eagle (*Haliaeetus leucocephalus*) first declined in the 1800s due to trophy hunting, feather collecting, and wanton killing. By the late 1940s, the use of DDT and other organochlorine compounds became increasingly widespread, causing eggshells to thin and lowering reproductive success. Eagle numbers plummeted, and in 1967 the species was listed as endangered in the Lower 48 states. It was joined by the American peregrine falcon, Arctic peregrine falcon and brown pelican in 1970. The plight of these large birds led to a ban on the use of DDT in the U.S. in 1972. Combined with habitat protection measures and a breeding, relocation, and reintroduction program, bald eagle numbers in the Lower 48 have soared from 416 in 1963 to 7,678 in 2003.

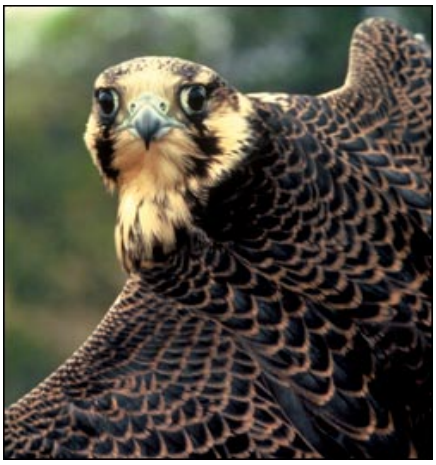




Northeast Highlight: Nesting pairs increased in the Northeast from 21 in 1967 to 562 in 2005. Maine contributed most of growth, increasing from 27 to 385. Between 1990 and 2005, New York pairs grew from 13 to 94 and New Jersey pairs grew from 5 to 53. After an absence of almost 80 years, eagles were reintroduced to Massachusetts in 1982, and grew to 19 pairs in 2005. New Hampshire's single pair in 1990 grew to eight in 2004. Due to the growth in neighboring states, eagles made their own way back to Vermont and Rhode Island.

The Northeast also provides essential wintering habitat for bald eagles. The Connecticut wintering population increased from 20 to 92 between 1979 and 2005, and the New York population increasing from 6 to 194 between 1978 and 2006.

American Peregrine Falcon

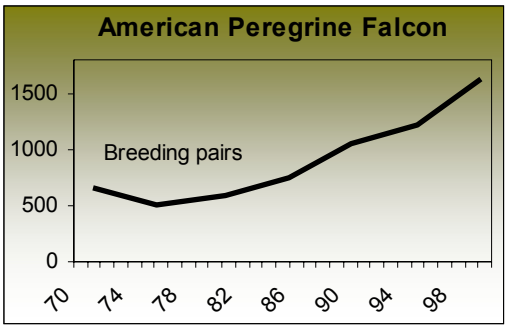


***Range**:* Occurs throughout much of North America from the subarctic boreal forests of Alaska and Canada south to Mexico. Breeds only in North and Central America.

***Endangered species listing**:* 1970
Federal recovery plans: 1979, 1982, 1984, 1985, 1991

Status since listing: Increased

Prior to the 1940s, there were approximately 3,875 nesting pairs of American peregrines (*Falco peregrinus anatum*) in North America. Populations crashed by the 1960s as a result of organochloride pesticides such as DDT which caused reproductive failures. By 1975, there were only 324 known nesting pairs in the U.S. The eastern population plunged from an estimated 350 active sites in the 1930s-40s to none by 1964. The use of DDT was banned in Canada in 1970 and in the U.S. in 1972. Efforts were also made to reestablish peregrine falcons by releasing offspring from wild stocks held in captivity by falconers. The first releases of captive-produced young occurred in 1974 in the eastern U.S. Since then, over 6,000 falcons have been released in North America. By 1980, peregrine populations wee on the rise. Today, American peregrines can be found nesting in nearly all states within their historical range. The American peregrine was removed from the endangered species list in 1999.



Northeast Highlight: In 1975, the Peregrine Fund first released young captive-bred American Peregrines into New Jersey. In 1980 wild pairs were nesting on their own. Nest sites are often less than wild, can be found on tall buildings, bridges, and man-made nesting towers. In 2003, a pair nested successfully on the cliffs of the Palisades overlooking the Hudson River- the first successful nest in a historic, natural site since reintroductions began. Each year since, nesting has occurred on natural cliff habitat that had been devoid of peregrines since 1950.

In New Hampshire, American Peregrines are also again soaring at many of their historic breeding cliffs. A dedicated group of rock climbers help New Hampshire Audubon and USFWS access the state's peregrine nests. Over the past two decades, a total of 119 climbs have resulted in the banding of 200 peregrine chicks and the collection of 80 peregrine eggs that failed to hatch for shell-thickness and chemical content analyses.

Atlantic Piping Plover

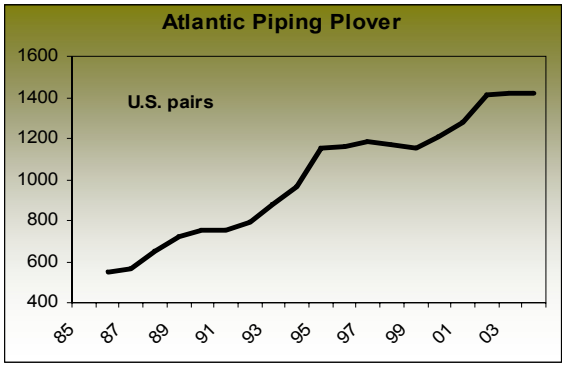
Range: nests in dunes and beaches along the Atlantic coast from Newfoundland to North Carolina, including ME, VT, RI, CT, MA, NY, NJ

Threatened species listing: 1985
***Federal Recovery Plan*:** 1988
Critical Habitat Designation: 2002

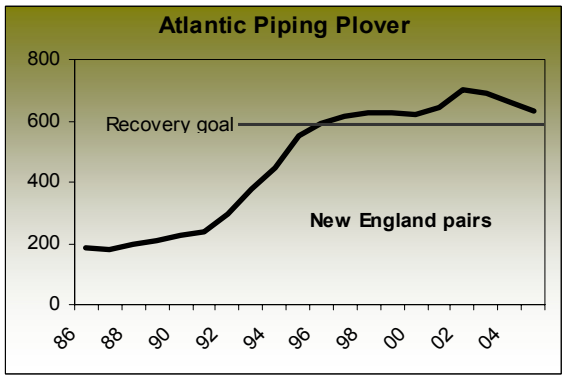
Status: Increased

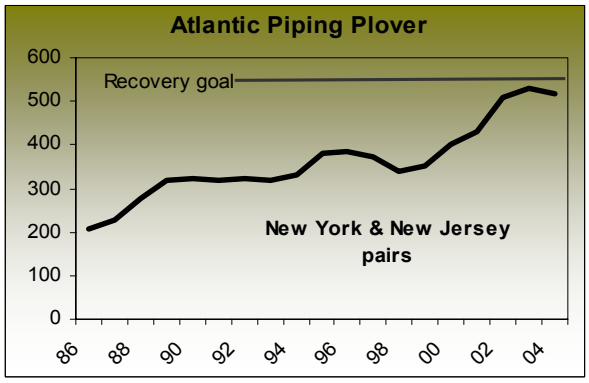
By the beginning of the 20th century the Atlantic population of the piping plover (*Charadrius melodus*) had plummeted due to hunting and egg collection. Numbers increased following the passage of the 1918 Migratory Bird Treaty Act, but declined again after World War II, as development and population growth began to seriously impact the Atlantic Coast. Plover numbers began a second upswing when it was placed on the endangered list in 1985. Nesting pairs grew from 550 in 1986 to 1,423 pairs in 2004. Most occur in New England (659 pairs) and New York/New Jersey (519 pairs).

While many endangered species inhabit Atlantic coast beaches, the plover is the most widely protected, and this has benefited many less known species such as the seabeach amaranth and northeastern beach tiger beetle which have been introduced to or naturally found their way into protected plover sites.



Northeast Highlight: Crane Beach, MA is one of the most important piping plover nesting areas in the world. Their Piping Plover Protection Program, which includes fencing nesting areas and prohibiting the removal of natural debris so birds feed on and seek cover in it, has been very successful and received state and national acclaim.





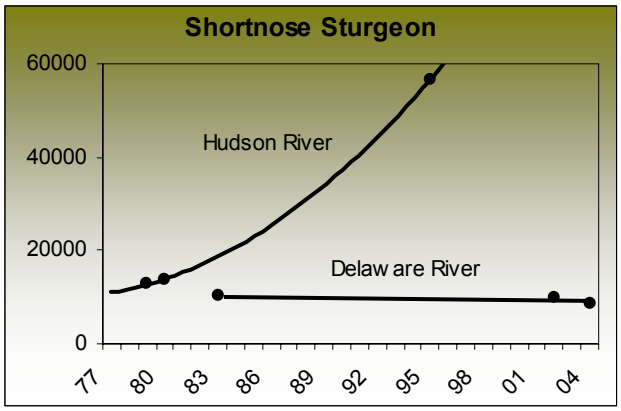
Shortnose Sturgeon

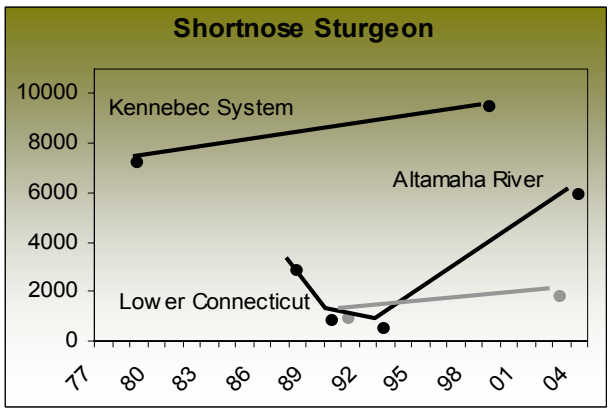
***Range**:* rivers and estuaries throughout the east coast of the U.S.: CT, DE, FL, GA, MA, MD, ME, NC, NJ, NY, RI, SC, VA

***Endangered species listing**:* 1967
Federal recovery plans: 1998

Status since listing: Increased

The shortnose sturgeon (*Acipenser brevirostrum*) formerly occupied rivers and estuaries along the Atlantic seaboard from New Brunswick, Canada to northern Florida. It was driven to near extinction by the 1950s or earlier due to overfishing, by-catch in the shad fishery, damming of rivers, habitat destruction, and deterioration of water quality. There are seven large populations of shortnose sturgeon: Saint John River (NB), Kennebec System (ME), Connecticut River (CT, MA), Hudson River (NY), Delaware River (DE, NJ, PA), Savannah River (SC), and Altamaha River (GA). Five of these seven increased in size, one remained stable, and one has an unknown trend. The 1987 draft federal recovery plan recommended downlisting the Connecticut, Delaware, and Hudson River populations to "threatened" and delisting the Kennebec System population as recovered.





Northeast Highlight: In New York, the sturgeon is found in the Hudson River and its estuary from the Troy Dam near Albany to Manhattan. It is larger than all other populations combined, and increased dramatically from 12,669 spawning fish in 1979 to 56,708 in 1994-1995. The Lower Connecticut River population increased from 875 in 1988-1993 to 1,800 in 2003. Maine's Kennebec system (Kennebec, Sheepscot, and Androscoggin Rivers) increased from 7,222 in 1977-1981 to 9,488 in 1998-2000.

Atlantic Green Sea Turtle

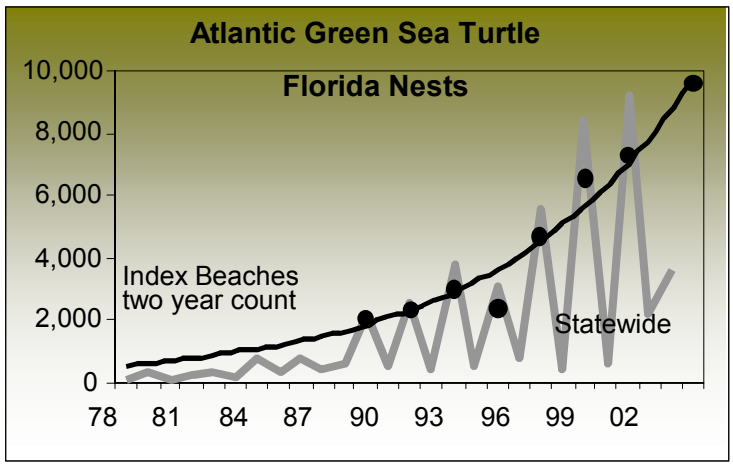
Range: forages from Massachusetts to Texas; nests in Florida and in smaller numbers in North Carolina, South Carolina, Georgia, the U.S. Virgin Island, and Puerto Rico.

Endangered species listing: 1978
Federal recovery plans: 1984, 1991
Critical habitat designation: 1998

Status since listing: Increased

Although green sea turtle populations continue to decline throughout much of their worldwide range due to hunting (both illegal and legal), entanglement in nearshore gillnets, and habitat destruction, the U.S. Atlantic population has steadily increased in size since being protected by the Endangered Species Act. Conservation actions have included protection and acquisition of nesting beaches, prohibition of turtle and egg hunting, nest watch programs, public education, development of turtle excluder devises to limit accidental capture and killing by commercial fisheries, and a volunteer program to rescue winter-stranded turtles.

In 2004-2005, total numbers of nests in Florida reached 9,609 and is approaching the federal recovery plan goal of have an average of at least 5,000 nests over six consecutive years. Other recovery criteria are less well accomplished.



Northeast highlight: Most green, Kemp's Ridley, loggerhead and leatherback sea turtles migrate to warmer climates in the fall. Each winter, however, some stragglers become cold-stunned and wash ashore in Cape Cod Bay where they would die of hyperthermia if not rescued. Alerted by beachgoers or their own patrols, volunteers from the Massachusetts Audubon Society's Wellfleet Bay Wildlife Sanctuary rescue the turtles and transport them to the New England Aquarium for rehabilitation. Rehabilitated turtles are released in Florida or back to the Northeast in the spring. Between 1995 and 2005, the yearly strandings ranged from 49 to 281 turtles, including as many as 7 green sea turtles per year.

Karner Blue

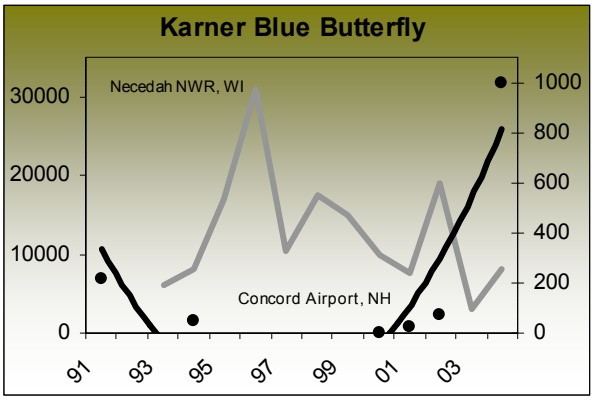
***Range**:* formerly occurred across 12 states from Minnesota to Maine and into the Canadian province of Ontario. Today there are populations in MN, WI, IN, MI, NY, NH, and OH.

***Endangered species listing**:* 1992
Federal recovery plans: 2003

Status since listing: Stable

The larvae of Karner blue butterflies (*Lycaeides melissa samuelis*) feed exclusively on one species of wild lupine and thus their range is restricted to areas that support this species. Much of the lupine's habitat has been destroyed by development and degraded by successional changes causing a decline in Karner blue locations and numbers. By the time the Karner blue was listed as endangered in 1992 it had declined by least 99%. Currently, the largest and most widespread populations occur in Wisconsin and Michigan where their numbers appear to have stabilized.

Northeast Highlight: A large population of over 10,000 blues is found in New York at the Saratoga Airport and appears to be stable. In the Saratoga Sandplains area of NY, the town of Wilton has joined state and Federal agencies and The Nature Conservancy in the creation of the Wilton Wildlife Preserve and Park, the heart of which will contain a core population of Karner blues. Near Albany NY, the Pine Bush Preserve and the Albany Pine Bush Preserve Commission were established. Although Karner blue populations in this area have decreased, in part due severe weather conditions that occurred between 1998 and 2000, efforts to restore habitat, to link Karner blue sites together, and to develop a local supply of lupine seeds has met with some success. In addition, successful captive propagation techniques have been developed for the Karner blue and reintroductions of captive bred Karner blues to sites in New Hampshire, Ohio, and Indiana have resulted in the establishment of new populations.



In New Hampshire, beginning in 2001, captive bred Karner blues were reintroduced to a site in the Concord Pine Barrens. Over 1,000 butterflies have been released at the site and in 2003 the butterfly began mating and reproducing in the wild again.

American Burying Beetle

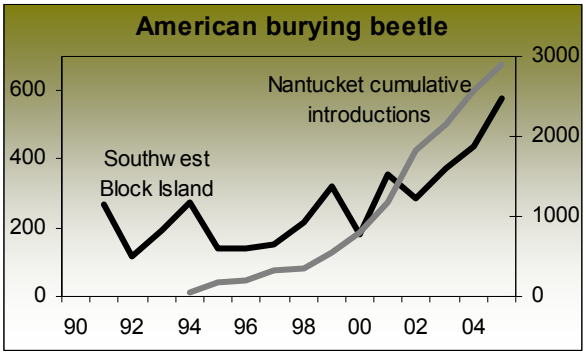
***Range**:* historically found throughout the eastern U.S.; now found in RI, MA, OK, SD, NE, KA, AR, and TX.

***Endangered species listing**:* 1989
Federal recovery plans: 1991

Status since listing: Increased

The American burying beetle (Nicrophorus americanus) formerly occurred across a vast range from Nova Scotia south to Florida, west to Texas, and north to South Dakota. It was documented in 150 counties in 34 states, the District of Columbia, and three Canadian provinces. Total historical numbers may well have been in the tens of millions or larger. The burying beetle's dramatic decline has been called "difficult to imagine" and "one of the most disastrous declines of an insect's range ever to be recorded." It was extirpated from mainland New England through New Jersey by the 1920s, from the entire mainland east of the Appalachian Mountains by the 1940s, and from the mainland east of the Mississippi River by 1974. It is currently absent from about 90% of its historic range.

The cause of the beetle's decline remains a mystery, but its unique dependence upon large (for beetles) carrion lends credence to the theory that it dwindled due to a cascading disruption of the food chain caused by the extinction, extirpation and suppression of wolves, bears and mountain lions and the extinction of the passenger pigeon. At the time of listing in 1989, three populations were known: one on Block Island, RI and two in eastern Oklahoma. Since then, populations have been discovered in South Dakota (1995), Nebraska (1992), Kansas (1997), Arkansas (1992) and Texas (2003). It has been reintroduced to Massachusetts and Ohio and several captive breeding facilities have been established.



Northeast Highlight: Located 12 miles off the south coast of Rhode Island, Block Island supports the last natural population of the American Burying beetle east of the Mississippi River. It is free of foxes, raccoons, skunks and coyotes which elsewhere compete for carrion. A study of one-third of the population determined that it was relatively stable between 1991 and 1997, then steadily grew to 577 adults in 2005. The population served as the source for the Roger Williams Park Zoo captive breeding which was initiated in 1994 and for direct translocations to Nantucket and Penikese Island.

Seabeach Amaranth

***Range**:* endemic to sand dunes and flats on the barrier islands along the Atlantic coast from Cape Cod, Massachusetts to central South Carolina: DE, MA, MD, NC, NJ, NY, RI, SC, VA

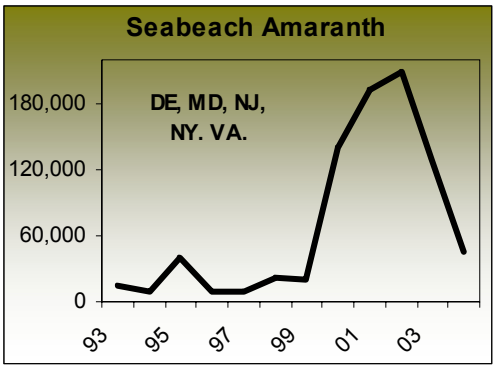
***Endangered species listing**:* 1993
Federal recovery plans: 1996

Status since listing: Increased

The seabeach amaranth (*Amaranthus pumilus*) is beach species which formerly occurred in 31 counties in nine states from Massachusetts to South Carolina. By 1988, it occurred only in the Carolinas. Its decline was caused by beach development, dune stabilization and enhancement projects, off-road vehicles, recreation, exotic species and hurricanes. Hurricanes and storms reduce and eliminate populations, but also create new habitat by reducing competing ground cover. The natural recolonization of New York in 1989 and 1990 may have been aided by severe winter storms.

The amaranth traps sand, initiating dune formation and creating suitable habitat for other plants, such as sea oats and beach grass. Numerous shorebirds, including the least tern, Wilson's plover, black skimmer, Caspian tern, and the endangered piping plover and roseate tern, nest in seabeach amaranth stands.

Since being placed on the endangered species list, the amaranth has recolonized New Jersey, Delaware, Maryland and Virginia. Numbers increased dramatically from 14,899-17,174 in 1993 to 46,108-48,668 in 2004. While the species fluctuated dramatically (well over 100,000 plants in 2000, 2001, 2003 and less than 50,000 in 1999, 2002 and 2004), the trend between 1993 and 2004 was clearly upward.



Northeast Highlight: Extirpated from New York around 1960, the amaranth naturally recolonized in 1990 with 331 plants and increased to 30,381 in 2004. Most amaranth sites are within areas fenced to protect endangered piping plovers. Extirpated from New Jersey in 1913, recolonization took place in 2000 at four sites within Gateway National Recreation Area and several sites on Monmouth County municipal beaches. The latter sites were created by a 1995 beach nourishment project by the Army Corps of Engineers. The 2000 population was 1,039; the 2005 population was 5,795.

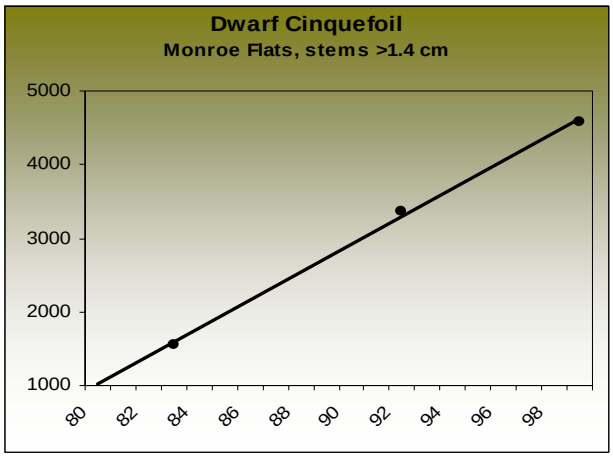
Dwarf Cinquefoil

***Range**:* endemic to the White Mountains of New Hampshire.

***Endangered species listing**:* 1980
Critical habitat designated: 1980
Federal recovery plans: 1983
Delisted due to Recovery: 2002

Status since listing: Increased

Dwarf or Robbins' cinquefoil (*Potentilla robbinsiana*) is a small perennial member of the rose family endemic to Mt. Washington and Franconia Ridge within the White Mountains National Forest, New Hampshire. When placed on the endangered species list in 1980, only two populations were known, a natural population at Monroe Flats and an introduced population at Camel Patch. Monroe Flats was designated as critical habitat. Over-collection was formerly a threat, but largely controlled by 1980. The primary threat at that point was recreational impact associated with the Appalachian Trail. The trail bisected the Monroe Flats population, extirpating the cinquefoil from the west side, severely curtailing it on the east side within eight meters of the trail, and causing an overall population decline of 75%. In 1984, a small population was rediscovered at a historic site on Franconia Ridge. In 1988 a new population was established on Franconia Ridge. Three of the four populations were considered viable (i.e. >50 plants) when the species was declared recovered and removed from the endangered species list in 2002.



Northeast Highlight: The primary population at Monroe Flats grew from 1,547 plants in 1983 to 4,575 in 1999 due to a propagation and augmentation program run by the New England Wildflower Center, and habitat protection efforts by the Appalachian Mountain Club and the U.S. Forest Service. The latter groups rerouted a section of the Appalachian Trail that bisected the dwarf cinquefoil population so that the trail instead ran outside the designated critical habitat zone. Recreational access was prohibited within critical habitat, and a scree wall and educational signs were placed along the habitat border. Compliance with the measures has been 98% successful. Propagation efforts have established over 100 new plants at the site.

Species Lists by State

Species (Common Name)	U.S. Status since listing	Currently in state	Notes
Connecticut			
American burying beetle	Increased	no	
American chaffseed	Unknown	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic green sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic hawksbill sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Bog turtle (Northern DPS)	Unknown	yes	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Florida manatee	increased	yes	Individuals range north to RI
Gray wolf (Eastern DPS)	Increased	yes	
Kemp's Ridley sea turtle	Increased	yes	Forage in NE waters in summer
North Atlantic right whale	Unknown	yes	
Northeastern beach tiger beetle	Stable	no	
Puritan tiger beetle	Declined	yes	
Roseate tern (Northeast DPS)	Increased	yes	
Sandplain gerardia	Increased	yes	
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	yes	
Sperm whale	Stable	yes	
Massachussets			
American burying beetle	Increased	yes	
American chaffseed	Unknown	no	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic green sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic hawksbill sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Blue whale	increased	yes	
Bog turtle (Northern DPS)	Unknown	yes	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Gray wolf (Eastern DPS)	Increased	yes	
Humpback whale	increased	yes	
Karner blue	Stable	no	

Species (Common Name)	U.S. Status since listing	Currently in state	Notes
Northeastern bulrush	Stable	yes	
Northern red-bellied cooter	Increased	yes	
Puritan tiger beetle	Declined	yes	
Roseate tern (Northeast DPS)	Increased	yes	
Sandplain gerardia	Increased	yes	
Seabeach amaranth	Increased	yes	
Sei whale	Unknown	yes	
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	yes	
Sperm whale	Stable	yes	
Maine			
American burying beetle	Increased	no	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Eastern cougar	Disappeared before listing	no	
Eastern prairie white-fringed orchid	Unknown	yes	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Furbish lousewort	Stable	yes	
Gray wolf (Eastern DPS)	Increased	no	
Humpback whale	increased	yes	
North Atlantic right whale	Unknown	yes	
Roseate tern (Northeast DPS)	Increased	yes	
Sei whale	Unknown	yes	
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	yes	
New Hampshire			
American burying beetle	Increased	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Dwarf cinquefoil	Increased	yes	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Gray wolf (Eastern DPS)	Increased	no	
Jesup's milk-vetch	Stable	yes	
Karner blue	Stable	yes	Extirpated but reintroduced
North Atlantic right whale	Unknown	yes	

Species (Common Name)	U.S. Status since listing	Currently in state	Notes
Puritan tiger beetle	Declined	no	
Roseate tern (Northeast DPS)	Increased	no	
Sei whale	Unknown	yes	
Small whorled pogonia	Increased	yes	
New Jersey			
American burying beetle	Increased	yes	
American chaffseed	Unknown	yes	
American Hart's-tongue fern	Declined	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic green sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic hawksbill sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Bald eagle (Continental U.S. DPS)	Increased	yes	
Bog turtle (Northern DPS)	Unknown	yes	
Brown pelican (Southeastern DPS)	Increased	yes	Non-breeding
Delmarva fox squirrel	increased	no	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eastern prairie white-fringed orchid	Unknown	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Florida manatee	increased	yes	Individuals range north to RI
Gray wolf (Eastern DPS)	Increased	no	
Humpback whale	increased	yes	
Indiana bat	Declined	yes	
Knieskern's beaked-rush	Unknown	yes	
Mitchell's satyr butterfly	Stable	no	
North Atlantic right whale	Unknown	yes	
Northeastern beach tiger beetle	Stable	yes	Extirpated but reintroduced
Red-cockaded woodpecker	Stable	no	
Roseate tern (Northeast DPS)	Increased	no	
Seabeach amaranth	Increased	yes	Extirpated but recolonized
Sensitive joint-vetch	Unknown	yes	
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	yes	
Sperm whale	Stable	yes	
Swamp-pink	Unknown	yes	
Whooping crane	Increased	no	
New York			
American burying beetle	Increased	yes	
American chaffseed	Unknown	no	
American Hart's-tongue fern	Declined	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic green sea turtle	Increased	yes	Forage in NE waters in summer

Species (Common Name)	U.S. Status since listing	Currently in state	Notes
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Blue pike (Blue walleye)	Extinct before listing	no	
Bog turtle (Northern DPS)	Unknown	yes	
Brown pelican (Southeastern DPS)	Increased	yes	non-breeding
Chittenango ovate amber snail	Unknown	yes	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eastern prairie white-fringed orchid	Unknown	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Florida manatee	increased	yes	Individuals range north to RI
Gray wolf (Eastern DPS)	Increased	no	
Great Lakes piping plover	Increased	yes	
Humpback whale	increased	yes	
Indiana bat	Declined	yes	
Karner blue	Stable	yes	
Kemp's Ridley sea turtle	Increased	yes	Forage in NE waters in summer
Leedy's roseroot	Stable	yes	
Longjaw cisco	Extirpated before listing	no	
North Atlantic right whale	Unknown	yes	
Northeastern beach tiger beetle	Stable	no	
Northeastern bulrush	Stable	no	
Northern wild monkshood	Stable	yes	
Roseate tern (Northeast DPS)	Increased	yes	
Sandplain gerardia	Increased	yes	
Seabeach amaranth	Increased	yes	Extirpated but recolonized
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	no	
Sperm whale	Stable	yes	
Swamp-pink	Unknown	no	
Rhode Island			
American burying beetle	Increased	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Atlantic hawksbill sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic leatherback sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic loggerhead sea turtle	Increased	yes	Forage in NE waters in summer
Atlantic piping plover	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Eastern cougar	Disappeared before listing	no	
Eskimo curlew	Disappeared before listing	no	
Fin whale	increased	yes	
Florida manatee	increased	yes	Individuals range north to RI
Gray wolf (Eastern DPS)	Increased	no	
Humpback whale	increased	yes	
North Atlantic right whale	Unknown	yes	

Species (Common Name)	U.S. Status since listing	Currently in state	Notes
Sandplain gerardia	Increased	yes	
Seabeach amaranth	Increased	yes	
Shortnose sturgeon	Increased	yes	
Small whorled pogonia	Increased	yes	
Sperm whale	Stable	yes	
Vermont			
American burying beetle	Increased	yes	
American peregrine falcon	Increased	yes	Extirpated but reintroduced
Arctic peregrine falcon	Increased	yes	
Bald eagle (Continental U.S. DPS)	Increased	yes	
Dwarf wedgemussel	Stable	yes	
Eastern cougar	Disappeared before listing	no	
Eskimo curlew	Disappeared before listing	no	
Gray wolf (Eastern DPS)	Increased	no	
Indiana bat	Declined	yes	
Jesup's milk-vetch	Stable	yes	
Northeastern bulrush	Stable	yes	
Puritan tiger beetle	Declined	no	
Small whorled pogonia	Increased	no	

Technical Species Accounts

North Atlantic right whale

Listed: 6/2/1970
Status since listing: Unknown

The northern right whale is composed of two species, the North Atlantic right whale (Eubalaena glacialis) and the North Pacific right whale (Eubalaena japonica) [1]. Both are among the most critically endangered large whales in the world. They were severely depleted by commercial whaling until the 1935 Convention for the Regulation of Whaling [2]. Incidents of illegal whaling continued in the North Pacific through the 1960s, but the whale populations increased significantly over time. However, in the past decade, direct and indirect impacts from human activities have increasingly caused mortalities and may be hindering recovery efforts. Collisions with vessels and entanglement in fishing gear have been particularly problematic, particularly in the North Atlantic. Efforts to protect the northern right whale population increased significantly following completion of the 1991 federal recovery plan.

Western North Atlantic Population
Right whales in the western North Atlantic population range from wintering and calving grounds in coastal waters of the southeastern U.S. to summer feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf [2]. New England waters are a primary feeding habitat and serve as a nursery for calves and perhaps also as a mating ground. Known wintering areas for this population are along the southeastern U.S. coast, where calving occurs from December through March and in Cape Cod Bay where they have been sighted from mid January to mid May (although no calving has been confirmed in Cape Cod bay). A majority of the population, however, remains unaccounted for in winter. Recent sightings of known individuals around the Gulf of St. Lawrence, Iceland, and northern Norway as well as in the Gulf of Mexico indicate that ranges may be larger than previously thought and suggest that some important habitat areas have not yet been described [1].

Five areas of “high use” have been identified for western North Atlantic right whales: 1) Coastal Florida and Georgia, 2) The Great South Channel east of Cape Cod, 3) Massachusetts Bay and Cape Cod Bay, 4) The Bay of Fundy, and 5) The Scotian Shelf. The first three of these areas were designated as northern right whale critical habitat in June 1994 [2]. Both Canadian areas were designated as Conservation Zones in the 1990s. Movements within and between these habitats may be extensive. Waters south of Cape Cod and north of the Georgia/Florida winter calving ground, have not been included as “high use” areas, although the coastal waters between the calving and feeding grounds are a well documented seasonal migratory zone.

Estimates of historic population size are not available, although models of population trajectories suggest that there may have been at least several thousand right whales during the early to mid-1600s, with the greatest population decline occurring in the early 1700s [1]. The population may have numbered fewer than 100 individuals by the time international protection for right whales came into effect in 1935. Not enough is known about the population dynamics of right whales during these years, however, to state any estimates with confidence. After 1935, the population is thought to have slowly increased [3] and may have still been increasing at a modest rate (about 2.5%) in the 1980s [2]. More recently, events such as the near-failure of calf production from 1993-95, increased intervals between calving, and a high number of human-induced mortalities, suggest that this modest recovery rate may not have continued in the 1990s. Minimum populations were thought to be 295 in 1992, 263 in 1996, and 291 in 1998. Although calf production has increased recently, the gains from increased birth rates are too small to overcome the estimated population decline of about 2% per year thought to be taking place [4].

Two periods of unusually high mortality have been documented; One from January to March 1996 where five North Atlantic right whale mortalities were reported in waters of the southeastern U.S [1], and one from March 2004 to July 2005 where 8 deaths were reported [4]. Four of the deaths in the latter period were attributable to human activities. Six of the deaths were adult females, 3 of which carried near-term fetuses. The loss of this number of whales, and particularly this number of reproductive females, in such a

short period, is unprecedented in 25 years of study. A recent model suggests that, under current conditions, the population is headed for extinction within 191 years [2]. Another model suggests that decreasing mortality of adult females by 2-3 females per year could reverse this negative trend [3].

Ship collisions and fishing gear entanglements are the most common anthropogenic causes of mortality in western North Atlantic right whales [2]. Other potential threats are habitat degradation, noise, contaminants, military activities, climate and ecosystem change. A high proportion of interactions between ships and whales are fatal to the whales -22% of documented deaths between 1970 and 1991 were caused by ship propellers severing the tail stock or spine, or causing mortal wounds on the head. Gear entanglement was estimated to account for 7% of the known mortality between 1970 and 1993. In a recent analysis of the scarification of right whales, a total of 61.6% of the whales bore evidence of entanglements with fishing gear [1]. Further research has indicated that, each year, between 10% and 28% of right whales are involved in entanglements [1]. Although currently no plans to explore or develop oil resources off the coast of the mid and south- Atlantic U.S. have been announced, offshore oil and gas activities have been proposed [2]. If these activities occur, vessel movements, noise, spills, or effluents could result in adverse effects to the right whale population. For waters of the northeastern USA, a present concern not yet completely defined, is the possibility of habitat degradation in Massachusetts and Cape Cod Bays due to a Boston sewage outfall opened in 2000 [1].

Eastern North Atlantic Population
The eastern North Atlantic right whale population may have originally migrated along the coast from northern Europe to the northwest coast of Africa [2]. This population was heavily exploited by whalers during the 14th-16th centuries and again between 1902 and 1920. Since the 1960's, there have only been sporadic sightings of right whales in the eastern North Atlantic. If this population remains extant, little is known about it's distribution and migration. It is considered a 'relict' population that probably numbers only in the low tens of animals and may be functionally extinct.

[1] NOAA Fisheries. 2005. Stock Assessment Report. North Atlantic Right Whale (Eubalaena glacialis): Western Stock revised Dec., 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
[2] National Marine Fisheries Service. 2005. Recovery Plan for the North Atlantic Right Whale (Eubalaena glacialis). Silver Spring, MD. [3] Masami Fujiwara and Hal Caswell. 2001. Demography of the endangered North Atlantic right whale. Nature 414:537-541.
[4] Kraus S., M. W. Brown, H. Caswell, C. W. Clark, M. Fujiwara, P. K. Hamilton, R.D. Kenney, A. R. Knowlton, S. Landry, C. A. Mayo, W. A. McLellan, M.J. Moore, D. P. Nowacek, D. A. Pabst, A. J. Read, and R. M. Rolland. 2005. North Atlantic Right Whales in Crisis. Science 309:5734, pp. 561-562.

Blue whale

Listed: 6/2/1970
Status since listing: increased

The blue whale (Balaenoptera musculus) is the largest animal ever known to have lived on Earth [1]. Blue whales are found in all oceans worldwide and are separated into populations from the North Atlantic, North Pacific and Southern Hemisphere [1]. Each population is composed of several stocks that typically migrate between higher-latitude summer feeding grounds and lower-latitude wintering areas. The largest numbers of blue whales in U.S. waters are within the eastern North Pacific stock. Other U.S. stocks occur in waters off the coast of Alaska, Hawaii, and the Northeast [1].

Pre-whaling blue whale populations had about 350,000 individuals [3]. In 1868, the invention of the exploding harpoon gun made the hunting of blue whales possible and in 1900, whalers began to focus on blue whales and continued until the mid 1960s [1, 3]. During this time, it is estimated that whalers killed up

to 99% of blue whale populations [3]. Currently, there are about 5-10,000 blue whales in the Southern Hemisphere and about 3-4,000 in the Northern Hemisphere [3]. Current threats include collisions with vessels, entanglement in fishing gear, reduced zooplankton production due to habitat degradation, and disturbance from low-frequency noise [1]. The offshore driftnet gillnet fishery is the only fishery likely to take blue whales, but few mortalities or serious injuries have been observed [2].

The Eastern North Pacific Stock feeds in waters off the coast of California (sometimes ranging into Oregon) from June to November and then migrates south to Mexico (sometimes going as far south as Costa Rica) in winter/spring [2]. The number of whales reported off the coast of California increased from 704 in 1979/80 to 2,584 whales in 1996, and then dropped to 788 whales in 2001. Following this drop, numbers began to increase and in 2003, 1,744 whales were reported [2]. It is not certain if the increasing trend indicates a growth in the size of the stock, or just increased use of California waters [2], but the stock is generally thought to have increased [1], and because of its size dominates the trend of the species in U.S. waters.

Blue whales feeding along the Aleutian Islands are probably part of a central western North Pacific stock that is thought to migrate to offshore waters north of Hawaii in winter [4]. Sightings of blue whales in Hawaiian waters are infrequent, although acoustic recordings indicate that blue whales occur there. There are no estimates of population size for this stock [4]. No blue whales were sighted during aerial surveys of Hawaiian waters conducted from 1993 to 1998 or during shipboard surveys conducted in the summer/fall of 2002 [4].

The blue whale is an occasional visitor along the Atlantic coast of the Northeast [5]. Sightings of blue whales off Cape Cod, Massachusetts, in summer and fall may represent the southern limit of the feeding range of the western North Atlantic stock that feeds primarily off the Canadian coast [5]. Blue whales have been sighted as far south as Florida, however, and the actual southern limit of this stock's range is unknown [5]. Because blue whales are not frequently seen in U.S. Atlantic waters, there are insufficient data to determine the stock's population trend [5]. In 1997, the total number of photo-identified individuals for eastern Canada and New England was 352 [1].

[1] National Marine Fisheries Service. 1998. Recovery plan for the blue whale (Balaenoptera musculus). Prepared by Reeves R.R., P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber for the Silver Spring, MD. 42 pp.
[2] NOAA Fisheries. 2004. Stock Assessment Report. Blue Whale (Balaenoptera musculus): Eastern North Pacific Stock. Revised 3/15/05. National Oceanic and Atmospheric Administration, Washington, D.C.
[3] American Cetacean Society. 2005 American Cetacean Society Fact Sheet: Blue Whale (Balaenoptera musculus). Website (http://www.acsonline.org/factpack/bluewhl.htm) accessed on November, 2005.
[4] NOAA Fisheries. 2004. Stock Assessment Report. Blue Whale (Balaenoptera musculus): Western North Pacific Stock. Revised 3/15/05. National Oceanic and Atmospheric Administration, Washington, D.C.
[5] NOAA Fisheries. 2002. Stock Assessment Report. Blue Whale (Balaenoptera musculus): Western North Atlantic Stock. Revised Jan. 2002. National Oceanic and Atmospheric Administration, Washington, D.C.

Fin whale

Listed: 6/2/1970
Status since listing: increased

Fin whales (Balaenoptera physalus) are widely distributed in the world's oceans [1]. Populations in the North Atlantic, North Pacific and southern oceans probably mix rarely, if at all. Within particular oceans, populations have been determined to belong to regional stocks. The Marine Mammal Protection Act recognizes three stocks of fin whales in the North Pacific: 1) the California/Oregon/ Washington stock, 2) the Hawaii stock, and 3) the Alaska stock [2]. A western North Atlantic stock inhabits U.S. waters along northeastern coasts [3]. Fin whale populations exhibit differing degrees of mobility, presumably depending on the stability of access to sufficient prey resources through the year [1]. Most groups are thought to migrate seasonally, in some cases over large distances [1]. They feed at high latitudes in summer and move to low latitudes in winter. Some groups apparently move over shorter distances and can be considered resident to areas with a year-round supply of adequate prey.

Fin whales were hunted, often intensively, in all the world's oceans for the first three-quarters of the 20th century [1]. From 1947 to 1987, approximately 46,000 fin whales were taken from the North Pacific alone [2]. Commercial whaling did not end until 1976 in the North Pacific and 1987 in the North Atlantic. The current status of fin whale populations relative to pre-whaling levels is uncertain.

In the North Pacific, pre-whaling populations were estimated to be between 42,000 and 45,000 [2]. By 1973, the North Pacific population is thought to have been reduced to between 13,620 and 18,680 -- less than 38% of historic carrying capacity [2]. More recently, however, there is some indication that the population may be growing. The California/Oregon/Washington stock of the North Pacific is thought to be increasing [5]. Fin whale acoustic signals are detected year-round off northern California, Oregon and Washington, with a concentration of vocal activity between September and February [2]. Fin whales increased in abundance along the California coast between 1979 and 1996, and based on ship surveys in 2001, they continued to increase. Populations appeared to be increasing monotonically from 1991 to 2001 [5]. In 2001, 3,279 (CV= 0.31) were estimated in California, Oregon and Washington coastal waters [2].

Since 1999, information on abundance of fin whales in Alaskan waters has improved, however, and although the full range of fin whales in these areas has not yet been surveyed, a rough estimate of the size of the population west of the Kenai Peninsula is 5,703 [6]. Surveys conducted in 1999 and 2000 in the central-eastern Bering Sea and southeastern Bering Sea provided provisional estimates of 3,368 (CV = 0.29) and 683 (CV = 0.32), respectively [6]. One aggregation of fin whales spotted in 1999 involved more than 100 animals [6]. Because historical abundance information is lacking, population trends are difficult to determine [6].

Fin whales are rare in Hawaiian waters and the stock is thought to be quite small [7]. Over the course of 12 aerial surveys conducted within about 25 nmi of the main Hawaiian Islands in 1993-98, only one fin whale was sighted [7]. More recent acoustic data suggest that fin whales migrate into Hawaiian waters mainly in fall and winter [7]. In 2002, a ship survey of the entire Hawaiian Islands resulted in an abundance estimate of 174 (CV=0.72) fin whales [7].

Western North Atlantic fin whales off the eastern U.S. coast north to Nova Scotia and the southeastern coast of Newfoundland are considered a single stock [3]. New England waters represent a major feeding ground and calving is thought to take place along mid-Atlantic U.S. latitudes from October to January. The locations used for calving, mating and wintering for most of the population remains unknown. It is likely that fin whales occurring in the U.S. Atlantic undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. An abundance of 2,200 (CV=0.24) fin whales was estimated from a 1995 line-transect sighting survey that covered waters from Virginia to the mouth of the Gulf of St. Lawrence. A more recent estimate of 2,814 (CV=0.21) fin whales, currently considered the best estimate for the western North Atlantic stock, was derived from a 1999 line-transect sighting covering

waters from Georges Bank to the mouth of the Gulf of St. Lawrence [3]. Although there is little data on population trends, the minimum population estimate reported in NOAA Fisheries Stock Assessment Reports has steadily increased since 1992.

The main direct threat to fin whales today is the possibility of illegal whaling or a resumption of legal whaling [1]. In 2006, Japan announced that it will expand hunts to include fin whales [4]. They expect to harvest 10 fin whales from Antarctic waters [4]. Collisions with vessels, entanglement in fishing gear, reduced prey abundance due to over-fishing and habitat degradation, as well as disturbance from low frequency noise, are also potential threats [1]. The offshore drift gillnet fishery is the main fishery likely to take fin whales [2].

[1] National Marine Fisheries Service. 1998. Draft Recovery Plan for the Fin Whale (Balaenoptera physalus) and Sei Whale (Balaenoptera Borealis). Silver Spring, MD.
[2] NOAA Fisheries. 2005. Stock Assessment Report. North Atlantic Right Whale (Eubalaena glacialis): Western Stock revised Dec., 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
[3] NOAA Fisheries. 2004. Stock Assessment Report. Fin Whale (Balaenoptera physalus): Western North Atlantic stock. Revised Dec. 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
[4] Hans Greimel, Associated Press. 2005. Japan To Double Usual Whale Kill in New Antarctic Hunt, Expanded To Include Fin Whales. Nov. 9, 2005.
[5] Barlow, J. 2003. Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991-2001 Southwest Fisheries Science Center Administrative Report LJ-03-03. Accessed at (http://swfsc.nmfs.noaa.gov/prd/PROGRAMS/CMMP/default.htm).
[6] NOAA Fisheries. 2004. Stock Assessment Report. Fin Whale (Balaenoptera physalus): Northeast Pacific stock. Revised 10/21/2004. [7] NOAA Fisheries. 2005. Stock Assessment Report. Fin Whale (Balaenoptera physalus): Hawaiian stock. Revised 3/15/2005.

Humpback whale

Listed: 6/2/1970
Status since listing: increased

The humpback whale (Megaptera novaeangliae) occurs in all oceans of the world [1]. They generally inhabit waters over continental shelves, along continental edges and around some oceanic islands [1]. Humpback whales winter in warm waters in a few specific locations and mate and give birth on wintering grounds where little feeding is thought to take place [1]. For the summer season, they migrate to high-latitude summering areas where they tend to stay relatively close to shore (although some groups inhabit deeper water) and spend the majority of their time feeding [1].

Humpback whale populations were greatly depleted by commercial whaling [1]. Prior to whaling, humpback whale numbers are thought to have exceeded 125,000 [1]. America whalers alone, however, killed between 14,164 and 18,212 humpback whales between 1805 and 1909 [1]. Humpback whales first received protection in the North Atlantic in 1955 when the International Whaling Commission placed a prohibition on non-subsistence whaling by member nations [1]. Protection was extended to the North Pacific and southern hemisphere populations following the 1965 hunting season [1]. Although hunting has largely been stopped (some exceptions exist that allow the take of a limited number of whales), and populations appear to be increasing, human impacts such as vessel collisions and entanglements are factors that may be slowing the recovery of the humpback whale population [3].

The total level of human-caused mortality and serious injury is unknown, but current data indicate that it is significant [3]. Humpback whales are also vulnerable to marine pollution [2]. Furthermore, the increasing

levels of anthropogenic noise in the world's oceans, such as that produced by certain types of Sonar, may also be problematic for whales, particularly for baleen whales that may communicate using low-frequency sound [4].

Western North Atlantic: It is thought that there are likely six stocks of humpback whales that make up the western North Atlantic population [3]. A feeding aggregation in the Gulf of Maine (considered a single stock) is the only one of these in U.S. waters [3]. Within New England waters, humpbacks are present in spring, summer and autumn [3]. They spend much of their time feeding and their distribution in this region has been largely correlated to prey species and abundance [3]. In winter, humpbacks from the different western Northern Atlantic feeding areas mate and calve primarily in the West Indies, where spatial and genetic mixing among subpopulations occurs [3]. From late December to early April most of the population is found at Silver and Navidad Banks at the end of the Bahamian archipelago, and along the coast of the Dominican Republic [1]. They are also found at much lower densities throughout the remainder of the Antillean arc, from Puerto Rico to the coast of Venezuela [3]. The only U.S.-controlled portions of the breeding range include waters along the Northwest coast of Puerto Rico and the U.S. Virgin Islands [1]. Not all of the stock migrates to the West Indies every winter, however, and significant numbers of animals are found in mid- and high-latitude regions during the winter months [3]. There have recently been a number of wintertime humpback sightings in coastal waters of the southeastern U.S [3].

North Atlantic humpback numbers are thought to be slowly increasing. An average increase of 1% (SE=0.005) was estimated for the period 1979-1993 [3]. The best estimate of the number of North Atlantic humpbacks in 1992/1993 was 11,570 (CV=0.069) [3]. Data suggest that the Gulf of Maine humpback whale stock is also steadily increasing in size at a rate consistent with the larger population [3]. The Gulf of Maine minimum population was estimated to be 501 in 1992 and 647 in 1999 [3]. Both of these estimates are likely low due to sampling technique [3]. The best estimate of the actual number of animals is thought to be 902 [3].

North Pacific: Historic summering range for the North Pacific humpback whales encompassed coastal and inland waters around the Pacific rim from Point Conception, CA north to the Gulf of Alaska and the Bering sea, and west along the Aleutian Islands, Kamchatka peninsula and into the Sea of Okhotsk [1]. Rough estimates of the pre-whaling population speculate that there were around 15,000 humpbacks in the North Pacific [1]. In 1966, the entire North Pacific humpback population was thought to number only around 1,200 animals [4]. This estimate increased to between 6,000 and 8,000 by 1992 [4]. Although these estimates are uncertain and are based on different methods, the 6-7% growth rate implied is consistent with the observed growth rate of the better-studied eastern North Pacific subpopulation [4].

Although the International Whaling Commission only considered North Pacific humpbacks to be one stock, there is now good evidence for multiple stocks in the North Pacific [4]. There are at least three relatively separate populations that migrate between their respective summer/fall feeding areas and winter/spring calving and mating areas; the eastern North Pacific stock, the central North Pacific stock and the western North Pacific stock [4]. These divisions are a simplification, however, and are not perfect. In general, interchange occurs (at low levels) between breeding areas, although fidelity is extremely high among the feeding areas [4].

The eastern North Pacific stock spend much of their lives within U.S. waters [1]. They winter in coastal Central America and Mexico and migrate to coastal California through British Columbia in the summer/fall [4]. This stock appears to be increasing in abundance [4]. Mark-recapture population estimates increased steadily from 1988/90 to 1997/98 at about 8% per year [4]. Surveys of humpback whale abundance in feeding areas in California, Oregon and Washington conducted from 1991 to 2002 show a general upward trend in abundance followed by a drop in 1999/2000 and 2000/2001[5]. The 2002/2003 population estimate (1,391, CV=0.22) was higher than any previous estimate and may indicate that the lower numbers in 1999-2001 exaggerated any real decline that might have occurred [5]. It could also indicate that a real decline was followed by an influx of new whales from another area [4]. This latter view was

substantiated by a greater fraction of new whales seen for the first time in 2003 [4].

The central North Pacific stock, in general, winter around the Hawaiian Islands (some go to Mexico) and migrates to northern British Columbia/Southeast Alaska and Prince William Sound west to Kodiak [6]. Three feeding areas for the Central North Pacific stock have been studied using photo-identification techniques; these include southeastern Alaska, Prince William Sound and Kodiak Island [6]. There has been some exchange of individual whales between these locations, although the aggregation in southeastern Alaska seems to remain relatively isolated from other groups [6]. The current total estimated abundance for this stock is 4,005 individuals [7]. The abundance of the Prince William Sound feeding aggregation is thought to be less than 200 whales [6]. In the Kodiak region, 127 individual whales were identified between 1991 and 1994 and abundance was estimated to be 651 (95% CI: 356-1,523) [6]. The number of animals in the Southeast Alaska aggregation is thought to have increased [6]. The 2000 estimate of 961 is substantially higher than estimates from the 1980s, which put numbers in the high 300's [6]. In a 2004 report, an annual population rate of increase was calculated to be 10% [6]. Another study, based on aerial surveys conducted across the main Hawaiian Islands, and designed specifically to estimate trends in the Central Pacific Stock, found an annual increase of 7% from 1993-2000 [8].

The western North Pacific stock is the least studied of the Northern Pacific populations [9]. This aggregation winters off Japan and probably migrates to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer/fall [9]. Recent surveys in the central-eastern and southeastern Bering Sea in 1999 and 2000 resulted in humpback whale sightings suggesting that the Bering Sea is an important feeding area [9]. New information indicates that humpback whales from the western and Central North Pacific stocks mix on summer feeding grounds in the central Gulf of Alaska and perhaps the Bering Sea [9]. A major research effort (the SPLASH project) was initiated in 2004 in order to better delineate stock structure of humpback whales in the North Pacific [9]. There are no reliable estimates for the abundance of humpback whales in the western Pacific stock because surveys of the known feeding areas are incomplete, and not all feeding areas are known [9].

[1] National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (Megaptera novaeangliae). Prepared by the Humpback Whale Recovery Team for the Silver Spring, Maryland. 105pp.
[2] NatureServe. 2005. NatureServe's Central Databases. Arlington, VA. U.S.A.
[3] NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae): Gulf of Maine Stock, revised Dec. 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
[4] NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae): Eastern North Pacific Stock, revised May 15, 2005. National Oceanic and Atmospheric Administration, Washington, D.C.
[5] Calambokidis J., T. Chandler, L. Schlender, G.H. Steiger, and A. Douglas. 1995-2000. Final reports to Monterey Bay, Channel Islands, and Olympic Coast National Marine Sanctuaries, Southwest Fisheries Science Center, and University of California at Santa Cruz. Cascadia Research, 218 1/2; W Fourth Ave., Olympia, WA 9850. Accessed at http://www.cascadiaresearch.org/abstracts/abstract.htm.
[6] NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae): Central North Pacific Stock, revised Feb 12, 2005. National Oceanic and Atmospheric Administration, Washington, D.C.
[7] NOAA Fisheries, Office of Protected Resources. Cetaceans: Whales, Dolphins, and Porpoises. Humpback Whale. Accessed at http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpback_whale.doc
[8] Mobley J. Jr., S. Spitz, and R. Grotefendt. 2001. Abundance of Humpback Whales in Hawaiian Waters: Results of 1993-2000 aerial surveys. Hawaiian Islands Humpback Whale National Marine Sanctuary Office of National Marine Sanctuaries. National Oceanic and Atmospheric Administration U.S. Dept of Commerce. Accessed at http://hawaiihumpbackwhale.noaa.gov/research/HIHWNMS_Research_Mobley.pdf
[9] NOAA Fisheries. 2005. Stock Assessment Report. Humpback Whale (Megaptera novaeangliae): Western North Pacific Stock, revised Feb 5, 2005. National Oceanic and Atmospheric Administration,

---

Sei whale

Listed: 6/2/1970
Status since listing: Unknown

The sei whale (Balaenoptera physalus) is one of the least studied of the endangered “great whales” [1]. They occur in all oceans, but generally stay in more temperate waters within a smaller range of latitudes than other baleen whales and tend to be found in deeper waters associated with continental slopes and edges [2]. Little is known about either their current or historic status, and the structure of sei whale stocks and their migrations patterns are still relatively unknown [1].

Whaling in the 1950s through the early 1970s reduced most stocks of sei whales, some of them drastically [1]. The sei whale won international protection in 1970, when catch quotas for the North Pacific began to be set on a species basis. In 1976 the sei whale was given complete protection from commercial whaling in the North Pacific. In 1986, all legal commercial hunting for sei whales ended. Although it is expected that the cessation of whaling would result in increased sei whale numbers, the status and population trends for this species are unknown [3]. Currently, stock assessment reports by NOAA consider three stocks of sei whales in U.S. waters: 1) the Eastern North Pacific stock (California, Oregon and Washington waters) 2) the Hawaiian stock, and 3) the Nova Scotia stock (includes waters off the northeastern U.S. Atlantic coast) [4].

Although there have been no direct estimates (based on sighting surveys) of sei whale abundance for the entire North Pacific, populations are thought to have been reduced to 20% of their pre-whaling abundance [3]. The eastern North Pacific stock of this population also was likely depleted by whaling [3]. Records indicate that 384 sei whales were taken by shore-based whaling stations in central California between 1958 and 1965; 26 were taken off central and northern California between 1919 and 1926 [3]. Aerial surveys conducted off the coasts of California, Oregon and Washington in 1991, 1992, 1993, 1996 and 2001 produced only two confirmed sei whale sightings [3]. The sei whales’ offshore distribution along the continental slope may explain, at least in part, the infrequency of sightings between northern California and Washington [1]. An abundance estimate of 56 (CV = 0.61) sei whales was produced from shipboard surveys conducted in 1996 and 2001 in California, Oregon and Washington waters out to 300 nmi [3]. Population trends for this stock are unknown [3].

Little is known about the status of sei whales in Hawaiian waters [4]. A 2002 shipboard line-transect survey of the entire Hawaiian Islands Exclusive Economic Zone resulted in a summer/fall abundance estimate of 77 (CV=1.06) sei whales [4]. Currently, this is the best (and only) available abundance estimate for this stock [4]. At this time of year, however, the majority of sei whales would probably be at higher-latitude feeding grounds [4]. In the North Atlantic, the range of the Nova Scotia sei whale stock includes the continental shelf waters of the northeastern U.S., and extends northeastward to south of Newfoundland [5]. During the spring and summer, sei whales from this stock are found in waters of the Gulf of Maine to Georges Bank [5]. The total number of sei whales that enter U.S. Atlantic waters is unknown [5], but Sei whales are not thought to be common anywhere in the U.S. Atlantic [1]. Tag-recapture surveys conducted in the 1970s in Nova Scotia estimated the Nova Scotian stock to number between 1,393 and 2,248 [5]. Spring aerial surveys conducted in U.S. waters from 1979-1981 (CeTAP surveys) estimated an abundance of 280 sei whales in the stock [5]. This estimate is not considered statistically reliable, however, because of low survey effort and inaccuracy in accounting for submerged animals [2]. In 1986, an influx of sei whales into the southern Gulf of Maine was reported [5]. The cause of this phenomenon remains unknown, but similar events have been reported in other parts of the world [5]. There are no recent abundance estimates for this stock and population trends are unknown [5].

Today, the possibility of illegal whaling or a resumption of legal whaling represent potential direct threats to sei whale populations [1]. Japan currently conducts yearly harvests of sei whales for “scientific research” [2]. Ship collisions, entanglement in fishing gear, reduced prey abundance due to overfishing and habitat degradation, and disturbance from low-frequency noise may also pose threats to sei whales [1]. Since sei whales tend to inhabit deeper waters, however, they are probably less prone to collisions with fishing gear and ships than are most of the other Northern Hemisphere baleen whales [1].

[1] National Marine Fisheries Service. 1998. Draft Recovery Plan for the Fin Whale (Balaenoptera physalus) and Sei Whale (Balaenoptera Borealis). Silver Spring, MD.
[2] Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. Special Issue: The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1). [3] NOAA Fisheries. 2003. Stock Assessment Report. Sei Whale (Balaenoptera borealis): Eastern North Pacific Stock. Revised 12/15/2003. National Oceanic and Atmospheric Administration, Washington, D.C.
[4] NOAA Fisheries. 2005. Stock Assessment Report. Sei Whale (Balaenoptera borealis): Hawaiian Stock Revised 3/15/2005. National Oceanic and Atmospheric Administration, Washington, D.C.
[5] NOAA Fisheries. 2005. Stock Assessment Report. Sei Whale (Balaenoptera borealis): Nova Scotia Stock. Revised December 2003. National Oceanic and Atmospheric Administration, Washington, D.C.

Sperm whale

Listed: 6/2/1970
Status since listing: Stable

The sperm whale (Physeter macrocephalus) occurs in all oceans worldwide and were once abundant [1]. Over the past two centuries, however, commercial whalers killed somewhere around 1 million sperm whales [1]. Despite this, sperm whale populations are larger than those of other large whale species (rough estimates put the population somewhere between 200,000 and 1.5 million) [1]. Commercial whaling of sperm whales declined in the 1970s and 1980s, and virtually ceased when the International Whaling Commission implemented a moratorium against hunting sperm whales in 1988 [1]. Although populations are expected to have increased due to the cessation of whaling, determining population trends has been difficult. This is in part because sperm whale migration patterns are not well understood (patterns seem to vary with age and sex) [1] and because sperm whales occur in larger groups and tend to range more widely, making abundance estimates more variable than those of other large whales with similar population sizes [2]. Current threats to sperm whales include anthropogenic noise, incidental ship strikes and gillnet mortality [1]. The accumulation of stable pollutants (e.g. PCBs), chlorinated pesticides (e.g. DDT), polycyclic aromatic hydrocarbons and heavy metals could also affect the health and behavior of sperm whales [1].

For stock assessment reports by NOAA, sperm whales within the Pacific U.S. are divided into three discrete areas: 1) Hawaiian waters, 2) California, Oregon and Washington waters, and 3) Alaskan waters [3]. Although there are no reliable estimates of historic sperm whale abundance in Hawaiian waters, this area was the center of a major hunting ground for sperm whales in the 19th century [3]. The current best estimate of the number of sperm whales around the Hawaiian Islands is 7,082 (CV=0.30) [3]. Because this is the first reliable estimate from surveys covering the entire Hawaiian Island area, no estimates of population trends are available [3].
In the North Pacific, the eastern North Pacific stock of sperm whales ranges into Alaskan waters [4]. In 1998, the population of this stock was estimated to be in the neighborhood of 39,000 [4]. The number of sperm whales in Alaskan waters, however, is unknown and determining population trends has not been possible [1]. It is thought that male sperm whales in particular feed in the Gulf of Alaska, Bering Sea and waters around the Aleutian Islands [1].

The population of the California, Oregon, Washington sperm whale stock has fluctuated since 1979/80 without apparent trend and appears relativelyl stable [5, 6]. Ship line-transect surveys conducted in 2001 estimated sperm whale abundance in these waters to be 1,581 (CV=0.59). This is similar to an estimate of 1,168 (CV=0.40) produced from surveys conducted between 1991 and 1993 [2]. Because of the methodologies used in early surveys, earlier population estimates are unreliable and can not be used for comparison with more recent population numbers [5].

In the Atlantic Ocean, sperm whales along the U.S. East Coast likely represent only a fraction of the total North Atlantic sperm whale stock [7]. Research indicates stable social groups, site fidelity and latitudinal range limitations in groups of North Atlantic females and juveniles, while males migrate to polar regions to feed and return to more tropical waters to breed [7]. In winter, sperm whales are concentrated east and northeast of Cape Hatteras, North Carolina [7]. In spring, the center of distribution shifts northward to Delaware and Virginia with sperm whales occurring throughout the central portion of the mid-Atlantic bight and the southern portion of Georges Bank [1]. Total numbers of sperm whales off the U.S. or Canadian Atlantic coast are unknown, although research suggests that at least several thousand sperm whales occupy these waters [7]. Ship surveys conducted along the Atlantic coast from the Gulf of St. Lawrence to Florida in 1998 resulted in a population estimate of 4,029 (CV=0.3) [7]. In 2004, the population was estimated at 3,768 (CV=0.337). Because estimates were not corrected for whale dive-time, they likely underestimated abundance. There are insufficient data to determine the population trends for this stock of sperm whales [1].

The northern Gulf of Mexico stock is present year-round in the northern part of the Gulf of Mexico, with sightings occurring most frequently in summer [1]. Recent research supports suggestions that this population represents a distinct stock [8]. A recent re-analysis of survey data collected from 1991 to 1994 resulted in a population estimate of 805 (CV=0.27) [8]. The current best estimate of this population, 1,349 (CV=0.23), is from 1996 and 2001 data that were pooled [8]. There is not sufficient data to determine population trends for this stock [8]. Of particular concern for sperm whales in the Gulf of Mexico is disturbance by anthropogenic noise from areas where oil, gas and shipping activity are high. Coastal pollution may also pose threats for this stock [8].

[1] NOAA Fisheries. Office of Protected Resources. Species Information: Sperm Whales. Website: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhales.htm (Accessed on 12/1/05).
[2] Barlow, J. 2003. Preliminary estimates of the abundance of cetaceans along the U.S. west coast: 1991-2001. Southwest Fisheries Science Center Administrative Report LJ-03-03. La, Jolla, CA. 31 p. [3] NOAA Fisheries. 2004. Stock Assessment Report. Sperm Whale (Physeter macrocephalus): Hawaiian Stock. Revised 03/15/2005. National Oceanic and Atmospheric Administration, Washington, D.C.
[4] NOAA Fisheries. 2003. Stock Assessment Report. Sperm Whale (Physeter macrocephalus): North Pacific Stock. Revised 5/1/03. National Oceanic and Atmospheric Administration, Washington, D.C.
[5] NOAA Fisheries. 2003. Stock Assessment Report. Sperm Whale (Physeter macrocephalus): California/Oregon/Washington Stock. Revised 12/15/03. National Oceanic and Atmospheric Administration, Washington, D.C.
[6] Barlow, J. 1994. Abundance of large whales in California coastal waters: a comparison of ship surveys in 1979/80 and in 1991. Rept. Int. Whal. Commn. 44:399-406.
[7] NOAA Fisheries. 2005. Draft Stock Assessment Report. Sperm Whale (Physeter macrocephalus): North Atlantic Stock. Revised Nov 2004. National Oceanic and Atmospheric Administration, Washington, D.C.
[8] NOAA Fisheries. 2003. Stock Assessment Report. Sperm Whale (Physeter macrocephalus): Northern Gulf of Mexico Stock. Revised Dec 2003. National Oceanic and Atmospheric Administration, Washington, D.C.

Florida manatee

Listed: 3/11/1967
Status since listing: increased

The Florida manatee (Trichechus manatuslatirotris) lives in freshwater, brackish and marine environments and inhabits shallow coastal waters, estuaries, bays, rivers, and lakes [1]. Florida manatees occur in waters of the southeastern United States, primarily in Florida and southeastern Georgia, but individuals can range as far north as Rhode Island and probably as far west as Texas [2]. During winter, cold water temperatures keep the population concentrated at warm water sites in peninsular Florida [2].

Collisions with boats represent the greatest threat to Florida manatees but water control structures also account for significant mortality. Habitat loss caused by residential and commercial development also remains a problem and the loss of warm water refuges could pose a significant threat [2].

Historical data for Florida manatee numbers are poor [2]. Early aerial survey studies conducted in the late 1980's concluded that there were at least 1,200 animals [4]. Beginning in 1991, the state initiated synoptic aerial surveys to count manatees in potential winter habitat during periods of extreme cold weather. Aerial survey results are highly variable however, and results depend on weather conditions [2]. The number of manatees counted increased from 1,267 (highest minimum count) in 1991 to 3,276 in 2001 [2]. Warm water refuge counts, which are more accurate, also show an increase since the 1970s [2]. An analysis of trends at winter aggregation sites suggest a mean annual increase of 7 -12% occurred at sites on the east coast from 1978-1992 [3]. More detailed demographic data is needed, however, and more widespread accurate surveys must be conducted, before population trends can be determined with certainty.

Over the past 25 years, there has been a clear increase in Florida manatee deaths as well. It is unclear, however, whether this represents a proportional increase relative to overall population size [2]. This needs further investigation because Florida manatee recovery likely depends on controlling human caused mortality of adult manatees [2]. "Red tides" caused by the dinoflagellate (Gymnodinium breve) have also resulted in three incidents (1982,1991, and 1996) of high mortality [2]. Observed declines in the percentage and number of calves seen at power plant aggregation sites could be cause for concern [4].

[1] Lefebvre, L. W., et al. 1989. Distribution, status, and biogeography of the West Indian manatee. Pages 567-
610 in C. A. Woods (editor). Biogeography of the West Indies. Sandhill Crane Press, Gainesville, Florida
[2] U.S. Fish and Wildlife Service. 2001. Florida Manatee Recovery Plan, (Trichechus manatus latirostris),Third Revision. U.S. Fish and Wildlife Service. Atlanta, Georgia. 144 pp. + appendices.
[3] U.S. Fish and Wildlife Service. West Indian Manatee (Trichechus manatus latirotris) Florida Stock Assessment. U.S. Fish and Wildlife Service Jacksonville Florida. Revised 1995
[4] Reynolds, J.E., III and J.R. Wilcox. 1994. Observations of Florida manatees (Trichechus manatus latirostris) around selected power plants in winter. Marine Mammal Science 10(2): 143-177

Delmarva fox squirrel

Listed: 3/11/1967
Status since listing: increased

The Delmarva fox squirrel (Sciurus niger cinereusis) is a large, heavy-bodied tree squirrel with an unusually full, fluffy tail [1]. Historically, it occurred in southeastern Pennsylvania, Delaware, south-central New Jersey, eastern Maryland, and the Virginia portion of the Delmarva Peninsula [2]. Because the Delmarva fox squirrels' habitat requirements are somewhat specific (they require mature park-like forests) it is likely that populations were scattered and discontinuous. As forests were logged or converted to

farms, they became unsuitable for the fox squirrel. As forests regrew, they were cut again before the mature forest required by fox squirrels could develop. By the turn of the century, the Delmarva fox squirrel had disappeared from New Jersey, Pennsylvania and Virginia and by 1936, it disappeared from Delaware as well. At the time of its listing as endangered in 1967, the Delmarva fox squirrel occurred on only about 10% of its former range in four eastern Maryland counties (Kent, Queen Anne's, Talbot and Dorchester) [1].

After listing, population monitoring was conducted at remaining fox squirrel populations between the mid 1970s and the mid 1980s [2]. Populations were found to be healthy and to be naturally expanding their range [2]. Starting in 1968, efforts were made to translocate fox squirrels into unoccupied habitat. Delmarva fox squirrels were translocated and introduced at 17 sites within their historical range [1]. Eleven of the 17 translocations are thought to have been successful [1]. Between 1979 and 1991, squirrels were translocated into six counties in Maryland [1]. During the 1980s, Delmarva fox squirrels were translocated to locations in Delaware, Pennsylvania and Virginia [1]. Thus, the range contraction of this species has subsided [3] and the Delmarva fox squirrel can now be found in all counties on the Eastern Shore of Maryland and at a few sites in Delaware, Pennsylvania and Virginia [4]. More than 90% of the Delmarva fox squirrel populations known at the time of listing have persisted [3] and in the four Maryland counties where natural populations remained at the time of listing, Delmarva fox squirrels are more abundant and widespread [5]. Fox squirrels have also expanded naturally into one additional county in Maryland and one in Delaware [5]

In 1990, seven benchmark sites were selected at established sites to monitor Delmarva fox squirrel population status [1]. Six of these sites were in Maryland within the Delmarva fox squirrels' remaining natural range and one was in Virginia on the Chincoteague National Wildlife Refuge [1]. Thirty squirrels were translocated to the Chincoteague National Wildlife Refuge between 1968 and 1971 [1]. This population reached a high of 300-350 squirrels in the 1990s [3]. In general, benchmark populations appear to be stable [5], although some sites experienced a drop in abundance after an outbreak of southern pine beetles in 1994-95 resulted in a loss of habitat [6]. The monitoring of benchmark populations was discontinued in 2000 [5].

Current threats to the Delmarva fox squirrel include development, timber harvest, short-rotation pine forestry and forest conversion to agriculture [1]. Because much of the squirrel's occupied habitat is on privately owned lands, the success of conservation efforts will be largely dependent on management practices on these lands [7]. By 2001, 114 conservation easements had been established totaling 23,019 acres in the three counties that support the majority of Delmarva fox squirrels [5].

[1] U.S. Fish and Wildlife Service. 1993. Delmarva Fox Squirrel (Sciurus niger cinereus) Recovery Plan, Second Revision. Hadley, Massachusetts. 104 pp.
[2] U.S. Fish and Wildlife Service. 1984: Proposed Determination of Experimental Population Status for Introduced Population of Delmarva Fox Squirrel; Federal Register (49:13556-13558).
[3] Therres, G.D. and G.W. Willey, Sr. 2005. Final Report to USFWS: Persistence of local Delmarva fox squirrel populations between 1971 and 2001. Maryland Department of Natural Resources, Annapolis, MD.
[4] U.S. Fish and Wildlife Service. 1999. The Delmarva Peninsula fox squirrel. U.S. Fish and Wildlife Service, April 1999. Website (http://training.fws.gov/library/Pubs/foxsquirrel.pdf) accessed October, 2005.
[5] Therres, G.D. In press. Conservation of the Endangered Delmarva Fox Squirrel: State and Federal Recovery Efforts. In The Endangered Species Act and Federalism: A path to stronger federal and state collaboration for species conservation. [6] Dueser, R.D. 1999. Project Report to USFWS: Analysis of Delmarva fox squirrel (Sciurus niger cinereus) benchmark population data (1991-1998). Dept. of Fisheries and Wildlife, Utah State University, Logan UT.
[7] Ratnaswamy, M.J., C.E. Keller, G.D. Therres. 2001. Private Lands and the Endangered Species: Lessons from the Delmarva Fox Squirrel in the Chesapeake Bay Watershed. Transactions of the 66th North American Wildlife and Natural Resources Conference.

Gray wolf (Eastern DPS)

Listed: 3/11/1967
Status since listing: Increased

The eastern gray wolf (Canis lupis) was the only wild U.S. population that survived the early 20th century wolf eradication. During this period, gray wolves were hunted to near extinction because they were blamed for livestock losses. In 1974, the gray wolf became one of the first species listed under the 1973 Endangered Species Act. However, at the time it was found in the wild only in extreme northeastern Minnesota and in a small number on Isle Royal, Michigan [1, 2]. The eastern population formerly occurred throughout the Great Lakes and Northeast.

Just 13 years after their disappearance from Minnesota, the gray wolf had recolonized the state and reached numbers of 350-700 individuals. By 1978, USFWS had proposed downlisting the Minnesota gray wolf to "threatened" to allow for killing of "problem" wolves. Twenty five wolves inhabited Wisconsin in 1980 and increased to 323 in 2002. Surveys of gray wolf occurrence in Minnesota estimated over 2,400 individuals in 1998 and in Michigan 279 wolves were counted in 2002 [2]. As of late winter 2004-05, there were roughly 435 gray wolves in Michigan (including wolves on Isle Royal), 3,020 in Minnesota, and 425 in Wisconsin, for a total Great Lakes population count of 3,880 [3]. The species remains extirpated from the rest of the eastern United States.

[1] U.S. Fish and Wildlife Service. 2004. Gray Wolf. U.S. Fish and Wildlife Service. Updated May, 2004. (http://www.fws.gov/midwest/wolf/biology/biologue.htm)
[2] Great Lakes Wolves: Regional Overview: Wolf Recovery and Management in the Upper Midwest. (http://seaborg.nmu.edu/WOLF/2Regional_wolf_status.html) accessed 1/18/06.
[3] International Wolf Center. 2005. Gray Wolf Population Trends in the Contiguous United States. Updated September, 2005. (www.wolf.org)

Indiana bat

Listed: 3/11/1967
Status since listing: Declined

The Indiana bat (Myotis sodalis) ranges from North Carolina west to Oklahoma and north to Iowa, Michigan and Vermont [1]. They winter in caves or mines that satisfy their highly specific needs for cold (but not freezing) temperatures during hibernation [2]. In the summer, maternity colonies of 30-300 individuals with young roost in the sloughing bark of dead and dying trees and under the exfoliating bark of live trees [1].

The Indiana bat numbered somewhere between 808,505 [1] and 883,300 [3] in 1960s. It was placed on the endangered species list in 1967 and granted critical habitat in 1976 [1]. Nonetheless, it continued to decline, reaching a low point of 353,185 in 1996 [2]. Since then it has steadily increased and in 2005 was estimated at 457,374 [3].

Over 77% of hibernating bats winter in nine locations [4]. Indiana, Kentucky, and Missouri each contain three of these "Priority One" hibernacula (defined as sites where >30,000 bats hibernate), although numbers have dropped considerably below this level at some locations [2]. Currently, half of all the hibernating Indiana bats winter in Indiana where numbers decreased by 50,000 between 1960 and 1980, but rebounded somewhat in recent years [2]. In 2005, Indiana supported an estimated 206,610 Indiana bats [3].

Severe declines took place in Kentucky (where populations decreased by 180,000 between 1960 and 1997) and Missouri (where populations decreased by 250,000 between 1980 and 1997) [2]. Populations in Missouri have continued to decrease, but between 2001and 2005 populations in Kentucky increased from 50,047 to 62,380 [3].

Virtually all Indiana bats in the Northeast (>99%) hibernate in the state of New York, although they likely summer throughout a larger area within New England and perhaps into Canada [5]. Historically, 24 hibernacula were known to occur in New England, New York, and New Jersey [5]. The presence of Indiana bats has been documented at 14 of these sites (typically abandoned mines) since 1996 [5]. In 1975 the total rangewide Indiana bat population was estimated at 459,000, with the northeast region supporting only about 500 bats (<1% of the population) [5]. However, by 1995-1997, rangewide population estimates for the Indiana bat had declined to 353,000 individuals while numbers in the Northeast increased to around 30,000 (about 9% of the population) [5]. Thus the northeast is becoming increasingly important for this species continued survival [5]. Northeastern populations have continued to increase and in 2005,a population of over 56,000 bats was estimated to comprise over 12% of the total Indiana bat population [3].

The reasons for the Indiana bat's decline are not fully understood [2]. One serious cause is thought to be human disturbance of hibernating bats – if a bat is aroused from hibernation too frequently, its fat reserves can be exhausted before it is able to forage again in the spring [2]. Vandals have damaged caves and killed bats [2]. Population declines in Kentucky were largely attributable to the construction of gates and buildings at the entrances of two of the three most important hibernation sites [2]. Not only can this prevent bats from entering the cave, improper gate designs can result in changes of airflow patterns that in turn alter the cave climate [2].

[1] Currie, R.S. USFWS Federally Listed Threatened and Endangered Species of Importance to Mining in Proceedings of Bat Conservation and Mining: A Technical Interactive Forum, Airport Hilton, St. Louis, Missouri, November 14-16, 2000.
[2] U.S. Fish and Wildlife Service. 1996. Agency Draft Indiana Bat (Myotis sodalist) Revised Recovery Plan. Ft. Snelling, Minnesota.
[3] King, R.A. 2006. Indiana bat range-wide population trend. Spreadsheet provided by R. Andrew King, U.S. Fish and Wildlife Service, Bloomington, IN, February 8, 2003.
[4] Harvey, M.J., and R.K. Redman. Endangered Bats of Arkansas: Distribution, Status, and Ecology (2003-
2004). Annual Report to Arkansas Game and Fish Commission, Projects Number W-56-R.
[5] Hicks, A. and P.G. Novak. 2002. History, Status and Behavior of Hibernating populations in the Northeast in Indiana Bats in the Northeast. New York State Department of Environmental Conservation, New York Natural Heritage Program, Albany, NY.

Eastern cougar

Listed: 6/4/1973
Status since listing: Extinct before listing

The eastern cougar (Puma concolor couguar) formerly ranged from Nova Scotia, New Brunswick, Quebec and southern Ontario to Michigan, Tennessee and South Carolina [1]. This species was persecuted by early settlers and many states offered bounties to people who killed them [2]. It is likely that the eastern cougar was virtually eliminated in each region shortly after it became settled by European immigrants [2]. In addition, the cougars' habitat and prey have been severely reduced by human activities [3].

Currently, if the eastern cougar still exists, it is limited to only a few scattered areas at best [3] The last known individual was captured in 1938 and died in captivity several years later [4]. There have been numerous reports of eastern cougars in southeast Canada and adjacent United States from the 1970s to the present, but none have been confirmed [3]. In the southeast, the best evidence for a small population has come from the Great Smoky Mountain National Park Region [3]. A 5-year survey was conducted in the 1980s in an attempt to confirm the presence of a cougar population in the southern Appalachian Mountains. Although many promising leads were pursued, no concrete evidence was ever obtained [3].

[1] Tischendorf, J. W., and S. J. Ropski (eds.). 1996. Proceedings of the eastern cougar conference, 1994. American Ecological Research Institute. 245 pp.
[2] U.S. Fish and Wildlife Service. 1982. Eastern Cougar Recovery Plan. Atlanta, Georgia,17pp.
[3] U.S. Fish and Wildlife Service. 1991. Species Account, Eastern Cougar. Website (http://www.fws.gov/endangered/i/a/saa48.html) accessed February, 2006.
[4] U.S. Fish and Wildlife Service. 2003. Recovery Report to Congress: Fiscal Years 1997-98 and 1999-2000. Washington, D.C.

Arctic peregrine falcon

Listed: 6/2/1970
Status since listing: Increased

The Arctic peregrine falcon (Falco peregrinus tundrius) is one of three subspecies of peregrine falcon [1]. The Arctic peregrine nests in tundra regions of Alaska, Canada (Yukon, Northwest Territories, Quebec, and possibly Labrador), and the ice-free perimeter of Greenland [1]. It is a long-distance migrant that winters in Latin America from Cuba and Mexico south through Central and South America [1].

Severe declines in peregrine falcon numbers began in the 1950s [1]. These declines were linked to organochlorine pesticides that were put into use following World War II, and whose use peaked in the late 1950s-
early 1960s [1]. Scientists investigating the peregrine's decline found unusually high concentrations of the pesticide DDT and its breakdown product DDE in peregrine falcons and other birds of prey [2]. Organochlorine pesticides cause direct mortality and reduced reproduction in birds of prey who, being at the top of the food chain, ingest high doses of pesticides concentrated and stored in the fatty tissue of prey animals that themselves ingested contaminated food [1]. Heavily contaminated females may fail to lay eggs and organochlorines passed from the female to the egg can kill the embryo before it hatches. Probably the most serious problem resulted from DDE, the principal metabolite of DDT, which prevents normal calcium deposition during eggshell formation, causing eggs to frequently break before hatching [1]. Arctic peregrine numbers reached their lowest levels in the early 1970s and in some areas of North America successful reproduction virtually ceased [1]. Populations are thought to have decreased by as much as 80% [2].

Following the passage of the Endangered Species Act in 1973, the use of DDT and other organochlorines became severely restricted in the U.S. (their use had been restricted in Canada in 1970) [1]. These restrictions were the most pivotal action in aiding the recovery of the peregrine falcon and Arctic peregrine falcons recovered substantially after organochlorine pesticide use was curtailed [1]. Breeding surveys conducted in widely scattered areas showed that productivity rates returned to normal after the restrictions and as a result, populations expanded. This was particularly true in northern areas, where pesticide exposure was lower and impacts upon populations were less severe [1]. By 1984, the recovery of Arctic peregrine falcons had progressed sufficiently that the USFWS reclassified the subspecies as threatened [2]. The number of Arctic peregrine falcons continued to increase and in 1991, the USFWS began

reviewing the Arctic peregrine's threatened status to determine if a proposal to delist was appropriate [2]. The Arctic peregrine was delisted in 1994.

Four major factors were considered in the delisting process: (1) Population size and trend, (2) reproductive performance, (3) pesticide residues in eggs, and (4) eggshell thickness [1]. Despite a lack of long-term studies using consistent methodologies, there was strong evidence of significant population increases from throughout the Arctic [1]. Four areas in northern North America (one in Alaska and three in Canada's North West Territories) for which historical survey information was available indicated the number of Arctic peregrine pairs occupying nesting territories increased since the 1960s [1]. Some areas of Alaska even exceeded the original estimates of pre-DDT-era population size [1]. In addition, in the eastern Arctic, peregrines began nesting in previously vacant nesting sites [1]. Standardized yearly migration counts at Cape May, New Jersey, an area where Arctic peregrines concentrate during migration, also saw increasing numbers, most likely from Arctic breeding grounds especially in Greenland and eastern Canada (these counts may have also contained peregrines in the American subspecies; however, banding recoveries indicate that the majority of peregrines along the East Coast during fall migration are from the Arctic and thus represent a true increase in Arctic peregrine numbers) [1].

At the time of delisting, it was determined that reproduction had met recovery goals. Productivity in all regions studied had been sufficient to support a stable or increasing population since the 1980s [1]. There had also been improvements in levels of DDE concentration in eggs. Concentrations in excess of 15-20 ppm (parts per million, wet weight basis) are associated with high rates of nesting failure. Residue in eggs in 1993 was well below the 15-20 ppm critical level [1]. In addition, Alaskan eggshells collected in 1988-1991 averaged only 12% thinner than pre-DDT thickness (17% or greater reduction in thickness results in population declines).
Today, Arctic peregrine numbers continue to increase. On the Sagavanirktok River in Alaska where Arctic peregrine surveys have been conducted since the late 1950s, the number of pairs increased from five in 1958, to 23 in 1992, to 25 in 1999 [3]. Migration counts at the Cape May Hawkwatch site saw an increase from 103 migrating peregrines in 1976, to 429 in 1992, to 1,017 in 2004 [4]. Although the species is currently doing well, there are still threats, such as habitat modification that could potentially affect Arctic peregrines [5]. Since habitat modification has drastically increased since the 1970s, however, while Arctic peregrine populations tripled during the same period, habitat modification may not currently threaten the continued existence of the subspecies [5]. Pesticides accumulated in Latin America, where the use of DDT continues, still affect eggshell thickness, and although shell thickness has increased, it is still below pre-DDT levels and therefore still at risk of decreasing to below critical levels [1].

[1] U.S. Fish and Wildlife Service. 1993. Proposal to Remove the Arctic Peregrine Falcon From the List of Endangered and Threatened Wildlife. Federal Register (58:188).
[2] U.S. Fish and Wildlife Service. 1995. Peregrine falcon, (Falco peregrinus anatum, Falco peregrinus tundrius, Falco peregrinus pealei). Species account. Website (http://www.fws.gov/species/species_accounts/bio_pere.html) accessed October, 2005.
[3] Wright, J.M. and P.J. Bente. 1999. Documentation of active peregrine falcon nest sites, 1 Oct 1994- 31 March 1998. Alaska Department of Fish and Game. Annual research report. Endangered species conservation fund federal aid project SE-2-9, 10, and 11. Juneau, AK. 15 pp.
[4] Cape May Bird Observatory. Cape May Hawkwatch, Cape May, New Jersey. New Jersey Audubon Society. Website (http://www.njaudubon.org/Sightings/cmhw25.html) accessed October 31, 2005.
[5] NatureServe. 2005. NatureServe's Central Databases. Arlington, VA. U.S.A.

Bald eagle (Continental U.S. DPS)

Listed: 3/11/1967
Status since listing: Increased

The bald eagle (Haliaeetus leucocephalus) first declined in the 1800s at the hands of trophy hunters, feather collectors, and wanton killing [1]. By the late 1940s, the use of DDT and other organochlorine became increasingly widespread. DDE, a breakdown product of DDT, accumulates in the fatty tissue of female eagles, impairing the formation of calcium needed for normal egg formation and causing a reproductive success to decline. Eagle numbers plummeted, and in 1967 the species was listed endangered in the lower 48 states [1]. It was joined by the American peregrine falcon, Arctic peregrine falcon and brown pelican in 1970. The plight of these large birds led to a ban on DDT production and sale in 1972. Bald eagle pairs increased exponentially from 416 in 1963 to 7,678 in 2003 [2, 3]. In 1984, thirteen states in the Lower 48 had no nesting eagles; by 1998, only two lacked nesting. The eagle was proposed for delisting in 1998 [1] and again in 2006 [4].

The bald eagle is managed under five federal recovery plans:

Chesapeake Recovery Region: Virginia east of Blue Ridge Mountains, Delaware, Maryland, the eastern half of Pennsylvania, West Virginia Panhandle, and two-thirds of New Jersey
Delisting goals were met in 1996, with 300 occupied breeding areas estimated in 1992 and 538 in 1998 [1].

Northern States Recovery Region: 25 Northernmost states
Delisting goals were met in 1991, with 1,349 occupied breeding areas over 20 states, and 2,204 breeding areas recorded in 1998.

Pacific Recovery Region: Idaho, Nevada, California, Oregon, Washington, Montana, and Wyoming
Numeric delisting goals were met in 1995, but the distribution goals were not yet fully achieved as of 1998. 1,480 breeding pairs were estimated in 1998 [1].

Southeastern Recovery Region: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and eastern Texas.
Downlisting goals were met between 1991 and 1998. In 1998, 1,485 occupied breeding areas were estimated [1].

Southwestern Recovery Region: Oklahoma and Texas west of the 100th meridian, New Mexico, Arizona, and California bordering the Lower Colorado River
As of 1998, the delisting goals had not been met. Forty breeding pairs were present in 1998, with 36 occurring in Arizona and four in New Mexico [1].

In the eight Northeast states from New Jersey to Maine and Vermont, nesting eagle pairs increased from 21 in 1967 to 562 in 2005 [5]. The majority were in Maine which supported all 21 pairs in 1967 and 385 of the 2005 pairs. Eagles returned to Massachusetts and New Hampshire in 1990, with the former supporting 19 pairs in 2005 and the latter eight in 2004. In 2005 there were 53 pairs in New Jersey, 94 in New York, and one in Vermont. The Northeast is also an important wintering area, with the Connecticut population increasing from 20 to 92 between 1979 and 2005, and the New York population increasing from 6 to 194 between 1978 and 2006.

[1] U.S. Fish and Wildlife Service. 1999. Proposed rule to remove the bald eagle in the Lower 48 states from the list of endangered and threatened wildlife. July 6, 1999 (64 FR 36453)
[2] U.S. Fish and Wildlife Service. 2001. Bald eagle pairs, lower 48 states, 1963-2000. U.S. Fish and Wildlife Service, Washington, D.C.

[3] Environmental Defense. 2003. The Eagle is Back. Environmental Defense, New York.
[4] U.S. Fish and Wildlife Service. 2006. Removing the aald eagle in the Lower 48 States from the list of endangered and threatened wildlife; reopening of public comment period with new information. February 16, 2006 (71 FR 8238).
[5] Center for Biological Diversity. 2006. Bald eagle trends in the Northeastern United States. Tucson, AZ.

Atlantic piping plover

Listed: 12/11/198
Status since listing: Increased

The Atlantic piping plover (Charadrius melodus) breeds on Atlantic coastal beaches from Newfoundland to northernmost South Carolina [1]. Hunters and the millinery trade decimated the population in the late 19th and early 20th century, but were stopped by the Migratory Bird Treaty Act of 1918. The plover steadily recovered up to about 1950, then began to decline again under pressure from development, beach stabilization programs, increased recreation, and human-caused ecosystem changes which increased predation by native and introduced species.

Following its listing as an endangered species in 1985, the plover was subject to ntensive nest site, nest area, and predator management programs [1]. The U.S. population increased from 550 pairs in 1986 [1] to about 1,423 pairs in 2004, with 659 pairs in New England, 519 in NY-NJ, and 245 in the Southern region [4].

The 1996 federal recovery plan [1] established the following delisting criteria: 1) Increase and maintain for five years a total of 2,000 breeding pairs, distributed among four recovery units as follows: Atlantic Canada, 400 pairs; New England, 625 pairs; New York-New Jersey, 575 pairs; Southern (DE-MD-VA-NC), 400 pairs. 2) Verify the adequacy of a 2,000-pair population of piping plovers to maintain heterozygosity and allelic diversity over the long term. 3) Achieve five-year average productivity of 1.5 fledged chicks per pair in each of the four recovery units described in criterion 1, based on data from sites that collectively support at least 90% of the recovery unit's population. 4) Institute long-term agreements to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit. 5) Ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population.

The New England region met or nearly met its nesting pair goal of 625 pairs in 1998 and in each of the seven following years [3, 4, 5]. The preliminary estimate for 2005 is 630 pairs. The New York-New Jersey region is progressing toward, but has not yet reached its goal of 575 pairs. Populations in the Southern region are growing, but not as rapidly; the 2004 total of 245 pairs was well below the goal of 400. Canada was the only population not to have grown since 1986. It remains at 245 pairs in 2004 (240 in 1986), while its recovery goal is 400.

[1] U.S. Fish and Wildlife Service. 1996. Piping Plover (Charadrius melodus), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
[3] U.S. Fish and Wildlife Service. 2004. 2002-2003 Status Update: U.S. Atlantic Coast Piping Plover Population, (www.fws.gov/northeast/pipingplover/status/index.html accessed 1/13/06)
[4] U.S. Fish and Wildlife Service. 2005. Preliminary 2004 Atlantic Coast Piping Plover Abundance and Productivity Estimates.
[5] Center for Biological Diversity. 2006. Preliminary 2005 Atlantic piping plover counts. Tucson, AZ.

Great Lakes piping plover

Listed: 12/11/198
Status since listing: Increased

The Great Lakes piping plover (Charadrius melodus) population breeds and raises its young on sparsely vegetated beaches, cobble pans, and sand spits of glacially formed sand dune ecosystems along the Great Lakes shoreline [1]. It formerly nested in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario. In the late 1800s the population may have been as large as 492-682 breeding pairs with 215 in Michigan, 152-162 in Ontario, 125-130 in Illinois, fewer than 100 in Indiana, Ohio, and Wisconsin and fewer than 30 in Minnesota, New York, and Pennsylvania. Hunting, egg collecting and the millinery trade caused a late 19th-early 20th century population crash of many bird species but were stopped by the Migratory Bird Treaty Act of 1918. How and when the Great Lakes population declined to its precariously small size at the time of listing is unknown [3]. However, conversion of nesting habitat to public recreation and general shoreline development are believed to have been important causes of the decline. By the late 1970s, the plover was essentially extirpated from Illinois, Indiana, New York, Ohio, Pennsylvania and Ontario. It was extirpated from Wisconsin in 1983 and Minnesota in 1986, leaving just a small Michigan population. Impacts (e.g. development, recreation, beach stabilization) on the plover's wintering range also negatively affected birds from coastal North Carolina to Florida and along the Florida Gulf Coast to Texas, Mexico, and the Caribbean Islands.

When the plover was listed as an endangered species in 1985, just 19 pairs remained, all in Michigan [2]. The population fluctuated between 12 and 19 pairs between 1985 and 1993, then increased steadily to 58 birds in 2005. The range expanded to the south, east and west, and plovers recolonized Wisconsin in 1998 at Apostle Islands National Lakeshore, Lake Superior, after being absent since 1983 [1]. The largest nesting congregation is at Sleeping Bear Dunes National Seashore which typically supports about 25% of the population. The post-1993 increase was facilitated by aggressive management programs that protected nests from predators, nest areas from recreationists, and beaches from development. There is also a small captive rearing program focused exclusively on raising chicks hatched from abandoned eggs.

The 2003 federal recovery plan [1] establishes the following downlisting criteria: 1) a population of at least 150 pairs maintained over five consecutive years, with at least 100 breeding pairs in Michigan and 50 in other Great Lakes states; 2) a five year average range-wide fecundity of 1.5 to 2.0 fledglings per pair; 3) a ten year, post-downlisting projection of a stable or growing population. Delisting can occur when these population goals are paired with 1) a determination that genetic diversity is adequate, and 2) development of long-term funding and management agreements to ensure the population is adequately protected in its breeding and wintering range.

Michigan has attained 50% of its 100 pair breeding goal for four consecutive years [2]. The five-year average fecundity goal has been met. However, breeding in other Great Lakes states is limited to 1-2 pairs in Wisconsin.

[1] U.S. Fish and Wildlife Service. 2003. Recovery Plan for the Great Lakes Piping Plover (Charadrius melodus). Ft. Snelling, Minnesota. viii + 141 pp.
[2] University of Minnesota Great Lakes Piping Plover Research Program. 2006. Summary of Great Lakes piping plover reproductive success 1984-2005. Spreadsheet provided by Francie Cuthbert, University of Minnesota, February 6, 2006.
[3] Cuthbert, F. 2006. Personal communication with Francie Cuthbert, Great Lakes Piping Plover Research Program, University of Minnesota, February 6, 2006.

Whooping crane

Listed: 3/11/1967
Status since listing: Increased

The whooping crane (Grus americana) formerly occurred from the Arctic coast south to central Mexico, and from Utah east to New Jersey, South Carolina, Georgia and Florida [1]. In the 19th and 20th century, the whooping cranes' primary nesting area extended from central Illinois, northwestern Iowa, northwestern Minnesota, and northeastern North Dakota northwesterly through southwestern Manitoba, southern Saskatchewan and into east central Alberta. Wintering grounds and migration routes included much of the United States east of the Rocky Mountains. Currently, whooping cranes nest in the wild at only three locations: 1) Wood Buffalo National Park and adjacent areas in Canada (this population winters in Aransas National Wildlife Refuge, Texas), Central Florida (this is an introduced, non-migratory population), and Wisconsin (this population winters in Florida) [1]. An effort to reintroduce whooping cranes into the Rocky Mountain area by cross-fostering whooping cranes to sandhill crane foster parents was abandoned when the last whooping crane introduced into this population died in 2002 [1]. Captive whooping crane populations are maintained at the Calgary Zoo, International Crane Foundation, Patuxent Wildlife Research Center, San Antonio Zoo, New Orleans Zoo, Lowry Park Zoo, and the Audubon Center for Research on Endangered Species.

Whooping crane populations in 1870 were variously estimated at 1,300-1,400 and 500-700 birds, but then declined precipitously due to hunting and habitat destruction [1]. Conservation efforts were able to maintain an extremely endangered but relatively stable population of 21-44 birds between 1938 and 1966 [2]. When placed on the endangered species list in 1967, just 48 wild and six captive birds remained. In 1978, critical habitat was designated in parts of Idaho, Kansas, Nebraska, Oklahoma, and Texas, primarily on Federal and State wildlife management lands [3]. Due to intensive habitat management, nest area protection, captive breeding and reintroductions, the population rose steadily to 317 wild birds and 119 captive birds in 2003 [2]. Current threats include low genetic diversity, loss and degradation of migration stopover habitat, construction of power lines, degradation of coastal habitat, and in Texas, the threat of chemical spills [1].

The 2003 draft international recovery plan sets forth two alternate criteria for downlisting the whooping crane to threatened status: 1) The Aransas-Wood Buffalo population must have at least 160 total birds with at least 40 productive pairs, and two additional separate self-sustaining populations must have at least 25 productive pairs and 100 total birds each. All three populations must maintain their status for a decade; or 2) the Aransas-Wood Buffalo population must have 250 reproducing pairs and a total of 1,000 birds [1]. In either scenario, at least 21 productive pairs and 153 total birds must be maintained in captivity. Downlisting is estimated to occur in 2035. Delisting criteria have not yet been established.

[1] Canadian Wildlife Service and U.S. Fish and Wildlife Service. 2005. Draft International recovery plan for the whooping crane. Albuquerque, New Mexico. 196pp.
[2] ICF. 2005. Historic Whooping Crane Numbers. International Crane Foundation, Baraboo, WI.
[3] U.S. Fish and Wildlife Service. 1978. Determination of critical habitat for the whooping crane. Federal Register (43:20938).

Eskimo curlew

Listed: 3/11/1967
Status since listing: Extinct before listing

The Eskimo curlew (Numenius borealis) is only known to have bred in two small, treeless areas in Canada's Northwest Territories, but is likely to have bred more widely there and possibly in the Yukon,

Alaska and Siberia as well [1]. In autumn it migrated across a large swath of northern and eastern Canada, and New England (especially Massachusetts) to pampas of Argentina. Small numbers of migrating birds were occasionally seen in Michigan, Illinois, Ohio, New York, Pennsylvania, Maine, Rhode Island, Connecticut, New Jersey, Maryland, North Carolina, and South Carolina. The United States was of more importance to the spring migration which passed over Central America, eastern Mexico and the Gulf of Mexico, and the central states: Texas, Louisiana, Oklahoma, Missouri, Nebraska, Kansas, western Iowa, Illinois, western Minnesota, eastern South Dakota, and North Dakota. Birds also migrated across central and northern Alaska.

Based on location, timing, and crude descriptions of the birds, some speculate that the Eskimo curlew and the American golden plover were the migrating land birds reported by Christopher Columbus on October 7, 1492 while several days out of sight from the shores of North America [3]. Columbus changed course to follow the birds, landing on San Salvador Island on October 12, 1492.

The Eskimo curlew was seen in massive flocks during the 19th century [1]. Its total numbers were certainly in the hundreds of thousands, could well have exceeded a million, but probably fell short of the ten million sometimes reported. It declined catastrophically between 1870 and 1890 and was thought extinct between 1905 and 1945. The last documented nest was found in 1866, the last documented U.S. sighting in 1962, and the last documented sighting ever in 1963. There are only four photographs of live birds, all of the same pair on the same day in 1962. The curlew was placed on the endangered species list in 1967. Since then there have been sporadic, often disputed reports of isolated birds from Argentina to Texas, Maine, and Manitoba [1], the most recent by a well-credentialed shoreline birder on Martha's Vineyard, Massachusetts in 2002 [2].

While its remote breeding habitat remains intact, the curlew's tallgrass and eastern mixed-grass prairies habitats on the Great Plains were all but eliminated by agriculture and fire suppression [1]. Only 4% of the original 74 million ha of native tallgrass prairie remain. Historic prairie landscapes consisted of a shifting patchwork of habitats supporting immense insect populations and a diverse assemble of birds feeding on them. As fire was actively suppressed and passively hemmed in by agricultural patterns, it became unable to create new habitat patches as the older ones fell under the plow. Patches thus not only declined in extent, but grew farther apart and more difficult to find. Patch dynamics also increased the efficiency of commercial hunters who persecuted the curlew from 1860 until 1890 when it became too rare to support the industry. Hunting pressure was especially intense after the late 1870s when the extinction of the passenger pigeon forced hunters to concentrate on other prey. Though hunting was significant in some portions of the autumn migration route (especially Massachusetts), it was most intense on the Great Plains. As the habitat patches became small, curlew densities grew larger, allowing hunters to more efficiently kill them en masse. Hunting efficiency was also increased by efforts to eradicate the Rocky Mountain grasshopper by plowing up its eggs and nymphs. The freshly exposed grasshoppers drew enormous curlew flocks to hunters lying in wait. Within a span of fifty years, however, the Rocky Mountain grasshopper changed from one the most common large insects in the central and west central states to one of North America's most rapid extinctions. The loss of this massive, irruptive food source placed additional stress on a dwindling curlew population. While the combined effects of these factors led many bird species to decline, only the curlew was pushed to the brink, possibly further, of extinction. It seems likely that the curlew, like the passenger pigeon, was rendered vulnerable to extinction by the combination of flocking in very large groups, gathering in small habitat patches, and being simultaneously subjected to intense hunting and habitat loss [1].

For the purposes of determining its post-listing population trend, we censor the curlew as "extinct before listing" because it has not been documented since four years prior to being protected under the Endangered Species Act. On the bright side we note that several of the post-1967 sightings are intriguing enough to warrant continued searching. On the dark side, if the species still exists, its population must be very small and therefore facing an extraordinary extinction risk for a species evolved to exist in large flocks and migrate over 16,000 miles round trip.

[1] Gill, R E., Jr., P. Canevari, and E.H. Iversen. 1998. Eskimo Curlew (Numenius borealis). In The Birds of North America, No. 347 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
[2] Laux, E.V. 2002. Eskimo curlew. Martha's Vineyard Gazette, August 30,2002.
[3] Gollop, J.B., T.W. Barry, and E.H. Iversen. 1986. Eskimo curlew: a vanishing species? Saskatchewan Natural History Society Special Publication No. 17. Regina, Saskatchewan.

Brown pelican (Southeastern

Listed: 10/13/197
Status since listing: Increased

The southeastern brown pelican (Pelecanus occidentalis pop.) breeds from Maryland south along the Atlantic Coast to southern Florida and westward along the Gulf Coast to Alabama [1]. Breeding was attempted in New Jersey in 1992 and 1994. The brown pelican occurs regularly as a non-breeder in New York, New Jersey, and Delaware, and occasionally northward to Nova Scotia.

The listing history of this population is complex. The brown pelican species was listed as endangered throughout its range in 1970. The "southeastern brown pelican," a taxon not previously recognized by scientists or wildlife managers, was separated from the rest of the species, declared recovered, and delisted in 1985 [1]. This distinct population includes and is limited to all portions of the eastern brown pelican (P. o. carolinensis) east of Mississippi. The remaining listed taxon include the MS, LA and TX portions of P. o. carolinensis, the Caribbean brown pelican (P. o. occidentalis) and the California brown pelican (P. o. californicus). Logically, the listed entity should be split into the Western Gulf distinct population segment (MS, LA, TX population of P. o. carolinensis), the Caribbean brown pelican and the California brown pelican.

Nests on the Atlantic Coast increased from 2,796 in 1970 to 10,300 in 1985, when it was delisted, and 15,670 in 1999. Nests on the Gulf Coast (eastern and western) increased from 5,100 in 1970 to 7,000 in 1985 when the Eastern Gulf Coast population was delisted, then continued increasing to 24,400 in 1999.

MARYLAND: Prior to 1987, when six pairs nested on a state-owned dredge spoil island in Chincoteague Bay near Assateague Island, the brown pelican had not been recorded nesting in Maryland [3. 4]. The species has nested in all subsequent years except 1996 and 1997 [4]. Nesting pairs increased from 26 in 1989, to 281 pairs in 2002, then declined to 189 pairs in 2005.

VIGINIA: The brown pelican was not recorded as nesting in Virginia prior to 1987 [4]. Nests increased from 37 in 1989 to 1,406 in 1999 [2].

NORTH CAROLINA: Nests increased from 75 in 1976 [1] to 3,105 in 1989 and 4,350 in 1999 [2].

SOUTH CAROLINA: Nests increased from 1,117 in 1970 [1] to 7,739 in 1989, then decreased to 3,486 in 1999 [2]. The latter decline is believed to be the result of key island habitats eroding away. The birds likely moved to other states.

GEORGIA: The first record of nesting pelicans was in 1988 [2]. Nests increased from 200 in 1989 to 3,622 in 1999 [2].

FLORIDA: Nests increased from 7,690 in 1970 [1] to 12,312 in 1989, then decreased to 8,605 in 1999 [2].

ALABAMA: The brown pelican was not recorded to nest in Alabama prior to 1983 [1]. Nests increased from 588 in 1989 to 5,225 in 1999 [2].

NEW JERSEY: Beginning in the 1980s, brown pelicans were seen with some regularity during the summer. Several pairs unsuccessfully attempted to nest in 1992 and 1994 [2].

NEW YORK: Beginning in the 1980s, brown pelicans were seen with some regularity during the summer, but have not been recorded nesting [2].

DELAWARE: Beginning in the 1980s, brown pelicans were seen with some regularity during the summer, but have not been recorded nesting [2].

[1] U.S. Fish and Wildlife Service. 1985. Removal of the brown pelican in the southeastern United States from the list of endangered and threatened wildlife. Federal Register (50:4938).
[2] Shields, M. 2002. Brown Pelican (Pelecanus occidentalis). In The Birds of North America, No. 609 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
[3] USGS. 2005. Biological and ecotoxicological characteristics of terrestrial vertebrate species residing in estuaries. U.S. Geological Survey. Website (www.pwrc.usgs.gov/bioeco/bpelican.htm) accessed December 30, 2005.
[4] Brinker, D.F. 2006. Brown pelican nesting in Maryland, 1986-2005. Data provided by David Brinker, Natural Heritage Program, Maryland Department of Natural Resources, Cantonsville, MD, January 3, 2006.

American peregrine falcon

Listed: 6/2/1970
Status since listing: Increased

The American peregrine falcon (Falco peregrinus anatum) breeds only in North and Central America and occurs throughout much of North America from the subarctic boreal forests of Alaska and Canada south to Mexico [1]. It is estimated that prior to the 1940s, there were approximately 3,875 nesting pairs of peregrines in North America [1]. From the 1940's through the 1960's, however, the population of the peregrine, and many other raptors, crashed as a result of the introduction of synthetic organochlorine pesticides to the environment. By 1975, there were only 324 known nesting pairs of American peregrine falcons in the U.S. [2].

Scientists investigating the peregrine's decline, found unusually high concentrations of the pesticide DDT and its breakdown product DDE in peregrine falcons and other birds of prey [1]. Organochlorine pesticides were put into use following World War II. Use peaked in the late 1950's-early 1960's and continued through the early 1970s [1]. Organochlorine pesticides cause direct mortality and reduced reproduction in birds of prey who, being at the top of the food chain, ingest high doses of pesticides concentrated and stored in the fatty tissue of prey animals that themselves ingested contaminated food [1]. Heavily contaminated females may fail to lay eggs and organochlorines passed from the female to the egg can kill the embryo before it hatches [1]. Probably the most serious problem resulted from DDE, the principal metabolite of DDT, which prevents normal calcium deposition during eggshell formation, causing eggs to frequently break before hatching [1] During the period of DDT use in North America, eggshell thinning and nesting failures were widespread in peregrine falcons, and in some areas, successful reproduction virtually ceased [1].

The degree of exposure to these pesticides varied among regions, and peregrine falcon numbers in more contaminated areas suffered greater declines [1]. The eastern population plunged from an estimated 350 active nest sites in the 1930's and 1940's to no active breeding birds from 1964 to 1975 [3]. Peregrine falcons in the Great Plains states east of the Rocky Mountains and south of U.S. and Canadian boreal forests were also essentially extirpated [1]. West of the 100th meridian, peregrine falcons were significantly reduced [1]. Local populations were greatly depressed or extirpated and by 1965, fewer than 20 pairs were known west of the U.S. Great Plains [1].

In 1970, the American peregrine was listed as endangered and efforts to recover the species began. The use of DDT was banned in Canada in 1970 and in the United States in 1972 [1]. This was the single most significant action in the recovery of the peregrine falcon [1]. In addition, in the eastern United States, efforts were made to reestablish peregrine falcons by releasing offspring from a variety of wild stocks that were held in captivity by falconers [1]. The first experimental releases of captive-produced young occurred in 1974 and 1975 in the eastern United States [1]. These and future releases demonstrated that “hacking”, the practice of retaining and feeding young captive bred birds in partial captivity until they are able to fend for themselves, was an effective method of introducing captive-bred peregrines to the wild [1]. Since then, over 6,000 falcons have been released in North America [1]. Approximately 3,400 peregrines were released in parts of southwest Canada, the northern Rocky Mountain States, and the Pacific Coast States [1].

In the late 1970s Alaska became the first place American peregrine falcon population growth was documented and, by 1980, populations began to grow in other areas [1]. Not only did the number of peregrine falcons begin to increase, productivity (another important measure of population health) improved [1]. Efforts to reestablish peregrine falcons in the East and Midwest proved largely successful and by 1999 peregrines were found to be nesting in all States within their historical range east of the 100th meridian, except for Rhode Island, West Virginia, and Arkansas [1]. In highly urban areas, peregrine falcons showed great adaptability, and began substituting skyscrapers for natural cliff faces as nesting sites [4]. By 1998, the total known breeding population of peregrine falcons was 1,650 pairs in the United States and Canada (far exceeding the 456 required for delisting) and other recovery goals, including estimates of productivity, egg-shell thickness, and contaminants levels, had been met [1]. The final decision to delist the America Peregrine was made on August 25, 1999. Monitoring of American Peregrine populations has continued, however, under a post-delisitng monitoring plan [5]. Starting in 2003, data has been collected from a subset of American peregrine falcon territories [5]. Data will be collected every 3 years and presented in triennial reports [5]. Monitoring will continue through 2015 [5]. So far, it appears American peregrine populations have continued to increase since delisting [5].

ALASKA: Surveys conducted between 1966 and 1998 along the upper Yukon River demonstrated increases in the number of occupied nesting territories from a low of 11 known pairs in 1973 to 46 pairs in 1998 [1]. Similarly, along the upper Tanana River, the number of occupied nesting territories increased from 2 in 1975 to 33 in 1998 [1]. The recovery objective of 28 occupied nesting territories in the two study areas was first achieved in 1988, with 23 nesting territories on the Yukon River and 12 on the Tanana River [1].

PACIFIC STATES: By 1976, no American peregrine falcons were found at 14 historical nest sites in Washington [1]. Oregon had also lost most of its peregrine falcons and only 1 or 2 pairs remained on the California coast [1]. Surveys conducted from 1991 to 1998 indicated a steadily increasing number of American peregrine falcon pairs breeding in Washington, Oregon, and Nevada [1]. Known pairs in Washington increased from 17 to 45 and in Oregon from 23 to 51 [1]. The number of American peregrine falcons in California increased from an estimated low of 5 to 10 breeding pairs in the early 1970s to a minimum of 167 occupied sites in 1998 [1]. The increase in California was concurrent with the restriction of DDT and included the release of over 750 American peregrine falcons through 1997 [1].

ROCKY MOUNTAINS/SOUTHWEST: The Rocky Mountain/Southwest population of the American peregrine falcon has made a profound comeback since the late 1970s when surveys showed no occupied nest sites in Idaho, Montana, or Wyoming and only a few pairs in Colorado, New Mexico, and the Colorado Plateau, including parts of southern Utah and Arizona [1]. Surveys conducted from 1991 through 1998 indicated that the number of American peregrine falcon pairs in the Rocky Mountain/Southwest area has steadily increased [1]. In 1991, there were 367 known pairs; in 1998 the number of pairs increased to 535 [1].

EASTERN STATES: The eastern peregrine population has a unique history and complex status under the Act [1]. Peregrine falcons were extirpated in the eastern United States and southeastern Canada by the mid-1960s [1]. Releases of young captive bred peregrines have reestablished populations throughout much of their former range in the east [1]. In 1998, there were a total of 193 pairs counted in five designated eastern State recovery units [1]. The number of territorial pairs recorded in the eastern peregrine falcon recovery area increased an average of 10% annually between 1992 and 1998 [1]. Equally important, the productivity of these pairs during the same 7-year period averaged 1.5 young per pair, demonstrating sustained successful nesting [1].

[1] U.S. Fish and Wildlife Service. 1999. Final Rule to Remove the American Peregrine Falcon from the Federal List of Endangered and Threatened Wildlife, and to Remove the Similarity of Appearance Provision for Free-
Flying Peregrines in the Conterminous United States. Federal Register (64:46542).
[2] Hoffman, C. 1999. The Peregrine Falcon is Back! New release, U.S. Fish and Wildlife Service, August 20, 1999.
[3] Clark, K. 2005. The Peregrine Falcon in New Jersey, Report for 2005. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program.
[4] New Jersey Division of Fish and Wildlife. Fact sheet, Peregrine Falcon Falco peregrinus. New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program. Website (http://www.njfishandwildlife.com/tandespp.htm) accessed February, 2006.
[5] USFWS. 2003. Monitoring Plan for the American Peregrine Falcon, A Species Recovered Under the Endangered Species Act. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs. Pacific Region, Portland Oregon 53pp.

Red-cockaded woodpecker

Listed: 10/13/197
Status since listing: Stable

The red-cockaded woodpecker (Picoides borealis) was once a common bird, distributed continuously across the southeastern United States [1]. The total population at the time of European colonization is estimated to have ranged from 920,000 to >1.5 million groups [2]. By the time of its listing as an endangered species in 1979, the red-cockaded woodpecker had declined to fewer than 10,000 individuals in approximately 4,000 widely scattered, isolated and declining groups [2]. Because red-cockaded woodpeckers are cooperative breeders with “helpers” that are available to replace breeders that die, the size of the breeding population is not strongly affected by the number of breeders that die, or by how many young are produced each year [1]. Thus, the number of potential breeding groups (or “active clusters”) is a better measure of population size than are numbers of individuals [1]. Because red-cockaded woodpeckers typically take years to complete a nesting/roosting cavity (cavities are excavated in large, old, live pine trees over many years, allowing resin produced by the tree to build up and form a barrier to predators), the availability of cavities is thought to be the main factor limiting the number of breeding populations [1]. Currently, there are an estimated 14,068 red-cockaded woodpeckers living in 5,627 known

active clusters across 11 states [1].

The precipitous decline in red-cockaded woodpecker populations was caused by an almost complete loss of habitat [1]. Longleaf pine (Pinus palustris) ecosystems, of primary importance to red-cockaded woodpeckers, are among the most endangered systems on earth [1]. The longleaf pine communities that historically characterized the Atlantic and Gulf coastal regions covered an estimated 24 to 37 million ha. Today, longleaf forests cover only 1.2 million ha, of which roughly 3% remains in relatively natural condition [2]. Logging is responsible for much of this decline. Logging practices before the late 1800s left a number of residual trees that were suitable for red-cockaded woodpecker cavities, allowing red-cockaded woodpeckers to survive early forest exploitation [1]. Loss of residual trees in the 20th century, however, has been a major factor in the decline of woodpecker populations [1]. In addition, the cutting of second-growth longleaf pines began during World War II and continues today. Much remaining longleaf is aging without replacement [1]. Fire suppression also has led to changes in tree species composition and forest structure [1]. Under a regime of fire suppression, longleaf pine is replaced by other species of pines and hardwoods, and the open, old-growth pine savannas needed by red-cockaded woodpeckers are replaced by mixed hardwood forests with a multi-layered mid-story and canopy [1].

All monitored populations of red-cockaded woodpeckers (with one exception) declined in size throughout the 1970s and into the 1980s [1]. Declines and local extirpations were documented on public and private lands [1]. In the 1990s, most populations on federal land were stabilized through intensive management based on a new understanding of population dynamics and the use of new management tools (artificial cavities, bird translocations and prescribed burning) [1]. Many populations even showed increases [1]. The implementation, in 1992, of the private lands strategy between the U.S. Fish and Wildlife Service and private land conservation partners also helped to slow, stabilize and in some cases reverse population declines on privately owned lands [1].

From 1997 to 2000, 44 of 55 populations on federal lands were either stable or increasing [1]. The Apalachicola Ranger District, together with the Wakulla Ranger District of the Apalachicola National Forest (Florida), currently supports the largest woodpecker population in existence, with 665 active clusters [1]. Fifteen military installations harbor red-cockaded woodpeckers. All but one of these populations appear to be stable or increasing [1]. There are also 1,296 known active clusters on private lands in 11 states and the existence of up to 280 additional groups is considered likely -- 509 of these groups are protected, in agreements involving 139 private landowners [1].

Most important for the recovery of red-cockaded woodpeckers is the widespread and frequent application of early-mid growing season fire and the preservation of large, older longleaf pine trees [1]. The isolation of woodpecker groups through further habitat fragmentation must also be prevented since the disruption of “helper” dispersal to neighboring territories causes populations to become much less likely to persist through time [1]. Two types of catastrophes pose threats to red-cockaded woodpecker populations: catastrophic winds (hurricanes, downbursts and tornadoes) and outbreaks of southern pine beetles [1]. Although beetles typically do not pose a major threat, hurricanes have caused extensive damage to red-cockaded woodpecker populations (for example, Hurricane Hugo in 1989) [1]. In order to protect the species from this threat, a number of populations, broadly spaced geographically and including many inland populations, need to be maintained [1].
The U.S. Fish and Wildlife Service formulated recovery criteria for the red-cockaded woodpecker by creating 11 recovery units delineated according to eco-regions [1]. Thirteen populations have been designated “primary core” populations, 10 “secondary core” populations, 16 “essential support” populations. These populations are distributed among recovery units to ensure the representation of broad geographic and genetic variation, and goals have been set for total numbers of active clusters at each location [1]. The hope is to achieve species viability by maintaining a number of populations within each unit that, with immigration, are able to withstand genetic and demographic threats [1]. The U.S. Fish and Wildlife Service estimates that if all recovery recommendations were followed, the red-cockaded woodpecker could be considered for downlisting by 2050 and delisting by 2075 [1].

[1] U.S. Fish and Wildlife Service. 2003. Recovery plan for the red-cockaded woodpecker (Picoides borealis): second revision. Atlanta, GA. 296 pp.
[2] Rudolph C.D., R.N. Conner, and J.R. Walters. 2004. Red-cockaded woodpecker recovery: an integrated strategy. In: Costa, Ralph; Daniels, Susan J., eds. Red-cockaded woodpecker: Road to recovery. Blaine, WA: Hancock House Publishers: 70-76. Available on line: (http://www.srs.fs.usda.gov/pubs/ja/ja_rudolph013.pdf accessed 11/18/05).

Roseate tern (Northeast DPS)

Listed: 11/2/1987
Status since listing: Increased

The northeast population of the roseate tern (Sterna dougallii dougallii) nests on barrier islands and salt marshes (typically along with common terns) and forages over shallow coastal waters, inlets and offshore seas [1]. While competing with common terns for food and nesting sites, roseates benefit from the former's aggressive defense of colony sites against predators. While breeding, they primarily feed on American sand lance, a small marine fish. Their nesting success rates may be related to the abundance and proximity of sand lance.

Roseate terns formerly bred from Sable Island, Nova Scotia to Virginia, but no longer breed south of Long Island, NY [1]. Declines were first noted during the late 1800s, as large numbers of birds were killed by the millinery trade to acquire plumes for women's hats. Most historically known breeding sites were extirpated during the 1870s and 1880s. By 1890, just 2,000 pairs were thought to remain. Public outcry, changes in fashion and the creation of the Migratory Bird Treaty Act in 1918 curtailed hunting, enabling the species to rapidly recolonize much of its historic range. By the 1930s, the population had grown to 8,500 pairs with about three-quarter of the birds occurring in Massachusetts. From this peak, however, the species declined to about 4,800 pairs in the 1950s. It maintained this level through the early 1970s. During this period roseate terns were extirpated from New Hampshire, Maryland and Virginia. The only nesters south of Long Island were a very few pairs in New Jersey. During the 1970s, the population again declined, became extirpated from New Jersey, and reached a level of less than 3,000 pairs in 1978. At this point, 90% of all birds were located in just four colonies (Bird Island and Monomy Island, MA; Great Gull Island, NY; and Falkner Island, CT). The decline from the 1930s peak corresponded with increased coastal development and recreation pressure, including the related increase in predacious/competitive herring gulls (Larus argentatus) and great black-backed gulls (L. marinus).

The population may have grown between 1978 and 1988, but inconsistency of survey methods and efforts preclude establishment of a definitive trend [1]. It was listed as an endangered species in 1987. Since then the U.S. population has increased from 2,995 in 1988 to 3,457 in 2004 [2]. The progress was temporarily set back by Hurricane Bob in 1992 and has declined from the 2000 high of 4,310. The species has not increased in the Canadian portion of its range.

CANADA: The Canadian population is small and has remained stable since the mid-1980s at 100-150 pairs [3]. The population is concentrated on a few islands off the coast of Nova Scotia. Small numbers nest on the Îles-de-
la-Madeleine, and a pair occasionally nests on Machias Seal Island, a migratory bird sanctuary in the Bay of Fundy. A few nest on Sable Island. Sable Island is an important staging area where birds collect for several weeks before migrating en masse to South America.

MAINE: Roseate terns formerly bred on at least 150 of Maine's 3,000-plus islands, but in recent years

have been found on only four to six [4]. The population was never very large, peaking at about 275 pairs in 1931 following the cessation of hunting. It declined to 52 pairs in 1987 before increasing steadily to 289 in 2001 [2]. The 2004 population was 173 pairs. The species is intensively managed on ten islands: gull are removed or limited, decoys and sound recording are used to attract roseate terns, and biologists live on each island to chase away predators and control recreational impacts [4]. All ten are designated as Essential Habitats under the Maine Endangered Species Act, Significant Wildlife Habitats under the Maine Natural Resources Protection Act, or Protection Fish and Wildlife Areas under the Land Use Regulation Commission. The Essential Habitat designation requires that all projects or activities funded or carried out by municipalities or state agencies within a 1/4 mile of the islands are reviewed by the Maine Department of Inland Fish and Wildlife.

NEW HAMPSHIRE: In 1997, the Audubon Society of New Hampshire, the New Hampshire Fish and Game Department, the U.S. Fish and Wildlife Service and others completed the first year of a project to return roseate terns to New Hampshire by discouraging gulls from nesting on White and Seavey islands and attracting common and roseate terns with decoys and bird calls [6]. Six common terns nested in 1997 (the first in the state since the 1950s). By 2004, the population had risen to 2,582 pairs. A single pair of roseate terns nested in 2001 (the first in the state since the 1940s) and increased to 107 by 2004 before declining to 67 in 2005 [2, 7].

MASSACHUSETTS: Almost all Massachusetts roseate terns (and a large portion of the entire U.S. population) nest in Buzzards Bay at Bird and Ram Islands. Smaller populations nest at Nashawena Island and Penikese Island. Outside Buzzards Bay, the species nests on the Monomoy Islands. The statewide population has increased dramatically since 1970 and slightly between 1988 and 2004 [1, 2]. The population was 1,524 pairs in 2004, down from 2,124 pairs in 2000. As the rangewide population has increased faster than the Massachusetts population, the state's share of the total has declined from about 53% (1988-1992) to about 45% (1997-2004).

Tern habitat restoration and gull control began in Buzzards Bay in the early 1990s in response to the Endangered Species Act listing [8]. These efforts led to roseates colonizing Ram Island in 1994 after being absent since 1973. The Ram Island population has grown rapidly, surpassing Bird Island in 2002. Much of the increase was due to terns relocating from Bird to Ram as the latter experienced severe erosion during the 1990s and 2000s [8]. Nonetheless, the combined population of Buzzards Bay birds has increased significantly from the 1970s to 2004, remaining relatively stable from 1988 to 2004 [2, 8]. Superfund money will be used in 2007 to replenish Bird Island beaches and prevent future erosion [8]. A 2003 oil tanker spill fouled Ram Island beaches. Biologists hazed migrating terns to keep them away from the island, dramatically increasing the nesting colony on Penikese Island, but in the following year only nine pairs nested there. Cape Cod National Seashore is an important staging area where birds collect for several weeks before migrating en masse to South America [A].

RHODE ISLAND. No more than five pairs of roseate terns have nested in Rhode Island since the 1950s [1]. The last breeding record is of two birds in 1984, though immature and summer birds continue to be seen, indicating that the species may still nest in small numbers.

CONNECTICUT. Connecticut's small population is centered on Falkner Island [5]. In 1987 and 1988, about two-
thirds of the Falkner population had dispersed from other colonies, especially Bird Island (MA) and Great Gull Island (NY), indicating that the population was not self-sustaining and potentially unstable. Failure of birds to disperse into Connecticut is probably the reason the state's population declined between 1988 and 2004 from 139 pairs to 37 [1, 2].

NEW YORK. The New York population of roseate terns grew from 1,122 in 1988 to 1,616 in 2004 [1, 2]. Growing faster than the U.S. population as a whole, it increased from about 38% of the population between 1988 and 1990 to about 47% in 2002 to 2004. The great majority of the state's birds nest on

Great Gull Island, owned by the American Museum of Natural History. Cartwright Island supported substantial numbers in 2001-2004. The eastern tip of Long Island is an important staging area where birds collect for several weeks before migrating en masse to South America [1].

[1] U.S. Fish and Wildlife Service. 1998. Roseate tern recovery plan, northeastern population, first update. Hadley, MA.
[2] Roseate Tern (Northeast Population) Recovery Team. 2005. Numbers of nesting pairs (peak/total) and productivity in chicks fledged per pair of Roseate Terns in the Northeastern United States, 1998-2004 (January 18, 2005 version). Unpublished data provided by Carolyn Mostello, Massachusetts Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program.
[3] Boyne, A. 2005. Nesting roseate tern pairs in Canada, 1985-2005. Personal communication with Andrew Boyne Wildlife Biologist, Canadian Wildlife Service, Environment Canada, November 22, 2005.
[4] MDIFW. 2003. Roseate tern (Sterna dougallii). Maine's Threatened and Endangered Wildlife, Maine Department of Inland Fisheries & Wildlife.
[5] Spendelow, J. 1995. Roseate Tern Fact Sheet. U.S. National Biological Survey website (www.mbr-pwrc.usgs.gov/mbr/tern2.htm)
[6] New Hampshire Fish and Game Department. 2004. Summary of accomplishments achieved ending FY 2004, sea bird restoration: Isles of Shoals tern restoration project. New Hampshire Fish and Game Department, Concord, New Hampshire.
[7] DeLuca, D. 2005. Personal communication with Diane DeLuca, New Hampshire Audubon, October, 2005.
[8] Buzzards Bay National Estuary Program. 2006. Roseate Tern Recovery In Buzzards Bay. Website (www.buzzardsbay.org/roseates.htm) accessed on January 8, 2006.

Longjaw cisco

Listed: 3/11/1967
Status since listing: Extirpated before listing

The longjaw cisco (Coregonus alpenae) was a deepwater fish endemic to lakes Michigan, Huron, and Erie [1]. It was last collected in Lake Erie in 1957, in Lake Michigan in 1967, and in U.S. waters in 1967 [1, 2]. It was listed as an endangered species in 1967 and was last captured in Georgian Bay, Lake Huron on June 12, 1975. Due to its extirpation from the United States at the time of listing and its extreme rarity in Canada, no critical habitat was designated, no recovery plan was developed, and no conservation efforts other than surveying were initiated. It was removed from the endangered species list in 1983.

Ciscos demonstrate tremendous morphological variation which has and continues to cause taxonomic uncertainty [3]. After its extinction, the longjaw cisco was recognized as a variation of the shortjaw cisco (C. zenithicus) rather than a separate species. Excluding the longjaw variety, the shortjaw cisco historically occurred in Lake Superior, Lake Michigan, and Lake Huron, but has been extirpated from the latter two and declined by 99% between the 1920s and 2000s in the former [4]. It also currently occurs in at least 22 additional lakes spread out from Ontario to the Northwest Territories [3]. It was listed as threatened by Canada in 1987, as threatened by the state of Michigan and as endangered by the state of Wisconsin [4].

Deepwater ciscos were targeted by the smoked fish trade and were an important part of a large 20th century Great Lakes commercial fishery [1, 3]. In Lake Superior alone, gillnetters took an average of 395 metric tons of deepwater ciscos per year (mostly shortjaws) from 1895 to 1908 [4]. The fishery slowed until 1926 when the collapse of the Lake Erie lake herring left the shortjaw as the only deepwater cisco large enough to support commercial operations. Fishing levels spiked to about 400 metric tons in Lake Superior in 1926 then gradually tailed off until 1950. By this time the shortjaw fisheries in Lake Michigan, Lake

Huron, and Lake Erie had collapsed [1]. Shortjaw gillnetting continued in Lake Superior though the 1970s [4].

The cisco was also impacted by habitat degradation in Lake Erie and the introduction of predatory sea lamprey in all the Great Lakes [1].

[1] U.S. Fish and Wildlife Service. 1983. Deregulation of the Longjaw Cisco and the Blue Pike. September 2, 1983 (48 FR 39941).
[2] American Fisheries Society. 1980. Fishes known or suspected to be extinct. American Fisheries Society Special Publication No. 12 (1980).
[3] Todd, T.N. 2003. Update COSEWIC status report on the shortjaw cisco Coregonus zenithicus in Canada in COSEWIC assessment and update status report on the shortjaw cisco Coregonus zenithicus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-19 pp.
[4] Hoff, M.H., and T.N. Todd. 2004. Status of the shortjaw cisco (Coregonus zenithicus) in Lake Superior. Ann. Zool. Fennici 41:147-154.

Blue pike

Listed: 3/11/1967
Status since listing: Extinct before listing

The blue pike (Stizostedion glaucum) was historically found in Lake Erie, Lake Ontario and in the Niagara River [1]. It was driven to extinction by unbridled commercial and sport fishing that landed over a billion pounds of fish from the Great Lakes between 1885 and 1962. At times, the blue pike made up more than 50% of the Lake Erie commercial catch. Around 1915, population levels began a cycle of extreme fluctuations, leading to the eventual collapse of the fishery in 1958. The blue pike was protected under the precursor to the Endangered Species Act in 1967 and placed under the protection of the modern Endangered Species Act in 1974. The blue pike, however, was last seen in 1971.

[1] U.S. Fish and Wildlife Service. 1983. Deregulation of the longjaw cisco and the blue pike. September 2, 1983 (48 FR 39941).

Shortnose sturgeon

Listed: 3/11/1967
Status since listing: Increased

The shortnose sturgeon (Acipenser brevirostrum) formerly occupied rivers and estuaries along the Atlantic seaboard from New Brunswick to northern Florida [1]. It was driven to near extinction by overfishing, by-catch in the shad fishery, damming of rivers, habitat destruction, and deterioration of water quality. Scientists and fishermen in the 19th and early 20th centuries did not distinguish between Atlantic and shortnose sturgeon, so there are no historical population estimates. Clearly, however, by the early 20th century populations were declining and by the 1950s or earlier had become endangered. The sturgeon was placed on the endangered species list of 1967.

Shortnose sturgeon populations are divided into 19 management units based on presumed reproductive isolation [1]. Recent genetic analysis generally supports the management units, but suggests that the

Delaware River be combined with Chesapeake Bay and the Ogeechee River be combined with the Altamaha River [2]. The 1987 draft and 1988 final federal recovery plans recommended that each of the units be treated as a distinct population segment that can be recovered and delisted separately. The 1987 draft recommended downlisting the Connecticut, Delaware, and Hudson River populations to "threatened" and delisting the Kennebec System population as recovered.

Seven large populations (>=1,000 fish): Saint John River (NB), Kennebec System (ME), Connecticut River (CT, MA), Hudson River (NY), Delaware River (DE, NJ, PA), Savannah River (SC), and Altamaha River (GA).

Two small populations (<1,000 fish): Winyah Bay (SC, NC) and Ogeechee River (GA).

Ten very small populations (<100 fish): Penobscot (ME), Merrimack River (MA), Chesapeake Bay (MD, VA), Cape Fear River (NC), Santee River (SC), Cooper River (SC), "ACE" Basin (SC), Satilla River (GA), St. Marys River (FL), St. Johns River (FL).

Five improved populations: Kennebec System (ME), Connecticut River (CT, MA), Hudson River (NY), Savannah River (SC), and Altamaha River (GA).

One stable population: Delaware River (DE, NJ, PA).

No declining populations

Thirteen unknown populations: Saint John River (NB), Penobscot (ME), Merrimack River (MA), Chesapeake Bay (MD, VA), Winyah Bay (SC, NC), Cape Fear River (NC), Santee River (SC), Cooper River (SC), "ACE" Basin (SC), Satilla River (GA), Ogeechee River (GA), St. Marys River (FL), and St. Johns River (FL).

Five of the seven large populations, and four of the six improved/stable population are north of Chesapeake Bay. The southern populations are generally smaller and less well known. Six of the seven large populations are improved/stable. All of the unknown populations are small/very small with the exception of the St. John River (NB). The latter trend likely indicates that the small populations consist of numbers too small support robust trend estimates. The species overall trend has improved since being placed on the endangered species list in 1967.

IMPROVING POPULATIONS
* Kennebec System (Kennebec, Sheepscot, Androscoggin Rivers, ME). This population increased from an estimated 7,222 adults (95% CI 5,046-10,765) in 1977-1981 [1] to 9,488 in 1998-2000 [5]. The 1993 capture rate in the Adrosscoggin River was the highest ever recorded [1]. Since the 1998 removal of Kennebec Dam, the upstream range has increased [5].

* Connecticut River (CT, MA): Sturgeon in the upper and lower Connecticut River have been largely separated by the Holyoke Dam for 157 years. The Upper Connecticut River was estimated to support 297-515 total fish 1976-1978 and 47 and 98 spawning fish in 1992 and 1993 respectively [1]. The Lower Connecticut supported approximately 875 adults in 1988-1993 [1, 8] and 1,800 in 2003 [8].

* Hudson River (NY). The shortnose sturgeon occupies a 246-km section of the Hudson River from New York City to Troy Dam upstream of Albany [4]. This population is larger than the other 19 management populations combined. From late spring through early fall adults use deep, channel habitats of the freshwater and brackish reaches of the estuary. In the late fall, most or all adults concentrate at a single overwintering site in the river channel near Kingston while juveniles remain in the estuary. In the spring, adults spawn at a single location slightly downstream of the Troy Dam. The larvae gradually disperse downstream with juvenile sturgeon that inhabit much of the estuary during the summer, but occupy a more

limited range in the southern portion of the estuary during winter.

Due to fishing prohibitions and habitat protection efforts (the population has not been augmented with hatchery fish or translocations), numbers in the Hudson River increased dramatically between 1979 (12,669 spawning fish (95% CI = 9,080-17,735)), 1980 (13,844 (95% CI = 10,014-19,224)), and 1994-1996 (56,708 (95% CI = 50,862-
64,072)) [4]. The size and age of individual fish and the demographic structure of the population as a whole indicate a healthy condition typical of non-endangered, long-lived species. The 1998 federal recovery plan specifies that a sturgeon population is to be considered viable if it has at least 10,000 members, is on a stable or improving population trajectory, and is protected from degradation of its key habitat areas [2]. As the demographic parameters have been exceeded and the spawning and overwintering habitats appear stable, some biologists have recommended that the Hudson River population be designated as a distinct population segment and removed from the endangered species list as recovered species [4]. Delisting, however, would require the establishment of management agreements to guarantee long-term protection from unsustainable fishing, by-catch, pollution, and habitat degradation.

* Savannah River (SC): Between 1984 and 1992, approximately 97,000 shortnose sturgeon were stocked in the Savannah River [1]. The 1999-2000 population had many more adults than in 1992, primarily due to presence of stocked fish, but there was little evidence of reproduction [3]. The 1999 population was estimated at 3,000 fish [5].

* Altamaha River (GA): Population estimates on the Altamaha River were 2,862 total fish in 1988 (95% CI=1,069-4,226) [1], 798 in 1990 (95% CI=645-1,045) [1], 468 in 1993 (95% CI=316-903) [1], and 5,910 (95% C.I. 4,740-7,848) in 2003-2005 [7].

STABLE POPULATIONS
* Delaware River (DE, NJ, PA): The Delaware River population was 6,408-14,080 in 1981-1984 [1], 10,000 in 2002 [6], and 8,445 in 2004 [5].

UNKNOWN POPULATIONS
* Saint John River (NB): The only Canadian population occurs in the Saint John River system, New Brunswick, including its tributary, the Kennebecasis River [11]. Construction of the Mactaquac Dam in 1967 closed off much the former spawning grounds while logging, development and pollution from agricultural and industrial sources degraded habitat and water quality. A fish lift was built into the dam, but there is no record of sturgeon using it, probably because the intake is only 1.8 m down in water 12.8 m deep. It is not known whether sturgeon persist above the dam. In the lower Saint John River below the dam, the 1973-1977 population was estimated at 18,000 adults (+/-30%) [11]. Surveys conducted in recent years were not sufficient to estimate a total population and were not comparable to prior surveys due to differences in methodology [11, 12]. Aboriginal people familiar with the river, however, tend to believe the population has declined since the construction of the Mactaquac Dam [11].

* Merrimack River (MA): unknown trend. The 1989-1990 population was estimated at 33 total fish [1].

* Penobscot (ME) Dennys, Machias, East Machias, Ducktrap: the last report is of a single fish in 1978 [2].

* Chesapeake Bay (MD, VA): unknown trend, very small population [1, 5].

* Winyah Bay (Waccama, Pee Dee, Black Rivers; SC, NC): unknown trend [1].

* Cape Fear River (NC): unknown trend, likely less than 50 individuals [1, 5].

* Santee River (SC): unknown trend [1].

* Cooper River (SC): unknown trend [1], 100-300 fish in recent years [5].

* "ACE" Basin (Ashepoo, Combahee, and Edisto Rivers; SC): unknown trend [1].

* Satilla River (GA): unknown trend

* Ogeechee River (GA): unknown trend. The 1993 population was estimated to have 266 adults [9] and 361 total fish [1]. The 1999 population was estimated at 195 adults, which was not statistically different from the 1993 estimate [9].

* St. Marys River (FL): unknown trend

[1] National Marine Fisheries Service. 1998. Recovery Plan for the Shortnose Sturgeon (Acipenser brevirostrum). Silver Springs, Maryland. 104 pages.
[2] Wirgin, I., C. Grunwald, E. Carlson, J. Stabile, D.L. Peterson, and J. Waldman. 2005. Range-wide population structure of shortnose sturgeon Acipenser brevirostrum based on sequence analysis of the mitochondrial DNA control region. Estuaries 28(3):406-421.
[3] Smith, T. I. J., M. C. Collins, W. C. Post, and J. W. McCord. 2002. Stock enhancement of shortnose sturgeon: a case study. Pages 31–44 in W. VanWinkle, P. Anders, D. H. Secor, and D. Dixon, editors. Biology, management, and protection of North American sturgeon. American Fisheries Society, Symposium 28, Bethesda, Maryland.
[4] Bain, M.B, N. Haley, D.L. Peterson, K.K. Arend, K. Mills, and P. Sullivan, 2000. Shortnose sturgeon of the Hudson River: an endangered species success story. EPRI-AFS Symposium: Biology, Management and Protection of Sturgeon, 2000 Annual Meeting of the American Fisheries Society, St Louis, MO, August 23-24, 2000.
[5] National Marine Fisheries Service. 2004. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2002–September 30, 2004.Washington (DC): Department of Commerce.
[6] National Marine Fisheries Service. 2002. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2000–September 30, 2002.Washington (DC): Department of Commerce. [7] DeVries, R.J and D.L. Peterson. 2006. Population dynamics and spawning habitat of shortnose sturgeon in the Altamaha River, Georiga. Georgia Chapter of the American Fisheries Society, 2006 Annual Meeting, Gainesville, GA, January, 2006.
[8] Connecticut Department of Environmental Protection. 2003. Working with Nature: Shortnose Sturgeon. Webpage (http://dep.state.ct.us/whatshap/press/2003/mf0730.htm) Accessed January 31, 2006.
[9] Bryce, T.D., Bryce, J.E. Fleming and J.P. Kirk. 2002. Fort Stewart Assesses Status of Shortnose Sturgeon: A 2001 Update. Environmental Update, A Quarterly Publication of Army Environmental News 14 (1). Available at (http://aec.army.mil/usaec/publicaffairs/update/win02/win0220.html).
[10] Crossman, J.A., A. Giberson, R. Hardy, R.M. Browne, and M.K. Litvak. 2003. Estimating population size and wild growth rates of the shortnose sturgeon (Acipenser brevirostrum) in the St. John River, NB. Canadian Conference for Fisheries Research and the Canadian Society of Limnologists, January 2-5, 2003, Ottowa, ON.
[11] COSEWIC. 2005. COSEWIC assessment and update status report on the shortnose sturgeon Acipenser brevirostrum in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp.
[12] Litvak, M.K. 2006. Personal communication with Matthew K. Litvak, Department of Biology, University of New Brunswick, St. John, NB, February 1, 2006

Kemp's Ridley sea turtle

Listed: 12/2/1970
Status since listing: Increased

The Kemp's Ridley sea turtle (Lepidochelys kempii) nests only in the Gulf of Mexico [6]. Historical nesting areas are not well known, but have likely always been centered in Mexico. Even less is known about historic population numbers, but as late as 1947, over 40,000 females nested in a single day on one beach in Mexico. Collection of turtle eggs, development of nesting beaches, commercial fisheries by-catch and oil extraction pushed the species to near extinction by the 1970s.

Kemp's Ridley sea turtle was extirpated from the U.S. as a breeding species by the 1950s, though it continued to forage in U.S. waters along the Gulf Coast and the Atlantic. In 1978, an international, multi-agency project began to reestablish a nesting colony at Padre Island National Seashore in Texas [5]. From 1978-1988, 22,507 eggs were transported from Mexico for incubation and imprinting on the sands and surf of the National Seashore. Most hatchlings were transported to a National Marine Fisheries Service laboratory where they were raised away from predators for 9-11 months. They were then released into the Gulf of Mexico, where it was hoped that they would return to nest on the sands where they were imprinted. The program proved controversial at first, due to setbacks and little nesting success between 1979 and 1994, but nest counts began to steadily increase in 1995, reaching a high of 51 in 2005 [1, 7].

Ridley turtles nest at six additional sites in Texas: Bolivar Peninsula, Galveston Island, near Surfside (Brazoria County), Mustang Island, South Padre Island and Boca Chica Beach [1]. Sixty percent of Texas nesting occurs in the National Seashore. Very small, sporadic nesting efforts occur in Alabama, Florida and South Carolina. In 1999, single nests were found on the Bon Secour National Wildlife Refuge in Alabama and on the Gulf Island's National Seashore in Perdido Key, Florida [3]. In 2001, a single hatchling was found at Bon Secour and a nest was found at Gulf Shores' West End Beach, AL [2, 3].

The vast majority of Kemp's ridley turtles nest on a single beach near Rancho Nuevo, Tamaulipas, Mexico. The Mexico population declined from over 40,000 nests in 1947 to 740 in 1985 before steadily climbing to 7,100 in 2004 [4, 8]. The increase was facilitated by habitat protection, prohibition and education about egg collection, and the requirement that turtle excluder devices be used by U.S. and Mexican shrimp fishing fleets in the Gulf of Mexico. Prior to their use, the fleet killed 500-5,000 turtles annually [6].

[1] Padre Island National Park. 2005. Kemp's Ridley sea turtle. U.S. National Park Service website (www.nps.gov/pais/myweb2a/kemp's_ridley.htm) visited December 11, 2005.
[2] U.S. Fish and Wildlife Service. 2001. World's Most Endangered Sea Turtle Nest Discovered Along U.S. Coastline for Only Ninth Time This Year, August 17, 2001 press release. (http://www.fws.gov/southeast/news/2001/al01-001.html)
[3] U.S. Fish and Wildlife Service. 2002. Availability of an Environmental Assessment and Receipt of an Application for an Incidental Take Permit for FML81A, LLC, Fort Morgan Peninsula, Baldwin County, AL. May 9, 2002 (67 FR 31359).
[4] Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.
[5] Arroyo, B., P. Burchfield, L.J. Pena, L. Hodgson, and Pl Luevano. 2003. The Kemp's Ridley: recovery in the making Endangered Species Bulletin, May-June, 2003.
[6] NOA Fisheries. 2005. Kemp's Ridley Turtle (Lepidochelys kempii) (www.nmfs.noaa.gov/prot_res/species/turtles/kemps.html)
[7] Padre Island National Park. 2005. Current sea turtle nesting season. U.S. National Park Service website (www.nps.gov/pais/myweb2a/current_season.htm) visited December 11, 2005.
[8] Caribbean Conservation Corporation and Sea Turtle Survival League. 2006. Sea turtle species of the world. Website (www.cccturtle.org/species_world.htm) accessed January 23, 2006.

Atlantic leatherback sea turtle

Listed: 6/2/1970
Status since listing: Increased

The leatherback sea turtle (Dermochelys coriacea), the largest living turtle species, is a monotypic genus [1]. It is typically associated with continental shelf habitats and pelagic environments. Adult leatherbacks feed primarily on jellyfish in temperate and boreal latitudes, are highly migratory and have the most extensive range of any extant reptile [1]. Although their oceanic distribution is nearly worldwide, the number of nesting sites is few [3]. Gravid females emerge onto beaches to excavate nests and lay eggs. They prefer high-energy beaches with deep, unobstructed access, which occur most often along continental shorelines [2].

In the Western Atlantic, leatherbacks nest from North Carolina to southern Brazil [4]. In U.S. waters, leatherbacks can be found along the East Coast from Maine to Florida, and in the Greater and Lesser Antilles [6]. Critical habitat has been designated as the nesting beaches and adjacent waters of Sandy Point, St. Croix, U.S. Virgin Islands [2]. The Pacific population does not nest in the United States or its territories, but has important foraging areas on the West Coast and near Hawaii [1].

Although leatherback populations under U.S. jurisdiction have increased in size since 1970, worldwide their numbers are decreasing. Leatherback numbers have declined in Mexico, Costa Rica, Malaysia, India, Sri Lanka, Thailand, Trinidad, Tobago and Papua New Guinea [7]. In 1980 there were over 115,000 adult female leatherbacks worldwide. Now there are less than 25,000 [6]. The most precipitous declines have occurred in the Pacific Ocean [5]. One study estimated that the number of females in the eastern Pacific went from 91,000 in 1980 to 1,690 in 2000 [7]. The number of leatherback nests has also declined at all major nesting beaches throughout the Pacific [6]. Nesting along the Pacific coast of Mexico, which is estimated to represent about 50% of all nesting, declined at an annual rate of 22% over the last 12 years [6].

In the western Atlantic and Caribbean, the largest nesting assemblages are found in the U.S. Virgin Islands, Puerto Rico and Florida. Nesting data for these locations have been collected since the early 1980s [6]. Nest numbers in Florida as well as on St. Croix, USVI, and Culebra Island, Puerto Rico, increased over the past 20 years [8]. At St. Croix, the number of nests deposited annually on Sandy Point NWR, the largest nesting rookery in U.S. territory, ranged from 82 in 1986 to 260 in 1991 [2]. From 1979 on, the trend indicates a 7.5% increase per year (SE = 0.014). In Florida, several models estimated trends as indicating a 9.1% increase per year (SE = 0.049) to 11.5% per year (SE = 0.053) [2]. In Florida, the number of nests on beaches used as "index beaches" (beaches where standardized counts have been conducted, allowing for more accurate comparisons between years and between beaches) by the Index Nesting Beach Survey increased significantly between 1989 and 2004 [9]. Statewide, the number of nests in 1999 was 558, representing at least 100 individual female turtles. In the most recent statewide count in 2004, 473 nests were reported [9]. Information regarding the status of the entire leatherback population in the Atlantic is lacking, however [6], and the population still faces significant threats from incidental take in commercial fisheries and marine pollution [1].

Habitat destruction, incidental catch in commercial fisheries, and the harvest of eggs and flesh are the greatest threats to the survival of the leatherback [6]. In Indonesia there is nearly complete collection of eggs. Entanglement and ingestion of marine debris, including old abandoned nets, also pose a threat to leatherbacks [1]. Artificial lights on nesting beaches can result in mortality in hatchling turtles by causing newly emerged hatchlings to become disoriented [1]. Eggs can also be lost to beach erosion. At Sandy Point NWR, 40-60% of the eggs laid each year would be lost to erosion if not for human intervention [2]. Because leatherbacks nest in the tropics during hurricane season, there is also potential for storm-related loss of nests. In 1980, only four out of approximately 80 nests laid on Sandy Point NWR survived to hatch following the catastrophic effects of Hurricane Allen [2]. For the species as a whole, researchers believe egg collection is the most significant cause of population decline, followed by mortality associated with the fishing industry. One study estimates that halting egg collection and longlining (world-wide) would allow for

the recovery of this species within the next 50 years [7].

[1] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle, (Dermochelys coriacea). Silver Spring, MD. 66pp.
[2] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1992. Recovery Plan for Leatherback Turtles, (Dermochelys coriacea) in the U.S. Caribbean, Atlantic and Gulf of Mexico. Washington, D.C.1992. 60 pp + appendices.
[3] NatureServe. 2005. NatureServe's Central Databases. Arlington, VA. U.S.A.
[4] Rabon, D. R. Jr., S. A. Johnson, R. Boettcher, M. Dodd, M. Lyons, S. Murphy, S. Ramsey, S. Roff, and K. Stewart. 2003. Confirmed Leatherback Turtle (Dermochelys coriacea) Nests from North Carolina, with a Summary of Leatherback Nesting Activities North of Florida. Marine Turtle Newsletter 101:4-8. [5] NOAA Fisheries. 2001. Stock Assessment of Leatherback Sea Turtles of the Western North Atlantic.
[6] NOAA Fisheries. 2005. Leatherback Sea Turtle {Dermochelys coriacea). Website (http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.html) accessed December, 2005.
[7] Kaplan, I.C. 2005. A Risk Assessment for Pacific Leatherback Turtles (Dermochelys coriacea). Canadian Journal of Fisheries and Aquatic Sciences. 62(8):1710-1719. [8] Endangered Species Technical Bulletin 22(3):25.
[9] Florida Fish and Wildlife Conservation Commission. Fish and Wildlife Research Institute. Florida's Index Nesting Beach Survey Data. Available at (http://research.myfwc.com/features/view_article.asp?id=10690)

Atlantic hawksbill sea turtle

Listed: 6/2/1970
Status since listing: Increased

Hawksbill sea turtles (Eretmochelys imbricatause) use different habitats at different stages of their life cycle [1]. Post-hatchling hawksbills occupy pelagic environments, taking shelter in weedlines that accumulate at convergence zones [1]. They reenter coastal waters when they reach approximately 20 to 25 cm carapace length [1]. Coral reefs are used as resident foraging habitat by juveniles, subadults and adults [1]. Along the eastern shores of continents where coral reefs are absent, hawksbills are known to inhabit mangrove-fringed bays and estuaries [1]. They feed primarily on sponges [1, 2]. Female hawksbills nest on low- and high-energy beaches of tropical oceans. Throughout their range, hawksbills typically nest at low densities with aggregations consisting of a few dozen, or at most a few hundred individuals [1]. Nests have been found on both insular and mainland beaches where nests are typically placed under vegetation [1]. Migratory patterns of hawksbills are not well known, although a reproductive migration is thought to take place [1,2].

Hawksbills occur in tropical and subtropical seas of the Atlantic, Pacific and Indian oceans and nest on beaches in at least 60 different nations [3]. Along the Eastern and Gulf coasts of the continental U.S., hawksbills have been reported by all of the Gulf states and from as far north as Massachusetts, although sightings north of Florida are rare [1]. Representatives of at least some life-history stages regularly occur in southern Florida (where the warm Gulf Stream current passes close to shore) and the northern Gulf of Mexico (especially Texas), in the Greater and Lesser Antilles, and along the Central American mainland south to Brazil [1].

The largest remaining concentrations of nesting hawksbills occur on the beaches of remote oceanic islands of Australia and the Indian Ocean [1]. The Yucatan peninsula in Mexico also supports a significant population of nesting hawksbills [1]. Within U.S. jurisdiction, nesting occurs principally on beaches in Puerto Rico and the U.S. Virgin Islands (USVI) [1]. The most important nesting sites are Mona Island (Puerto Rico) and Buck Island (St. Croix, USVI) [1]. Within the continental United States, nesting is restricted to the southeastern coast of Florida and the Florida Keys, where one or two nests have been

reported annually [1].

Quantitative data on population changes of hawksbills are scarce, in part because hawksbills were already greatly reduced in number when scientific studies of sea turtles began in the late 1950s [3]. In addition, visual evidence of hawksbill nesting is the least obvious among the sea turtle species, because hawksbills often select remote pocket beaches with little exposed sand to leave traces of revealing crawl marks [1]. An estimate of the minimum number of female hawksbills in 1989 indicated that at least 15,000-25,000 female hawksbills nested annually worldwide [4]. Although global numbers are very difficult to estimate, it appears that this turtle has suffered drastic decline, probably by as much as 80% over the last century (3). Only five regional populations, Seychelles, Mexico, Indonesia, and two in Australia, support more than 1,000 nesting females annually [3]. Hawksbill populations are either known or suspected to be declining in 38 of the 65 geopolitical units for which nesting density estimates are available [3]

Hawksbill populations in the Western Atlantic-Caribbean region are thought to be greatly depleted [3]. In the Caribbean region, the number of females nesting annually is about 5,000 (order-of-magnitude estimate) [3]. With few exceptions, all of the countries in the Caribbean report fewer than 100 females nesting annually [3]. The largest known nesting concentrations are in the Yucatan Peninsula of Mexico [3]. These populations may be increasing [3]. A total of 4,522 nests were recorded in the states of Campeche, Yucatán and Quintana Roo in 1996, compared to only a few hundred in the early 1980s [5].

In the United States Caribbean, there is evidence that hawksbill nesting populations have been severely reduced during the 20th century [1]. At present, they are not believed to be declining, but neither are there clear signs of recovery, despite over a decade of protection [1, 3]. Estimates of the size of nesting populations under U.S. jurisdiction are available for only a few localities [1] and although trends are uncertain due to long intervals between hawksbill nesting generations (hawksbill take between 30 and 40 years to reach sexual maturity) and fluctuations in the number of reproductive females that nest in a particular year [3], hawksbill numbers seem to be increasing at two protected locations, Mona Island, Puerto Rico and at Buck Island Reef National Monument (BIRNM) in USVI [5]. The number of nests on Mona Island increased from 177 in 1974 to 537 in 1998 [5]. On BIRNM, the number of nesting females increased from 73 in 1987 to 121 in 1998 [5].

International commerce in hawksbill shell (“tortoiseshell” or “bekko”) may be the most significant factor endangering hawksbill populations worldwide [1]. Despite protective legislation, international trade in tortoiseshell and subsistence use of meat and eggs continues in many countries [1]. Females and eggs are vulnerable to poaching on nesting beaches and nests are vulnerable to beach erosion [1]. Egg poaching is a serious problem in Puerto Rico and also occurs in the USVI [1]. The practice of beach armoring can prevent females from reaching suitable nesting sites and can result in the loss of dry nesting beaches [1, 2]. Many hawksbill nesting beaches in the Caribbean are privately owned and in jeopardy of being developed [1]. Sand mining is also a threat to nesting beaches throughout the Caribbean [1]. The extent to which hawksbills are killed or debilitated after becoming entangled in marine debris has not been quantified, but it is believed to be a serious and growing problem [1]. Incidental catch in finfish fisheries may also pose a serious threat and the ingestion of marine debris (i.e. plastic bags, styrofoam) can result in hawksbill mortality [1].

[1] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. St. Petersburg, Florida.
[2] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (Eretmochelys imbricata). Silver Spring, MD.
[3] Meylan, A.B. and M. Donnelly. 1999. Status Justification for Listing the Hawksbill Turtle (Eretmochelys imbricata) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology. 3(2):200–224.
[4] NatureServe. 2005. NatureServe’s Central Databases. Arlington, VA. U.S.

[5] Meylan. 1999. Status of the Hawksbill Turtle (Eretmochelys imbricata) in the Caribbean Region. Chelonian Conservation and Biology 3(2):177–184. Available at (http://www.iucn-mtsg.org/publications/cc&b_april1999/4.14-Meylan-Status.pdf).

Atlantic green sea turtle

Listed: 7/28/1978
Status since listing: Increased

The green sea turtle (Chelonia mydas) occurs throughout the tropical and subtropical waters of the Mediterranean, Atlantic, Pacific, and Indian Oceans, and as far north as Massachusetts [1, 2]. It migrates enormous distances between foraging and nesting areas [2]. When not migrating, the green sea turtle's typical near-shore habitat includes shallow waters inside bays, reefs, and inlets [1]. Most nesting occurs on minimally disturbed open beaches [3]. Females generally breed every two or more years, and nest an average of 3-4 times per breeding year [4].

Exploitation of the green sea turtle, their eggs, and their habitat resulted in population declines [1]. Although green sea turtle populations continue to decline throughout much of their range due to directed harvest (both illegal and legal), incidental capture in nearshore gillnets, and negative impacts on essential habitats [1], two populations that nest in the U.S. (Florida and Hawaii) have increased in size since the species was placed on the endangered list in 1978 [3].

Green sea turtle populations in the U.S. Atlantic occur from Massachusetts to Texas and the Caribbean [1, 2]. In the U.S. Pacific, green sea turtles occur from the mainland coast to Hawaii, Guam and the Mariana Islands [1, 2]. Atlantic green sea turtles are variously considered a population and a subspecies (Chelonia mydas mydas) [1]. In the U.S. Atlantic, nesting occurs primarily on beaches along Florida's east coast, although smaller numbers of nests can be found in North Carolina, South Carolina, Georgia, the U.S. Virgin Islands and Puerto Rico [5]. Foraging occurs in the Gulf of Mexico to Texas and along the Atlantic Coast to Massachusetts [1].

Population estimates based on Florida nest counts have been conducted since the 1970s. In addition, standardized systematic surveys that control for survey effort have been conducted at Florida index beaches since 1988 [4]. Nest numbers tend to alternate between high and low years. Low year numbers remained relatively stable from 1989 to 2001, and then increased in 2003 [4]. Numbers during high years were stable to slightly increasing from 1990 to 1996, and since then, have increased steadily with the exception of an anomalous, hurricane-driven crash in 2004 [4]. The best indicator of population trends is produced by considering a combination of high and low years [4]. Total numbers of Florida nests counted increased from 2,100 in 1989-1990 (the equivalent of approximately 600 nesting females) to 9,609 (the equivalent of approximately nesting 2,745 females) in 2004-2005 [6].

Each winter green, Kemps Ridley and loggerhead sea turtles migrating southward from Northeastern waters are regularly stranded on shores of Cape Cod Bay between Brewster and Truro [7]. These turtles die of hypothermia if not rescued. The total number of strandings ranged between 49 and 281 turtles between 1995 and 2003. Green sea turtle strandings ranged from 0 to 7 each year [7]. A volunteer program has been established to rescue, rehabilitate, and release the turtles in Florida.

Reliable, long-term nesting data is unavailable for Puerto Rico and the Virgin Islands [8]. The number of green turtle nests has remained low for all the islands, but there appears to have been a gradual increase in the numbers of juveniles observed in foraging grounds since the mid-1970s [8]. The largest concentration of nests occurs on St. Croix, where an average of 100 nests were counted per year between 1980 and 1990. Waters surrounding the island of Culebra, Puerto Rico have been designated critical

habitat [1].

In order for the green sea turtle to be delisted, the 1991 federal recovery plan requires that: 1) Florida supports an average of 5,000 nests over six consecutive years, 2) at least 105 km of nesting beach be in public ownership and support at least 50% of U.S. nests, and 3) a reduction in stage-class mortality results in an increase in individuals in foraging grounds [1].

[1] U.S. Fish and Wildlife Service. 1991. Recovery Plan for U.S. Populations of Atlantic Green Turtle. Washington, DC.
[2] Plotkin, P.T. (editor). 1995. National Marine Fisheries Service and U. S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973. Silver Spring, Maryland.
[3] USFWS. 2004. Green Sea Turtle (Chelonia mydas). U.S. Fish and Wildlife Service, North Florida Office. Website (http://www.fws.gov/northflorida/SeaTurtles/Turtle%20Factsheets/Green-Sea-Turtle.htm) accessed January, 2006.
[4] Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea Turtle Nesting Activity in the State of Florida 1979-1992. Florida Marine Research Publications no 52. State of Florida Department of Environmental Protection, Florida Marine Research Institute, St. Petersburg , FL.
[5] NMFS. Green Sea Turtle (Chelonia mydas). Threatened Species Account. Endangered Florida and Mexican Breeding Populations. NOAA Fisheries, Office of Protected Resources. Silver Spring, MD. Website (http://www.nmfs.noaa.gov/pr/species/turtles/green.html) accessed January, 2006. [6] Fish and Wildlife Research Institute. 2006. Florida's index nesting beach survey data. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission,. Website (http://research.myfwc.com/features/view_article.asp?id=10690) accessed January, 2006.
[7] Lewis, D. Photo diary of a terrapin researcher. Website (http://terrapindiary.org/) accessed January 7, 2006.

[8] Hillis-Starr, Z.M., R. Boulon, M. Evans. Sea turtles in the Virgin Islands in Status and trends of the Nation's Biological Resources, USGS. Available at (http://biology.usgs.gov/s+t/SNT/noframe/cr136.htm, accessed January, 2006).

Atlantic loggerhead sea turtle

Listed: 7/28/1978
Status since listing: Increased

The loggerhead sea turtle (Caretta caretta) inhabits open water, continental shelves, bays, estuaries and lagoons in temperate, subtropical and tropical waters [1]. Its West Atlantic range extends from Newfoundland to Argentina, with virtually all nesting occurring from North Carolina southward. Nesting between New Jersey and Virginia is very rare, but turtles regularly forage as far north as Nova Scotia.The northwest Atlantic population accounts for 35-40% of the species' global nesting [1]. It is informally managed in five subpopulations: Northern (North Carolina to northeast Florida at about 29°), South Florida (from 29° on the Atlantic Coast to Sarasota on the Gulf Coast), Florida Panhandle (Eglin Air Force Base and beaches near Panama City), Dry Tortugas (seven islands west of Key West), and the Yucatan Peninsula (eastern Yucatan Peninsula, Mexico and Belize) [1, 4]. Nesting in Florida, which supports well over 95% of all U.S. nests and parts or all of four of the five subpopulations, increased substantially between the listing of the species in 1978 and 2005, though the trend can not be precisely described because survey efforts prior to 1989 were not systematic [2, 7].

South Florida Subpopulation (from 29° on the Atlantic Coast to Sarasota on the Gulf Coast)
South Florida contributed 89-92% of the U.S. nesting population between 1989 and 1998, and is the second largest population globally [1]. Its population trend dominates the entire U.S. trend. Annual nest

counts indicate a substantial increase between the late 1970s and 2003, but the trend can not be precisely determined because of variable survey effort and methodology [2]. On Hutchinson Island, the only site with a consistent long-term survey, nest numbers grew by an average of 4% annually between 1981 and 1998, from 3,121 to 8,214 nests [1]. Systematic population-wide surveys began in 1989 [1]. They indicate a fluctuating but increasing trend between 1989 and 1998 [1]. The low point was 1989 (48,531), the high 1998 (83,442) nests. The species declined thereafter, establishing an overall stable trend between 1989 and 2002 [2]. The 2005 nesting season was better than 2004 [7], hopefully signaling an end to the 1998-2004 decline.

Northern Subpopulation (North Carolina to northeast Florida)
The Northern subpopulation is the second largest, contributing 6-11% of U.S. nests between 1989 and 1998 [1]. The population fluctuated considerably (low of 4,370 nests, high of 7,887) but without a discernable trend during this period. Long-term census data are not available for the subpopulation as a whole, but do exist for some regions within it. Cape Island, Cape Romain National Wildlife Refuge, South Carolina Cape supported approximately 15% of the nesting within the Northern subpopulation between 1989 and 1998 and its trend during that period correlated with the subpopulation as a whole [1], thus its long-term trend may index that of the subpopulation. Nesting declined between 1974 (2,800) and 1979 (1,090), but has remained stable since then, hovering around 1,000 nests. Its trend since the 1978 endangered species listing is stable. Nesting at Little Cumberland Island, Georgia fluctuated greatly, but without trend between 1964 and 1972, then declined drastically in 1973 and has remained at low numbers since [6]. Nesting at Bald Head, South Carolina remained stable between 1980 and 2004, but increased from 1980 to 1991 and declined from 1991 to 2002 [3]. Nesting in South Carolina as a whole, which supports over 50% of nesting in the subpopulation, declined by 60% between 1980 and 2002 [2]. The high point was about 6,600 nests in 1981; the low point was about 2,600 nests in 2002 [8].

Florida Panhandle Subpopulation (Eglin Air Force Base and beaches near Panama City)
The third largest subpopulation, the Florida Panhandle contributed 0.2% to 1.7% of U.S. nests between 1989 and 1998 [1]. Nest counts rose steadily during this period from 113 to 1,188 [1], and to 1,282 in 2002 [6], but the actual trend is unclear due to variable survey effort [2].

Yucatan Peninsula (eastern Yucatan Peninsula, Mexico and Belize)
The Yucatan Peninsula supported 1,051 nests in 1998, slightly less than the Florida Panhandle [2]. It appears to be stable or increasing, but long-term trend data does not exist [2].

Dry Tortugas (seven islands west of Key West)
The Dry Tortugas consists of seven islands 70 miles west of Key West [4]. It is the smallest subpopulation, averaging 213 nests between 1995 and 2001 (range: 184-270) [2]. The data are insufficient to determine a trend. Dry Tortugas National Park supports the largest nesting group within the subpopulation and within Monroe County, which includes all of the Florida Keys [4]. East Key and Loggerhead Key, two of the subpopulation's seven islands, support about 90% of the National Park's nests.

Other Areas
Small numbers of loggerhead turtles nest on the Gulf Coast outside the five identified subpopulations. About 100 turtles nested on the offshore islands of Louisiana, Mississippi and Alabama between 1960 and 1962, but declined by 1977 [1]. The Bon Secour National Wildlife Refuge in Alabama supported 21-31 nests between 1994 and 1998. The Gulf Islands National Seashore in Mississippi supported up to nine annual nests between 1990 and 1998. The Breton National Wildlife Refuge in Louisiana supported less than ten nests annually in 1989 and 1990. The Texas coast supported just 18 known nests between 1977 and 2000, eleven of them between 1966 and 1998. All but one were on the southern Texas coast. The Mexican states of Tamaulipas and Campeche supported small numbers in recent years, one to five in the former and about 50 in the latter.

The 1991 U.S. Fish and Wildlife Service Recovery Plan states that delisting can occur if over a period of

25 years (1) the adult female population in Florida is increasing, and nesting in Georgia, South Carolina and North Carolina returns to pre-listing levels (approx. 12,800 nests); (2) certain amounts of available nesting beaches are in public ownership; and (3) all the identified recovery tasks necessary to prevent extinction or irreversible decline have been successfully implemented [5].

[1] Turtle Expert Working Group. 2000. Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic. U.S. Dep. Commerce. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.
[2] U.S. Fish and Wildlife Service. 2003. 12-month finding on a petition to list the Northern and Florida Panhandle loggerhead sea turtle (Caretta caretta) subpopulations as endangered. U.S. Fish and Wildlife Service. Federal Register (68:53947).
[3] Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2005. Status of nesting loggerhead turtles Caretta caretta at Bald Head Island (North Carolina, USA) after 24 years of intensive monitoring and conservation. Oryx 39(1):65
[4] National Marine Fisheries Service Southeast Fisheries Science Center. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce NOAA Technical Memorandum NMFSSEFSC-455, 343 pp.
[5] National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991. Recovery Plan for U.S. Population of Loggerhead Turtle. Washington, D.C. 64 pp.
[6] National Research Council. 1990. Population trends in Decline of the Sea Turtles: Causes and Prevention, pp. 42–50. National Academy Press, Washington, DC, USA.
[7] Fish and Wildlife Research Institute. 2006. Florida's Index Nesting Beach Survey Data. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission. Available at (http://research.myfwc.com/features/view_article.asp?id=10690).
[8] Murphy, S and G. DuBose. 2005. Loggerhead turtle, Caretta caretta. South Carolina Department of Natural Resources fact sheet. Website (www.dnr.sc.gov/wcp/pdf/Loggerheadturtle.pdf) accessed December, 2005.

Northern red-bellied cooter

Listed: 4/2/1980
Status since listing: Increased

The northern red-bellied cooter (Pseudemys rubriventris pop.) is endemic to ponds in eastern Massachusetts [1]. It formerly occurred in a patchy distribution in most of the state's coastal counties including Essex, Middlesex, Plymouth, Barnstable, and Dukes. The only non-coastal county with a historical record is Worcester. Today it occurs only in Plymouth County.

Due to the loss of historic populations, increasing shoreline and between-pond development, and increased predation pressure, the northern red-bellied cooter was placed on the endangered species listed and granted critical habitat in 1980 [1]. Twelve occupied ponds were known at the time. Three additional populations, including Federal Pond, were discovered in subsequent years. Federal Pond was and is the largest population. An active "headstarting" program introduced the cooter to ten additional ponds and two rivers by 2005 [2, 3, 4]. All nests discovered each year are caged to protect the eggs and hatchlings from predators (about 95% of uncaged nests suffer predation) [2]. When hatching is complete, 50% of the hatchlings are released into the same pond and 50% are moved to headstarting facilities which raise them to a size that is less vulnerable to predation. The headstarted turtles are reintroduced to the same or new sites. Between 1985 and 2005, the program released over 2,500 turtles [3, 4]. Headstarted turtles were first documented to breed in the wild in 2000 [5].

Due to the difficulty of censusing the species, quantitative population trend data have not been gathered

[2]. However, species experts are in agreement that the number of occupied sites and the number of individuals has increased in size since 1980, primarily due to the headstarting program and to a lesser extent natural reproduction [2, 4]. The 1994 federal recovery plan requires a total of at least 600 breeding-age turtles distributed among at least 15 self-sustaining populations for downlisting to be considered [1]. Delisting will require at least 1,000 breeding-age turtles in 20 or more self-sustaining populations.

When listed as an endangered species, the taxon was called the "Plymouth red-bellied turtle" and was considered a subspecies (Pseudemys rubriventris bangsi) [1]. The subspecies has since been invalidated, but the 1994 federal recovery plan explains that as an ecologically and geographically distinct population, it still qualifies as an endangered species. The nearest individuals of the southern population are 250 miles away in southern New Jersey. The northern population is also unique in only being found naturally in ponds. The southern population is often riverine. The taxon's status as an endangered species will be reviewed in 2006 in response to a delisting petition [2, 5].

[1] U.S. Fish and Wildlife Service. 1994. Plymouth Redbelly Turtle (Pseudernys rubriventris) Recovery Plan, Second Revision. U.S. Fish and Wildife Service, Hadley, Massachusetts. 48 pp.
[2] Amaral, M. 2006. Personal communication with Michael Amaral, U.S. Fish and Wildlife Service, Concord, NH, February 7, 2006.
[3] Amaral, M. 2006. Released northern red-bellied cooters, 1985-2003. Spreadsheet provided by Michael Amaral, U.S. Fish and Wildlife Service, Concord, NH, February 7, 2006.
[4] French, T. 2006. Personal communication with Tom French, Massachusetts Natural Heritage and Endangered Species Program, Westborough, MA, February 7, 2006, and February 8, 2006.
[5] Gordon, R. 1997. Petition to Remove the 'Plymouth Redbelly Turtle' ('Pseudemys rubriventris bangsi') from the List of Endangered and Threatened Wildlife and Plants. National Wilderness Institute, February 3, 1997.

Bog turtle (Northern DPS)

Listed: 11/4/1997
Status since listing: Unknown

The bog turtle (Glyptemys muhlenbergii) occurs in two separate populations [1]. The northern population was listed as threatened in 1997 and occurs in Massachusetts (three sites), Connecticut (five sites), New York (37 sites), New Jersey (165 sites), Pennsylvania (75 sites), Delaware (four sites), and Maryland (61 sites). The southern population is not listed as an endangered/threatened species, but is protected under the Endangered Species Act's "similarity of appearance" category because it is indistinguishable by sight from the northern population. It occurs in Virginia, North Carolina, South Carolina, Georgia and Tennessee.Bog turtles usually occur in small, discrete populations, usually in open-canopy sedge meadows and fens bordered by wooded areas [1]. These wetlands are a mosaic of micro-habitats that include dry pockets, saturated areas and areas that are periodically flooded. Bog turtles depend on the diversity of micro-habitats for foraging, nesting, basking, hibernation and shelter. Unfragmented riparian systems that are sufficiently dynamic to allow the natural creation of open habitat are needed to compensate for ecological succession. Beaver, deer and cattle may be instrumental in maintaining the open-canopy wetlands.

Northern bog turtle populations declined by about 50% between 1980 and 2000 due to habitat loss and collection [1]. Although the number of known sites increased from 191 in 1996 to 350 in 2001, this increase was due to survey effort rather than population growth [1]. Most of the new sites are small, in poor condition and threatened with development; their discovery did not alter species' threatened status. Substantial monitoring programs have not been established, so the species' trend since listing is unknown [2].

To delist the bog turtle, the 2001 federal recovery plan requires that: 1) Long-term protection is secured for at least 185 populations distributed among five recovery units: Peninsula/Lake Plain Recovery Unit (10), Outer Coastal Plain Recovery Unit (5), Hudson-Housatonic Unit (40), Susquehanna-Potomac Recovery Unit (50) and Delaware Recovery Unit (80); 2) Monitoring at five-year intervals over a 25-year period shows that these 185 populations are stable; 3) Illicit collection and trade no longer constitute a threat to this species' survival; 4) Long-
term habitat dynamics, at all relevant scales, are sufficiently understood to monitor and manage habitats and turtles, including succession, invasive wetland plants, hydrology and predation.

[1] U.S. Fish and Wildlife Service. 2001. Bog Turtle (Clemmys muhlenbergii), Northern Population, Recovery Plan. Hadley, Massachusetts. 103 pp.
[2] Behler, J. 2005. Personal communication with John Behler, Wildlife Conservation Society, December 15, 2005.

Karner blue

Listed: 12/14/199
Status since listing: Stable

The Karner blue butterfly (Lycaeides melissa samuelis) is a small blue butterfly, with a wingspan of only about one inch [1]. The famous novelist, Vladimir Nabokov, who was also a self-taught lepidopterist, identified the Karner blue as a distinct subspecies in 1944 [2]. The larvae of Karner blue butterflies feed exclusively on wild lupine (Lupinus perennis), and thus the Karner blue's range is restricted to areas that support this species of lupine [3]. Lupine is an early successional plant historically associated with savanna and barrens habitats [3]. Lupine is adapted to dry, relatively infertile soils, and requires ecological disturbances to persist [3]. Much of the lupine's habitat has been destroyed by development and fragmentation, or degraded by successional changes [3]. The loss of suitable habitat resulted in a decline in Karner blue locations and numbers [3]. By the time the Karner blue was listed as endangered in 1992 the number of Karner blue butterflies had declined by at least 99% [4]

The Karner blue formerly occurred throughout a band extending across 12 states from Minnesota to Maine and into the Canadian province of Ontario [3]. Now it only occurs in Minnesota, Wisconsin, Indiana, Michigan, New York, New Hampshire, and Ohio [3]. At three sites (New Hampshire, Ohio, and West Gary, Indiana) populations are the result of reintroduction programs [3]. Wisconsin and Michigan have the largest remaining number of local populations with the greatest numbers of individuals [3].

WISCONSIN: Currently, Wisconsin supports the largest and most widespread Karner blue populations [5]. The largest extant population is found at the Necedah National Wildlife Refuge [5] where, although the number of butterflies is highly variable between years, the population overall seems stable [6]. Systematic statewide surveys conducted in Wisconsin in 1990 found Karner blues at only 11 of 33 historical sites, but located an additional 23 previously unknown sites [3]. By 1993, an estimated 150 to 170 discrete Karner blue sites had been documented [3]. As of April 2002, Wisconsin's Department of Natural Resources had records of 311 Karner blue butterfly occurrences across 20 counties [1]. This reflects an 815% increase in recorded occurrences since listing [1]. In addition, as part of a statewide Habitat Conservation plan approved in 1999, the number of existing lupine sites has been monitored on lands participating in the partnership, and an increase in lupine occurrences has also been documented [1]. Other measures outlined in the HCP have also been initiated by the state [5]. The Wisconsin Gas Company now mows grass along its power lines later in the summer so that Karner blue caterpillars have time to metamorphose. Other agencies delay herbicide and pesticide spraying on their lands until the fall, after lupine and other plants have died [7]. It is now thought that the butterfly is likely to be more stable in Wisconsin than previously believed [1].

MICHIGAN: The Karner blue butterfly is currently found in 10 of the 11 Michigan counties in which it historically occurred [3]. These populations, however, have been reduced and highly fragmented [3]. Surveying efforts since listing have resulted in the discovery of more Karner blue subpopulations in Michigan and currently, nearly 200 subpopulations are known to occur in the state [8]. In northern Michigan, the largest Karner blue sub-population is found on the Huron-Munistee National Forest [8]. In southern Michigan, the largest subpopulation occurs on Allegan State Game Area where over 25,000 butterflies were counted in 2004 [9]. In 2005, surveys conducted on three game areas (Muskegan, Allegan, and Flat River) produced a total estimate of over 100,000 butterflies [8].

MINNESOTA: Karner blue butterflies currently only occur at the Whitewater Wildlife Management Area in Southeastern Minnesota [3]. An effort to accelerate colonization by translocating butterflies into an unoccupied site has met with some success [3]. Female Karner blues from the Whitewater Wildlife Management area were used to captive rear butterflies that were then released in 1999, 2001, and 2002 to Lupine Valley [3]. The butterflies have been extirpated at Cedar Creek Natural History Area, the only other location known to have once supported a Karner blue population in Minnesota [10].

NEW HAMPSHIRE: The last native population in New Hampshire occurred in the Concord Pine Barrens in a powerline right-of-way and in grassy safeways of the Concord Airport [3]. In 1983, this population was estimated to have 3,700 butterflies [3]. By 1994 numbers had dropped below 50 and in 2000 the population was extirpated [3]. A reintroduction program was started in 2001 [3] and in 2003 the butterfly began mating and reproducing in the wild again [11]. Biologists are now keeping watch over about 700 Karner larvae (caterpillars) in a captive rearing facility [11].NEW YORK: The Saratoga Airport Site, a treeless prairie area maintained by mowing, currently supports the largest population of Karner blues in New York [3]. This population has remained large for several years now and is estimated to support around 10,000 butterflies [3]. Efforts are underway to connect this population with nearby sites [3].

In 1978, the Albany Pine Bush area supported an estimated 17,500 butterflies in one 300 acre site [3]. By the mid-1980's much of the Albany Pine Bush had been destroyed by development and degraded by introduction of non-Pine Bush species and natural succession [3]. By 1988, only 2,500 acres of the original 25,000 acres remained and the NY legislature decided to establish the Albany Pine Bush Preserve Commission to enact protections for the pine bush community [3]. In 1990, a fire management program was initiated to try to help restore habitat [3]. The Preserve currently contains approximately 3,010 protected acres, with a goal of a 4,610 acres [12]. Restoration and management of inland pitch pine-scrub oak barrens has been initiated on 1,248 acres since 1991 and 1,005 of these acres have received prescribed fire treatments [12]. Over 400 acres have received habitat restoration treatments specific for the Karner blue [13]. Despite these efforts, Karner blue butterfly numbers in the Albany Pine Bush remain low, with the population estimated to be approximately 1,000 individuals in 2005 [13]. However, the number of Karner blue butterflies observed at restoration sites is increasing and habitat restoration continues [13].

In the Saratoga Sandplains area, the Town of Wilton has joined with state and Federal agencies and The Nature Conservancy in the creation of the "Wilton Wildlife Preserve and Park". The Park's goal is a 3,000 acre protected area, the heart of which will contain a core population of Karner blues [3]. An active restoration and management program has been implemented on the several hundred acres currently protected in the Park [14]. Karner numbers are increasing at restoration sites here as well [14]. Karner blues are also being actively managed along powerline corridors in the Queensbury Sandplains, north of Saratoga Springs [14].

OHIO: The first Karner blue reintroduction effort was made in 1998 at The Nature Conservancy's Kitty Todd Nature Preserve in Ohio [3]. It is hoped this effort will restore a viable population of Karner blues to the Oak Openings of northwest Ohio [3]. A total of 1,617 Karner blue butterflies have been released on the Preserve since 1998 [15]. The butterflies were raised at the Toledo Zoo in Toledo, Ohio [3]. The effort

appears to have been successful and there are reports of steadily increasing numbers of wild-born butterflies [16]. Importantly, this effort resulted in the development of successful captive propagation techniques [3]. In 2005, 315 Karner blue butterflies were released to a second site in the Oak Openings-The Nature Conservancy's Moseley Barrens tract. This release will be evaluated in summer of 2006 [15].

INDIANA: Industrial, commercial, and residential development as well as road and airport construction; and gravel and sand mining depleted much of the Karner blue habitat in Indiana [10]. Historically, the Karner blue was reported from eight counties in Indiana [3]. In 1990, surveys found them in only two counties [3]. A population of several thousand is thought to occur at Indiana Dunes National Lakeshore [3]. In addition, a reintroduction project was initiated by the Nature Conservancy to restore Karner blues to West Gary, Indiana after they were extirpated from the area in 2000 [3]. In the first two years, 1,000 butterflies were released at a Nature Conservancy preserve in West Gary [17]. Now, the Conservancy is monitoring the initial effort to determine the size of core populations as well as dispersal patterns within the preserve [17]. The reintroduction effort appears successful thus far and will be monitored to determine whether future captive rearing efforts are needed [17]. Karner blues were found at a second site in West Gary in 2002 [3].

[1] U.S. Fish and Wildlife Service. Fact Sheet: The Karner Blue Butterfly. Website (http://www.fws.gov/northeast/factshee.html) accessed January, 2006. [2] Lipske, M. 2001. How a famed novelist became a godfather to a tiny endangered butterfly. National Wildlife 39(1). National Wildlife Federation. [3] U.S. Fish and Wildlife Service. 2003. Final Recovery Plan for the Karner Blue Butterfly (Lycaeides melissa samuelis). Fort Snelling, Minnesota. 273 pp.
[4] U.S. Fish and Wildlife Service. 1997. The Karner Blue Butterfly (Lycaeides melissa samuelis), Great Lakes-
Big Rivers Region. Website (http://www.fws.gov/midwest/Endangered/insects/kbb/karnerbl.html) accessed January, 2006.
[5] Wisconsin Department of Natural Resources. 1999. Wisconsin Karner Blue Butterfly Habitat Conservation Plan and Environmental Impact Statement. Madison, WI. [6] King, R. 2006. Personal communication with Richard King, USFWS, Necedah National Wildlife Refuge, WI.
[7] Glick, D. 2005. Back from the brink: not every endangered species is doomed -thanks to tough laws, dedicated researches, and plenty of money and effort, success stories abound. Smithsonian 36(6):54.
[8] Lerg, J. 2006. Personal communication with John Lerg, Allegan State Game Area, Department of Natural Resources, Natural Heritage Unit Lansing, MI. [9] Lerg, J. 2004. Survey of Karner blue butterflies at Allegan State Game Area. Michigan Department of Natural Resources. Available at (http://www4.gvsu.edu/karnerblue/hcpdocs/ASGA_2004_KBB_Survey.pdf).
[10] U.S. Fish and Wildlife Service. 1992. Proposed Endangered Status for the Karner Blue. Federal Register (57: 59236).
[11] New Hampshire Fish and Game Department. 2005. Newsroom: Season Starts Strong for Karner Blue Butterflies. Available at
(http://www.wildlife.state.nh.us/Newsroom/News_2005/News_2005_Q2/KBB_update_052005.htm).
[12] Albany Pine Bush Preserve Commission. 2002. Management Plan and Final Environmental Impact Statement for the Albany Pine Bush Preserve. Albany, NY. 135pp.
[13] Gifford, N., K. Nelson, N.Tregger, K. Breisch and NYS Department of Environmental Conservation. 2005. Karner Blue butterfly (Lycaeides melissa samuelis) population monitoring results – 2005: Albany Pine Bush Karner Blue Butterfly Recovery Unit. Albany, NY. 33 pp. Available at (http://www.albanypinebush.org).
[14] Gifford, N. 2006. Personal Communication with Neil Gifford, Conservation Director Albany Pine Bush Preserve Commission, The Nature Conservancy, Albany, NY.
[15] Tolson, P. 2006. Personal communication with Peter Tolson, Toledo Zoo, Toledo, OH.
[16] The Nature Conservancy. 2005. Habitat Gets a Boost at Kitty Todd Preserve. Website (http://nature.org/wherewework/northamerica/states/ohio/science/art12321.html) accessed January, 2006.
[17] The Nature Conservancy. 2005. The Karner Blue Reintroduction Effort. Website (http://nature.org/wherewework/northamerica/states/indiana/preserves/art12869.html) accessed January,

2006.

Mitchell's satyr butterfly

Listed: 6/25/1991
Status since listing: Stable

The Mitchell's satyr butterfly (Neonympha mitchelli mitchelli), a small chocolate brown butterfly, is one of the rarest butterflies in North America [1]. Historically, the Mitchell's satyr was known from approximately 30 sites in four states including southern Michigan, northern Indiana, northern Ohio, and northern New Jersey [1]. Most historical satyr sites were known from Michigan, which could indicate this was the core of their range [2]. The Mitchell's satyr was first listed as endangered in 1991 after intensive searches of over 100 sites between 1985 and 1990 found that the satyr had disappeared from approximately half of its historical locations [3]. Loss and modification of habitat, loss of habitat to succession, habitat fragmentation,and collection by butterfly enthusiasts are all thought to have contributed to population declines and local extirpations [1]. Currently there are 17 known extant colonies in Michigan and two in northern Indiana [2]. The butterfly is considered extirpated in Ohio and New Jersey [2] Monitoring conducted from 1981 to 1986 suggested that remaining populations in Michigan and Indiana were stable but at relatively low densities [1]. Surveys conducted in 1993 and 1994 suggested that populations were a bit higher at some locations [1].

The Mitchell's satyr butterfly is found in peatlands ranging from prairie/bog fen to sedge meadow/swamp [1]. Prairie fens, typically thought to be the butterfly's characteristic habitat, are shrub and herb peatlands where calcium-rich groundwater seeps through the surface maintaining wet and calcareous conditions [4]. Much remains unknown about this species biology, but it is thought that sedges, in particular Carex stricta, are the primary hostplants [2]. Adult butterflies fly in late June through mid July [1]. During the flight period, which generally lasts 2-3 weeks [5], the butterflies mate, lay eggs, and then die [1].

In Michigan, the Mitchell's satyr occurs primarily in southern part of the state [2]. It has been documented in at least 22 sites in 11 counties [2]. Surveys conducted from 1995 to 2000, however, confirmed extant populations at only 16 sites [2]. Five were believed extirpated possibly due to wetland alteration [5]. Of the 16 confirmed sites, at least 6 were considered to be of high quality [1]. These sites consistently supported medium to high densities of adult butterflies, and seemed to represent fen complexes that have adequate habitat to support viable populations of Mitchell's satyr [1]. The Michigan Natural Features Inventory has conducted annual sighting surveys for the satyr at known and potential sites since 1996 [5]. Although the numbers obtained by these surveys can not be used to deduce population estimates (the only way to do this accurately is by using mark-recapture techniques that could be detrimental to the butterflies if conducted over long periods), it appears the populations are remaining relatively stable [5]. Since 1996 five new populations were found and one population (last seen in 2000) appears to have been lost [5]. Surveys conducted in 2005 confirmed satyrs at 17 sites –one of which was a new population discovered in Cass County [5]. A short-term mark-recapture study conducted in 2003 at a Jackson County site produced a population estimate of 1,106 adult butterflies – the largest population documented thus far [6].

In Indiana, 4 -5 sites are known to have supported Mitchell's satyr [1]. Two sites in northern Indiana still support Mitchell's satyr populations [1]. The status of two other sites is unknown [1]. In 1995, the Nature Conservancy translocated eight pairs of Mitchell's satyr adults from one portion of a fen in LaPorte County to another TNC owned portion in an effort to re-colonize the protected area [1].

The primary threat to the Mitchell's satyr is the loss and disruption of suitable fen habitats [1]. Alterations in natural drainage from disturbances such as roads, paths, residential development, and agricultural drains can have drastic effects and prairie fens and their Mitchell's satyr populations are very sensitive to

changes in groundwater and surface water flow [4]. Alteration of wetlands can also lead to invasions by nuisance plants [1]. Wetland alteration is responsible for extirpating the single known satyr population in Ohio and several populations in Michigan [1], and some wetland complexes currently occupied by Mitchell's satyrs have been altered or drained for agriculture or development [2]. In addition, landscape-scale processes such as fire and flooding that may be important for maintaining habitat and/or creating new habitat have been virtually eliminated or altered throughout the species range [2]. This suppression of natural processes has resulted in the succession of upland species into wetland habitats which can lead to the shading out of fen plants by shrubs and trees [5]. Without management many wetlands will convert from fens into shrub swamps or shrub carr [5]. Currently The Nature Conservancy, Southwest Michigan Land Conservancy, Michigan Nature Organization, and the State of Michigan are working to manage and acquire satyr habitat on both public and private lands and a landowner incentive program has been put into place to encourage appropriate stewardship of fen habitat [5].

[1] U.S. Fish and Wildlife Service. 1998. Recovery Plan for Mitchell's Satyr Butterfly (Neonympha mitchellii mitcheliji French). U.S. Fish and Wildlife Service Ft. Snelling, MN. viii+71 pp.
[2] Michigan Natural Features Inventory. Neonympha mitchellii mitcheliji French: Mitchells' Satyr Butterfly. Lansing, MI. Website accessed 2/2006. (http://web4.msue.msu.edu/mnfi/abstracts/zoology/Neonympha_mitchellii.pdf)
[3] U.S. Fish and Wildlife Service. 1991. Notice of Emergency rule to list Mitchell's Satyr Butterfly as Endangered. Federal Register.
[4] Michigan Department of Natural Resources. Mitchell's Satyr Butterfly (Neonympha mitchellii mitcheliji). (http://www.michigan.gov/dnr/0,1607,7-153-10370_12145_12204-33013--,00.html) Website accessed 2/006
[5] Daria Hyde Pers. Comm. Michigan Natural Features Inventory Associate Conservation Planner.
[6] Barton, B.J. and C.E. Bach. 2004. Habitat Use by the Federally Endangered Mitchell's Satyr Butterfly (Neonympha mitchellii mitchellii) in a Michigan Prairie Fen. American Midland Naturalist. 153(1):41-51

Puritan tiger beetle

Listed: 8/7/1990
Status since listing: Declined

The Puritan tiger beetle (Cicindela puritana) formerly inhabited sandy water-edge habitats in Vermont, New Hampshire, Massachusetts and Connecticut along the Connecticut River and on the shores of Chesapeake Bay in Maryland [1]. It is currently found in only four locations: on the Connecticut River (Massachusetts and Connecticut) and on the shores of Chesapeake Bay, Maryland (Calvert County and the mouth of the Sassafras River).

The species' decline was caused by damming and channelization of rivers, development, and stabilization of riverbanks and shorelines [1]. Twenty-three percent of extirpated sites on the Connecticut River were flooded by dams, 38% were heavily urbanized, and 8% were riprapped and stabilized. Along the entire course of the Connecticut River, only two sites in addition to the occupied sites are considered suitable for beetle reintroductions. While large-scale natural processes remain substantially intact in Chesapeake Bay, the erosive shoreline is being developed rapidly, causing local, state and federal agencies to fund beach stabilization and augmentation programs that destroy tiger beetle habitat. Calvert County has grown by over 300% since 1950 and much of the tiger beetle's habitat has been subdivided and either has been or is likely to be developed. The Connecticut River populations are small but intensively managed. They have increased in size since being placed on the endangered list in 1990. The Chesapeake Bay populations are much larger, but enjoy very little institutionalized habitat protection or management. They have declined substantially since listing and continue to decline as of 2005.

CONNECTICUT RIVER: The Puritan tiger beetle formerly occurred in at least 12 populations along the Connecticut River in Vermont, New Hampshire, Massachusetts and Connecticut [1]. It was thought extinct in the region as of about 1939 until a population of 100-200 adults was discovered near Northampton in 1986 [3]. Shortly thereafter, unscrupulous collectors raided the location, taking as many beetles as possible [7]. By the time the species was placed on the endangered list in 1990, the population had declined to about 75 adults [5]. It continued declining to about 25 adults by 1993 [1], but habitat protection efforts prevented the beetle's extinction and kept numbers stable at 25-40 adults between 1997 and 2001 [6]. Beginning in 2000, this population was augmented with beetles from a larger population in Connecticut [3]. These efforts increased the population size to 198 in 2005 -- the largest since its discovery. The Connecticut population occurs downstream in the Cromwell-Portland area. It was discovered in 1989 and consists of three small sites acting as a metapopulation [1]. The population level has fluctuated considerably, but increased from 374 adults in 1991 to 648 in 2005 [6]. Its highest point was 1,072 in 2004. An experimental but failed reintroduction effort was conducted in South Windsor, Connecticut in 1993 [1]. The tiger beetle remains extirpated from the Vermont and New Hampshire sections of the Connecticut River.

CHESAPEAKE BAY: The Calvert County population is composed of eight subpopulations, three of which regularly had (until recently) more than 500 adults [2]. Numbers declined sharply from 11,431 censused adults in 1988 to 4,073 in 1990, then fluctuated considerably but without discernable trend between 1990 and 2000, with most years having between 3,400 to 6,200 adults [2, 4]. Numbers steadily declined between 2000 and 2005 to 1,098 adults. The Sassafras River mouth population is composed of eight subpopulations, with the vast majority of beetles occurring at the Grove Point subpopulation [2]. Censused adults increased from 950 in 1989 to 2,755 in 2001, then declined relatively steadily (with the exception of high years in 1995 (1,766) and 1996 (1,821) to 458 in 2005 [2, 4]. The cause of the decline is not well known, but is probably associated with increased vegetation growth (much of it non-native) on the cliff-face, and habitat changes (natural and anthropogenic).

The 1993 federal recovery plan calls for: 1) A minimum of six large (500-1000+ adults) populations within habitat that is protected in perpetuity at current sites along both shores of the Chesapeake Bay; 2) protection of sufficient habitat between these populations to support smaller populations, providing an avenue for genetic interchange among large populations and ensuring a stable metapopulation structure; 3) a minimum of three metapopulations, at least two of which are large (500-1000+ adults), maintained (at extant sites) or established within the species' historical range along the Connecticut River, with the habitat they occupy permanently protected; and 4) an effective and long-term program for site-specific management that is based on an adequate understanding of life-history parameters, human impacts, factors causing decline, population genetics and taxonomy [1].

[1] U.S. Fish and Wildlife Service. 1993. Puritan tiger beetle (Cicindela puritana) recovery plan. Hadley, MA.
[2] Knisley, C.B. 2005. Biology of Cicindela puritana, the Puritan tiger beetle: distribution and abundance, 1988 to 2005, habitat ecology, and the status of the Grove Point population. Final draft. Report to the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, Maryland, August 2, 2005.
[3] Babione, M. 2003. Bringing tiger beetles together. Endangered Species Bulletin XXVIII(1):28-29.
[4] Knisley, C.B. 2005. Puritan tiger beetle population trend in Maryland, 1986-2005. Spreadsheet provided by C. Barry Knisley, Randolph-Macon College, Ashland, VA, November, 2005.
[5] U.S. Fish and Wildlife Service. 1990. Determination of threatened status for the Puritan tiger beetle and the northeastern beach tiger beetle. Federal Register (55:32088).
[6] Babione, M. 2006. Puritan tiger beetle population trend in New England 1991-2005. Data provided by Michelle Babione, U.S. Fish and Wildlife Service, Silvio O. Conte National Fish and Wildlife Refuge, Turners Falls, MA, January 13, 2006.
[7] Babione, M. 2006. Personal communication with Michelle Babione, U.S. Fish and Wildlife Service, Silvio O. Conte National Fish and Wildlife Refuge, Turners Falls, MA, January 25, 2006.

Northeastern beach tiger beetle

Listed: 8/7/1990
Status since listing: Stable

The northeastern beach tiger beetle (Cicindela dorsalis dorsalis) formerly occurred in great swarms along coastal beaches from Cape Cod to New Jersey and along the Chesapeake Bay shoreline [1]. Shoreline development, beach stabilization efforts, and increased recreation, especially off-road vehicles, nearly extirpated it from the Atlantic coast and threaten its existence in Chesapeake Bay. When listed as an endangered species in 1990, it occurred in just two populations in Massachusetts (though only one was known at the time) and in numerous populations along Chesapeake Bay. Since then, the species has increased in number in Massachusetts and New Jersey, declined dramatically in Maryland, and appears to be stable in Virginia. Overall, the beetle's population trend since 1990 is stable, but the trend is dominated by the Virginia population which is orders of magnitude larger than all others combined.

Massachusetts. #1) The Northeastern tiger beetle was thought extinct in the Northeast until a population was discovered on Martha's Vineyard in 1990. The population fluctuated significantly, but increased overall between 1990 and 2005 [11]. It declined steadily from 1,787 adults in 1990 to 220 in 1993, spiked back to 1,392 in 1994, then declined steadily again to 268 in 1998. With the exception of 2003, however, it increased every year between 1999 and 2005. The 2005 census documented 2,159 adults. There is a close correlation between the declining periods and severe tropical storms and hurricanes which caused massive erosion of beetle habitat [12]. The storms also created beetle habitat by producing washover fans and blow-outs, many of which have since been recolonized; areas not recolonized were subjected to thousands of off-road vehicle trips annually [12]. #2) A small population of 100 adults was discovered at Horseneck Beach State Reservation/Westport Town Beach in 1994 [5]. The population fluctuated significantly between 1994 and 1996, crashed to just eight adults in 1999 and steadily dwindled to zero in 2005. If not already extirpated, the population is very close to it. #3) 113 larvae were translocated from Martha's Vineyard to the 7,604-acre Monomoy National Wildlife Refuge between 2000 and 2003 [7]. The number of counted adults ranged from 16 to 28 between 2001 and 2005. The presence of adults in 2004 and 2005 despite there being no introductions that year is a promising sign that this experimental reintroduction is working. The beetles use a large overwash backed by dunes that is also an important piping plover nesting area; about 75% of the population occurs in plover protected areas [13].

New Jersey. Formerly extirpated from New Jersey, larvae from Chesapeake Bay were translocated to the northern section of the Sandy Hook Unit of Gateway National Recreation Area between 1994 and 2000 [6]. Emergent adults increased from 55 in 1995 to over 700 in 2000 and 2001, declined to six in 2004 and were not censused in 2005 [4, 6]. The cause of the decline is not known, but a large increase in gull numbers is suspected of increasing predation and disturbance pressure. Additional relocations are planned for 2006 [4].

Maryland. Six major Maryland populations are known along the Chesapeake Bay. The two large eastern shore populations fluctuated greatly in abundance between 1997 and 2005 [8], exhibiting a stable to slightly increased overall trend. The 2005 count was 2,475 at Janes Island and 1,298 at Cedar Island.. The four Calvert County populations declined from an average of 9,257 in 1990-1992, to 3,069 in 1996, and then fluctuated without a trend (usually between 1,000 and 3,000 adults) between 1996 and 2004 [8]. The beetle has disappeared from two of the four sites.

Virginia. Virginia populations are distributed along the eastern and western shorelines of Chesapeake Bay. The 1998-1999 to 2004-2005 population trend was relatively stable, fluctuating around 60,000 adults. Eastern shoreline populations increased slightly in recent years: 1999 (32,143 adults), 2002 (33,469), and 2005 (36,201, excluding the newly found Church Neck North population) [8]. The fewest numbers of adults and smaller populations were in the marshier northern third of the peninsula and the largest total numbers and most large populations in the middle section, from Parkers Marsh to Savage Neck [9]. Western shoreline populations increased from 1998 (26,693 adults, 15 populations with >500) to 2001 (33,624

adults, 19 populations with >500) [10]. Following Hurricane Isabel, which caused widespread erosion on the western shore (but less so on the eastern), the population declined to 12,187 adults with only 6 populations >500 in 2004. The population rebounded in 2005 (approximately 19,300), but not yet to pre-hurricane levels [2].

The 1994 federal recovery plan [1] requires that: 1) At least three viable populations have been established and permanently protected in each of four designated Geographic Recovery Areas (GRAs) covering the subspecies' historical range in the Northeast, with each GRA having one or more sites with large populations (peak count > 500 adults) and sufficient protected habitat for expansion and genetic interchange; 2) At least 26 viable populations distributed throughout all five Chesapeake Bay GRAs are permanently protected; 3) Life history parameters (including population genetics and taxonomy), human impacts, and factors causing decline are understood well enough to provide needed protection and management; and 4) An established, long-term management program exists in all states where the species occurs or is reintroduced. The GRAs are as follows: GRA 1— Coastal Massachusetts and Islands, GRA 2- Rhode Island, Block Island, and Long Island Sound, GRA 3- Long Island, GRA 4- Sandy Hook to Little Egg Inlet, NJ, GRA 5- Calvert County, MD, GRA 6- Tangier Sound, MD, GRA 7- Eastern Shore of Chesapeake Bay, VA, GRA 8- Western Shore of Chesapeake Bay (north of Rappahannock River), VA, GRA 9- Western Shore of Chesapeake Bay (south of Rappahannock River), VA. The major factor limiting recovery in the northeast is the lack of suitable translocation sites [4].

[1] U.S. Fish and Wildlife Service. 1994. Northeastern beach tiger beetle (Cicindela dorsalis dorsalis) recovery plan. Hadley, MA. 45 pp.
[2] Traxler, C. 2005. VAFO Completes Northeastern Beach Tiger Beetle Comprehensive Survey. U.S. Fish and Wildife Service news advisory, August 18, 2005.
[3] Shifflett, S.A., M.S. Fenster, C.B. Knisley. 2001. A threatened species of northeastern tiger beetle, cincindela dorsalis dorsalis as an indicator of beach health. Abstract presented at The Geological Society of America Annual Meeting, November 5-8, 2001. (http://gsa.confex.com/gsa/2001AM/finalprogram/abstract_27129.htm)
[4] Knisley, C.B. 2005. Personal communication with C. Barry Knisley, Department of Biology, Randolph-Macon College, November 21, 2005.
[5] Bogart, J. 2006. Population changes in Northeastern Beach Tiger Beetles on Horseneck Beach and Westport Town Beach from 1994-2005. Spreadsheet provided by Jamie Bogart, The Lloyd Center for the Environment, February 10, 2006.
[6] Knisley, C.B., J.M. Hill, and A.M. Scherer. 2005. Translocation of threatened tiger beetle Cicindela dorsalis dorsalis (Coleoptera: Cicindelidae) to Sandy Hook, New Jersey. Ann. Entomol. Soc. Am. 98(4): 552-557
[7] Davis, C. 2006. Monomoy NWR, C .dorsalis dorsalis, number of translocated larve and adults emerged, 2000-2005. Spreadsheet provided by Chris Davis, biological contractor, February 13, 2006.
[8] Knisley, C.B. 2005. Northeastern beach tiger beetle census data, Calvert County, Maryland and Eastern Shore of Chesapeake Bay, Virginia. Spreadsheet provided by C. Barry Knisley, Department of Biology, Randolph-Macon College, November, 2005.
[9] Knisley, C.B. 2005. A survey of the northeastern beach tiger beetle (cicindela dorsalis dorsalis) at eastern shore of virginia sites of the chesapeake bay, 2005. Final draft report to the U.S. Fish and Wildlife Service, Virginia Field Office, Gloucester, VA, September 10, 2005.
[10] Knisley, C.B. 2005. A survey of the northeastern beach tiger beetle (cicindela dorsalis dorsalis) at all western and selected eastern shoreline sites of the chesapeake bay, 2004. Final draft report to the U.S. Fish and Wildlife Service, Virginia Field Office, Gloucester, VA, January 9, 2005.
[11] Simmons, T. 2006. Northeastern tiger beetle trends on Marthas Vineyard, 1990-2005. Spreadsheet provided by Tim Simmons, Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA on February 11, 2006.
[12] Simmons, T. 2006. Personal communication with Tim Simmons, Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA on February 13, 2006.
[13] Davis, C. 2006. Personal communication with Chris Davis, biological contractor, February 13, 2006.

American burying beetle

Listed: 8/13/1989
Status since listing: Increased

The American burying beetle (Nicrophorus americanus) is a large, spectacularly colored orange and black insect. It formerly occurred across a vast range from Nova Scotia south to Florida, west to Texas, and north to South Dakota. It was documented in 150 counties in 34 states, the District of Columbia, and three Canadian provinces. Total historical numbers are not known, but the species may well have occurred in the tens of millions. The burying beetle's dramatic decline has been called "difficult to imagine" and “one of the most disastrous declines of an insect’s range ever to be recorded” [2]. It was extirpated from mainland New England through New Jersey by the 1920s, from the entire mainland east of the Appalachian Mountains by the 1940s, and from the mainland east of the Mississippi River by 1974. It is currently absent from about 90% of its historic range.

The largest of North America's 32 burying beetles, N. americanus is uniquely dependant upon quail-size carrion weighing 100-200 grams [1, 15]. Males smell freshly dead mammals and birds (and occasionally even fish) within an hour of death and up to two miles away. Females arrive shortly thereafter, attracted by male pheromones. A competition ensues and is typically won by the largest male and female. Lying on their backs, the winning couple inches into an excavated burial chamber. During this time, orange phoretic mites borne by the beetles leap to the carcass, cleaning it of fly eggs and microbes. The buried carcass is relieved of its feathers, feet, tail, ears and/or fur. Now known as a "brood ball," it is coated with oral and anal embalming secretions to retard fungal and bacterial growth. The beetles then mate and within 24 hours lay eggs in the soil near the carcass. White grubs emerge three or four days later and are carried to the carcass. The parents also defend the grubs from predators and feed them regurgitated food. The American burying beetle is one of the few non-
colonial insects in the world to practice dual parenting. In approximately a week, the grubs leave the chamber and pupate into adults.

The cause of the American burying beetle's decline is not well understood, but the most cogent hypotheses see it as victim of interacting food chain disturbances which reduced the number of large carcasses [2]. The passenger pigeon, which formerly occurred in the billions, was an ideal size. It was last seen in 1914 and was greatly reduced in number in the decades preceding. Its decline and disappearance occurred just prior to the burying beetle's. Other endangered or greatly reduced carrion of ideal size include the black-footed ferret, northern bobwhite, and greater prairie chicken. Competition for dwindling carrion numbers was exacerbated by increasing numbers of mid-sized predators following the extinction or decline of large predators such as the eastern cougar, mountain lion, and gray wolf. In their absence, coyotes, raccoons, fox and other mid-size scavengers increased in number and consumed more quail-size carrion. Finally, as habitats became more fragmented mid-size predators were increasingly able to exploit forest and grass land edges, taking more carrion.

At the time of listing in 1989, three populations were known: one on Block Island, Rhode Island and two in eastern Oklahoma [1]. Since then, populations have been discovered in South Dakota (1995), Nebraska (1992), Kansas (1997), Arkansas (1992), and Texas (2003) [3]. The burying beetle has been reintroduced to Massachusetts and Ohio. The total number of captive and introduced populations increased from one to six between 1990 and 2005 [7, 11, 13, 10].

RHODE ISLAND. Located 12 miles off the south coast of Rhode Island, Block Island supports the last natural population of the American burying beetle east of the Mississippi River. The island is free of foxes, raccoons, skunks, and coyotes. A study of one-third of the population determined that it was relatively stable between 1991 and 1997 (mean=184), and then steadily grew to 577 in 2005 [8]. This population served as the source for the successful Roger Williams Park Zoo captive breeding program initiated in 1994 and for direct translocations to Nantucket and Penikese Island.MASSACHUSETTS. The American

burying beetle was extirpated from Massachusetts shortly after 1940 [1] and was reintroduced to the 70 acre Penikese Island in Buzzards Bay over a four year period between 1990 and 1993. Reintroduced beetles initially came from a Boston University captive breeding population originating from Block Island stock [6]. The population persisted at low numbers through 2002, but was not located in 2003, 2004, and 2005. On Nantucket, 2,892 beetles were introduced from the Roger Williams Park Zoo between 1994 and 2005 to the Audubon Society's Sesachacha Heathland Wildlife Sanctuary (east side of the Island) and the Nantucket Conservation Foundation's Sanford Farm (west side of the island) [5, 6, 21]. Existing and new beetles were trapped and provisioned with quail carcasses each summer to boost larva production [5]. The introduction program ended in 2005 in order to determine if population is self-sustaining [6]. No population estimates or trends are available.

The Roger Williams Park Zoo program produced 4,551 adult beetles between 1995 and 2005, releasing 2,742 back to the wild [21].

OHIO. The American burying beetle was extirpated from Ohio shortly after 1974 when it was last seen near Old Man's Cave in Hocking Hills State Park [9, 10]. A short-lived captive population derived from Block Island stock was established in 1991 at the Insectarium of the Cincinnati Zoo and Botanical Garden [1]. In July, 1998, Ohio became the site of the first mainland introduction when 35 pairs of beetles taken from a wild population near Fort Chaffee, Arkansas were introduced to the Waterloo Wildlife Experiment Station in southeast Ohio [10]. The Waterloo population was augmented in 1999 (20 pairs and 15 females) and 2000 (33 pairs and four males), but not 2001 or 2002. Additional augmentation occurred in 2003. A captive population established at Ohio State University in 2002 produced 828 beetles as of 2004; 199 of these were used for reintroductions in 2003 and 156 were reintroduced in 2004. The Wilds (managed by the Columbus Zoo) plans to create a second captive colony [10] and a second reintroduction is planned for the Athens District of the Wayne National Forest [11].

MISSOURI. The American burying beetle was extirpated from Missouri in the early 1980s [1]. It has not been relocated despite repeated and recent surveys [12]. A captive breeding population was established at the Monsanto Insectarium, St. Louis Zoo in 2004 (with 10 pairs from Ohio State University) and 2005 (with wild beetles from Arkansas) [7, 15]. Six-hundred-fifty-four adults were produced as of June 2005, 50 of which were transferred to Ohio State University. Plans are being developed to introduce the species to The Nature Conservancy and Missouri Department of Conservation lands. [7].

OKLAHOMA. The presence of American burying beetles has recently been confirmed in 22 eastern Oklahoma counties, reported but unconfirmed in two more, and likely to occur in nine more [16]. The largest known concentrations are a population at Camp Gruber and a smaller one on private timber lands held by Weyerhaeuser International. Captures (not to be confused with population estimates) at Camp Gruber fluctuated around a mean of 213 adults between 1992 and 2003 without discernable trend. Captures at Weyerhaeuser had a mean of 52 adults between 1997 and 2003, with no apparent trend. Additional post-listing trend data is unavailable for Oklahoma.

NEBRASKA. The American burying beetle was rediscovered in Nebraska in 1992 [18]. Between 1995 and 1997, nearly 1,000 individuals were trapped or collected in the upland grasslands and cedar tree savannas of the dissected loess hills south of the Platte River in Dawson, Gosper, and Lincoln Counties of Nebraska. The population is estimated at about 3,000 adults.

SOUTH DAKOTA. The American burying beetle was rediscovered in South Dakota in 1995 and is believed to have a statewide population in excess of 500 adults [17].

ARKANSAS. The American burying beetle was rediscovered in Arkansas in 1992 [3]

KANSAS. The American burying beetle was rediscovered in Kansas in 1997 [19].

TEXAS: The American burying beetle, thought to be extirpated from Texas since the 1930s, was rediscovered in 2003 [3]. Two populations are now known to exist, one on a military base, the other on a Nature Conservancy preserve.

The American burying beetle recovery plan states: "The interim objective [extinction avoidance] will be met when the extant eastern and western populations are sufficiently protected and maintained, and when at least two additional self-sustaining populations of 500 or more beetles are established, one in the eastern and one in the western part of the historical range. Reclassification will be considered when (a) 3 populations have been established (or discovered) within each of 4 geographical areas (Northeast, Southeast, Midwest, and the Great Lake states), (b) each population contains 500+ adults, (c) each population is self-sustaining for 5 consecutive years, and, ideally, each primary population contains several satellite populations." It is estimate that, if the recovery criteria are met, reclassification could be initiated as early as 2012.

[1] U.S. Fish and Wildlife Service. 1991. American burying beetle (Nicrophorus americanus) recovery plan. Newton Corner, MA.
[2] Sikes, D.S. 2002. A review of hypotheses of decline of the endangered American burying beetle (Silphidae: Nicrophorus americanus Olivier). Journal of Insect Conservation 6: 103–113
[3] Quinn, M. 2006. American Burying Beetle (ABB). Website (http://www.texasento.net/ABB.htm) accessed January 29, 2006.
[4] Peyton, M.M. 1997. Notes on the range and population size of the American Burying beetle (Nicrophorus americanus) in the dissected hills south of the Platte River in central Nebraska. Paper presented at the 1997 Platte River Basin Ecosystem Symposium, Feb. 18-19, 1997 Kearney Holiday Inn Kearney, Nebraska.
[5] Mckenna-Foster, A.A., M.L. Prospero, L. Perrotti, M. Amaral, W.T. Maple, and R.S. Kennedy. 2005. American burying beetle (Nicrophorus americanus) survey and reintroduction to Nantucket, MA, 2004-2005. Abstract presented at the First Nantucket Biodiversity Initiative Conference, September 24, 2005, Coffin School, Egan Institute of Marine Studies, Nantucket, MA.
[6] Amaral, M. 2005. Personal communication with Michael Amaral, U.S. Fish and Wildlife Service, Concord, NH, November 28, 2005.
[7] Homer, P. 2005. Missouri's Threatened and Endangered Species Accomplishment Report: July 1, 2004 - June 30, 2005. Missouri Department of Conservation.
[8] Raithel, C. 2005. American burying beetle, Southwest Block Island trend, 1991-2005. Spreadsheet provided by Christopher Raithel, Rhode Island Dept of Environmental Management, Rhode Island Division of Fish and Wildlife, November 23, 2005.
[9] Ohio Department of Natural Resources, Division of Wildlife. 2005. American Burying Beetle, Nicrophorus americanus. Website (www.dnr.state.oh.us/wildlife/Resources/projects/beetle/beetle.htm) accessed January 28, 2006.
[10] Ohio Department of Natural Resources, Division of Wildlife. 2004-2005 Wildlife Population Status and Hunting Forecast.
[11] Wayne National Forest. 2004. Schedule of Proposed Action, 10-01/04-12/31/04.
[12] Stevens, J. and B. Merz. American Burying Beetle Survey in Missouri. St. Louis Zoo, Department of Invertebrate. Website (http://biology4.wustl.edu/tyson/projectszoo.html) accessed January 29, 2006.
[13] Dabeck, L. 2006. The American Burying Beetle Recovery Program: Saving nature's most efficient and fascinating recyclers. Roger Williams Park Zoo. Website (www.rogerwilliamsparkzoo.org/conservation/burying%20beetle%20program.cfm) accessed January 29, 2006.
[14] Kozol, A. J. 1990. NICROPHORUS AMERICANUS 1989 laboratory population at Boston University: a report prepared for the U.S. Fish and Wildlife Service. Unpublished report.
[15] Stevens, J. 2005. Conservation of the American burying beetle. CommuniQue, September, 2005:9-10.
[16] U.S. Fish and Wildlife Service. 2006. American Burying Beetle (Nicrophorus americanus). U.S. Fish and Wildlife Service. Website (www.fws.gov/ifw2es/Oklahoma/beetle1.htm) accessed January 29, 2006.
[17] South Dakota Game, Fish and Parks. 2006. The American Burying Beetle in South Dakota. Website

(www.sdgfp.info/Wildlife/Diversity/ABB/abb.htm) accessed January 29, 2006.
[18] Peyton, M.M. 2003. Range and population size of the American burying beetle (Coleoptera:Silphidae) in the Dissected Hills of South-central Nebraska. Great Plains Research 13(1): 127-138
[19] Miller, E.J. and L. McDonald. 1997. Rediscovery of Nicrophorus americanus Olivier (Coleoptera Silphidae) in Kansas. The Coleopterists' Bulletin 5(1):22.
[20] Mckenna-Foster, A., W.T. Maple, and R.S. Kennedy. 2005. American Burying Beetle (Nicrophorus americanus) survey and reintroduction on Nantucket 2005. Unpublished report.
[21] Perrotti, L. 2006. Roger Williams Park Zoo American Burying Beetle Project Statistics. Spreadsheet provided by Lou Perrotti, American Burying Beetle project coordinator, Roger Williams Park Zoo, Providence, RI, February, 2006.

Dwarf wedgemussel

Listed: 3/14/1990
Status since listing: Stable

The dwarf wedgemussel (Alasmidonta heterodon) lives in muddy sand, sand, clay and gravel bottoms in creeks and rivers of various sizes [1]. It requires areas of slow to moderate current, good water quality, and low silt deposition. It formerly occurred in 15 major Atlantic slope drainages from New Brunswick to North Carolina. By 1993, it was known from only 20 locations in eight drainages in New Hampshire, Vermont, Connecticut, New York, Maryland, Virginia and North Carolina. Due to increased survey effort, it was known from over 80 sites as of 2004, but only about 16 were believed to support reproducing populations, while at least 31 were based on observations of fewer than five individuals or solely on spent shells [2]. The rediscoveries have expanded the current state range to include Massachusetts, New Jersey and Pennsylvania.

The species population trend since 1990 can not be quantified due to the absence of systematic surveys, but is believed to be relatively stable overall [3]. The New Hampshire and Vermont populations are stable with hundreds of thousands of individuals in the Connecticut River mainstem in the New Hampshire section; the Massachusetts, Connecticut, New York, New Jersey, and Pennsylvania populations appear to be stable; it is rare and probably declining in Virginia; and declining (e.g. Swift River watershed) or stable (e.g. Tar River) in North Carolina rivers.

[1] U.S. Fish and Wildlife Service. 1993. Dwarf Wedgemussel (Alasmidonta heterodon) Recovery Plan. Hadley, MA.
[2] King, T.L., C.L. Morrison, K.M. Playfoot, M.S. Eackles, S.L. von Oettingen, and W.A. Lellis. 2004.

Chittenango ovate amber snail

Listed: 7/3/1978
Status since listing: Unknown

The Chittenango ovate amber snail (Novisuccinea chittenangoensis) is endemic to the wet, vegetated slopes adjacent to a 167-foot-high waterfall within Chittenango State Park in central New York. When discovered in 1905, it was considered to be "in great abundance" [1]. Sporadic attempts to determine its population size have been attempted since 1972, but have been plagued by differing methodologies, difficulty of accessing the steep, vulnerable habitat, and confusion of the species with N. ovalis, which historically occurred at the site but does so no more [1]. Estimates were typically in the range of 100 to 500 individuals [1]. Systematic surveys began in 2002, yielding the following estimates of 183 (2002), 178

(2003), 680 (2004), and 735 (2005 preliminary) [2, 3]. The population increase is believed to be real [2], but may reflect a population fluctuation rather than a long-term change. Additional survey years are needed to establish a long-term trend. Chittenango Falls has been protected from development since the establishment of Chittenango State Park in 1928 [1]. Prior to the snail placement on the endangered species list, however, habitat trampling by recreationalists was a significant issue [1]. While water quality has been raised as a potential concern, the most immediate threat is the colonization of the site and the river by Succinea sp. B. This exotic was first noticed at the falls in 1984, when its 3,000 individuals already greatly outnumbered the amber snail [1]. It is feared that it will out-compete the amber snail for resources. Efforts to reduce the population by collection have had little to no effect [2]. Attempts to establish captive populations began in 1990, but have not been successful [1]. The last remaining captive snail died in November, 2002.

[1] U.S. Fish and Wildlife Service. 2003. Chittenango ovate amber snail (Novisuccinea chittenangoensis) Recovery Plan, First Revision. Hadley, MA.
[2] Whiteleather, K. 2004. Mark-Release-Recapture Study of the Chittenango Ovate Amber Snail (Novisuccinea chittenangoensis Pillsbury), June-October 2004. Final Report to New York Department of Environmental Conservation Endangered Species Unit.
[3] Whiteleather, K. 2005. Chittenango ovate amber snail 2005 field season report as of September 7, 2005. (http://members.aol.com/whiteleath/COAS_2005/2005_journ11.html).

Jesup's milk-vetch

Listed: 6/5/1987
Status since listing: Stable

Jesup's milk-vetch (Astragalus robbinsii var. jesupii) occurs at three sites along a 15-mile stretch of the Connecticut River in New Hampshire and Vermont. Its habitat is periodically scoured by spring ice flows which remove competing vegetation and deposit fertile silt. The species occupies a small portion of the apparently available and suitable habitat. The annual population size fluctuates dramatically and appears to have been relatively stable since it was listed as an endangered species in 1987.

Sumner Falls is the smallest of the three populations. Six plants plants were present in 1987 [5]. It was relatively stable between 1997 and 2005, with six of the nine years supporting between 100 and 154 plants. The exceptions were low counts in 2000 (42), 2002 (81) and 2003 (7). There was no apparent trend. Jesup's milk-vetch stems are difficult to count because they cluster tightly, leading different observers to vary by as much as 21% [2]. Trend analyses of stem counts must therefore be regarded with caution. Inflorescences counts are more reliable (measured observer difference of 6%), but indicate productivity rather than population size [2].

Hartland Ledge is the second largest population. Less than 75 plants were present in 1987 [5]. It was quite variable between 1997 and 2005, reaching a high of 426 in 2004 and a low of 21 in 2000 [1]. Six of the nine years supported between 94 and 226 plants. The population appeared to trend slightly upward, but likely not significantly.

Jarvis Hill supports the majority of known plants and is the most dynamic of the populations. About 1,000 plants were present in 1987 [5]. Between 1997 and 2004, it reached a high of 1,798 in 2002 and a low of 234 in 1997 [1]. Annual counts did not cluster around the median of 527. The population trended upward.

The U.S. Fish and Wildlife Service 1989 recovery plan set a preliminary recovery goal of establishing or discovering seven new populations of 100-500 plants [3], but no additional populations have been established or discovered since the species was placed on the endangered species list in 1987. Only the

Jarvis Hill population meets the preliminary viability goal of maintaining 100 to 500 plants. The New England Wildflower Society has propagated plants from seed many times, but attempts to transplant seedlings or directly sow seeds were unsuccessful [4]. Augmentation protocols are still in development.

[1] Cairns, S. and H. Herrmann. 2005. 2005 Astragalus robbinsii var. jesupii (Jesup's milk-vetch) Recovery Activities in New Hampshire. Prepared by the New Hampshire Natural Heritage Bureau for the U.S. Fish and Wildlife Service, Hadley, MA.
[2] Cairns, S. 2005. Personal communication with Sara Cairns, New Hampshire Natural Heritage Bureau, December 16, 2005.
[3] U.S. Fish and Wildlife Service. 1989. Jesup's milk-vetch (Astragalus robbinsii var. jesupii) recovery plan. Hadley, MA. 32 pp.
[4] Brumback, W. 2005. Personal communication with William Brumback, Conservation Director, New England Wild Flower Society, December 17, 2005.
[5] U.S. Fish and Wildlife Service. 1987. Determination of Astragalus robbinsii var. jesupii (Jesup's milk-vetch) to be an endangered species. June 5, 1987 (52 FR 21481).

Seabeach amaranth

Listed: 4/7/1993
Status since listing: Increased

The seabeach amaranth (Amaranthus pumilus) is endemic to beaches on the Atlantic coast from Cape Cod, Massachusetts to Kiawah Island along the central South Carolina coast [1]. It occurs on sparsely vegetated overwash flats and fore dunes, often around inlets on accreting barrier island ends. Hurricanes and storms reduce and eliminate populations, but also create new habitat by reducing competing ground cover. They may also aid large-scale dispersal. The amaranth traps sand, initiating dune formation and creating suitable habitat for other plants, such as sea oats and beach grass. Numerous shorebirds, including the least tern (Sterna antillarum), Wilson's plover (Charadrius wilsonia), black skimmer (Rhynchops niger), Caspian tern (Sterna caspia), and the endangered piping plover (Charadrius melodus) and roseate tern (Sterna dougallii dougallii), nest in seabeach amaranth stands [2].

The amaranth formerly occurred in 31 counties in nine states, from Massachusetts to South Carolina [1]. By 1988, it occurred only in North and South Carolina. Its decline was likely caused by beach development, dune stabilization and enhancement projects, off-road vehicles, recreation, exotic species and hurricanes. Severe weather in 1989 and 1990 (Hurricane Hugo, Hurricane Bertha, northeasters) caused the South Carolina population to decline by 90% (1,800 plants in 1988, 188-379 in 1990).* At the same time, 13 populations recolonized Long Island, New York, perhaps carried by the storms. Even with the inclusion of the Long Island populations, the species declined by 76% between 1988 and 1990. Since being placed on the endangered species list, the amaranth has recolonized New Jersey, Delaware, Maryland and Virginia. Annual population counts were not consistently made in South Carolina, but in the other six states, it increased dramatically from 14,899-17,174 in 1993 to 46,108-48,668 in 2004. While the species fluctuated dramatically (well over 100,000 plants in 2000, 2001, 2003 and less than 50,000 in 1999, 2002 and 2004), the trend between 1993 and 2004 was clearly upward.

New Jersey. Extirpated in 1913 [1]; recolonized in 2000 at four sites within Gateway National Recreation Area and several sites on Monmouth County municipal beaches [3]. The latter sites were created by a 1995 beach nourishment project by the Army Corps of Engineers. The 2000 population was 1,039; the 2005 population was 5,795-5,813 [5].

Delaware. Extirpated in 1875 [1]; recolonized in 2000 between the north end of Delaware Seashore State Park and Fenwick Island State Park [6]. The 2000 population of 32 plants grew to 423 in 2002, but

declined to just six in 2005 [6, 7]. Some of the plants were found in protected piping plover nest areas [6]. There was no obvious change in habitat conditions which would explain the dramatic decline; it may reflect a natural population fluctuation [7].

Maryland. The amaranth was first found in 1967 at Assateague Island National Seashore in storm overwash areas, but was extirpated, probably due to failed Park Service dune construction and stabilization efforts in 1973 [1]. Two plants naturally recolonized the seashore in 1998 -- the first sighting of the species between New York and North Carolina in 26 years. With Hurricane Bonnie approaching, the U.S. Park Service and the Maryland Department of Natural Resources removed one of the plants and took cuttings from the other. The cutting did not seed and the wild plant was killed by Bonnie. The captured plant produced thousands of seeds and some 5,400 of their greenhouse-raised offspring were outplanted between 2000 and 2002. The population increased to about 870 in 2001 and 2002, then stabilized at 480-560 plants in 2003-2005 [8].

Virginia. Extirpated in 1973 [1]; recolonized in 2001 with 10 plants, probably dispersers planting at Assateague Island National Seashore [8]. The population fluctuated without apparent trend and was at 30 plants in 2005.

New York. Extirpated about 1960 [1]. Recolonized in 1990 with 331 plants and increased to about 190,500 plants in 2002 before declining to 30,831 in 2004 [9]. Most amaranth sites are within areas symbolically fenced to protect endangered piping plovers.

North Carolina. The North Carolina population fluctuated significantly with lows of 490 (1991), 710 (1999), and 183 (2000) and highs of 29,993 (1992), 38,702 (1995), and 21,966 (2005) [10].

South Carolina. Amaranth populations declined from 1,334 in 1987 to 0 and 4 plants in 1999 and 2000 [1, 10], but the population sizes in 2003 (1,381) and 2004 (2,110) were similar to the 1987 count [11]. The South Carolina Department of Natural Resources transplanted nearly 4,000 seedlings from greenhouses to barrier-island beaches in 2000-2001.

* There are minor discrepancies between reported counts in some years, likely due to a confusion of preliminary and final counts, timing of surveys, etc. [10]. In all such cases we report the data as a range between the different reports. In all such cases, one of the numbers was provided by Dale Suiter of the U.S. Fish and Wildlife Service. The Service is in the process of systematizing the data and subjecting them to statistical analysis.

[1] U.S. Fish and Wildlife Service. 1993. Amaranthus pumlius (Seabeach Amaranth) determined to be threatened. April 7, 1993 (58 FR 18035).
[2] Randall, J. 2002. Bringing back a fugitive - seabeach amaranth. Endangered Species Bulletin, July-August 2002.
[3] Walsh, W. 2000. Regional News & Recovery Updates: Region 5. Endangered Species Bulletin, September, 2000.
[4] U.S. Fish and Wildlife Service.1996. Recovery Plan for Seabeach Amaranth (Amaranthus pumilus) Rafinesque. Atlanta, Georgia.
[5] Staples, J.C. 2005. Personal communication with John C. Staples, U.S. Fish and Wildlife Service, New Jersey Field Office, November 21, 2005.
[6] Pepper, M. 2004. 2004 Amaranthus pumilus (Seabeach amaranth) Survey Results. Unpublished report, Delaware Division of Fish and Wildlife, Natural Heritage and Endangered Species Program.
[7] McAvoy, W. 2005. Personal communication with William McAvoy, Botanist, Delaware Natural Heritage Program, November 7, 2005.
[8] Sturm, M. 2005. Personal communication with Mark Sturm, Assateague Island National Seashore, November 14, 2005.
[9] Young, S. 2005. Amaranthus pumilus Counts on Long Island 1990-2005. New York Natural Heritage

Program Information.
[10] Suiter, D. 2005. Personal communication with Dale Suiter, U.S. Fish and Wildlife Service, Raleigh, NC, December 7, 2005 and February 22, 2006.
[11] Strand, A. 2005. Seabeach Amaranth 2004 census and seed rain estimates. Unpublished report, College of Charleston, Charleston, S.C.

Sandplain gerardia

Listed: 9/7/1988
Status since listing: Increased

The sandplain gerardia (Agalinis acuta) inhabits dry, sandy, poor-nutrient soils in sandplain and serpentine sites in Massachusetts, Rhode Island, Connecticut, New York and Maryland [1]. Its favored growing conditions are native grasslands on sandy loam, loam and loamy sand soils. It requires exposed mineral soil in close proximity to little bluestem and other native grasses, with which it is thought to form hemiparasitic root connections [12]. Most sites are within ten miles of the coast. The taxonomic relationship between A. acuta and the non-endangered A. tenella is unclear. They are morphologically distinct, but chloroplast DNA variation is not significant [11].

Fifty-one populations were known historically (two more than reported in the 1989 federal recovery plan), but only 12 remained when the gerardia was placed on the endangered species list in 1988 (two more than known at that time). Reintroductions increased the number of occupied populations to 22 in 2005. Short-term population trends can be misleading because of the species' capacity for explosive population growth and rapid decline. Populations in all states except Rhode Island grew substantially between 1988 and 2005. Massachusetts, Connecticut and New York populations were stable to moderately increasing between 1988 and the late 1990s, increasing significantly in the late 1990s and early 2000s, growing explosively for one or several years, then rapidly declining in 2004 or 2005. There are indications of a similar pattern in Maryland, but adequate data are not available. The small Rhode Island population fluctuated substantially with an overall stable trend. Cumulatively, the MA, RI, CT and NY populations increased dramatically from means of 4,441 (1988-1993) to 14,069 (1994-1999) to 196,466 (2000-2005).

MASSACHUSETTS. The sandplain gerardia historically occurred in 24 populations on Cape Cod, Nantucket, Martha's Vineyard and a few disjunct populations as far west as Worcester County [1]. Its decline was so complete that it was thought extinct in the state until rediscovered on Cape Cod in 1980. When placed on the endangered species list in 1988, just two populations were known in historic cemeteries in Sandwich and Falmouth [3]. A third population was discovered on Martha's Vineyard in 1994 [3]. Due to intensive management, including scientific research, reintroductions, habitat protection and habitat management, the Massachusetts population grew remarkably. From 1988 (when it was listed as an endangered species) to 1991 it declined from 13,977 plants to 150, steadily increased to 23,161 in 1998, then exploded to about 483,530 in 2004, before declining to about 49,063 in 2005. The 2005 decline is believed to be drought related [4].

The Sandwich population fluctuated greatly, but increased significantly between 1988 (9 plants) and 2005 (2,299) [3]. High points were in 1995 (4,253), 2000 (4,757) and 2003 (3,712). The population only dipped below 1,000 plants twice between 1993 and 2005. The Falmouth population was discovered in 1981 and supported 6,994 plants in 1988. It was augmented with an introduced subpopulation on an adjacent site beginning in 1989. It declined to less than 50 plants in 1991 and 1992, steadily increased to 4,476 in 1999, exploded to 231,600 in 2004, then plummeted to 21,262 in 2005. A third natural population was discovered on Martha's Vineyard in 1994. It increased steadily from 378 in 1994 to 1,315 in 2000, then jumped to over 4,200 in 2002-2004, before declining to 1,309 in 2005.

Three populations were introduced in 1998 and 2000 [3]. The Falmouth population increased steadily from 552 plants in 1998 to 15,000 in 2004, then declined to 1,910 in 2005. One Martha's Vineyard reintroduction increased from five plants in 1998 to 1,092 in 1994. A second Martha's Vineyard reintroduction increased from 23 plants in 2000 to 1,238 in 2003. Prior to these successes, there were "several" failed reintroduction attempts on Nantucket and a "couple" on Martha's Vineyard [4]. Introduced populations, including the Falmouth subpopulation, often made up 40-50% of the total state population in the last decade.

RHODE ISLAND. The sandplain gerardia historically occurred in six populations in Rhode Island, but by 1988 was reduced to just a single population of 56 plants in a historic cemetery [1]. The population fluctuated considerably, but without discernable trend between 1988 and 2005 [5]. A second population of 33 plants was established in 2003 and grew to 241 plants in 2005.

CONNECTICUT. By 1988, the sandplain gerardia was extirpated from the only two known sites in Connecticut [1], but a very small population was discovered in 1990 [6]. It fluctuated between zero and 32 observable plants from 1990 to 2002, then due to better site management, increased to 165 plants in 2004 before declining to 84 in 2005.

NEW YORK. The sandplain gerardia formerly occurred in 17 populations in New York [1]. The Montauk, Long Island population alone was said to have once had "untold millions" of plants [2]. At the time of listing, only six populations remained in New York with a total population of 814 plants [10]. Cumulatively, the populations remained relatively stable until 1997 (approx. 500-2,000 plants), grew substantially through 2002 (7,272 plants), exploded to 83,531 in 2003, and declined to 10,488 in 2005. Reintroductions were attempted at seven locations after 1988. Of these, four were successful with a mean of 96-263 plants. Plants sown at new introduction sites, and at unoccupied locations within existing sites, accounted for 61-94% of total plants in New York 2001-2005.

MARYLAND. Maryland supported two historical gerardia populations, one of which was destroyed by urbanization and highway construction prior to 1988 [4]. At the time of listing, a single population of 150 plants existed at Soldiers Delight Natural Environmental Area within Patapsco Valley State Park. The population has not been augmented, but due to an active program of burning, clearing, mowing and eradication of exotic plants, the Soldiers Delight population increased to 10,000 in 1989 and well over 100,000 "recently" [2]. More detailed annual population estimates are not available, but the population presumably fluctuated significantly between these extremes. The Maryland Department of Natural Resources describes the population as stable or increasing, but cautions that additional monitoring is needed to establish a scientifically defensible trend [8]. A second potential population was discovered at Andrews Air Force Base in 1993 but could not be relocated in 1995 [9]. However, specimens could not be distinguished from A. obtusifolia and A. decemloba and thus may not be the sandplain gerardia.

The 1989 federal recovery plan [1] requires 1) The establishment or discovery of 20 stable, wild populations located throughout the species' historic range. To be "stable," a population must have a continuous five-year geometric average of at least 100 plants. 2) At least 15 of the populations must be on protected lands. 3) There must be proven technology for propagation or seed storage. As of December 2005, 13 populations had a five-
year mean of at least 96 plants.

[1] U.S. Fish and Wildlife Service. 1989. Sandplain gerardia (Agalinis acuta) recovery plan. Newton Corner, MA. 47 pp.
[2] NatureServe. 2005. Central database. NatureServe, Arlington, VA.
[3] Somers, P. 2005. Agalinis acuta data summaries, 1980-2005. Spreadsheets provided by Paul Sommers, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, Westborough, MA, November 2005.

[4] Somers, P. 2005. Personal communication with Paul Somers, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, Westborough, MA, November 17, 2005
[5] Raithel, C. 2005. Personal communication with Christopher Raithel, Rhode Island Division of Fish and Wildlife, Endangered Species Program, Providence, RI, November, 2005.
[6] Murray, N. 2005. Personal communication with Nancy Murray, Connecticut Department of Environmental Protection, Wildlife Division, November 22, 2005.
[7] Thomas, J. 2004. Endangered Plants of Maryland: Sandplain Gerardia. Maryland Department of Natural Resources website (www.dnr.state.md.us/wildlife/rtesandplain.asp) dated 10-25-04.
[8] Tyndall, W. 2005. Personal communication with Wayne Tyndall, Maryland Department of Natural Resources, Annapolis, MD, November 23, 2005.
[9] Davidson, L. 2005. Personal communication with Lynn Davidson, Maryland Department of Natural Resources, Annapolis, MD, November 28, 2005.
[10] Jordan, M. 2005. Agalinis acuta monitoring data, Long Island, New York. Spreadsheet provided by Marilyn Jordan, The Nature Conservancy, Cold Spring Harbor, New York, November, 2005
[11] Neel, M.C. and M.P. Cummings. 2004. Section-level relationships of North American Agalinis (Orobanchaceae) based on DNA sequence analysis of three chloroplast gene regions. BMC Evolutionary Biology 4:15.
[12] Jordan, M. 2006. Personal communication with Marilyn Jordan, The Nature Conservancy, Cold Spring Harbor, NY, February 13, 2006.

Sensitive joint-vetch

Listed: 5/20/1992
Status since listing: Unknown

The sensitive joint-vetch (Aeschynomene virginica), a large annual plant in the bean family, was named for its leaves, which fold slightly when touched [2]. It grows in intertidal zones on the Atlantic coast from New Jersey to North Carolina that are flooded twice daily but are far enough upstream to have nearly fresh or barely brackish water chemistry [3]. Growing sites have bare to sparsely vegetated substrates, including accreting point bars that have not yet been colonized by perennial species, low swales within extensive marshes, or areas where muskrats have eaten most of the vegetation [1]. It is often found in the estuarine meander zone of tidal rivers where sediments transported from upriver settle out and extensive marshes are formed.

Historically, the sensitive joint-vetch was known from New Jersey, Delaware, Pennsylvania, Maryland, Virginia and North Carolina, but no longer found in Delaware or Pennsylvania [2]. Currently, there are 26 known populations, including three in Maryland, one in New Jersey, two in North Carolina, and twenty in Virginia [4]. The species' decline was caused by habitat destruction [1]. Many of the marshes where it occurred historically have been dredged and/or filled and the riverbanks stabilized with bulkheads or riprap [1]. It continues to be threatened by road construction, residential, commercial and industrial development, water pollution, bank erosion, and motor boat traffic [3].

Virginia. Sensitive joint-vetch is most abundant in Virginia, with 20 populations occurring along six rivers [3]. Populations occur on the Potomac, Rappahanock, Mattaponi, Pamunkey, Chickahominy and James rivers [2]. A comprehensive survey conducted in 1987 found an extensive population along approximately 25 miles of the Rappahannock River [4]. Another large population was found along approximately 15 miles of the Mattaponi River and a third large population was documented along a 15-mile stretch of the Pamunkey River [4]. Three smaller populations (<50 individuals) were found along the other three rivers [4]. In 2000, the sensitive joint-vetch was rediscovered at the Colonial Natural History Park where it had last been seen in 1938 [5]. Approximately 15 plants were found near the 1938 site and as of 2004 the population appeared healthy with over 200 plants observed [5]. The expansion of this population could be

due to two seasons of unusually high rainfall, which reduced water salinity [5]. Most remaining Virginia populations occur in areas potentially threatened by proposed water withdrawal projects, filling, erosion, impoundments, and commercial and residential development [4].

Maryland. There are three extant sensitive joint-vetch populations in Maryland [4]. The largest, with over 1,000 individuals, is in the Princess Anne Marshes on Manokin Creek in Somerset County [4]. Population counts surveys in 1991 and 1992 suggested this population was stable [4]. Two other smaller populations were rediscovered in 1994 in Calvert and Prince Georges counties [4].

New Jersey. The only remaining population occurs on the Manumuskin River in Cumberland County [4]. This site is partially located within The Nature Conservancy's Manumuskin River Preserve, and represents one of the few remaining examples of pristine freshwater tidal marsh habitat in the state. It is one of only two joint-vetch sites (the other is in Virginia) across the entire range of the species that is afforded adequate habitat protection [1]. The number of vertical stems counted increased from 229 in 1982 to over 10,000 in 1994 [4]. However, in 1993, Phragmites australis, an invasive plant that had been found near the site had expanded rapidly and could become a problem [4]. The Nature Conservancy has started a program to try to remove this invasive species [3]. This site could also potentially be threatened by a proposed highway (Route 55 extension) and power plant [4].North Carolina. In 1990, sensitive joint-vetch occurred only in two ditches connected to Lake Mattamuskeet in Hyde County [4]. These man-made habitats were thought to be temporary and populations were not considered viable [4]. Surveys conducted in 1985 did not find sensitive joint-vetch at any other historic North Carolina locations [5].

[1] U.S. Fish and Wildlife Service. Species Description: Sensitive Joint-vetch in North Carolina. North Carolina Ecological Services. Website accessed, (http://nc-es.fws.gov/plant/sensjointv.html)
[2] Virginia Department of Conservation and Recreation. 1997. Natural Heritage Resources Fact Sheet: Sensitive joint-vetch Aeschynomene virginica. Website accessed 2/2006 (http://www.dcr.virginia.gov/dnh/fsaevi.pdf)
[3] Center for Plant Conservation. Aeschynomene virginica. National Plant Collection Profile. Website accessed 2/2006. (http://www.centerforplantconservation.org/ASP/CPC_ViewProfile.asp?CPCNum=35)
[4] U.S. Fish and Wildlife Service. 1995. Sensitive Joint-Vetch (Aeschynomene virginica) Recovery Plan. Hadley, Massachusetts. 55 pp.
[5] Rafkind, C.D. and B Blumberg. 2004. Sensitive joint vetch rediscovered at Colonial Natural History Park. Natural Resource Year in Review. (http://www2.nature.nps.gov/YearinReview/03_D.html).

Northern wild monkshood

Listed: 4/26/1978
Status since listing: Stable

The northern wild monkshood (Aconitum noveboracense) is a small, upright perennial herb that occurs in three geographic regions: northeastern Iowa/southwestern Wisconsin, northeastern Ohio, and the Catskill Mountains of New York [1]. It formerly occurred in 27 regions in these four states, but at the time it was placed on the endangered species list in 1978, it was known from only 14 colonies [2]. The species is limited to algific talus slopes (cold air slopes) and moist soil pockets at the bottom of sandstone or limestone cliffs which provide cold microclimates.

Little is known about the requirements for seed germination, but it is thought that a low rate of germination may contribute to its rarity. It is previously threatened by a proposed dam, and is now threatened by road/powerline construction and maintenance, grazing, sinkhole filling, invasive species and logging operations [1].

Numerous populations have been discovered since 1978 and the species is now thought to occur at about 114 locations, with the largest concentrations being in Iowa and Wisconsin [3]. Some populations may be as large as 10,000 individuals. Long-term trends are not well known, but population monitoring since 1992 indicates a generally stable population [4].

[1] U.S. Fish and Wildlife Service. 1983. Northern wild monkshood (Aconitum noveboracense) recovery plan.
[2] U.S. Fish and Wildlife Service. 1978. Determination that 11 Plant Taxa are Endangered Species and 2 Plant Taxa are Threatened Species. U.S. Fish and Wildlife Service. April 26, 1978 (43 FR 17910).
[3] NatureServe. 2005. NatureServe's Central Databases. Arlington, VA. U.S.A
[4] Henry, C. 2005. Personal communication with Cathy Henry, Driftless Area National Wildlife Refuge, October 20, 2005.

American Hart's-tongue fern

Listed: 7/14/1989
Status since listing: Declined

The American Hart's-tongue fern (Asplenium scolopendrium var. americanum) generally grows in steep, sheltered locations on calcium-rich soil of talus slopes with a north to northeast aspect beneath a hardwood tree canopy [1]. Fronds unfurl early in the spring, achieving much of their yearly growth before the overstory leafs out, closing the canopy. The Hart's-tongue fern was placed on the endangered species list in 1989 due to historic declines and threats of continued habitat loss, trampling, and encroachment by the invasive swallow-wort (Cynanchum rossicum) [2]. Disjunct natural populations occur along the Niagara Escarpment in New York, Michigan and Ontario, and in Alabama and Tennessee. An introduced population occurs in New Jersey [2]. The majority of plants occur in Ontario [5]. About 92% of U.S. plants occur in New York [1].

ONTARIO (stable): The great majority of plants and colonies occur in Ontario, Canada [5]. There are 100 historic colonies, of which 72 are thought to still exist, though all 72 have not been recently surveyed. Colony sizes range from several plants to between ten and a hundred thousand. About half of the extant colonies occur on public lands. The Canada population as a whole is believed to be secure and stable.

MICHIGAN (stable?): Seven colonies occur in Mackinac County and one in Chippewa County [4, 6]. Two colonies of several hundred plants each are owned by the Michigan Nature Association. A nearby colony occurs on private land. Four colonies occur on the Hiawatha National Forest. The Chippewa County site was thought to have been extirpated by collectors in 1975, but two immature plants were observed in 1979 and one plant was seen in 1988 and 1992.NEW YORK: (declined). Ninety-two percent of known U.S. plants occur in 17 colonies in Onondaga and Madison counties, New York [1]. One of the colonies, Rock Cut Gorge, appears to be extirpated, as no plants were seen during surveys between 1989 and 2002. The last observation was of four plants in 1988. Counts of mature-plus-
immature plants indicate a decline of 39% between 1993-1995 and 1999, and 25% between 1999 and 2002.

NEW JERSEY (unknown): A population of New York plants was introduced to New Jersey in the 1930s and continues to exist [7].

TENNESSEE (stable): There are two extirpated and one small existing population in Tennessee [3, 4]. The first Tennessee population was discovered in 1849 at the entrance of a cave west of Post Oaks Springs in Roane County but was extirpated by 1900, probably by collectors or accidental trampling by recreationists [3]. A second population at Grassy Cove near Crossville was extirpated, probably by a forest

fire in 1927 or 1928. The sole remaining population was discovered in 1879 in a 30-foot wide, 75-foot long, and 75-foot deep sinkhole near South Pittsburg. The population was estimated at 200 in 1898, 110 in 1900, 58 in 1911, and 26 in 1929. The south slope of the sinkhole is thought to have collapsed between 1911 and 1929, killing a portion or possibly all of the population. Spores from Canadian plants were introduced in about 1929. Six plants were observed in 1930, two in 1934, and 26 in 1935. There were 17 plants in the late 1970s, one or two in 1991, two or three in the late 1990s, and five in 2004. It is not known how many are of native origin. Plants observed in recent years have been stunted and failed to produce spores. Spore production may have occurred in 1994, but has not been documented since the early 1980s.

ALABAMA (declined): There are two existing populations in Alabama. The Fern Cave National Wildlife Refuge population, Jackson County, was estimated at 20 plants in the late 1970s, nine in 1981, four in 1990, three in 1993-1994, and none in 2004 [3, 4]. The Peterson's Pit population, Morgan County, occurs on private land 25 miles away [4]. It was considered vigorous and healthy, with 97 plants in 1981. The population declined to about 50 plants in 1989, 39 in 1990, and 33 in 1993-1994 [3, 4].

PROPAGATION (AL): Spores were collected at the two Alabama sites in 1993-1994, and in 1995, the first plants with fronds were produced from germinated spores collected at the Morgan County site [3]. In 1998, however, a broken irrigation hose flooded the plants in the greenhouse and all were destroyed. In 2004, the Tennessee Division of Natural Heritage contracted with the Center for Research of Endangered Wildlife at the Cincinnati Zoo and Botanical Garden to again research the possibility of spore banking (long-term cold storage of spores using liquid nitrogen) and tissue culture propagation. Spores and leaf-tip tissue were collected from the Morgan County site. The tissue culture propagation using the leaf-tip tissue was not been successful, but the spores showed vigorous germination. Currently they have several immature plants.

PROPAGATION (NY): There has been some success in propagating and transplanting plants from the northern populations in New York [3].

[1] Kelsall, N., C. Hazard and D.J. Leopold. 2004. Influence of climate factors on demographic changes in the New York populations of the federally-listed Phyllitis scolopendrium (L.) Newm. var. americana. Journal of the Torrey Botanical Society
[2] New York Natural Heritage Program. 2005. Online Conservation Guide for Asplenium scolopendrium var. americanum. Available at: (http://acris.nynhp.org/guide.php?id=9819). Accessed December 14, 2005.
[3] Lincicome, D. 2005. The mysterious American Hart's-tongue fern in Tennessee. The Tennessee Conservationist, June, 2005.
[4] U.S. Fish and Wildlife Service. 1993. American Hart’s-tongue Recovery Plan. Atlanta, Georgia. 33 pp.
[5] Austen, M.J.W. 2000. Status Report on the American Hart's-tongue Fern (Asplenium scolopendrium var. americanum (Fern.) Kartesz & Gandhi) in Canada. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. 73 pp.
[6] Penskar, M.R. and P.J. Higman. 2000. Special plant abstract for Asplenium scolopendrium (Hart’s-tongue fern). Michigan Natural Features Inventory, Lansing, MI, updated September, 2000. 3 pp.
[7] New York Natural Heritage Program. 2005. Conservation guide: Hart's-tongue fern. Website (http://acris.nynhp.org/print.php?id=9819) accessed December 17, 2005.

Furbish lousewort

Listed: 4/26/1978
Status since listing: Stable

The furbish lousewort (Pedicularis furbishiae), discovered in 1880, was declared extinct in 1975 (it had not been collected since 1943) [1]. This member of the snapdragon family that occurs only along the St. John River in Maine and adjacent New Brunswick was rediscovered in 1976 during surveys of a stretch of the St. John River where a hydroelectric project was proposed [1]. This led to the furbish louseworts' listing under the endangered species act and the deauthorization of the proposed hydroelectric project (the Dickey-Lincoln School Lakes Hydroelectric Project) that would have resulted in the loss of 40% of the known plants [1].

Along the 140-mile stretch of the St. John River where furbish louseworts occur, they are largely confined to a narrow shrub-dominated transition zone on north-facing riverbanks below undisturbed boreal forest and above a sparsely vegetated, flooded cobble zone [2]. Because these plants are restricted to a narrow zone that is frequently disturbed by ice scour and flooding, populations tend to disappear unpredictably from one location and turn up in others [3]. Considering this variability, populations of furbish lousewort have been relatively stable since their rediscovery.

Extensive censuses were conducted in 1980, 1984 and 1989 [1]. For census purposes, the river was divided into 48 river segments, of which 28 were known to support furbish lousewort populations. The number of flowering plants counted in 1980 was 5,114 [1]. This number rose to 6,889 in 1989 [1]. In looking at the percent change in numbers of flowering stems over these time periods, researchers determined that there was an overall increase of 29% in flowering stems within 23 river segments [1]. These surveys also revealed dramatic fluctuations over time in the distribution of individuals within particular river segments [1]. In 1991, the furbish lousewort population was reduced by more then 50% by a particularly formidable ice scouring event that reshaped large portions of the riverbank [4]. Following this event, 3,065 flowering stems were counted [4]. By 2003, populations had increased to 5,647 flowering stems, but they still have not returned to 1989 levels [4]. The dynamism of the St. John River is both a benefit and a problem for furbish lousewort populations [2]. The lousewort requires disturbances to create habitat by removing competing vegetation [2]. These same disturbance events, however, can cause catastrophic lousewort mortality [2].

No furbish lousewort populations occur on federal land, making protection of this species difficult [1]. There are no prohibitions on the future construction of dams on a long stretch of the St. John River from Big Rapids to Hamlin [1]. Damming the river would not only inundate some populations, but would prevent the ice scour and floods that now shape riverbank vegetation [1]. New Brunswick Power is still considering possible modifications of an existing dam at Grand Falls, as well as the creation of an additional hydropower facility near Morrill, New Brunswick [1]. In addition, records suggest that the spring flows of the St. John River have been increasing since the 1940s [1]. This could result in more severe disturbance events [1]. Increasing flows could be due to accelerated timber harvesting within the watershed leading to increased runoff [1].

[1] U.S. Fish and Wildlife Service. 1991. Revised Furbish Lousewort Recovery Plan. Newton Corner, Massachusetts, 62 pp.
[2] Menges, E.S. 1990. Population Viability Analysis for an endangered plant. Conservation Biology 4(1):52-62.

Dwarf cinquefoil

Listed: 9/17/1980
Status since listing: Increased

Dwarf cinquefoil or Robbins' cinquefoil (Potentilla robbinsiana) is a small perennial member of the rose family endemic to Mt. Washington and Franconia Ridge within the White Mountains National Forest, New Hampshire. When placed on the endangered species list in 1980, only two populations were known, a natural population at Monroe Flats and an introduced population at Camel Patch [1], and the primary threat was recreational impact associated with the Appalachian Trail at Monroe Flats. Monroe Flats was designated as critical habitat. Over-
collection was formerly a threat, but largely controlled by 1980. Three of the four populations were considered viable (i.e. >50 plants) when the species was declared recovered and removed from the endangered species list in 2002.

Monroe Flats: The Appalachian Trail bisected the Monroe Flats population, extirpating the cinquefoil from the west side, severely curtailing it on the east side within eight meters of the trail, and causing an overall population decline of 75%. Population estimates at the 2.5-acre Monroe Flats site prior to the 1970s were not systematic [1]. In 1973, 1,801 plants with a rosette diameter greater than 1.4 cm were counted. Of the same size class, 1,547 plants were present in 1983, but due to active management climbed to 3,368 in 1992 and 4,575 in 1999. Over 14,000 plants in all size classes were estimated in 1999. The population was augmented with propagated plants, but the dramatic increase was primarily achieved by habitat protection efforts carried out by the Appalachian Mountain Club and the U.S. Forest Service: the Appalachian Trail was rerouted out of and around the critical habitat, recreational access was prohibited within critical habitat, and a scree wall and signs were placed along the critical habitat to warn hikers [1, 2]. Compliance with the measures has been 98% successful [1]. Propagation efforts established over 100 new plants at the site [2].

Franconia Ridge (natural): A single plant was rediscovered at the historic Franconia Ridge site in 1984, 18.6 miles west of Monroe Flats [1]. As of 2002, it numbered less than 50 plants growing in crevices on a vertical cliff and was not considered viable. It is believed to be a remnant of a larger population which has been largely extirpated due to recreation-related erosion.Prior to 1980, unsuccessful attempts were made to establish transplanted populations at roughly 20 different sites [1]. In the 1990s, the New England Wild Flower Society, with the help of the Appalachian Mountain Club, U.S. Fish and Wildlife Service and U.S. Forest Service, began a successful propagation program [2].

Franconia Ridge (established): This population was established on Franconia Ridge with transplants in 1988, 1989 and 1996 [1]. It has fluctuated in size, but the number of plants with a rosette diameter greater than 1.4 cm was 331 in 1999, 307 in 2000, and 331 in 2001.

Camel Patch: The species was successfully introduced to Camel Patch prior to listing [1]. It was augmented with an unknown number of plants from the 1980s to 1991, and more systematically from 1999 forward. The population has remained small but stable, with 84 plants in 1984, 87 in 1999, 101 in 2000, and 97 in 2001.

Boot's Spur: Reintroduction efforts began with 160 plants in 1986, but none survived as of 1991 [1]. A second failed attempt was made in 1995. A third attempt was recently initiated using new techniques [3]. As of December 2005, it is too early to tell if the new effort is succeeding.

The Viewing Garden: 19 plants were introduced between 1980 and 1997, but did not become established [1]. A second attempt was recently initiated using new techniques [3]. As of December 2005, it is too early to tell if the new effort is succeeding. The population will likely never be viable but will serve educational purposes.

[1] U.S. Fish and Wildlife Service. 2002. Removal of Potentilla robbinsiana (Robbins' cinquefoil) from the federal list of endangered and threatened plants. U.S. Fish and Wildlife Service, August 27, 2002 (67 FR 54968).
[2] Brumback, W.E., D.M. Weihrauch, and K.D. Kimball. 2004. Propagation and transplanting of an endangered alpine species: Robbins' cinquefoil, Potentilla robbinsiana (Rosaceae). Native Plants Journal 5(1):91-97.
[3] Weihrauch, D. 2005. Personal communication with Doug Weihrauch, ecologist, Appalachian Mountain Club, December 2, 2005.

Leedy's roseroot

Listed: 4/22/1992
Status since listing: Stable

Leedy's roseroot (Sedum integrifolium ssp. leedyi), an isolated subspecies of a more common plant that occurs in the western U.S., is endemic to western New York and southeastern Minnesota [1]. It has waxy leaves and small dark red flowers on tall floral stems [2]. Leedy's roseroot is likely a relict of a Pleistocene flora thought to have ranged across the continent before the last glaciation [1]. The warmer temperatures of post-glaciation climates caused Leedy's roseroot to become rare and unfortunately, human activities have exacerbated this decline by disturbing remaining habitat [3]. This is particularly problematic because the Leedy's roseroot requires extremely specialized cool cliff-side habitat [1]. Only seven populations –4 in Minnesota and 3 in New York- are known to exist [1].

The largest extant population of Leedy's roseroot occurs in New York on cliffs along the western shore of Seneca Lake [1]. This population, called the Glenora Cliff site, appears to have been relatively stable since the 1980s and numbers between 4,000 and 5,000 plants [4]. Another smaller population that probably numbers less than 100 plants [1] is found nearby at Glenora Falls, but is on private land and has not been recently surveyed [4]. A single robust individual plant occurs at Watkins Glen State Park, but was probably introduced to this location [2].

In Minnesota, all populations occur in two counties in the southeastern part of the State [1]. All four Leedy's roseroot sites are in drainages of the Root and Whitewater Rivers [1]. Along these drainages, roseroot sites occur on "maderate" cliffs where cliff-sides are cooled by air from underground passages that exits through cracks in the cliff-face [1]. When surveys were conducted in the early 1990s, each of the 4 sites had between 173 and 748 plants [1].

The primary limiting factor for the Leedy's roseroot is its' specialized habitat [1]. This specialization results in disjunct occurrences and leaves it vulnerable to stochastic events such as rock-slides and erosion [1]. In New York, the roseroot occurs downhill from a number of lakeside homes, and could be adversely affected by vegetation clearing and by pipes and staircases leading to the lakeshore [1]. Off-site influences, such as groundwater contamination and hydrologic alterations can also affect Leedy's roseroot [1] especially at sites where hydrologic changes can affect underground systems associated with the production of cool moist air [3]. The invasion of non-native plant species such as Japanese knotweed and black swallowwort can also adversely affect roseroot populations [4].

[1] U.S. Fish and Wildlife Service. 1998. Sedum integrfolium ssp. leedyi (Leedy's roseroot) Recovery Plan. Ft. Snelling, Minnesota. vi + 31 pp.
[2] U.S. Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Sedum integrifolium ssp. leedyi (Leedy's roseroot). Federal register (57:14649).
[3] Center for Plant Conservation. 2002. Sedum integrifolium ssp. leedyi. National Plant Collection Profile. Website (http://www.centerforplantconservation.org/asp/CPC_ViewProfile.asp?CPCNum=7501) accessed February, 2006.

[4] Young, S. 2006. Personal communication with Steve Young, Program Botanist, New York Natural Heritage Program Albany, NY. January 30, 2006.

Northeastern bulrush

Listed: 5/7/1991
Status since listing: Stable

The northeastern bulrush (Scirpus ancistrochaetus) ranges within the Appalachian Mountains from Vermont and New Hampshire to western Virginia, with most populations occurring in Pennsylvania. It is extirpated from New York and Quebec [3]. It is difficult to determine population trends because the number of observable plants in a population fluctuates widely over time (even going to zero) in response to water levels and competition [1]. When water levels are high (often due to beaver activity), most wetland plants including the bulrush die, but quickly return from seed when water levels decline. The bulrush initially does well as water levels drop, but in a few years is out-competed by other wetland plants. It requires subsequent flooding to begin the cycle again. The number of populations and their ecological integrity is better measure of the species' status than counts of individual plants [1].

NEW HAMPSHIRE: Two populations known as of 1994 [3]. Statewide annual population trends are not available, just minimum counts of fruiting stems at specific sites in specific years [2].

VERMONT: Two populations were known at the time of listing in 1991 [2]. Twenty additional populations were discovered by 2005, due to federal funding and better understanding of the plant's habitat requirements and life history.

MASSACHUSETTS: Only a single site has ever been known in Massachusetts. A specimen was collected in 1928, but the plants were not observed at the site in 1978 or 1982 [5]. Four mature plants in leaf with "very good vigor" were observed in 1989, none in 1991 and 1992, and one clump (probably one genet) in 1993. The population was not visible in 1998, 1999, and 2001, but thought to be possibly declining. Three mature plants were found in 2003, two of which were considered vigorous and one in poor vigor.

MARYLAND: One population was known as of 1994 [3].

PENNSYLVANIA: Fifty-four populations were known as of 1996 [3], most discovered since listing [4].

VIRGINIA: Four populations were known as of 1994 [3].

WEST VIRGINIA: Two populations were known as of 1994 [3].

The overall population trend is thought to be stable, though not well-quantified [1, 3]. There is some discussion about delisting the bulrush or downlisting it to "threatened" status [1]. The idea is supported by some biologists (e.g. Rob Popp, Vermont Department of Fish and Wildlife), but only if adequate long-term protection is established for a sufficient number of populations. It has been asserted that none of the known sites are specifically protected for the species [3], but it is unclear when this assessment was made.

[1] Popp, R. 2006. Personal communication with Rob Popp, Program Botanist, Vermont Department of Fish and Wildlife, January 6, 2006.
[2] Cairns, S. 2006. Personal communication with Sara Cairns, Biologist, New Hampshire Natural Heritage Bureau, Division of Forests & Lands, January, 2006.
[3] NatureServe. 2005. NatureServe central database, Arlington, VA.

[4] Pennsylvania Department of Conservation and Natural Resources. Website. Northeastern Bulrush (Scirpus ancistrochaetus Schuyler). www.dcnr.state.pa.us/wrcf/bulrush.aspx
[5] Pantalano, J. 2006. Personal communication with Jessica Pantalano, Data Manager, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, February 1, 2006.

American chaffseed

Listed: 9/29/1992
Status since listing: Unknown

The American chaffseed (Schwalbea americana) is a hemiparasitic plant (in a monotypic genus) that feeds on the roots of other plants [1]. It formerly occurred at 149 sites from Cape Cod, Massachusetts down the Atlantic Coast (except Rhode Island) and around the Gulf Coast to Texas (except Louisiana and Mississippi). A few inland populations occurred in Massachusetts, New York, Kentucky and Tennessee. The chaffseed is primarily, but not exclusively, a wetland species. It prefers acidic, sandy or peaty soils in open pine flatwoods, longleaf pine/oak sandhills, streamhead pocosins, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and ecotonal areas between peaty wetlands and xeric sandy soils.

Under pressure from residential development, road-building, inappropriate mowing regimes, over-collection and fire suppression, it was reduced to 72 extant and 11 undocumented sites by 1995 [1]. This is considerably more than the 18 sites thought to be extant when the species was listed as endangered in 1992, but still leaves the species much reduced from its historical level and vulnerable to extinction. The sites known as of 1995 were in New Jersey (1), North Carolina (18), South Carolina (42), Georgia (10), and Florida (one). More sites may have been found since 1995.

NEW JERSEY: The chaffseed declined from 19 historical sites to four by the early 1970s to two in 1980. [1]. One of these two sites (The Cape May site) was destroyed by road construction in 1986, leaving a single remaining site in Brendan T. Byrne State Forest (formerly known as "Lebanon State Forest") at a sandy, mowed roadside edge of a pitch pine-dominated, lowland Pine Barrens forest. The population declined during the 1980s due to recreational trampling, collection and inappropriate mowing. In 1993 a management agreement was established between the State Forest, the cranberry grower leasing the site, the county and the New Jersey Office of Natural Lands Management. In accordance with the agreement, vehicle barriers have been erected, the mowing season was changed, and the site is kept open through thinning and mowing of shrubs. These actions appeared to have stabilized the population as of 1995.

NORTH CAROLINA: As of 1995, 17 of the state's 18 extant sites occurred on the U.S. Army's Fort Bragg [1]. Frequent fires ignited by bombing activity reverse brush and tree encroachment, to the benefit of the chaffseed.

SOUTH CAROLINA: As of 1995, 42 of 53 historical sites were known to still exist [1]. The status of most of the remaining 11 is unknown. Ten of the extant sites are on the Francis Marion National Forest, 17 are on private property, one is on South Carolina Heritage property, and eight are of unknown ownership. The U.S. Fish and Wildlife Service believed as of 1995 that all activities on the National Forest were carefully planned to protect the chaffseed. Most of the private land sites are on quail plantations, which are routinely burned to maintain open understories and thus benefit the chaffseed as well.

GEORGIA: Ten of 14 historic sites were considered occupied as of 1995 [1]. Six are located on the Ichauway Plantation, a 28,000-acre private ecological reserve in Baker County. Ichauway is predominantly vegetated with a natural stand of longleaf pine (Pinus palustris). All populations on Ichauway are protected, and four of the populations are being included in a five-year research study on the life history,

seed banks and experimental management. Two sites are located on another private quail plantation in Dougherty County; one of them is included in the Ichauway studies. The remaining two sites are on private lands managed for quail in Baker and Worth counties. It is believed that burning regimes used to maintain quail populations also benefit the chaffseed.

FLORIDA: Eight of ten historical sites were known to be extirpated, and a ninth was suspected extirpated, as of 1995 [1]. The extant occurrence in Leon County is on private property managed for bobwhite quail. The USFWS believed that management practices as of 1995 (e.g. prescribed burning) would maintain the species.

The lack of systematic surveys precludes determination of the species trend between 1992, when it was placed on the endangered species list, and 2005.

[1] U.S. Fish and Wildlife Service. 1995. American Chaffseed (Schwalbea americana) Recovery Plan. Hadley, MA. 62 pp.

Small whorled pogonia

Listed: 9/9/1982
Status since listing: Increased

The small whorled pogonia (Isotria medeoloides) is a rare orchid of relatively open eastern deciduous and coniferous forests [1]. It formerly occurred in 48 counties in 16 states and Canada. When placed on the endangered species list in 1982, it was thought to exist in only 17 counties in 10 states and at one site in Ontario, Canada. By 1985 it was known from 34 sites, by 1991 it was known from 86 sites in 15 states, and by 1993 it was known from 104 sites in 15 states. The 104 sites included 66 in the Appalachian Mountains in New England and northern coastal Massachusetts: Maine (17), New Hampshire (42), Massachusetts (five), Rhode Island (one), Connecticut (10); 13 in the Coastal Plain and Piedmont: New Jersey (three), Delaware (one), Virginia (nine); 18 in the Southern Appalachians: North Carolina (five), South Carolina (four), Georgia (eight), Tennessee (one); and seven disjunct populations: Pennsylvania (three), Ohio (one), Michigan (one), Illinois (one), Ontario (one). In 1993 it was still extirpated from Vermont, New York, Maryland, Missouri and the District of Columbia. Since 1993, additional small populations were discovered in the southern portion of the pogonia's range, and in New Hampshire and Maine [4]. In 1999, a new population was documented for the first time in West Virginia.

As of 1998, plants had not been found at the Ontario site since the sighting of a single individual in 1989 [3].

The 1992 revised recovery plan stated that downlisting to "threatened" status should occur when 25% of the viable populations known as of 1992 are protected, and proportionally distributed throughout the species range [2]. The species was downlisted to threatened in 1994 based on finding that 23% of all sites were viable and protected, and 62% of viable populations were protected [1]. Though quantitative population trend data are lacking, we classify the pogonia as "increased since listing" because the downlisting rule in unambiguous about its status having improved independent of newly discovered populations.

[1] U.S. Fish and Wildlife Service. 1994. Final rule to reclassify the plant Isotria medeoloides (small whorled pogonia) From endangered to threatened. U.S. Fish and Wildlife Service. October 6, 1994 (59 FR 50852-50857).

Eastern prairie white-fringed orchid

Listed: 9/28/1989
Status since listing: Unknown

The eastern prairie white-fringed orchid (Platanthera leucophaea) once occurred from Maine west to southern Ontario and Michigan, southern Wisconsin, southeastern Iowa and south to Oklahoma, Louisiana and Arkansas, east to central Virginia and Pennsylvania [1]. Most populations are concentrated in the southern Great Lakes region in southern Wisconsin, Illinois, Ohio, and southern Lower Michigan. The eastern prairie white-fringed orchid is extirpated from much of its large historic range including Indiana, New Jersey, Pennsylvania, New York and South Dakota, and is very rare throughout its current range [3]. Most of this species' wet prairie habitat has been destroyed due to drainage and conversion to agriculture, fire suppression, and intensive mowing. Because of the destruction of most of the natural grasslands east of the Mississippi River, large populations no longer occur anywhere in the United States (the only population with more than 2000 individuals is in Ontario, Canada). The mostly small, isolated populations that remain are not representative of populations supported by the once-vast prairie habitat, and many are only infrequently visited by appropriate pollinators [3].

The eastern prairie white-fringed orchid was listed as an endangered species in 1989, but significant population trend data since then are not currently available [2]. A rangewide recovery assessment will be conducted in the summer of 2006 and will document population trends in recent decades.

[1] U.S. Fish and Wildlife Service. 1999. Eastern Prairie White-fringed Orchid, Platanthera leucophaea (Nuttall) Lindley Recovery Plan. Fort Snelling, MN.
[2] Bell, T. 2005. Personal communication with Timothy Bell, The Morton Arboretum and Chicago State University, December 2005.
[3] NatureServe. 2005. NatureServe's Central Databases. Arlington, VA. U.S.A.

Knieskern's beaked-rush

Listed: 7/18/1991
Status since listing: Unknown

The Knieskern's beaked-rush (Rhynchospora knieskernii) is a grass-like member of the sedge family endemic to the pinelands region of New Jersey [1]. Historically, two occurrences were documented in Sussex County, Delaware, but despite a decade of yearly searches, no extant populations have been located and the beaked-rush is considered extirpated from the state [1].

Typically, this obligate wetland plant is found in groundwater-influenced habitats created by human disturbances including areas such as the edges of clay, sand, or gravel pits; burrow pits functioning as vernal ponds; ditches; unimproved roads; and near railroads and powerline rights of way [1]. Some populations still occur on bog iron substrates, the beaked-rushes' assumed historical preferred habitat that generally occurs adjacent to slow-moving streams [1, 3]. Periodic disturbance, either natural or human-induced that maintains damp-to-wet sites in an early ecological successional stage are thought to be necessary for the beak-rushes' colonization, maintenance, and recruitment [1, 3].

As of 1997, there were 38 extant populations in New Jersey occurring in Atlantic, Burlington, Camden, Monmouth, and Ocean counties [1]. These populations vary widely in size, with the smallest site containing approximately a dozen plants and the largest population occurring in patches covering more than two acres [4]. Six of the known populations occur on bog-iron or other stream bank substrates considered to be naturally maintained without active management [3]. Because all six sites occur on State

land they are thought to be relatively secure [3]. Surveys for the Knieskern's beaked-rush were conducted in 1984 and 1985 and although during this time period the plant had been reduced due to severe drought, several previously unknown populations were discovered [1, 3]. In 1992, three of the populations surveyed in 1984-85 were revisited and although they were all extant, populations appeared to be less extensive [3]. Because populations of Knieskern's beaked-rush can vary dramatically year to year, however, especially as water levels fluctuate in the wetlands they inhabit, population levels of are difficult to estimate [4].

The beaked-rush is threatened by wetland loss and degradation, agricultural runoff, vegetative succession, off-
road vehicles, trash dumping and roadside grading [1]. Presently, vegetative succession is a major factor threatening Knieskern's beaked-rush with 19 of 38 extant populations currently undergoing vegetative succession that could eliminate these populations [1]. Without periodic intervention to reverse successional trends, these sites will likely become unsuitable for the species in the future [1].

The 1993 federal recovery plan [3] recommends that delisting be initiated when: (1) Nine populations and their habitat are permanently protected, (2) the species is shown to be an efficient colonizer of newly disturbed sites and/or introduction of the species to suitable habitat is proven to be a feasible technique for species maintenance, (3) a post-delisting strategy for monitoring the species' population trends and/or supplementing natural colonization through introductions to suitable habitat is in place, and (4) no evidence of decline in the species' status is seen by 1996.

[1] U.S. Fish and Wildlife Service. 1997. Knieskern's beaked-rush (Rhynchospora knieskernii): Region 5 species account. Website (www.fws.gov/northeast/njfieldoffice/Endangered/Knieskern's_beaked-rush.htm) accessed January 29, 2006.
[2] U.S. Fish and Wildlife Service. 1991. Determination of the plant, Rhynchospora knieskernii (Knieskern's beaked-rush), to be a Threatened Species. U.S. Fish and Wildlife Service. July 18, 1991 (50 FR 32978).
[3] U.S. Fish and Wildlife Service. 1993. Knieskern's Beaked-Rush (Rhynchospora knieskernii) Recovery Plan. Hadley, Massachusetts. 40p.
[4] Center for Plant Conservation. 2002. Rhynchospora knieskernii, National Plant Collection Profile. Website (http://www.centerforplantconservation.org/ASP/CPC_ViewProfile.asp?CPCNum=3751) accessed Feb. 16, 2006.

Swamp-pink

Listed: 9/9/1988
Status since listing: Unknown

The Swamp-pink (Helonias bullata), a member of the lily family, is a rare wetland perennial usually found clustered in moisture-rich areas near evergreen trees. Swamp pink grows in large dense patches creating magnificent displays that are easy to find when it blooms beginning in April or early May [2]. Historically, the swamp pink occurred in eight states in a range extending from Staten Island, New York south to Georgia [3]. Following increased development, logging, and wetland drainage in and near swamp pink habitat, populations began declining and in 1988, the swamp pink was listed as threatened [3].

In 1991, a recovery plan for the swamp pink was released with the intent of protecting remaining occupied sites and initiating regular monitoring [3]. At this time, it was estimated that the swamp pink occurred at 122 sites in New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia [3]. Each of these sites was thought to support a population of a few to several thousand plants [3]. The largest number of sites and the largest populations were in New Jersey where 68 occupied sites were documented [4]. This was down from the 100 sites the state is thought to have once supported [4].

A majority of swamp pink sites occur on private land [3] and many populations are still unprotected from known threats [2]. Even when the land where a population occurs is protected from development, off-site effects caused by development on neighboring lands can pose a severe threat [4]. Some detrimental off-site activities include: water withdrawal for irrigation or crop production, discharge from sewage treatment plants, increased siltation from inadequate control of soil erosion, and the introduction of excess nutrients or chemicals into the water [4]. Although some regulations such as required buffer zones around protected habitat have been implemented to try to prevent these impacts, they may be inadequate (with a buffer of only 150-300ft required in some areas) [1]. In overdeveloped areas, inadequate buffer zones tend to isolate a wetland causing it to become a sink that receives stormwater runoff and pollution from adjacent areas [4]. In addition to human threats, the swamp pink may also be threatened by limited genetic variability due to its mostly asexual reproduction, limited seed dispersal, and limited flowering potential [4].

[1] Citizens United to Protect the Maurice River and Its Tributaries, Inc. Website (http://www.cumauriceriver.org/pages/swmpnk.html) accessed Feb 16, 2006
[2] Center for Plant Conservation. 2002. Helonias bullata, National Plant Collection Profile. Website (http://www.centerforplantconservation.org/ASP/CPC_ViewProfile.asp?CPCNum=2210) accessed Feb. 16, 2006.
[3] U.S. Fish and Wildlife Service. 1991. Swamp Pink (Helonias bullata) Recovery Plan. Newton Corner, Massachusetts. 56 pp.
[4] U.S. Fish and Wildlife Service. 1990. Endangered and Threatened Species of the Southeastern United States (The Red Book). U.S. Fish and Wildlife Service, Region 4, September, 1990. Website (http://www.fws.gov/endangered/i/q/saq54.html) accessed Feb. 16, 2006.

CENTER FOR BIOLOGICAL DIVERSITY

PO Box 710
Tucson, AZ 85702-0710
520.623.5252
www.biologicaldiversity.org