

Chapter 1: Connecticut's Wildlife Distribution and Abundance: Determination of Species of Greatest Conservation Need (GCN)

Wildlife in Connecticut includes all species of mammals, birds, reptiles, amphibians, fish, and invertebrates that are “ferae naturae,” or wild by nature. Connecticut's wildlife is remarkably diverse for a state with a geographic size of only 5,090 square miles (third smallest state in the nation). This diversity is due to the state's range of landscapes, waterscapes, and habitat diversity, from the coastal plain and Long Island Sound in the south to the mountain ranges in the northwest (Dowhan and Craig 1976, Kulik et al. 1984, Klemens 1993, Finch and Stangel 1993, Metzler and Wagner 1998). The state's physiographic gradient and associated regional climatic differences provide a complex ecological framework that supports 84 species of mammals, 335 species of birds, 49 species of reptiles and amphibians, 168 species of fish and an estimated 20,000 species of invertebrates (CT NDDDB 2004, Wagner pers. comm., 2004).

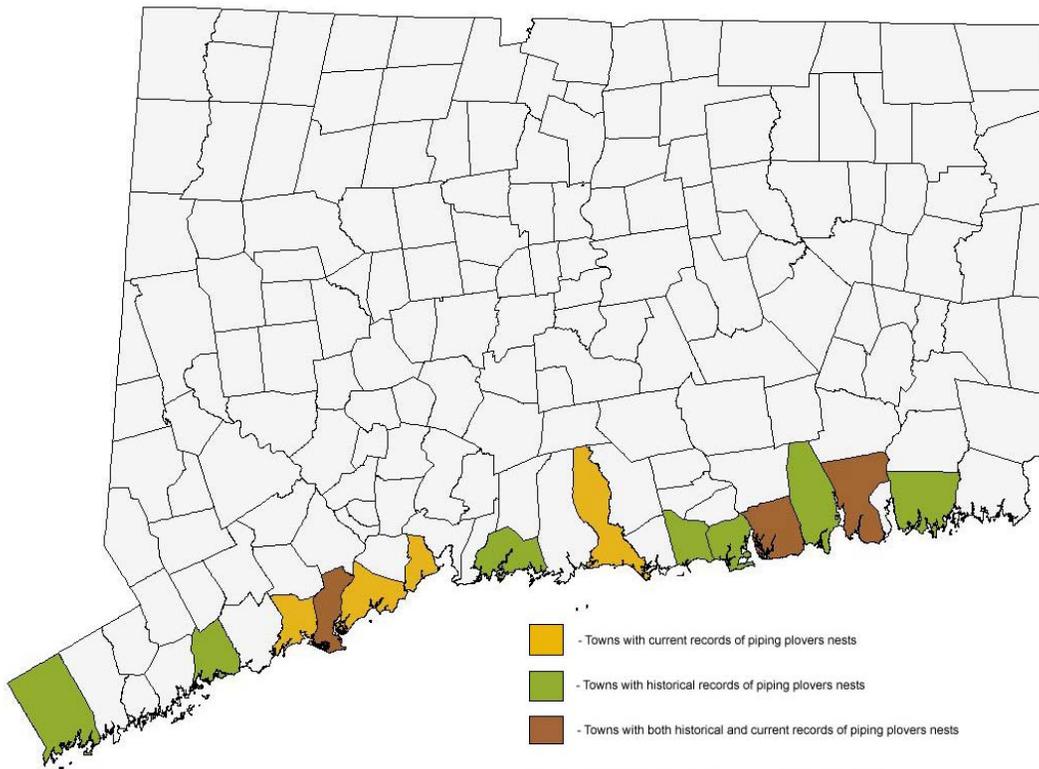
In terms of regional significance, Connecticut supports several species at the northern or southern limit of their ranges. The southeast corner of the state falls within the northern distribution limit of Atlantic and Gulf Coastal Plain species, like the king rail, while coastal Connecticut includes the northern distribution limit for southern Piedmont species, like the least shrew. The northeast and northwest upland areas of Connecticut fall within the southern distribution limit for some northern species, like the northern saw-whet owl and yellow-rumped warbler (Dowhan and Craig 1976, Kulik et al. 1984, Klemens 1993, Finch 1996, Metzler and Wagner 1998, Beers and Davison 1999, Barbour et al. 2003, Hammerson 2004, US EPA LISO 2004). Long Island Sound is near the southern extent of the inshore range of boreal species, such as the longhorn sculpin, rainbow smelt, and American lobster, and near the northern limit for temperate zone species, such as the weakfish and spot.

The state, federal, and global listings and abundance ranks for Connecticut's species are summarized in Table 1.1 by taxon. Each taxonomic group is discussed further in this chapter. A complete list of the best available summary information of wildlife species populations, abundance status, and distribution is provided in Appendix 1b.

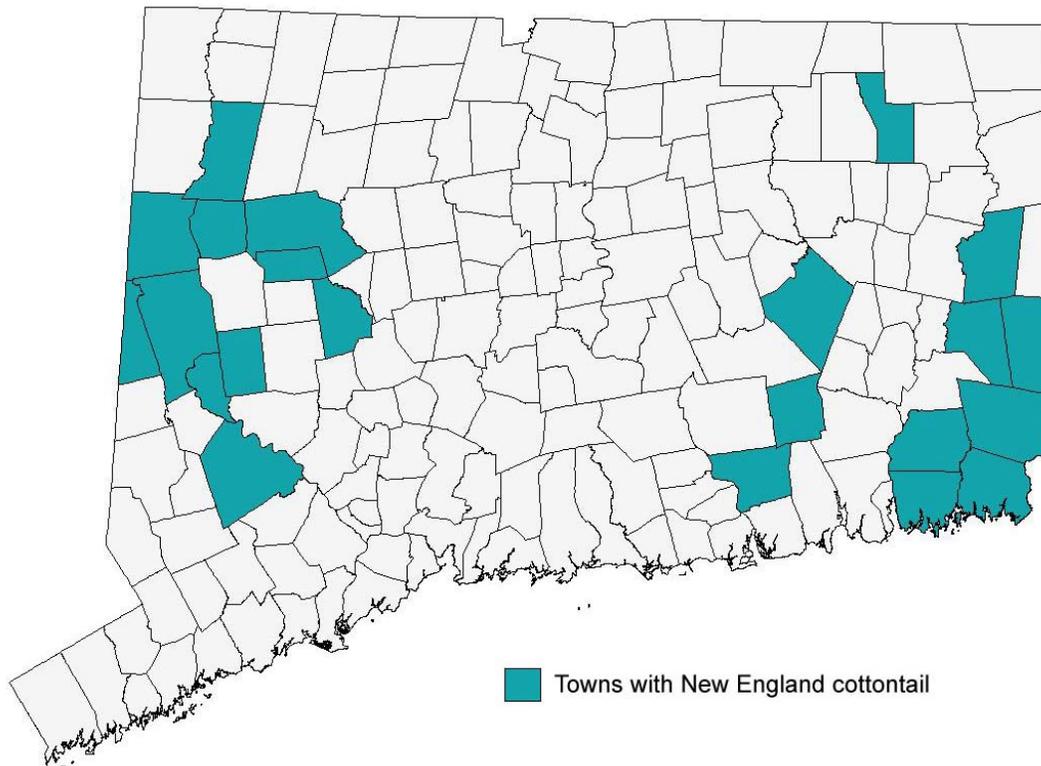
Table 1.1 Status of Wildlife Diversity in Connecticut

Taxa	Species Found in CT	State-Listed	Federally Listed	Imperiled Range-wide
Mammals	84	11	3	1
Birds	335	50	4	0
Reptiles and Amphibians	49	18	5	2
Fish	168	7	1	0
Invertebrates	20,000 estimate	170	4	5
Total	>20,636	256	17	8

The following sections provide background information including distribution and abundance for Connecticut's wildlife broken out by taxa or species groups. The quality of information on distribution and abundance varies greatly. For some species, substantial data exist on distribution and are published in references cited in the text. For example, breeding bird atlas data are presented in Bevier (1994) and occurrence and distribution maps for amphibians and reptiles in Connecticut appear in Klemens (1991, 1993, 2000). Other species have benefited from focused research efforts and have well documented distributions. Two examples include the piping plover and the New England cottontail illustrated below.



Piping plovers are confined to coastal habitats and the distribution and abundance of breeding birds has been monitored for several years. Until recently few data existed on New England cottontails. Since 2000 the Wildlife Division has documented the species in several towns as part of ongoing research to determine its distribution statewide.



For many species, however, data on distribution and abundance are sparse or non-existent (e.g., some birds, small mammals, invertebrates). In these cases, efforts needed to fill these data gaps are identified as priority research/survey needs or conservation actions in Chapter 4.

Mammals

Sources of information for mammals are listed in this section and summarized in Appendix 1a. Appendix 1b lists all mammals and the full array of wildlife known to be present in Connecticut, along with status rank and information on abundance and distribution. All scientific names are listed in Appendix 1b.

Connecticut is home to 84 mammal species, including black bear, deer, eight bat species, and marine mammals along the coast. Linsley (1842), Adams (1896), Goodwin (1935), and Wetzel (1974) provide valuable historical catalogues of the mammalian species of Connecticut. Southern New England Gap Analysis Program (SNE-GAP, Zuckerberg et al., 2004) provides a map of predicted distribution of mammal diversity in southern New England (Figure 1.1, page 1-4). In Connecticut, eleven mammal species are state-listed, three are federally-listed, and one, the Indiana bat, is globally rare. Based upon the evaluation of all available scientific information and expert opinion, seven mammal species are in decline (Table 1.2, page 1-4).

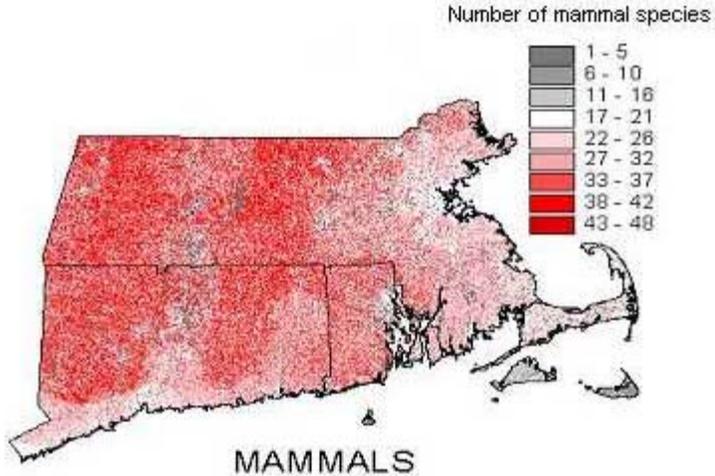


Figure 1.1 Mammal Species Richness and Distribution in Southern New England (Source: SNE-GAP, Zuckerberg et al., 2004)

Table 1.2 Status of Mammals by Subgroup

Subgroup	Federally Listed	State-Listed	G1, G2 Rank	S1-3	NE Rank	Declining population
Bats	1	5	1	2	4	unknown
Furbearers [^]	2	2	0	3	0	2
Small Mammals [^]	0	3	0	5	2	3
Marine Mammals	0	1	0	0	1	2
Ungulates [^]	0	0	0	0	0	0
Total*	3	11	1	10	7	7

*84 mammal species are known to occur in Connecticut; 46 are considered secure. Note: species can have multiple status designations, thus totals are not cumulative. [^] Furbearers are species that were historically or are currently harvested for fur; ungulates are deer and moose; small mammals includes all other species.

Key to above table (and following tables for other taxa):

Global ranks (G ranks; G1, G2) are used by Natural Heritage Program (NHP) programs (in Connecticut DEP Natural Diversity Database [NDDDB]), NatureServe, The Nature Conservancy (TNC) and other conservation groups to indicate the global status of a species. G1 and G2 species are listed to identify the number of globally rare species that exist in Connecticut. State ranks (S ranks) follow the same designation, but apply only within a given state.

G1 = Critically imperiled across its entire range

G2 = Imperiled across its entire range

S1 = Critically imperiled in Connecticut because of extreme rarity (5 or fewer occurrences)

S2 = Imperiled in Connecticut because of rarity (20 or fewer occurrences; steep

population declines; or other factors)

S3 = Uncommon in Connecticut (100 or fewer occurrences; limited range or distribution; or other factors)

State-listed = includes endangered, threatened, and special concern species

Federally listed = includes endangered and threatened species

NE Rank = Identified by the Endangered Species and Wildlife Diversity Technical Committee of the Northeastern Association of Fish and Wildlife Agencies as a species with a declining population, species with a high risk of disappearing from the Northeast, species lacking sufficient data to assess risk, or global responsibility species

Declining population = Scientific information and expert opinion indicate that these species are in decline

The federally endangered eastern cougar and gray wolf, both extirpated in Connecticut over 100 years ago, are addressed in existing recovery plans (USFWS 1982, 1987) which describe status and conservation actions throughout their range.

Bats

In Connecticut, and regionally, populations of bat species, especially tree roosting bats, have declined from historical levels in eastern woodlands (BCI 2001). National outreach efforts since the 1980s have increased public interest in bat conservation, but low reproductive rates and a variety of anthropogenic threats continue to place bats among the most likely to decline toward extinction (North American Bat Conservation Partnership 2004).

The DEP's Wildlife Division conducts research and management on bats in Connecticut. DEP information includes bat mist-netting data (1997-1999, 2001), hibernacula survey data (1997, 1999, 2001, 2003, 2005), and rabies data (1995-2005) (DEP Wildlife Division, unpub. data). The majority of bat species in Connecticut have been identified as rare or of unknown population status (Table 1.2, page 1-4). The Indiana bat, a federally endangered species, has a formal recovery plan that addresses its conservation (USFWS 1999).

Coordinated conservation practices and management guidelines can help stabilize or even increase numbers of many bat species. Ongoing research and implementation of conservation strategies to protect roosting and foraging areas and hibernacula are expected to continually benefit Connecticut's bat populations. Ecosystem-level management practices that maintain forest openings, corridors, and riparian habitats can increase bat abundance and diversity, as well as other wildlife (BCI 2001). The North American Bat Conservation Partnership (2004) recently developed a North American Bat

Conservation Partnership State Planning Guide for Bats that describes priority research, monitoring, survey, and management recommendations nationally.

Furbearers and Other Harvested Mammal Species

By the early 1800s, approximately 75% of Connecticut's landscape had been cleared for agriculture. This drastically affected the historic distribution and abundance of forest-dependent mammals, such as black bear, elk, cougar, white-tailed deer, and wolves. In addition, the unregulated harvest of trees and these mammals also greatly reduced or resulted in the extirpation of other furbearing species, such as beavers and otters (Wharton et al. 2004).

Connecticut's DEP Wildlife Division has several programs that monitor the current status of harvested mammal species, including deer, small game, and furbearers. The Deer Management Program monitors the abundance and distribution of deer and moose in the state and regulates hunting seasons to maintain healthy deer populations within biological and cultural carrying capacity. The Small Game Program monitors abundance and distribution of small game species, such as cottontail rabbits and gray squirrels. The Furbearer Program conducts research and monitors several mammal species, including bears, coyotes, beavers, fishers and raccoons. A few species of furbearers have spotty distribution or declining population trends. Associated management and outreach activities include resolving human-wildlife conflicts that occur frequently in this densely populated state.

Small Mammals

Much of the information on the distribution and abundance of Connecticut's small mammals is historical (Linsley, 1842; Adams, 1896; Goodwin, 1935; Wetzel, 1974). Little current information exists on the majority of these species. Several small mammal species are rare, declining regionally, or of unknown population status. Available information and some expert opinion on the New England cottontail suggest that this species may be in decline; however, additional information is needed to better understand its status.

Marine Mammals

Limited, non-breeding use of Connecticut's near-shore habitats by several species of endangered marine mammals necessitates cooperative efforts among National Oceanic and Atmospheric Administration-National Marine Fisheries Service (NOAA-NMFS), Sea Grant Programs, the U.S. Fish and Wildlife Service (USFWS), and DEP.

The observation of cetaceans in Connecticut's waters is a rare event. Visitors include the beluga, humpback, blue, sei, fin, and sperm whales; the harbor porpoise; the Atlantic white-sided dolphin; and the common dolphin. The harbor porpoise is a state-listed species of special concern and a northeast species of conservation concern (NE ranked). There has been only one known stranding of a harbor porpoise in Connecticut between 1994-2001 (in 1996; NOAA 2003). Another individual washed ashore dead with what appeared to be propeller injuries in early 2005. More research is needed to better understand and map the habitat use of this species along the coast of Connecticut.

A number of pinnipeds also occur commonly in the Sound, including gray and harbor seals, harp seals (winter only), and, rarely, the hooded seal. The harbor seal population is increasing in Connecticut. This species is now common in winter, spring, and fall, but is essentially absent from Connecticut waters during summer. Each of the above mentioned marine mammals has a NOAA stock assessment report. Details on the status, abundance, and distribution of these species are available online at <http://www.nefsc.noaa.gov/nefsc/publications/tm/tm182/>. Management of marine mammals in Connecticut's waters is addressed through existing NOAA-NMFS and USFWS recovery and management plans, in cooperation with DEP Programs and private institutions and organizations, such as Mystic Marine Life Aquarium and the Maritime Aquarium of Norwalk.

Birds

Sources of information for birds are listed in this section and summarized in Appendix 1a. Appendix 1b lists all birds and the full array of wildlife known to be present in Connecticut, along with ranks. All scientific names are listed in Appendix 1b. Appendix 1d lists threats and conservation actions for priority bird species categorized by habitat. Some of the conservation actions in Appendix 1d are species-specific; however, habitat-specific conservation actions will often benefit a suite of species.

There are 335 bird species that occur regularly in Connecticut (COA 2004). Species richness and distribution in Connecticut are shown in Figure 1.2. Species richness for common bird habitat guilds is depicted in Figure 1.3 (page 1-10).

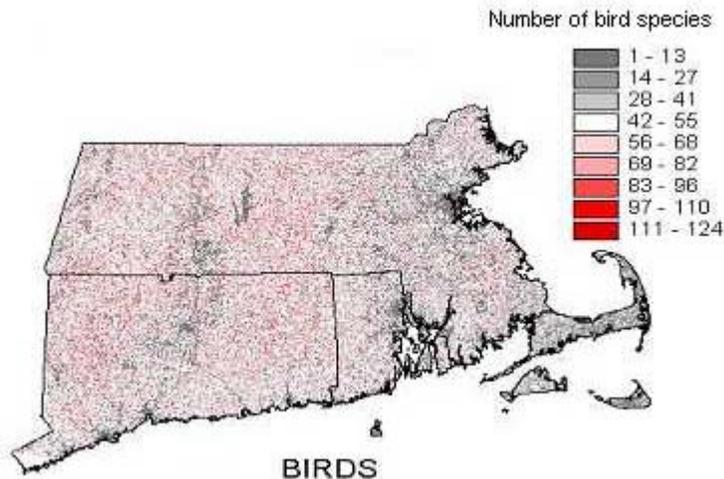


Figure 1.2 Bird Species Richness and Distribution in Southern New England (Source: SNE-GAP, Zuckerberg et al., 2004)

The Atlas of Breeding Birds of Connecticut identified 173 species and two hybrid species that were nesting in the state, with an additional 14 species that exhibited breeding behavior during the 1982-1986 surveys (Bevier 1994). The most current checklist of Connecticut birds, updated annually by the Connecticut Ornithological Association (COA), includes 408 species of birds. This checklist includes species that occur in

Connecticut during migration or the overwintering period, extirpated species, and “accidentals” that occur infrequently. Thus, the total number of species (408) is greater than the 335 species that regularly occur in Connecticut (Table 1.1, page 1-1). Merriam (1877), Sage et al. (1913), and Bevier (1994) have summarized the avian diversity of Connecticut. The Atlas of Breeding Birds of Connecticut provides distribution maps for each of Connecticut’s breeding bird species. Each species account includes information about its migratory or non-migratory status, comparative abundance in the state as a breeder, and wintering areas in the state (Bevier 1994). Though dated, the Atlas is the best source of information on the distribution and abundance of breeding birds in Connecticut.

The status of birds is shown in Table 1.3, organized by American Ornithologists Union (AOU) family groups. To facilitate discussion in this document, birds were grouped into broad categories as follows: grassland birds, migratory landbirds, waterbirds, and upland gamebirds (COA 2004).

Table 1.3 Status of Birds by Family

Family	Federally Listed	State-Listed	G1, G2	S1-S3	NE Rank	Declining
Swans, Geese & Ducks		1		5	1	8
Grouse, Turkeys & Quails						2
Loons		1		1		
Grebes		1		1	1	1
Storm-Petrels						
Gannets						
Pelicans						
Cormorants & Darters				1		
Frigatebirds						
Bitterns & Herons		6		10	1	3
Ibises		1		1		
American Vultures						
Kites, Eagles & Hawks	1	3		6	2	4
Falcons		2		2		1
Rails, Gallinules & Coots		3		6		
Cranes						
Plovers	1	1		1		1
Oystercatchers		1		1		
Stilts & Avocets						
Sandpipers & Phalaropes	1	2		2	2	5
Skuas, Gulls, Terns & Skimmers	1	3		3	3	4
Auks, Murres & Puffins						
Pigeons & Doves						
Cuckoos						2
Owls		4		4	2	4
Goatsuckers		2		2	1	2
Swifts						1
Hummingbirds						

CONNECTICUT'S COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY

Family	Federally Listed	State-Listed	G1, G2	S1-S3	NE Rank	Declining
Kingfishers						1
Woodpeckers		1		1		1
Tyrant Flycatchers		1		1		4
Shrikes					1	1
Vireos						
Jays & Crows		1		1		
Larks		1		1		1
Swallows		1		2		
Chickadees & Titmice						
Nuthatches						
Creepers						1
Wrens		1		2	2	3
Thrushes & their Allies				1	1	3
Mimids		1				1
Pipits						
Waxwings						
Wood-Warblers		3		5	4	11
Tanagers						1
Towhees, Sparrows & Longspurs		7		6	2	8
Cardinals, Grosbeaks & Buntings				1		2
Blackbirds & Orioles		2				4
Finches						1
Total*	4	50	0	67	23	81

*335 avian species are known to occur in Connecticut; 260 are considered secure or not of conservation concern in Connecticut. Note: species can have multiple status designations, thus totals are not cumulative. For families where all rows are blank, all species are considered secure.

Grassland Birds

The status of Connecticut's grassland birds has recently been described in a report prepared by Comins et al. (2003). This report incorporated information collected by the DEP on distribution, abundance, and habitat use by these species statewide. DEP Wildlife Division monitors current status of grassland birds with the use of staff and volunteers statewide. Information about grassland bird abundance and distribution has been obtained annually since 1998 through grassland bird surveys (DEP Wildlife Division, unpub. data). Partners In Flight (PIF) Physiographic Plans (Dettmers and Rosenberg 2000; Rosenberg 2004), USFWS North American Landbird Conservation Plan (NALCP) (Rich et. al 2004), and Region 5 Avian Conservation Summary for Connecticut (USFWS R5 2004) provide detailed status, abundance, and distribution information for grassland birds. These plans also provide population goals, objectives, and threats for grassland birds. Appendix 1d summarizes and integrates all international, national, and regional plans and provides detailed information specific to actions for Connecticut.

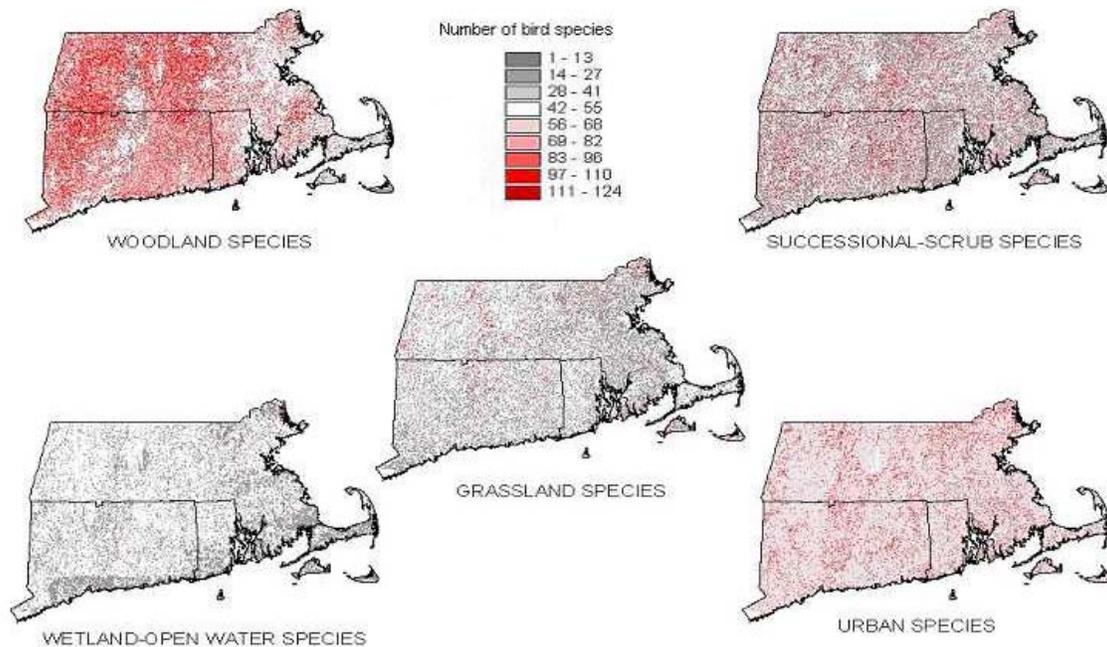


Figure 1.3 Species Richness for Common Bird Habitat Guilds (Source: SNE-GAP, Zuckerberg et al., 2004)

Migratory Landbirds

The decline in abundance and distribution for many migratory landbirds is well documented regionally and globally (Rich et al. 2004). The Northern Forest Avifaunal Biome contains 44 species of continental importance, 29 of which occur in Connecticut. The Eastern Avifaunal Biome contains 38 species of continental importance, of which 30 occur in Connecticut (Rich et al. 2004). Connecticut falls within three PIF Bird Conservation Regions (BCRs): the New England and Mid-Atlantic Coast (#30), the Atlantic Northern Forest (#14), and the Appalachian Mountains (#28) (Figure 2.11, page 2-13). The Physiographic Area 9, Southern New England, and Physiographic Area 27, Northern New England, conservation plans identify conservation issues and opportunities at the planning unit and habitat level. Conservation plans for the three BCRs and two physiographic regions examine the regional status of migratory landbirds. Rosenberg has identified state-level conservation actions from these plans for Connecticut's birds (Hodgman and Rosenberg 2000; Dettmers and Rosenberg 2000). PIF (Rosenberg 2000, 2004), USFWS NALCP (Rich et al. 2004) and Region 5 Avian Conservation Summary for Connecticut (USFWS R5 2004) provide detailed status, abundance, and distribution information, along with population goals, objectives, and threats for priority migratory landbird species. DeGraaf (1979) describes habitat associations for birds in the northeast and provides management recommendations. Appendix 1c describes abundance status, including low and declining populations, and distribution characteristics. Appendix 1d summarizes all international, national, and regional bird plans and provides detailed information specific to actions for Connecticut. It also provides detailed status, rank, and population goals and objectives for migratory landbirds (it can be found at www.rmbo.org/pif/pifdb.html).

The DEP Wildlife Division monitors current populations of certain migratory landbirds. Information about migratory landbird abundance and distribution is collected via:

- Golden-winged warbler surveys (2000-present),
- Migratory bird stopover habitat project (2002-2004),
- Annual midwinter eagle survey (1979-present),
- Bluebird nest box program (1980-present) (DEP Wildlife Division, unpub. data).

Upland Gamebirds

The American woodcock, eastern wild turkey, and ruffed grouse are upland gamebirds for which there are regulated hunting seasons. Information about gamebird abundance and distribution is maintained in several databases (DEP Wildlife Division, unpub. data), including:

- Woodcock surveys (1991-present),
- Turkey harvest surveys,
- Small game harvest surveys
- Ruffed grouse drumming surveys (2005-present).

Waterbirds

There are a variety of plans and partnerships focused on waterbird conservation. PIF (Rosenberg 2000, 2004), USFWS NALCP (Rich et al. 2004), and Region 5 Avian Conservation Summary for Connecticut (USFWS R5 2004) provide detailed status, abundance, and distribution information, along with population goals, objectives, and threats for priority waterbird species.

Connecticut has participated in the development of a variety of regional, national, and international programs and plans, including:

- North American Waterbird Conservation Plan (NAWCP),
- U.S. Shorebird Conservation Plan (USSCP),
- North American Colonial Waterbird Plan (NACWP),
- Waterbird Monitoring Partnership (WMP),
- South Atlantic Migratory Bird Initiative (SAMBI),
- Mid-Atlantic/New England/Maritimes Regional Working Group (MANEM),
- North American Waterfowl Management Plan (NAWMP),
- Atlantic Coast Joint Venture (ACJV), and
- Black Duck Joint Venture (BDJV).

These programs share the best available species abundance and distribution data at regional and state levels, as summarized in Appendix 1d. The ACJV has identified areas of particular importance to migratory waterbirds (Figure 1.4, page 1-12). The MANEM provides distribution maps in Connecticut for various guilds of waterbirds (Figure 1.5, page 1-13).

DEP Wildlife Division monitors current status of waterbirds through various surveys (DEP Wildlife Division, unpub. data):

- Midwinter waterfowl survey (1955-present),
- Waterfowl harvest surveys(1955-present),
- Waterfowl breeding survey (1989-present),
- Banding and recovery data (1955-present),
- Wood duck box productivity (1985-present),
- Wetland callback survey (1993-present),
- Colonial waterbird survey (1979-present) and
- Piping plover and least tern survey (1979-present).

The status and distribution of colonial nesting waterbirds is monitored by the DEP Wildlife Division, USFWS, and other cooperators, such as Connecticut Audubon, every three years. The conservation of the federally threatened piping plover and federally endangered roseate tern are addressed by existing recovery plans (USFWS 1996, 1998).

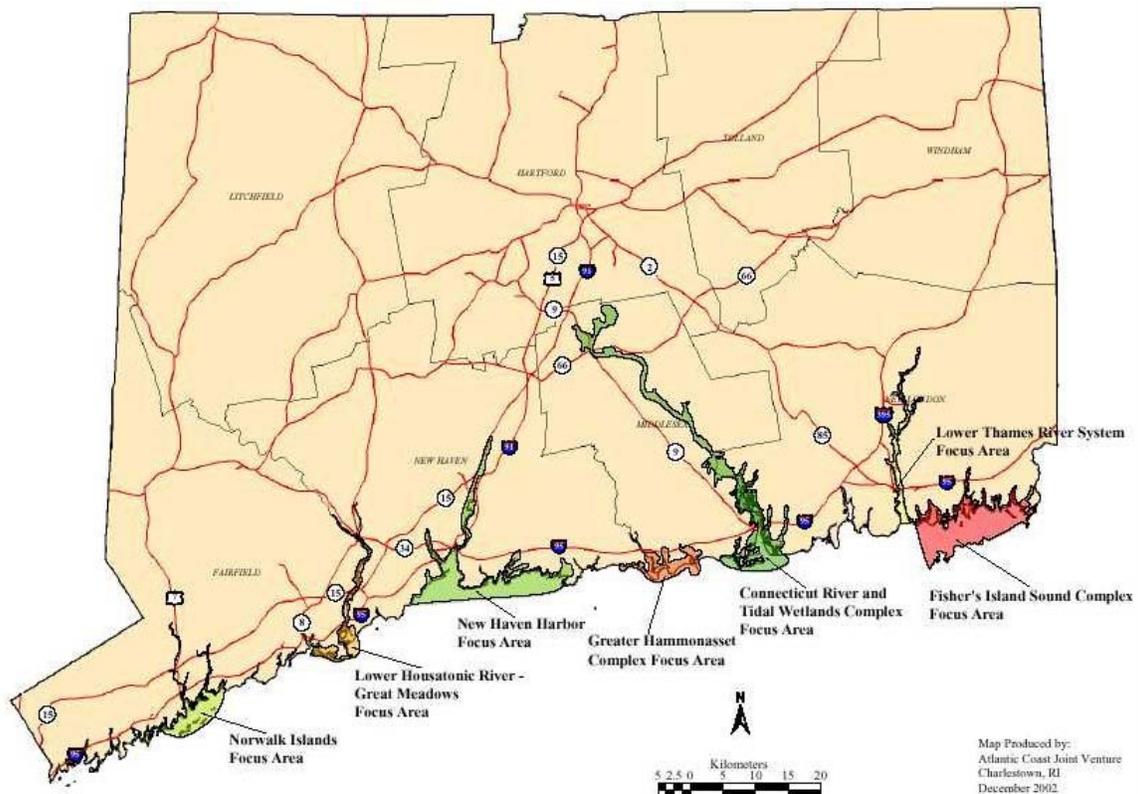


Figure 1.4 ACJV Waterfowl Focus Area Maps (Source: ACJV Plan 2004)

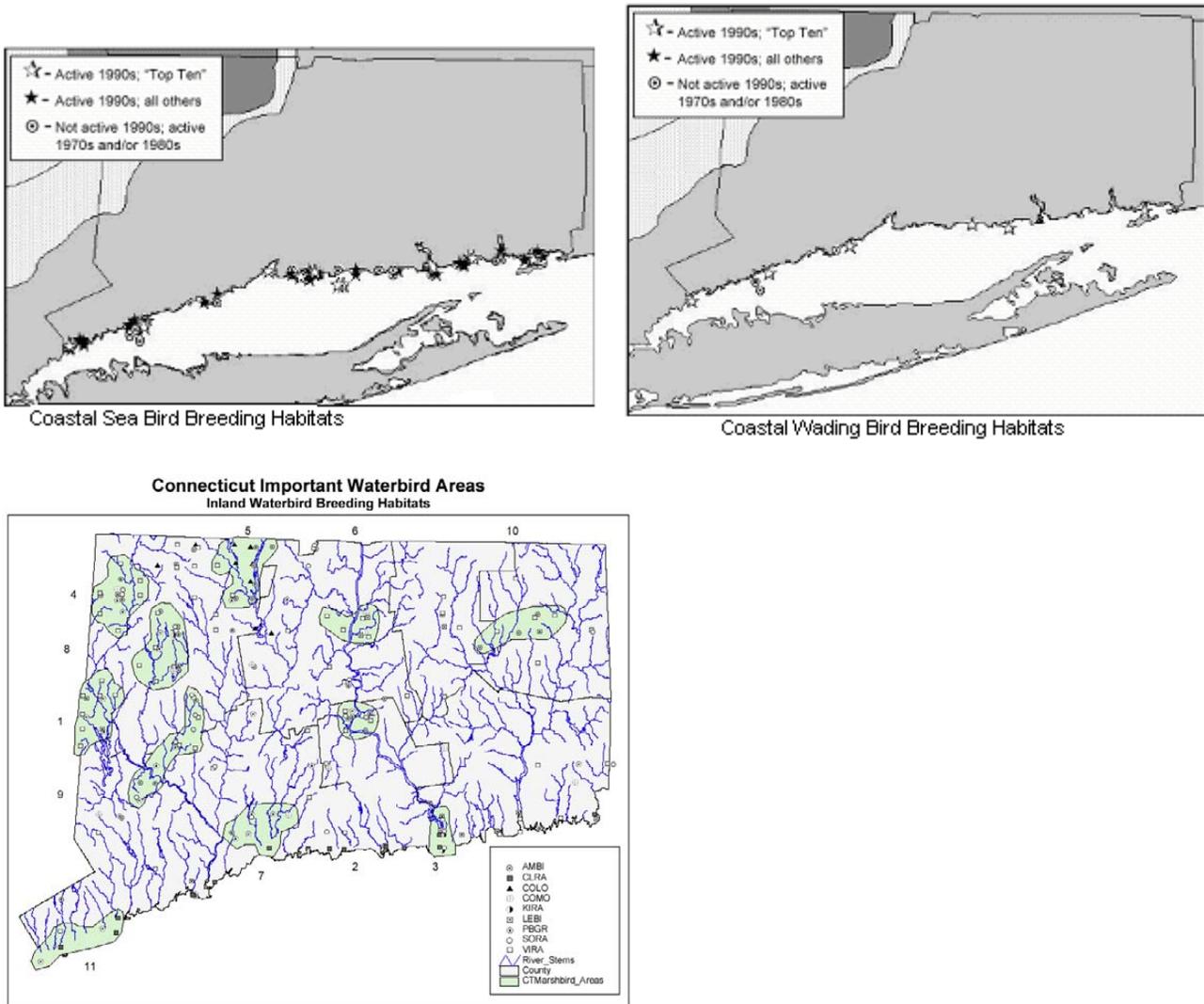


Figure 1.5 MANEM Important Waterbird Areas (Inland Waterbirds, Sea Birds, Wading Birds)
(Source: MANEM 2004)

Important Bird Areas

The National Audubon Society initiated the Important Bird Area (IBA) program in the United States in 1995. IBAs are areas of essential habitat for one or more species of birds. They are usually discrete sites that stand out from the surrounding landscape due to their unique characteristics. In recognition of Connecticut's importance for birds, 15 IBAs have been designated, 13 sites have status pending, 11 sites are currently under review, and 81 additional sites have been identified as potential IBAs (Figure 1.6, page 1-14) (Audubon Connecticut 2004).

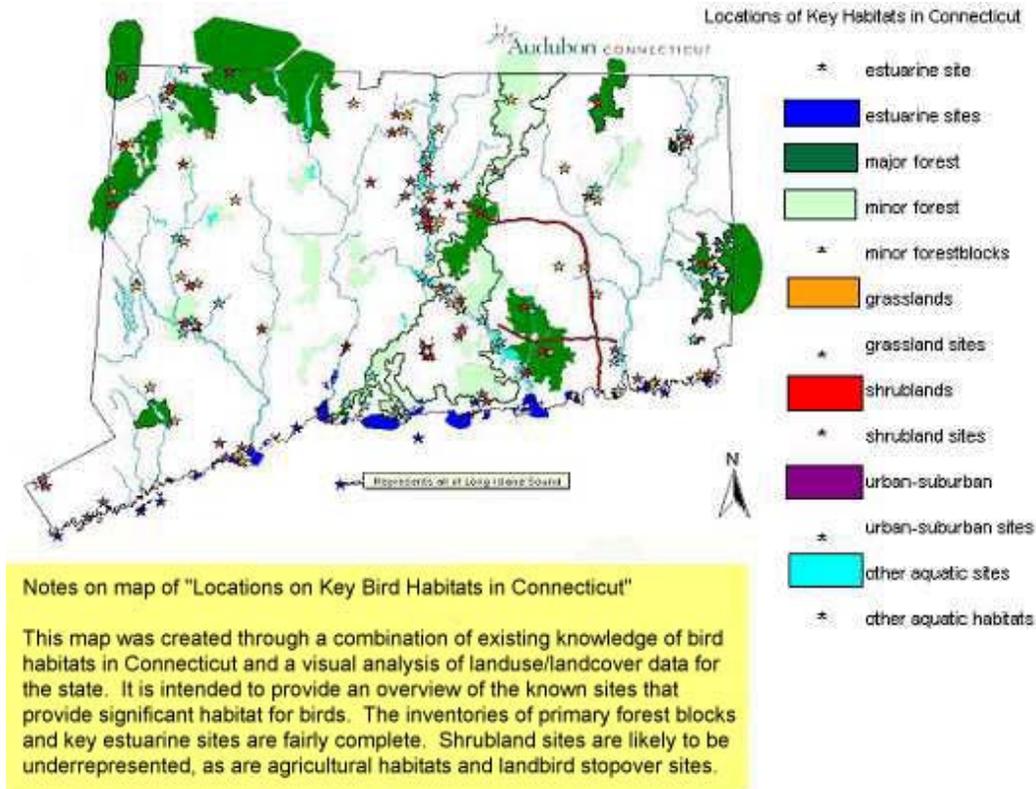


Figure 1.6 Audubon Key Bird Habitats in Connecticut (Source: Audubon Connecticut)

Reptiles and Amphibians (Herpetofauna)

Sources of information for herpetofauna are listed in this section and summarized in Appendix 1a. Appendix 1b lists all herpetofauna, as well as the full array of wildlife currently known to be present in Connecticut, along with status rank and information on abundance and distribution, including low and declining populations. All scientific names are listed in Appendix 1b.

The herpetofauna of Connecticut are diverse and have been thoroughly described by Lamson (1935), Babbitt (1937), Peterson (1970), and Klemens (1991, 1993, and 2000). SNE-GAP analysis provides maps of predicted amphibian and reptile distribution (Figs 1.7, page 1-16 and 1.8, page 1-17). Klemens (1993) provides regional and state occurrence and distribution maps for Connecticut's amphibian and reptile species. He concludes that the biodiversity of Connecticut's reptiles and amphibians is declining and local extirpations are increasing. Gruner and Victoria (2000) provide an overview of the conservation status of Connecticut's amphibians and reptiles. Appendix 1b details population abundance and distribution information according to the most recent literature and expert opinion. Forty-nine reptile and amphibian species are found in Connecticut. Of the 49, 18 are listed by the state as endangered, threatened, or species of special concern. Specific listings of GCN herpetofauna species by subgroup and order are shown in Table 1.4, page 1-15. Global evidence also indicates widespread declines in

reptiles and amphibians. According to all available scientific information and expert opinion, 24 of the 49 herpetofauna species in Connecticut are in decline (Table 1.4).

In general, little quantitative information is currently available to identify the specific problems affecting populations of this taxonomic group (Gibbons et al. 2000), although many experts believe that habitat loss and fragmentation, and road mortality are problems for some species. There is a recognized national and regional need for advocacy focused on conservation of amphibians and reptiles and the use of an ecosystem approach to incorporate herpetofauna species protection into existing management plans (PARC 1999). Additional efforts will be focused on data collection to assess population abundance and distribution and to identify threats so that conservation actions can be developed and implemented.

Table 1.4 Status of Herpetofauna by Subgroup

Subgroup	Federally Listed	State-Listed	G1, G2 Rank	S1-S3	NE Rank	Declining
Salamanders ¹	0	5*	0	5*	2	8
Frogs	0	1	0	1	1	2
Toads	0	1	0	1	1	1
Snakes	0	3	0	5	3	3
Lizards	0	1	0	1	0	1
Turtles	5	7	2	3	4	9
Total*	5	18	2	16	11	24

¹Includes both diploid and hybrid complex populations of blue-spotted salamander.

*49 herpetofaunal species are known to occur in Connecticut; 20 are considered secure or not of conservation concern in Connecticut. Note: species can have multiple status designations, thus totals are not cumulative.

The dispersal ability of many amphibians and reptiles is limited compared to other terrestrial vertebrate taxa. As a result, past fragmentation of habitats likely has resulted in some herpetofaunal populations becoming isolated. This factor continues to affect distribution in the state, as apparently suitable habitat may not be used by species with limited ability to colonize restricted or fragmented habitats (Klemens 1993, 2000).

Amphibians

Amphibians in Connecticut include 12 salamanders and 10 frogs and toads. The predicted distribution of amphibians in Connecticut is shown in Figure 1.7, page 1-16. Many species require both wetland and terrestrial habitats to complete their various life stages. For this reason, juxtaposition and connectivity of habitats are important. Guidelines on habitat conservation of upland buffers around wetlands, including vernal pools, have been developed for a number of species (PARC and NE PARC 2004). Guidelines have been developed for forestry habitat management practices to conserve vernal pools (Calhoun and deMaynadier 2004). Best Development Practices also have been developed for the northeast to conserve pool-breeding amphibians in commercial and residential developments (Calhoun and Klemens 2002). Connecticut's Amphibian Monitoring

Program (CAMP) is a statewide monitoring effort to investigate correlations between amphibian communities and land use. Several amphibian species in Connecticut have been identified as rare, declining, or of unknown population status (Table 1.4, page 1-15).

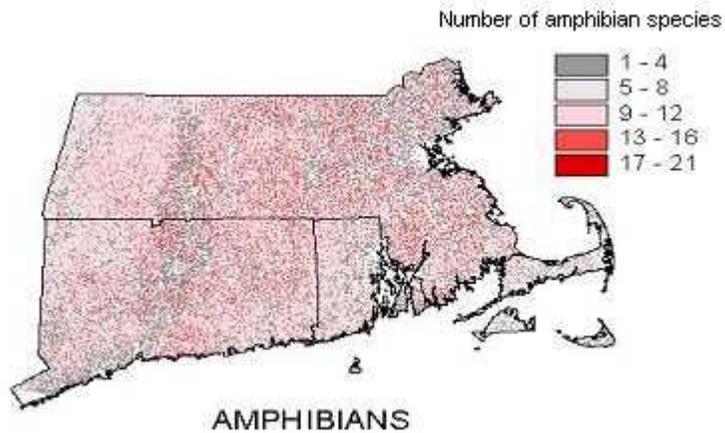


Figure 1.7 Predicted Distribution of Amphibians in Southern New England. (Source: SNE-GAP, Zuckerberg et al., 2004)

Reptiles

Reptiles in Connecticut include 14 snakes (2 that are venomous), 12 turtles (including 4 sea turtles), and 1 lizard. The predicted distribution of reptiles is shown in Figure 1.8 (page 1-17). One venomous snake, the timber rattlesnake, is listed as state endangered. Unfortunately, due to lack of understanding about snakes, human perception of these species is skewed, often resulting in unnecessary killing. Poaching of rattlesnakes also is a concern. The eastern ribbon snake and eastern hog-nosed snake are listed as state species of special concern due to their low population numbers. Habitat loss and urban sprawl are considered the main factors for the decline of these two snake species. Turtle populations are at high risk in developing landscapes due to their extremely low reproductive rates. Several reptile species in Connecticut have been identified as rare, declining, or of unknown population status (Table 1.4, page 1-15). Proportionally, reptiles have the highest number of specially ranked species compared to all other taxonomic groups.

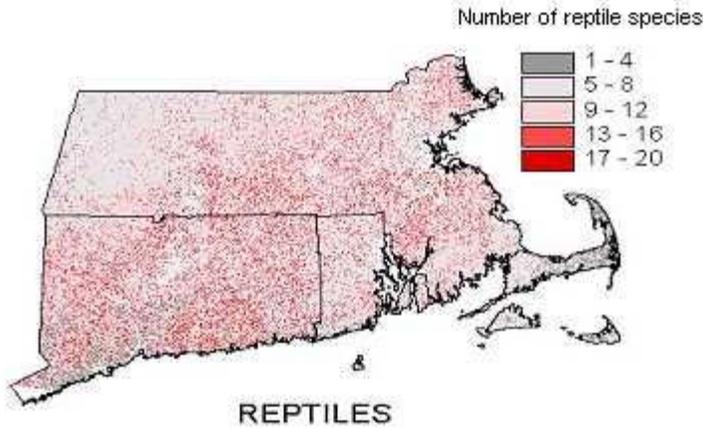


Figure 1.8 Predicted Distribution of Reptiles in Southern New England. (Source: SNE-GAP, Zuckerberg et al., 2004)

Four of the federally and state-listed reptiles are sea turtles. Three of these sea turtles, the Kemp’s ridley, green, and loggerhead, are common visitors to Long Island Sound and its estuaries between May and October. The occurrence of the fourth sea turtle, the leatherback, is an uncommon event. More information about distribution, abundance, migratory movements, and population characteristics is needed for the loggerhead. Conservation of all sea turtles is addressed in federal recovery plans (NMFS and USFWS, 1991, 1992, and 1993). The bog turtle also is federally and state-listed and its recovery plan includes specific actions focused on areas of the Hudson and Housatonic Rivers (USFWS 2001).

Fish

Sources of information for fish are listed in this section and summarized in Appendix 1a. Appendix 1b lists all species of fish and the full array of wildlife presently described in Connecticut, along with rank, abundance, and distribution information. All scientific names are listed in Appendix 1b. A total of 168 species of fish (63 freshwater and diadromous; 105 saltwater) are found in Connecticut’s aquatic habitats, including seven fish species that are state-listed and one that is federally listed. Table 1.5 breaks down these fish species by subgroup.

Table 1.5 Fish Species by Subgroup

Subgroup	Federally Listed	State-Listed	G1, G2 Rank	S1-3	NE Rank	Declining population
Diadromous	1	3	0	7	1	6
Freshwater	0	4	0	8	3	5
Marine	0	0	0	15	0	15
Total*	1	7	0	30	4	26

*168 fish species are known to occur in Connecticut; 119 are considered secure or not of conservation concern in Connecticut. Note: species can have multiple status designations, thus totals are not cumulative.

Diadromous Fish

Diadromous fish species are found in both freshwater and estuarine waters where sufficient freshwater habitat exists below the first barrier (e.g., dam, falls) upstream from Long Island Sound. Diadromous fish migrate between saltwater and freshwater to spawn. Of the nine diadromous species that occur in Connecticut, eight are anadromous (migrate from saltwater to freshwater to spawn) and one, the American eel, is catadromous (migrates from freshwater to saltwater to spawn) (Whitworth 1996).

The presence of dams on Connecticut rivers and streams has substantially reduced the historic range of several fish species, particularly the anadromous species that migrate into freshwater for spawning. As a result, all nine diadromous species are considered to be in need of conservation and several have been identified as declining (Table 1.5 page 1-17). Restoration of migratory routes is underway in many locations through dam removal and the construction of fish ladders. The abundance and distribution of several species, such as American shad and shortnose sturgeon, are being monitored. The DEP Inland and Marine Fisheries Divisions work cooperatively with USFWS, NMFS, ASMFC, Connecticut River Atlantic Salmon Commission, and non-government organizations (NGOs), like the Connecticut River Watershed Council, to manage diadromous fish species and assess the status of their populations (CT DEP 2002).

Freshwater Fish

The abundance and distribution of freshwater fish of Connecticut have been described by Thorpe et al. (1968), and Whitworth (1996). There are 26 (three species are extirpated) naturally-occurring freshwater fish species. Observations indicate that more than 50 non-native freshwater species have been released into Connecticut waters or imported into the state. At least half do not have viable, reproductive populations (Whitworth 1996). The results of the 1988-1994 DEP Fisheries Stream Survey provides considerable data on the abundance, status, and distribution of stream fish species (Figure 1.9, page 1-19). Of the 26 naturally-occurring species, 13 are considered to be in need of conservation, four are state-listed, eight are state-ranked, three are regionally ranked, and, according to all available scientific information and expert opinion, at least five, such as the slimy sculpin, are in decline (Table 1.5, page 1-17).

The Rivers Alliance of Connecticut conducted a statewide assessment of rivers and evaluated the diversity of fish and aquatic species and the quality of Connecticut's riverine habitat (CT Rivers Alliance 1993). Studies of several watersheds, such as the Farmington, Eightmile, Pawcatuck, and Quinebaug-Shetucket, provide additional natural resource assessments of wildlife and habitat within these watersheds (Appendix 1a).

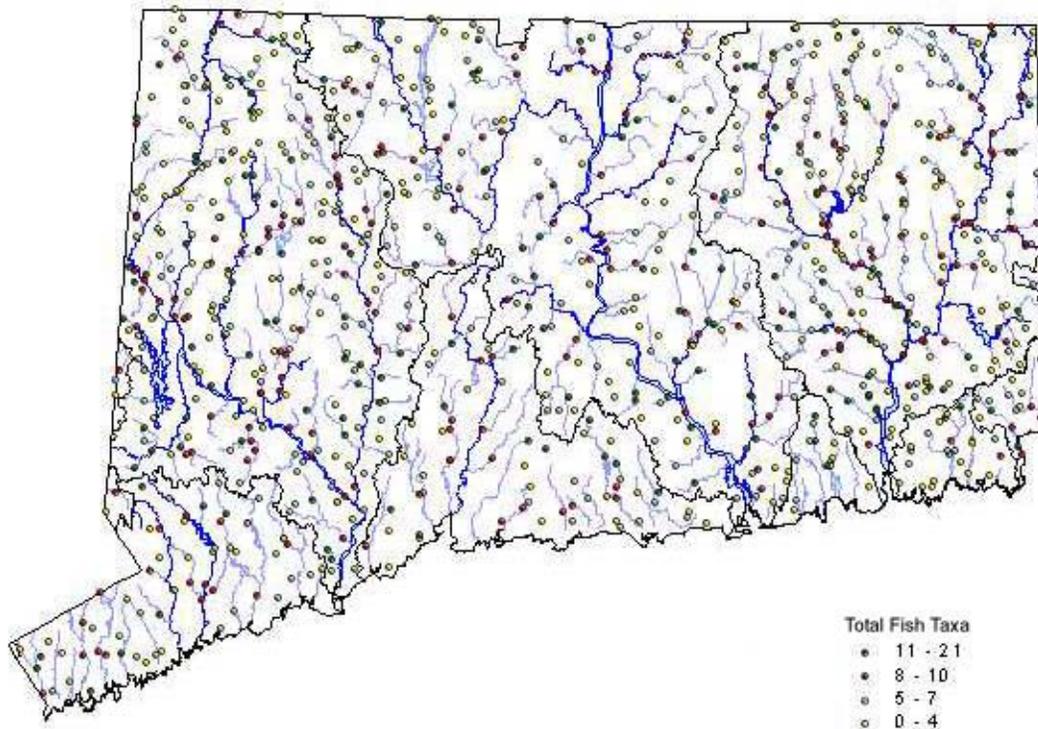


Figure 1.9 Total Number of Fish Species per Site (Source: CT DEP Stream Survey 1988-94)

Marine Fish

The distribution and abundance of saltwater fish in Connecticut have been described by Whitworth (1996) and Thomson et al. (1971). They identified 105 saltwater fish species that occur regularly in Connecticut waters. Of these, 42 are considered to be in need of conservation, 15 are state-ranked, and, according to all available scientific information and expert opinion, 15 marine species are in decline (Table 1.5, page 1-17). At least 50 marine fish species spawn in Long Island Sound and 120 species, including about 20 tropical species, enter the Sound seasonally (US EPA LIS 2004). Blake and Smith (1984) outlined the existing Marine Resources Management Plan for marine fisheries in Connecticut. The DEP Marine Fisheries Division annually conducts the Long Island Sound trawl survey to measure the abundance and distribution of important finfish. This survey is independent of harvest data collected by the Division. These data are used to evaluate fish stock health to guide effective management strategies (CT DEP 2004b). NMFS implements fishery management plans developed by the New England Fishery Management Council, of which Connecticut is a participating state. The Atlantic States Marine Fisheries Commission (ASMFC) develops fishery management plans for commercially and recreationally important migratory or shared fishery species occurring in the state waters (ASMFC 1997, 1998a-c, 2001, 2002a-d; MAFMC 1977, 1983, 1984, 1988; NEFMC 1999, 2003a-h). Connecticut is a statutorily-authorized member state of the commission. A list of these plans can be found in Appendix 1a.

Invertebrates

Information sources for invertebrates are identified in this section and summarized in Appendix 1a. Appendix 1b lists all invertebrate species for which information is available and the full array of wildlife presently described in Connecticut, including status rank, abundance, and distribution information. All scientific names are listed in Appendix 1b.

The invertebrate fauna of Connecticut is incredibly diverse. Taxon include freshwater mussels, gastropods and crustaceans; dragonflies and damselflies; butterflies and moths; benthic marine mollusks and crustaceans; and numerous others. Many of these fauna are rare. One hundred and seventy species are state-listed as endangered, threatened, or species of special concern. In addition, the DEP Marine Fisheries Division has identified 26 marine invertebrates as GCN species. It is estimated that there are at least an additional 20,000 species of invertebrates for which there exists little to no information on abundance or distribution (Wagner, University of Connecticut, pers. comm., 2004). The status of invertebrates is listed in Table 1.6.

Table 1.6 Invertebrates by Subgroup

Subgroup	Federally Listed	State-Listed	G1, G2	S1-3	NE Rank	Declining population
Burying Beetle	1	1	1	0	0	0
Butterfly	0	14	0	9	0	5
Crustacean	0	5	0	2	0	1
Damselfly	0	5	0	5	0	1
Dragonfly	0	13	0	12	0	0
Freshwater Mussel	1	6	1	4	4	1
Ground Beetle	0	32	0	2	0	6
Horseshoe Crab	0	0	0	1	0	1
Lacewings and Others	0	2	0	0	0	0
Mayfly	0	6	0	0	0	0
Moth	1	47	0	20	0	3
Plant Bug	0	1	0	0	0	1
Rove Beetle	0	1	0	0	0	0
Shellfish	0	0	0	2	0	1
Skipper	0	8	0	5	0	4
Snail	0	8	0	7	0	2
Soldier Fly	0	1	0	0	0	0
Spider	0	1	0	0	0	0
Squid	0	0	0	0	0	0
Starfish	0	0	0	0	0	0
Syrphid Fly	0	1	0	0	0	0
Tabanid Fly	0	10	0	2	0	0
Tiger Beetle	2	8	1	5	0	0
Total*	5	170	3	76	4	26

*Over 20,000 invertebrate species are estimated to occur in Connecticut. Note: species can have multiple status designations, thus totals are not cumulative.

The paucity of invertebrate information highlights the need for additional surveys and monitoring programs to provide meaningful data to guide species-specific conservation actions (M. C. Thomas, Connecticut Agricultural Experiment Station, pers. comm., 2004).

Nationwide, invertebrates are underrepresented on lists of rare species. Therefore, many scientists support an ecosystem-level approach to provide conservation for invertebrates. Eventually, better population data would allow species-focused actions to be incorporated into management plans to protect specific species (Black et al. 2001).

Freshwater Benthic Invertebrates

Data from the Rotating Basin Survey undertaken by DEP Bureau of Water Management provide information on the distribution of riffle-dwelling benthic macroinvertebrates at the community level (Figure 1.10). The abundance and distribution of these macroinvertebrates serve as barometers of environmental health of rivers and streams. For example, the presence of three pollution sensitive orders of riffle-dwelling macroinvertebrates - Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) - indicates high water quality (CT DEP 2004a). Water Quality Index figures for Ephemeroptera-Plecoptera-Trichoptera (EPT) are detailed in Chapter 4.

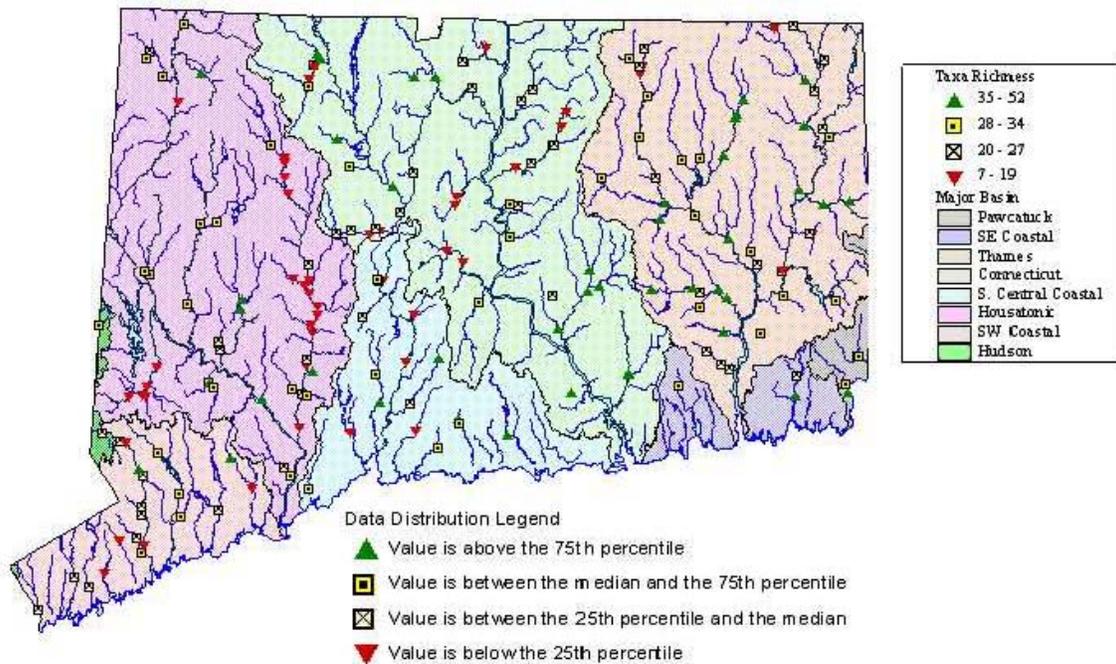


Figure 1.10. Distribution of Benthic Macroinvertebrates in Connecticut (Source: CT DEP BWM Rotating Basin Strategy)

The aquatic insects of Connecticut rely upon healthy riparian and wetland habitats throughout their life histories. Bog and calcareous wetlands of the northwest highlands are important habitats to Odonate (dragonfly and damselfly) species (M. C. Thomas,

Connecticut Agricultural Experiment Station, and D.L. Wagner, University of Connecticut, pers. com., 2004).

At least 22% of the dragonflies and damselflies of this state can be regarded as rare. Demographic surveys are needed for these species to identify both larval aquatic and adult feeding and maturation habitat requirements (M. C. Thomas, Connecticut Agricultural Experiment Station, and D.L. Wagner, University of Connecticut, pers. com., 2004).

Freshwater Shellfish

The *Field Guide to the Freshwater Mussels of Connecticut* provides state range distribution maps for each of Connecticut's mussel species. The guide includes key identification features, habitat, and conservation status (CT DEP 2003a). Figure 1.11 illustrates the known sites for state-listed freshwater mussels in Connecticut. Nationally and regionally, many freshwater mussel species are in danger of extinction (Williams et al. 1993). Half of Connecticut's 12 native freshwater mussel species are state-listed due to their rarity and one, the yellow lampmussel, is thought to be extirpated (CT DEP 2003a). Survey data and long-term monitoring research are needed to determine the distribution and abundance of these freshwater mussel species. Baseline population and life history information also are needed to determine appropriate conservation actions. The status of the state and federally endangered dwarf wedge mussel is addressed by its current recovery plan (USFWS 1993).

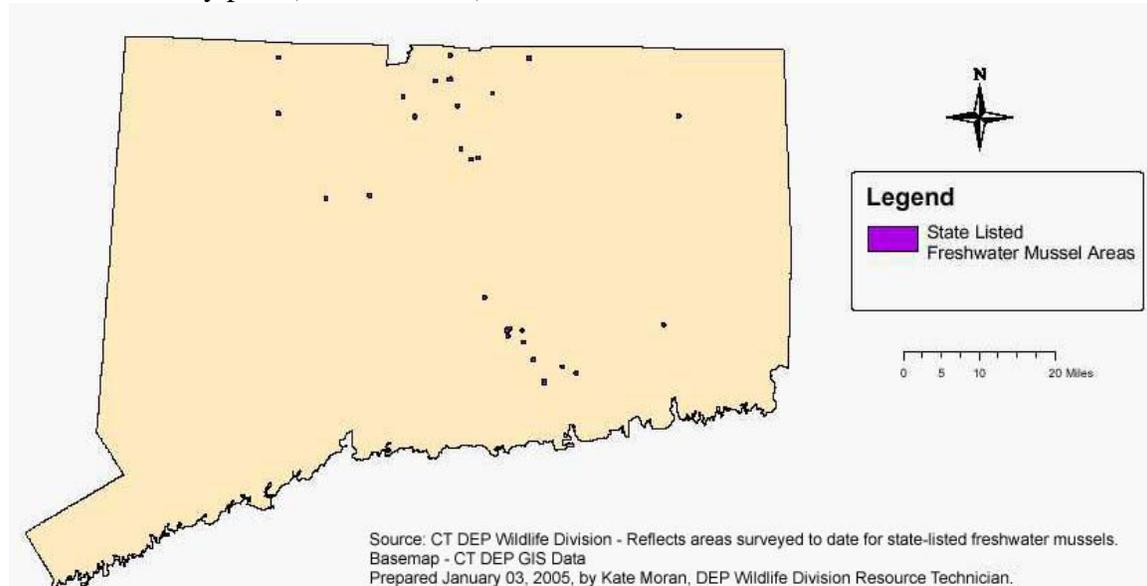


Figure 1.11 Sites for State-listed Freshwater Mussels in Connecticut (Source: CT DEP Wildlife Division, 2005 unpublished data)

Information on the status of knowledge of Connecticut's freshwater snails was reported by Jokinen (1983) but significant research is needed to accurately determine the abundance and distribution of this taxon.

Butterflies, Moths, and Bees

Efforts to map the distribution of Connecticut's 120 butterfly species are being undertaken through the Connecticut Butterfly Atlas Project (www.dep.state.ct.us/cgnhs/nddb/bfly.htm). Many of the state's butterflies have specific host plants. In general, these species are in decline as their required habitat continues to be lost or altered by development (Wagner et al. 2003; Rogers-Castro, DEP Wildlife Division, pers. comm. 2004).

Many specialized butterflies, such as northern metalmark, Harris' checkerspot, Acadian hairstreak, bronze copper, and falcate orange-tip, require very specific habitats (Rogers-Castro, DEP Wildlife Division, pers. comm. 2004). Conservation efforts focused on these specialists also will benefit generalist butterfly and moth species (Swengel 1998). Native bees, that are important pollinators, also would benefit from management efforts and native plantings targeting these focal butterfly species (Rogers-Castro, DEP Wildlife Division, pers. comm. 2004; Gall, et al, in press).

Endangered Tiger Beetles

The endangered tiger beetles are highly dependent upon specific habitats and can only be found in a few locations in the state. Recent research has identified a population of the Puritan tiger beetle along the Connecticut River in Middlesex County. Research, monitoring, and survey actions are on-going in accordance with the federal recovery plan (USFWS Puritan Tiger Beetle Recovery Plan 1993) and may reveal other sites along the Connecticut River that may prove to be suitable for reintroduction.

Marine Invertebrates and Shellfish

Marine invertebrates of interest for commercial or recreational harvest, such as lobsters, blue crabs, and horseshoe crabs, are managed by the DEP Marine Fisheries Division. Molluscan shellfish, such as oysters and clams, and conch are managed by the Connecticut Department of Agriculture's Aquaculture Bureau. There is a need to assess abundance and distribution of other, non-harvested benthic marine macroinvertebrates. As with other invertebrate species discussed above, a broad habitat approach will be necessary to start this process, as baseline information is lacking.

Species of Greatest Conservation Need (GCN)

The process used to select species in greatest conservation need (GCN) involved the collection, compilation, and evaluation of data from a variety of sources. Data sources included numerous state, regional, and national ranking systems that prioritize or rank species for various wildlife taxa including:

- Federal (USFWS and NOAA-NMFS) Official Threatened and Endangered Species lists,
- State (DEP) Official Threatened and Endangered Species lists,
- Environmental and Geographical Information Center (EGIC) Natural History Survey,
- Natural Diversity Database (NDDB) rare and tracked species,

- Environmental Protection Agency (EPA) and DEP - Resource Protection Areas (CT DEP 1997),
- Dowhan and Craig (1976) - listing of rare species and habitats,
- Special Projects, including Farmington Valley Biodiversity Project and the Green Valley Institute (GVI),
- Connecticut Rivers Assessment (1997),
- Water Bureau - Water Quality Assessment and 305B reports (CT DEP 2004a),
- TNC - ecoregional target species,
- USFWS - Threatened and Endangered Plans (USFWS 1993 - 2001),
- PIF - bird plan priority species (Rosenberg 2004),
- USFWS - Comprehensive Conservation Plans,
- Metzler and Wagner's 13 Most Imperiled Ecosystems (1998), and
- Northeast Endangered Species & Wildlife Diversity Technical Committee Regional Species of Conservation Concern list (NEES & WDTC draft)

In addition, quantitative and qualitative input were obtained from DEP staff and stakeholders, including:

- Wildlife Division,
- Inland Fisheries Division,
- Marine Fisheries Division,
- Office of Long Island Sound Programs,
- Environmental and Geographic Information Center,
- Watershed coordinators,
- Universities,
- Nonprofit organizations,
- State and federal agency partners,
- Tribal Nations, and
- Scientific experts

Connecticut's Endangered Species Act Scientific Advisory Committees (ESSAC), (six taxon committees comprising 50 recognized wildlife experts from academia, conservation stakeholder groups, and state agencies) were asked to provide information on status, abundance, distribution, and habitat associations. Their input, along with the contributions of DEP staff and other stakeholders, was used to guide development of the database for GCN species. Appendices 7b and 8b provide additional information on Connecticut's input.

All available information from a variety of existing plans and partner programs (Appendix 1a and 1e) and a survey of expert opinion (ESSAC) were used to characterize species rank, status, abundance, and habitat information. Existing designations, including the IAFWA recommended criteria (Table 1.7, page 1-25), were used to develop an initial list of Connecticut's species of Greatest Conservation Need (GCN). Three qualitative categories (most important, very important, and important) were used to highlight the relative ranking of GCN species with "most important" species being in the most urgent need of conservation efforts. The initial GCN list was provided to experts and interested

stakeholders for refinement and confirmation. Additional input was provided at subsequent meetings. There was considerable overlap of priorities among all participants indicating significant concurrence on GCN species. DEP staff and its consultant compiled these results and prepared a final list (Table 1.8). Appendix 1c lists the GCN species for all taxa, along with the criteria used to identify GCN species in Connecticut.

Table 1.7 IAFWA Guidance Criteria for Identifying GCN Species*

<ul style="list-style-type: none"> • Endangered, threatened, and candidate species (federal or state) • Imperiled species (globally rare) • Declining species • Endemic species • Disjunct species • Vulnerable species • Species with small, localized “at-risk” populations • Species with limited dispersal • Species with fragmented or isolated populations • Species of special or conservation concern • Focal species (keystone species, wide-ranging species, species with specific needs) • Indicator species • “Responsibility” species (i.e., species that have their centers of distribution within a state) • Concentration areas (e.g. migratory stopover sites, bat roosts or maternity sites) <p>*A national committee of experts was established to develop guidelines to help states identify GCN species.</p>

Table 1.8 Summary of Connecticut’s GCN Species

Taxa	Most Important	Very Important	Important	Total GCN Species	Total Species in CT
Mammals	8	7	12	27	84
Birds	22	57	69	148	335
Herpetofauna	6	13	11	30	49
Fish	22	24	28	74	168
Invertebrates	21	34	141	196	>20000*
Total	79	135	261	475	>20636

*Invertebrates are underrepresented on lists of rare species because they are poorly studied compared to vertebrate taxa.

Transient species generally were not considered unless Connecticut was critical to their overall survival. Many other species will benefit from conservation actions aimed at GCN species and their habitats. GCN species and taxon-level data gaps have been

prioritized into species conservation actions in Chapter 4. Figure 1.12 depicts general areas of concern based on existing and historical occurrences of federally listed and state-listed species, and significant natural communities.

General Areas of Concern for State and Federally Listed Species and Significant Natural Communities

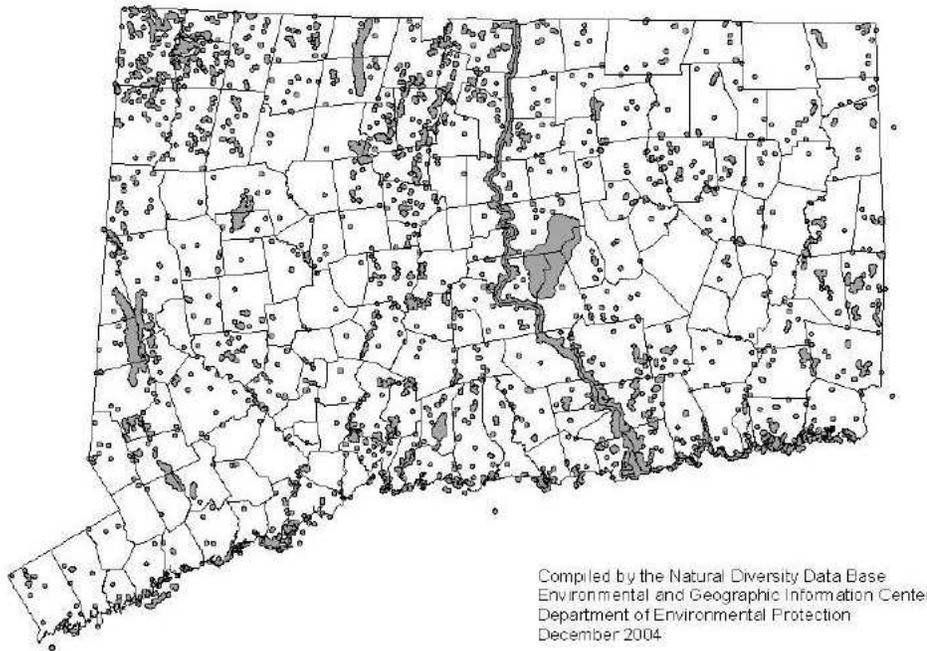


Figure 1.12 NDDB Threatened and Endangered Species Distribution in Connecticut (Source: CT DEP NDDB 2004)