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CHAPTER 4
CONSERVATION ACTIONS FOR CONNECTICUT'S KEY HABITATS AND SPECIES OF GREATEST CONSERVATION NEED

INTRODUCTION

This chapter addresses Element 4 and presents the highest priority actions developed to address Elements 1, 2, and 3. The Connecticut Wildlife Action Plan (WAP) conservation planning process began with the identification of conservation targets and objectives. Chapter 1 described Element 1 - Connecticut's fish and wildlife species of greatest conservation need (GCN). Chapter 2 described how Connecticut identified Element 2 - key fish and wildlife habitats. The WAP process then identified the key problems and threats facing these species and their key habitats, Element 3, presented in Chapter 3. This chapter focuses on the priority conservation actions to address these threats to Connecticut's GCN species and their associated key habitats.

Only the highest priority conservation actions, research, survey, and monitoring needs are presented in this chapter and are organized according to the threats they address. Many additional actions were identified and are presented in Appendix 4. Three different levels of actions were identified. First, the most broad, statewide actions are presented, as they apply to most or all GCN species and key habitats. Second, actions that are more specific to a particular taxonomic group or group of species are listed by taxon. Finally, specific actions are listed for each key habitat, and apply to many or all of the GCN species associated with those habitats.

Identifying conservation actions and research, survey, and monitoring needs provides the foundation for the dynamic process of developing accurate and current information on Connecticut's GCN species and key habitats. Use and dissemination of this information enables the important step of incorporating it into land-use decisions and key conservation efforts across the state. Implementation of the actions will require the efforts of many conservation partners working together to incorporate the needs of GCN species and key habitats into their programs and plans throughout the next decade.

DEVELOPMENT OF PRIORITY ACTIONS

To meet the goal of keeping common species common, fish and wildlife managers and their cooperators use a collection of tools and actions to address the many diverse threats to fish, wildlife, and their habitats. In 2005, a survey was conducted as part of the Association of Fish and Wildlife Agencies' (AFWA) National Synthesis to identify the most common types of actions identified in wildlife action plans of northeastern states (AFWA unpublished and 2011). A review of these actions was part of the process in developing and refining actions for the WAP (Table 4.1.).

TABLE 4.1: ACTIONS IDENTIFIED IN NORTHEASTERN STATE WILDLIFE ACTION PLANS IN DESCENDING ORDER OF LISTING RECURRENCES.

Actions	IUCN Category
Resource & Habitat Protection	Land/Water Protection
Planning	Planning/Best Management Practices (BMPs)
Monitoring	Data Gaps/Research
Site/Area Protection	Land/Water Protection
Awareness & Communications	Education & Awareness
Alliance & Partnership Development	External Capacity Building
Property Assessment and Prioritization	Data Gaps/Research
Research	Data Gaps/Research
Habitat & Natural Process Restoration	Land/Water Management
Threats Assessment	Data Gaps/Research
Site/Area Management	Land/Water Management
Data Collection and Management	Data Gaps/Research
Legislation	Law & Policy
Training	Education & Awareness
Compliance & Enforcement	Law & Policy
Conservation Funding	External Capacity Building
Policies & Regulations	Law & Policy
Invasive/Problematic Species Control	Land/Water Management
Conservation Payments	Livelihood, Economic & Other Incentives
Private Sector Standards	Law & Policy
Species Management	Species Management
BMPs	Planning/BMPs
Non-IUCN Action	Other
Inventory	Data Gaps/Research
Exploratory Survey	Data Gaps/Research
Evaluation	Data Gaps/Research
Species Assessment	Data Gaps/Research
Species Recovery	Species Management
Conservation-related Livelihood	Livelihood, Economic & Other Incentives
Eco-friendly Alternatives	Livelihood, Economic & Other Incentives
Market-driven Incentives	Livelihood, Economic & Other Incentives
Non-Monetary (cultural, etc.) Values	Livelihood, Economic & Other Incentives
Formal Education	Education & Awareness

The regional context significantly informed the development of Connecticut's conservation actions. The Northeast Synthesis (Terwilliger and the NEFWDTC 2013) provided regional reports and tools for more than 50 Regional Conservation Needs (RCN) projects. It summarized the northeast regional species of greatest conservation need (RSGCN) and key regional habitats. The Northeast Lexicon (Crisfield and NEFWDTC 2013) provided a consistent classification system of actions (TRACS) as well as guidance and criteria on ranking and prioritization. Connecticut's process applied these tools for action classification and prioritization. These

important regional tools and data, along with regular coordination with the other northeast states, informed Connecticut's WAP conservation action development.

The 2005 WAP conservation actions served as the foundation for the 2015 revision. Identifying and prioritizing conservation actions began with the WAP Core Team and DEEP staff review of the 2005 WAP actions. Each action was re-evaluated and revised using the Northeast Lexicon criteria (common terminology agreed upon for use by the 13 northeastern states) and included factors such as urgency and likelihood of success. Progress on 2005 WAP actions was also evaluated as well as the need to continue the action. As with the 2005 WAP, this 2015 revision includes performance measures for each action or need identified.

These conservation actions and research, survey, and monitoring needs were updated with current information and input from more than 100 conservation and management plans and information provided by DEEP staff, the Endangered Species Scientific Advisory Committee (ESSAC), and key partners and stakeholders during the WAP input process. These conservation programs, plans, and data were identified through a literature search and solicitation of local, state, regional, national, and international conservation plans (Appendix 1). Specific partner, stakeholder, and public input on actions and their priority was requested at ten public meetings held across the state. DEEP staff and contractors facilitated the meetings, gathered feedback on conservation actions previously identified, and documented any new actions identified to best address identified threats and issues.

The updated conservation action list was then reviewed by Wildlife, Inland Fisheries, and Marine Fisheries Divisions for final input and prioritization. Staff reviewed more than 300 actions, identified gaps, suggested new actions or edits, and applied additional ranking criteria. Actions were further ranked using the Northeast Lexicon criteria and categorized for consistency and clarity (Crisfield and NEFWDTC 2013). As recommended in the *Best Practices for Wildlife Action Plan—Voluntary Guidance to States for Revision and Implementation* (AFWA, BPWG 2012), and developed in coordination with the Northeast Lexicon for Threats and Actions (Crisfield and NEFWDTC 2013), the classification scheme employed was derived from a combination of the International Union for the Conservation of Nature (IUCN) classification system and the U.S. Fish and Wildlife Service's Tracking and Reporting Actions for the Conservation of Species (TRACS) system.

Worksheets with draft actions and threats were developed and distributed to other DEEP divisions and programs for their final review. Partner input was requested on the draft actions, which were also posted on the internet for public review and comment. All staff and public comments were recorded and compiled, resulting in the list of conservation actions that are presented in this WAP.

Objectives – Driven Conservation Actions and Opportunities

The following framework was developed collaboratively with the UConn to translate the broad goal of conserving GCN species and habitats (keeping common species common) into more specific conservation objectives.

These conservation objectives, listed below, can be depicted as focused opportunities and mapped as Conservation Opportunity Areas (COAs). They facilitate and guide actions for key

habitats and species of greatest conservation need. All of the highest priority actions fulfill the conservation objectives of the WAP. Conservation objectives for the WAP include:

A. **Protect** land and water habitats that support GCN species;
B. **Connect** key habitats used by GCN species;
C. **Restore** key habitat conditions to support GCN species;
D. **Manage** key habitats to support GCN species;
E. **Partner** with stakeholders to identify habitats of common interest; and
F. **Inform** the WAP and COA efforts by addressing data needs and information dissemination.

Conservation Opportunity Areas - Guiding the Implementation of Conservation Actions

AFWA *Best Practices for Wildlife Action Plan—Voluntary Guidance to States for Revision and Implementation* (AFWA, BPWG 2012) recommends that WAPs identify and spatially depict areas on the landscape that offer the best opportunities and potential for GCN species conservation, designating them as Conservation Opportunity Areas (COAs). COAs were determined by using information provided by the Northeast Regional Conservation Opportunity Areas effort. Ongoing collaborative efforts are being developed at the regional scale with the North Atlantic Landscape Conservation Cooperative, The Nature Conservancy, the University of Massachusetts Sustainable Landscapes project, and Northeast fish and wildlife agencies. The WAP Core Team and BNR staff also considered other partner efforts to identify areas important to Connecticut's wildlife. These included:

- Connecticut Statewide Forest Resource Plan (DEEP 2010)
- DEEP Grassland Habitat Conservation Initiative
- Audubon Connecticut's Important Bird Areas (IBA)
- Regional New England Cottontail (NEC) project
- Mid-Atlantic/New England/Maritimes Region (MANEM) Waterbird Conservation Plan
- Atlantic Coast Joint Venture (ACJV)
- Climate Change Vulnerability Models
- NOAA Essential Fish Habitat
- Atlantic Coast Fish Habitat Partnership
- Regional RCN migratory fish connectivity initiative
- Brook Trout Joint Venture focal species initiatives
- Water Quality Management Plans

Development of COAs that map and prioritize opportunities for conservation of key habitats and GCN species are best described by the framework that translates the broad goal into specific conservation objectives and actions such as those listed above. These conservation objectives, in turn, help guide the recommended actions and COA mapping.

An advantage of this objective-driven approach is that it identifies opportunities with which the WAP goals and conservation objectives are aligned. It also provides a logical and transparent approach to linking objectives, actions, and map outputs that may assist with communication and the engagement of partners in the implementation of the WAP.

Sources for Inclusion of Habitats and Species

Conservation goals, criteria for inclusion of habitats and species, and methods for developing COAs are outlined here. Factors considered in the development of COAs included the quality and quantity of geospatial data for the habitats and species of interest. In cases where sufficient geospatial data was not available for a particular habitat or species, other sources of reliable information, including published literature and/or expert opinion, were consulted.

The following sources were considered in deciding which habitats and species to include when establishing the COAs:

a) The Northeast Habitat Classification Systems (Terrestrial: Gawler 2008; Aquatic: Olivero and Anderson 2008) cross-walked to key habitats of Connecticut;
b) Species-specific geospatial data;
c) Atlases for birds, butterflies, fishes, and herpetofauna of Connecticut;
d) Partners In Flight and Audubon Important Bird Areas;
e) Northeast Partners in Reptile and Amphibian Conservation Priority Amphibian and Reptile Conservation Areas;
f) New England Cottontail Focus Areas;
g) National Marine Fisheries Service Conservation Areas and Essential Fish Habitat;
h) The Connecticut Statewide Forest Resource Plan;
i) Mid-Atlantic/New England/Maritimes Region (MANEM) Waterbird Conservation Plan;
j) Atlantic Coast Joint Venture;
k) Long Island Sound Study;
l) Atlantic Coast Fish Habitat Partnership; and
m) Brook Trout Joint Venture.

Methods for Developing COAs

The development of COAs was a building process that began with identification of key habitats and GCN species and continued with implementation of existing distribution models that identified potential habitats for GCN species. These models were used to identify optimal spatial configurations of habitats that had conservation value.

Dissemination will allow this information to be incorporated into land use decisions and planning efforts across the state. Conserving COAs will require the effort of many conservation partners working together to build the information it into their programs and plans. COAs can be used to guide conservation on the ground through planning processes at the local, state, and partnership levels.

For many species, the effects of local actions on regional population growth are not well known. Wildlife and fish population models could connect local actions to regional goals by taking into account population processes such as source-sink interactions, dispersal, and competition among species. For example, population models paired with COAs could be used to evaluate potential outcomes of multiple-species management; the balance of habitat management versus restoration versus protection activities; and scenarios of opportunistic versus strategic conservation. Integrating COAs and population models improves understanding of the ways local conservation actions contribute to regional conservation goals. It also helps to ensure that conservation activities have meaningful impacts on wildlife populations. As a result, increased knowledge of important habitats, GCN species, priority issues, and actions will help guide conservation statewide.

This COA process should be considered as a first step, with much additional work still needed over the next decade. The regional COA process will provide important initial guidance, and state and local partners will continue to be engaged in the development and use of COAs.

How Conservation Opportunity Areas Can be Used

COAs provide a visualization of WAP goals - a map - that identifies what actions to take, where to take them, and for what purpose. One of the most common goals identified in the WAP is land protection. Conservation partners (including NGOs, land trusts, private and public landowners) interested in land protection could use the COAs to identify lands to purchase or protect through easements (Figure 4.1). Some of the COAs highlighted in the WAP are species or habitat specific, while others encompass multiple species and habitats (Figures 4.2 – 4.13). COAs also address issues such as upland-aquatic linkages and marine-freshwater connectivity.

COAs are a first step towards identifying and prioritizing places to conserve Connecticut's wildlife, fish and their habitats. Potential next steps include developing COAs for all WAP goals; comparing across COAs to identify where overlap exists among the various goals; using COAs and population information for conservation planning; and web-enabling the WAP to connect people and places with conservation opportunities. Additional COA mapping efforts over the next decade will help to further refine and prioritize the COAs.

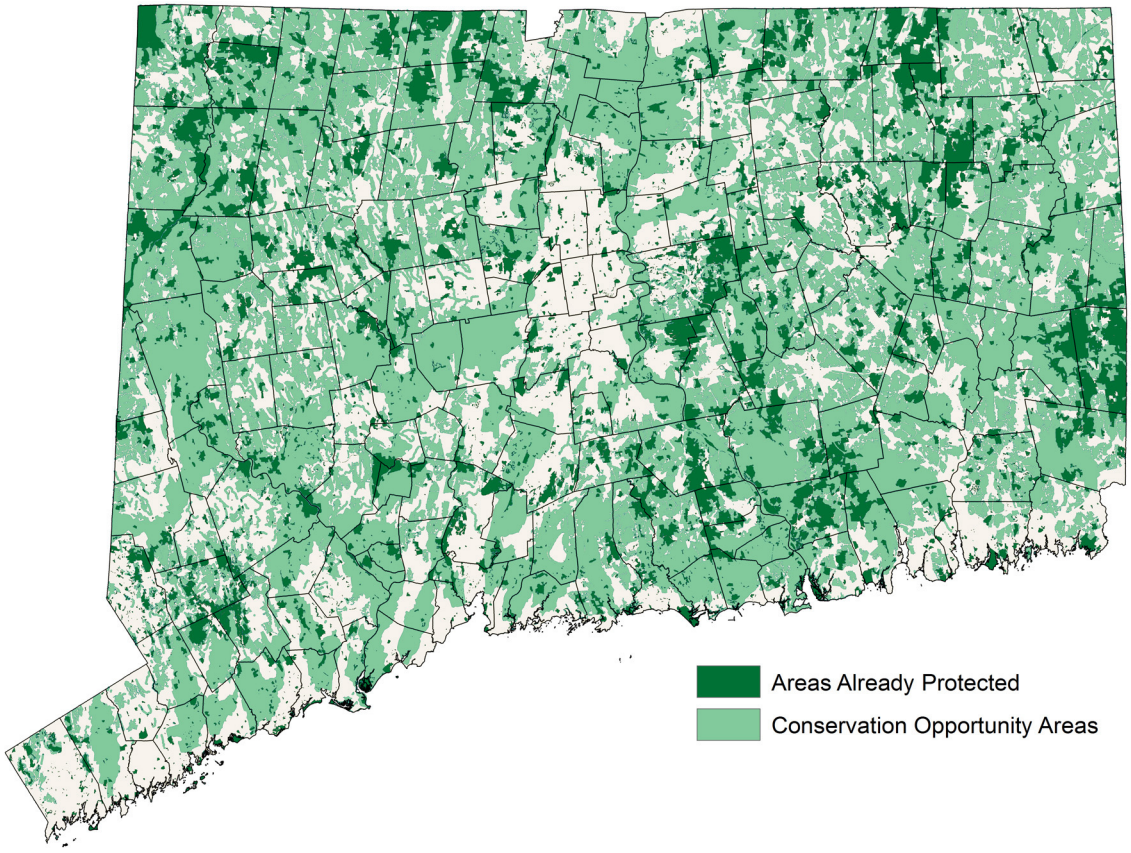


FIGURE 4.1: COMPOSITE CONSERVATION OPPORTUNITY AREAS MAP DEPICTING AREAS OF SIGNIFICANT VALUE TO CONNECTICUT GCN SPECIES.

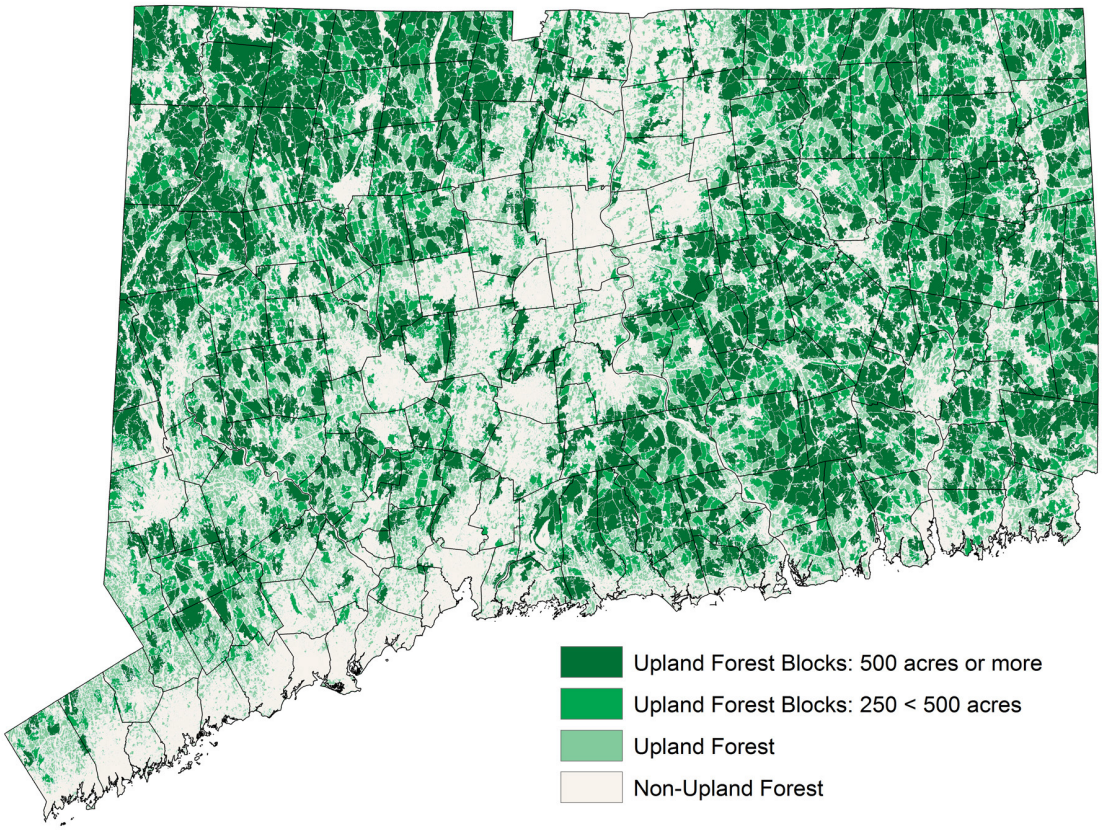


FIGURE 4.2: UPLAND FOREST CONSERVATION OPPORTUNITY AREAS.

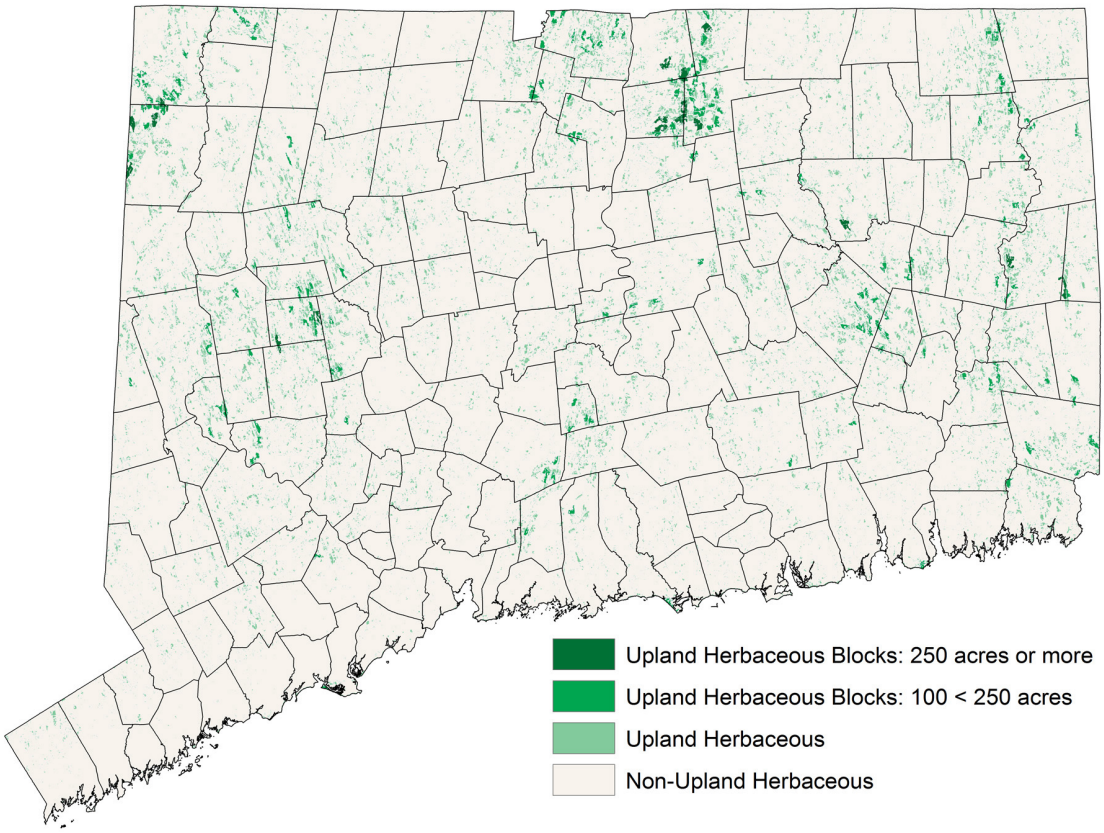


FIGURE 4.3: UPLAND HERBACEOUS CONSERVATION OPPORTUNITY AREAS.

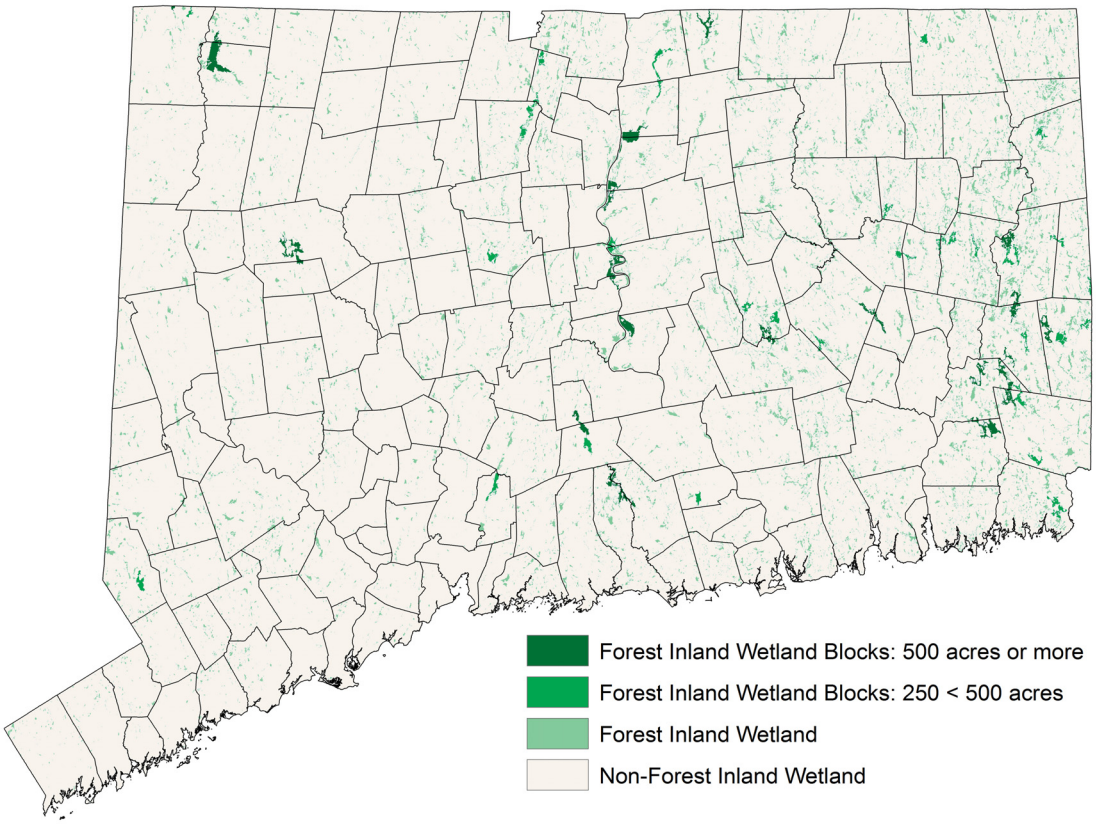


FIGURE 4.4: FOREST INLAND WETLAND CONSERVATION OPPORTUNITY AREAS.

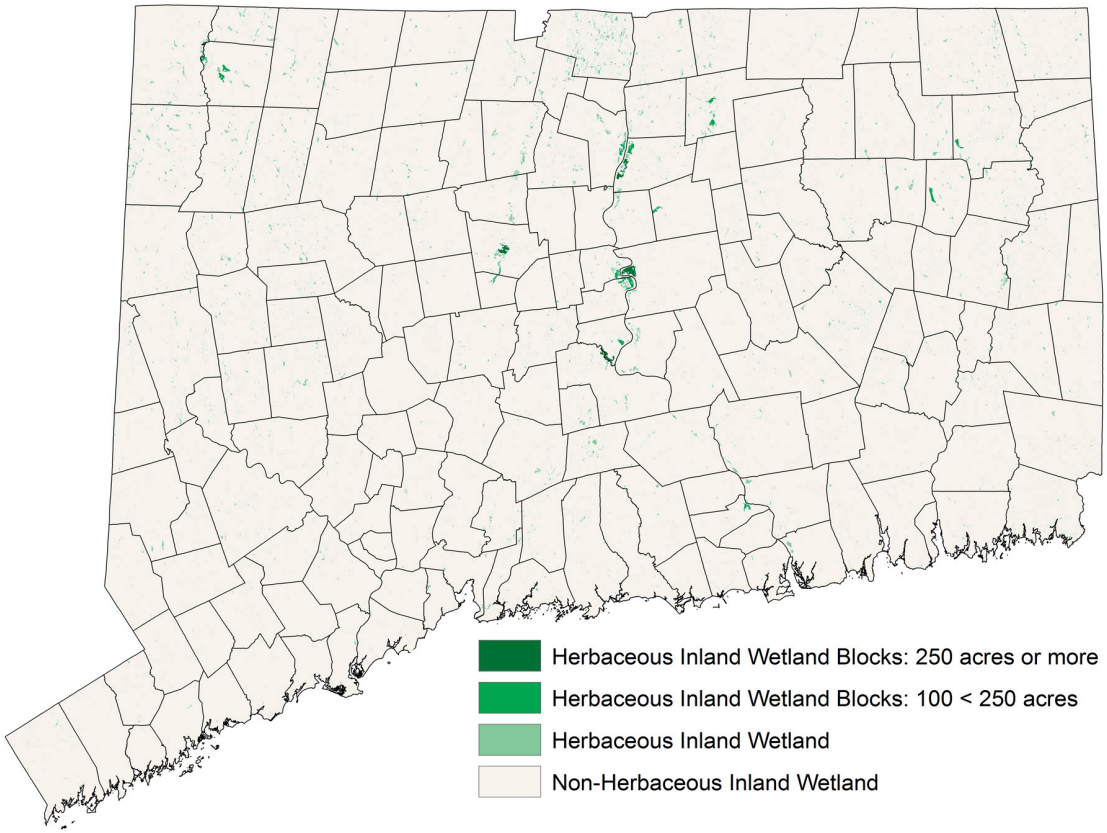


FIGURE 4.5: HERBACEOUS INLAND WETLAND CONSERVATION OPPORTUNITY AREAS.

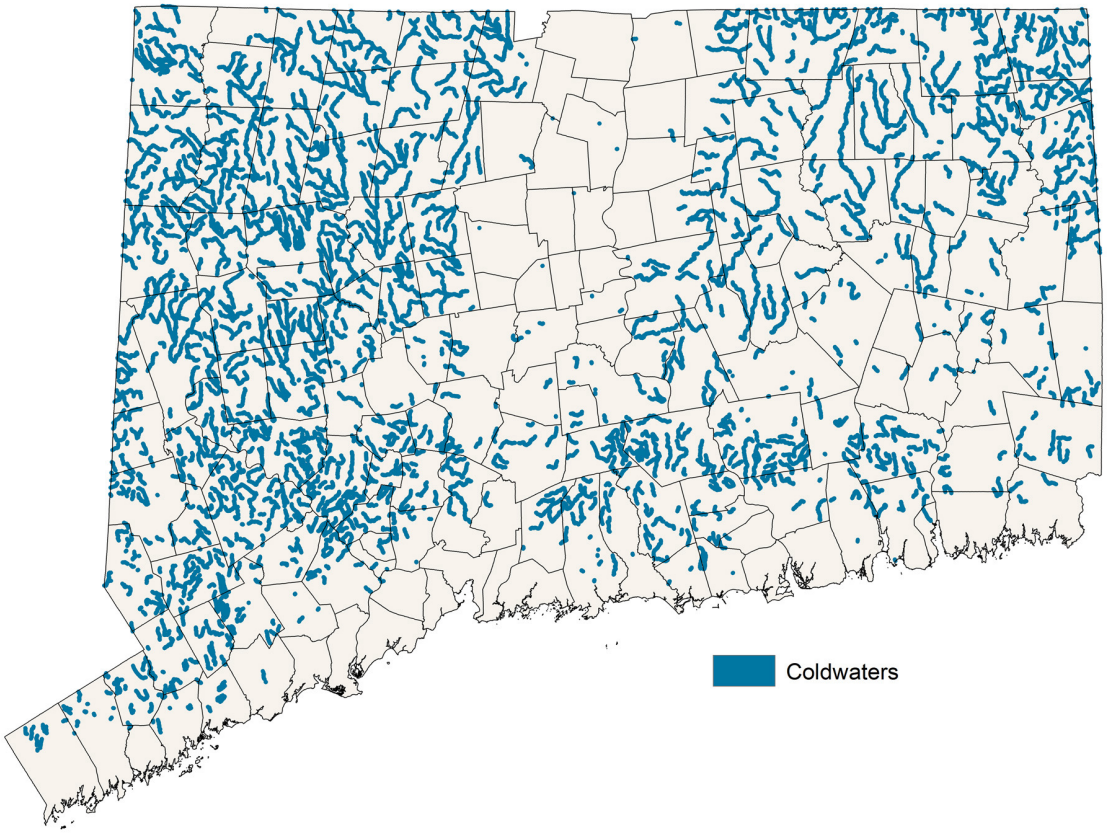


FIGURE 4.6: COLD WATER HABITAT CONSERVATION OPPORTUNITY AREAS.

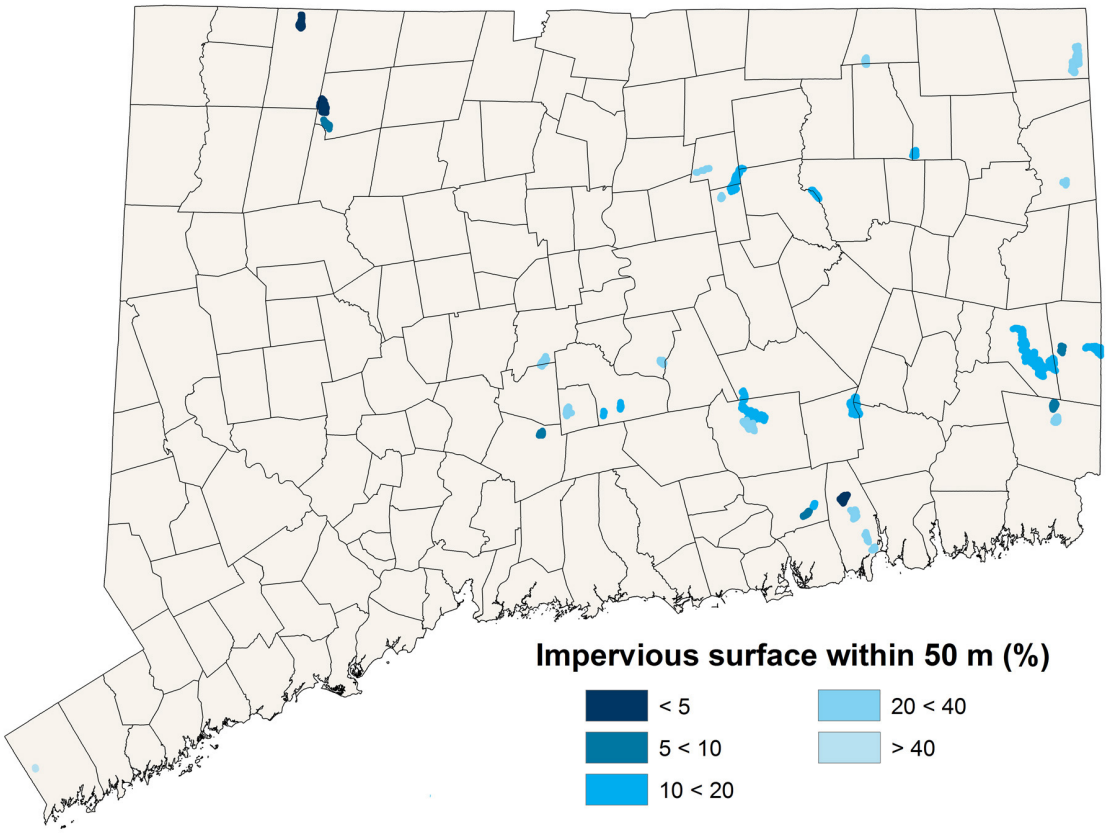


FIGURE 4.7: LAKE PROTECTION CONSERVATION OPPORTUNITY AREAS.

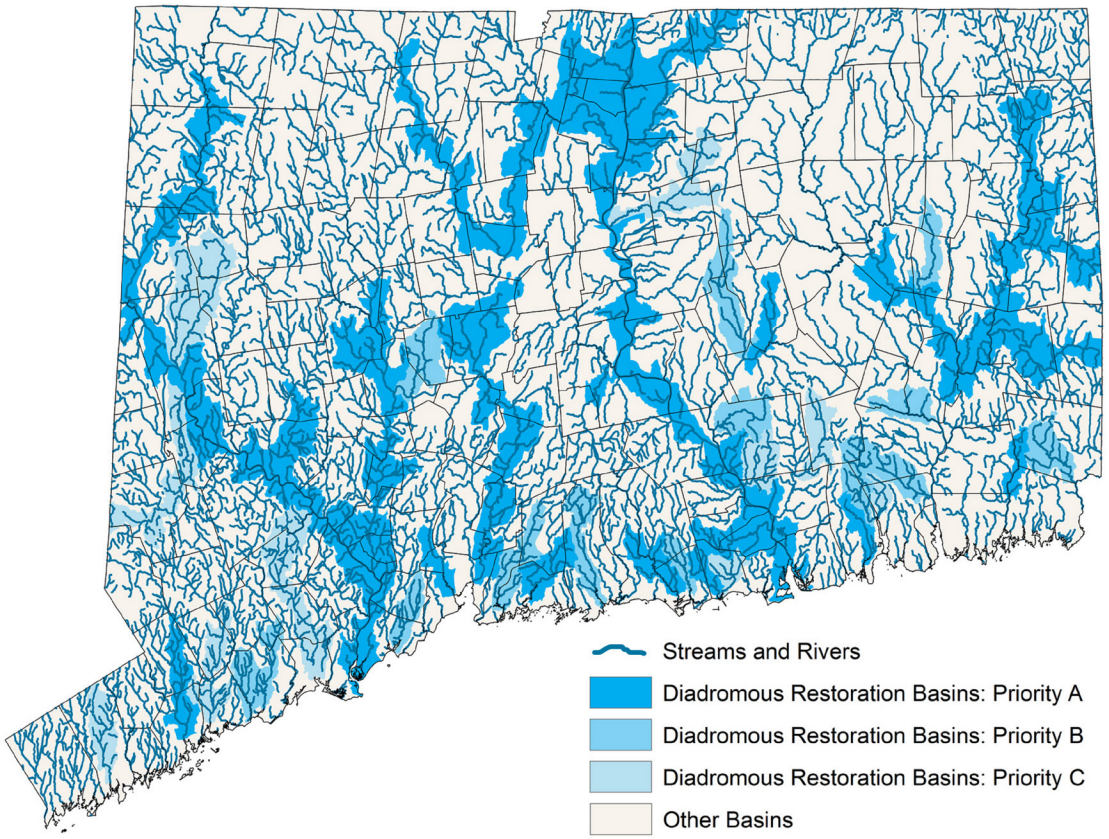


FIGURE 4.8: DIADROMOUS BASIN CONSERVATION OPPORTUNITY AREAS.

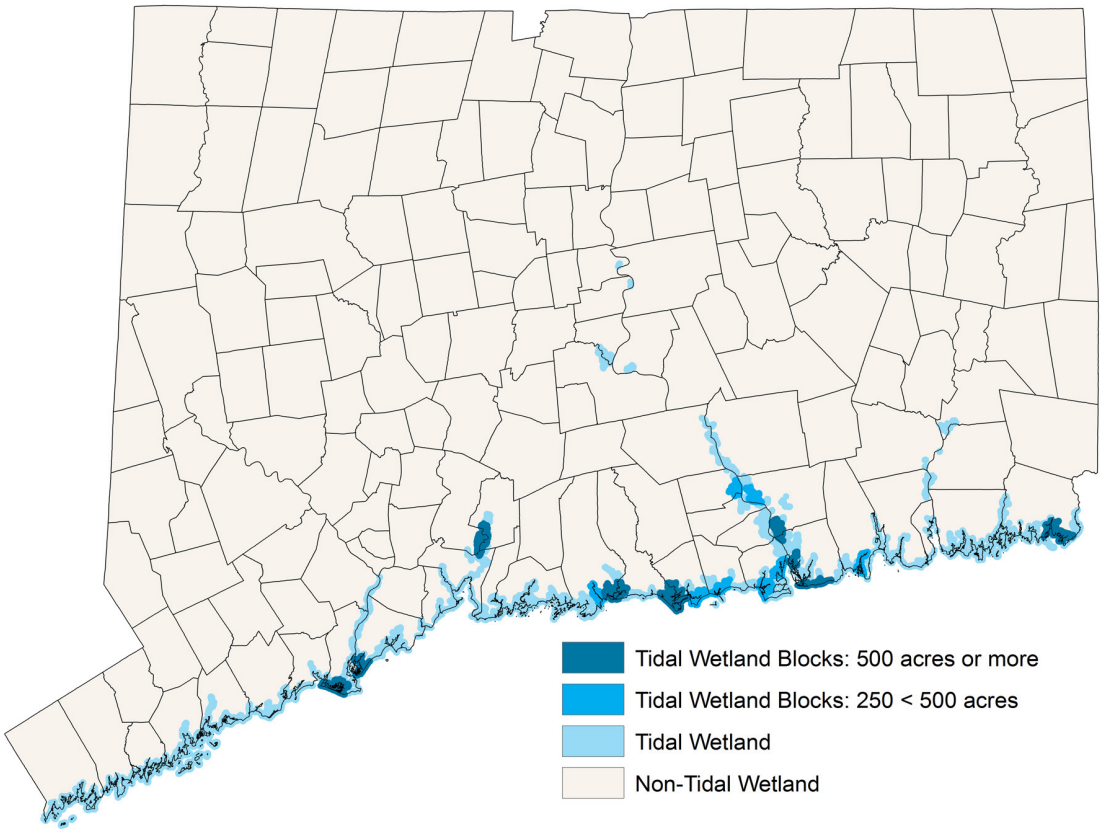


FIGURE 4.9: TIDAL WETLAND CONSERVATION OPPORTUNITY AREAS.

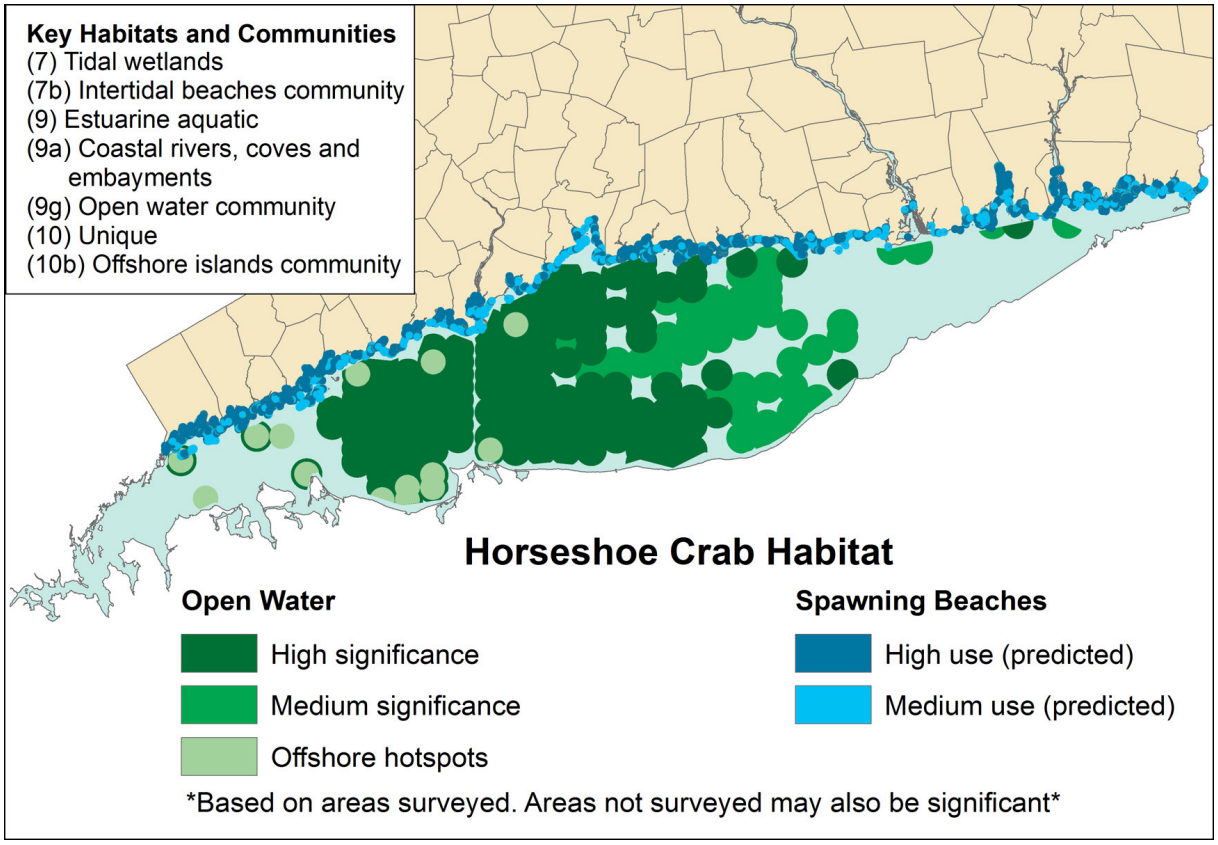


FIGURE 4.10: HORSESHOE CRAB CONSERVATION OPPORTUNITY AREAS.

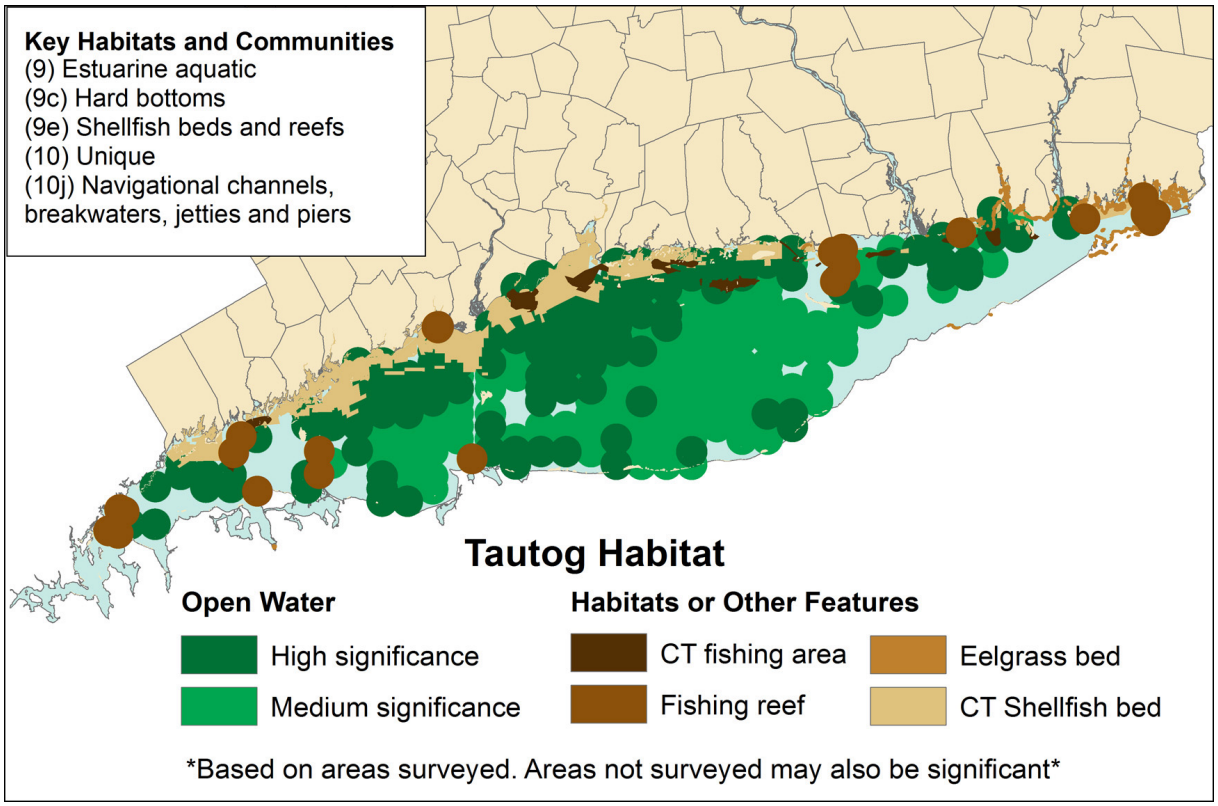


FIGURE 4.11: TAUTOG CONSERVATION OPPORTUNITY AREAS.

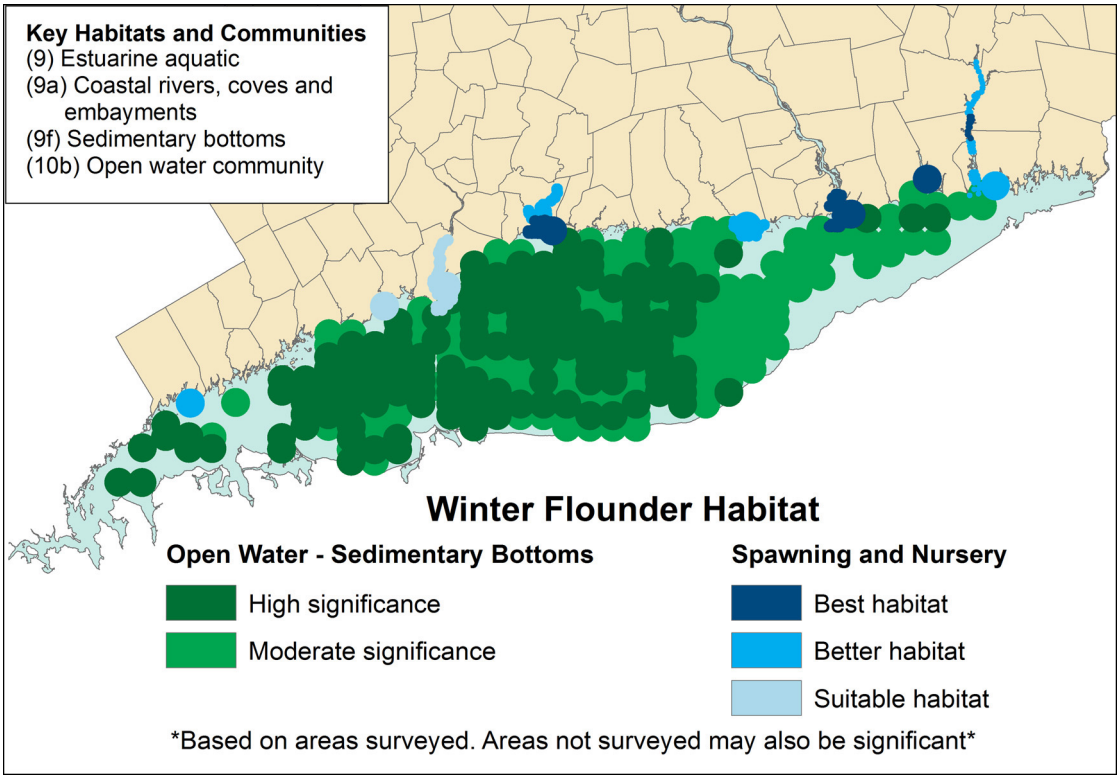


FIGURE 4.12: WINTER FLOUNDER CONSERVATION OPPORTUNITY AREAS.

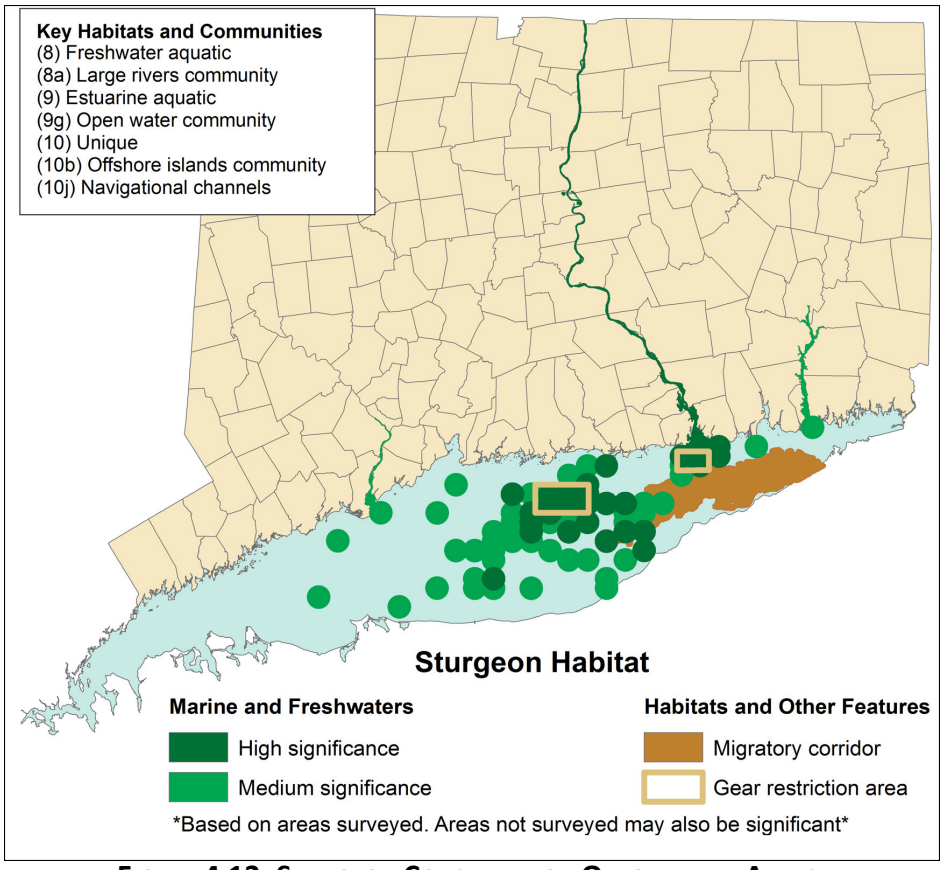


FIGURE 4.13: STURGEON CONSERVATION OPPORTUNITY AREAS.

STATEWIDE CONSERVATION ACTIONS

The highest priority actions are presented in this chapter. All recommended actions, including those of lower priority, are listed in Appendix 4. During the development process, suites of actions addressed narrow (e.g., species or habitat specific) outcomes while others addressed recurring themes that crossed taxonomic or ecological boundaries. Other actions were related to gathering new information through inventories, surveys, and research. The new information obtained from additional surveys will be used to identify limiting factors and habitat requirements for all GCN species and to identify mapping and database management needs. Other actions will attempt to minimize habitat stressors and improve key habitats. This will allow DEEP and its partners to identify and address emerging issues such as new diseases or invasive species. Implementing the priority actions will lead to improved documentation of species' responses to both focused threats as well as broad and longer term impacts, such as climate change.

Implementing the priority actions will require capitalizing on collaborative relationships with many conservation, public, private, non-profit, and academic partners. Federal partners, especially the U.S. Fish and Wildlife Service (USFWS), and national, state, and local non-governmental conservation organizations have a long history of working with DEEP to benefit the conservation of fish and wildlife. These partnerships were instrumental in implementing the 2005 WAP priority actions, and will need to continue, and expand, if the conservation actions are to be accomplished. It is the intent of DEEP to maximize collaboration with conservation partners in the implementation of the many actions identified in this WAP.

The following categories of conservation actions are being used in 2015 and follow the USFWS Wildlife and Sport Fish Restoration (WSFR) Program Wildlife Tracking and Reporting Actions for the Conservation of Species (TRACS):

- Administration
- Planning
- Law and Policy
- Education and outreach
- Technical assistance
- Data collection and analysis
- Direct Management of Natural Resources
- Land and Water Acquisition and Protection

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies these actions and provides objectives and indicators to measure their outcome. Examples of WAP indicators and performance measures for these actions are provided for each action category and are an important component of the WAP database.

Administration

Implementation of priority administrative actions identified will require significant effort within DEEP. However, the extent to which they can be implemented also depends upon external factors outside of DEEP's control. A number of long-standing constraints limit the Department's ability to fully implement the WAP, including advocacy from partners and the public, and implementation capacity.

Over the past several years, DEEP's Bureau of Natural Resources (BNR) budget and staffing levels have continued to decline. Although hunting and fishing license fees provide sufficient

match for federal aid related to game and sportfish research and management, there is insufficient in-house capacity and match for State Wildlife Grants that focus on GCN species.

In many cases, conservation partners have had to fulfill that role. BNR cannot fully carry out its mission until these capacity issues are addressed. Multiple stakeholders and key partners voiced concerns about the need for additional funding sources and capacity so that BNR could better achieve its mission.

The outcomes measured for the administrative conservation actions below include increased (agency and partner) capacity and development of new and enhanced administrative means (incentives and structure) to conserve GCN species and key habitats, and implement the priority actions identified in this WAP.

Highest Priority Actions:

- Expand tax incentives under the open space section of P. A. 490 (taxation and preservation of farms, forest, and open space) to foster conservation of key habitats that do not meet current forest standards.
  Measure: Number of tax incentives created for conservation of key habitats; number of stakeholders and partners using created tax incentives to conserve key habitats; and number of acres of key habitat conserved.
- Develop a stable, sustainable funding source to implement conservation efforts that benefit the full array of fish and wildlife.
  Measure: A sustainable funding source(s) developed to address conservation needs for all wildlife species and their habitats; and number of conservation needs addressed using a sustainable funding source.
- Develop incentives for towns to conserve key habitats.
  Measure: Number of incentives developed for towns to facilitate conservation of key habitats and number of towns utilizing the incentives to conserve key habitats.
- Increase capacity to create, maintain, and enhance key habitats on state lands.
  Measure: Number of successful capacity building efforts developed and number of key habitat acres created, conserved, or enhanced on state lands.
- Coordinate efforts regionally and with key partners to address emerging issues that may adversely affect wildlife and key habitats especially regional conservation priorities and regional species of greatest conservation concern.
  Measure: Number of regional conservation efforts participated in that address emerging issues and number of regional emerging issues addressed with key partners.

Planning

Working in advance of issues will mitigate or avoid negative impacts on fish and wildlife and their habitats. Planning can be done at many spatial scales—nationally, regionally, state-wide or locally. All have the ability to promote sound conservation practices that maximize benefits.

The WAP has incorporated by reference and considered many partner plans and programs (Appendix 1), from endangered species recovery plans to the Connecticut Climate Change Preparedness Plan. This provides support for shared priorities and maximizes coordination among partners. Partners have the opportunity to include WAP objectives and actions in their planning. In particular, the Conservation Opportunity Area (COA) maps can be incorporated into

local land-use plans. Next steps should include developing customized information at a finer municipal scale so that these WAP priorities can be incorporated into statewide and municipal land-use decisions.

Specific planning actions include assisting partners in implementation (see Appendix 1) and incorporating the WAP priorities into partners' plans. Examples include coordination with the Department of Transportation, Office of Policy and Management's Conservation and Development Policies Plan (CT OPM 2013), and local municipal plans of development.

Climate Change: In 2013, President Obama announced his vision for preparing the United States for the impacts of climate change through climate preparedness and resilience in the *President's Climate Action Plan* and an Executive Order (WHOPS 2013; WHEOP 2013). These announcements provided details regarding the future of America in the face of climate change, as well as the President's recommendations regarding the specific issues that must be addressed. The U.S. Forest Service, U.S. Fish and Wildlife Service, and the U.S. National Parks Service all have their own strategic plans for responding to climate change.

In July 2014, Connecticut Governor Dannell Malloy announced a partnership between DEEP and UConn to create the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). This Institute is to serve as a multi-disciplinary, regional center of excellence to join the efforts of experts from multiple disciplines, including natural resources, policy, economics, finance, law, and engineering. The overall goal of this organization is to identify practical solutions that will allow Connecticut and other northeastern states to effectively adapt to the effects of climate change, establish more resilient infrastructure, and protect ecosystems and their services in the presence of a changing climate (UConn 2014).

As part of the Global Warming Solutions Act of 2008, DEEP published a series of reports detailing the State's vision and goals for climate adaptation and mitigation strategies. DEEP's 2014 Progress Report on Climate Change actions (DEEP 2014) provides a detailed update on the state's progress toward mitigating climate change impacts. The *Connecticut Climate Change Action Plan* was developed to inform policy-makers, implementing agencies, organizations and institutions, and the general public on climate change efforts in the state through specific action and implementation recommendations (DEP 2005).

Another state-sponsored effort, the Connecticut Climate Preparedness Plan (Adaptation Subcommittee 2011) specifically describes adaptation strategies for agriculture, infrastructure, natural resources, and public health and provides more in-depth actions for important habitats in the state (Table 4.2). The report also provides general information on climate change impacts, adaptation opportunities, best management practices, and climate change concerns.

TABLE 4.2: CLIMATE CHANGE ADAPTATION ACTIONS FOR SPECIFIC HABITATS. (ADAPTATION SUBCOMMITTEE 2011)

Habitats	Near Term Strategies	Mid Term Strategies	Long Term Strategies
Cold Water Stream	• Acquire riparian lands • Re-establish connectivity • Adopt stream flow regulations • Prioritize restoration and management • Stock more resilient trout strains • Monitor fish population changes	• Explore water rights option that protect fish and Wildlife • Diversify fish species in DEEP hatcheries • Advance progressive land use policy/regulations • Identify and protect groundwater sources	
Tidal Marsh	• Acquire "advancement zones" for migration • Adopt sea rise monitoring tool • Promote eco-friendly coastal protection alternatives • Support coastal land use policy reform • Evaluate new techniques for new and post-storm redevelopment	• Research up-slope migration & marsh stabilization	• Implement new management techniques • Educate public on mitigation co-benefit
Open Water Marine	• Monitor marine resource changes • Reduce pollutant runoff via watershed management	• Identify ways to diversify fisheries	
Beaches and Dunes	• Acquire "advancement zones" for migration • Nourish coastal beaches • Promote eco-friendly coastal protection alternatives • Require softer engineering for coastal protection	• Evaluate new techniques for new and post-storm redevelopment • Require native vegetation buffers • Construct shoreline oyster reefs • Restore beach and dune plants and wildlife	
Herbaceous Freshwater Wetlands	• Advance policies that reduce runoff and temperature • Ensure that new infrastructure will not alter hydrology	• Reduce pollutant runoff via watershed management • Protect land adjoining habitat • Manage water withdrawals/diversions	
Intertidal Flats and Shores	• Inventory key habitats for birds and other wildlife	• Construct shoreline oyster reefs	• Restore land from disincentive • programs
Major Rivers and Associated Riparian Zones	• Remove or modify structural impediments to flow • Advance land uses that reduce temperature impact • Acquire easements in strategic areas	• Modify upstream flood control infrastructure • Update standards for warm water effluent, as needed	• Promote warm water game fish • Reduce warm wastewater • discharges

Habitats	Near Term Strategies	Mid Term Strategies	Long Term Strategies
Forested Swamps	• Employ BMPs that reduce thermal impacts	• Ensure that new infrastructure will not alter hydrology • Protect land adjoining habitat • Manage water withdrawals/diversions • Monitoring hydrologic changes	
Subtidal Aquatic Bed	• Examine watershed management practices impact • Restore or enhance habitat • Research and monitor impacts of climate		
Lakes, Ponds, Impoundments and Shorelines	• Reduce pollutant runoff through land use management • Promote shoreline vegetative buffers	• Promote alternative manure technologies	
Upland Forest Complex	• Manage invasive species • Research southern tree expansion impacts • Promote diverse forest habitat • Manage deer population densities • Monitor seedling regeneration • Provide education for private forest landowners • Encourage zoning reform to conserve forest size	• Include extreme event impacts in management • Provide education on extreme event impacts • Manage for maximum carbon sequestration	• Promote "smart growth" principles • Increase preparedness for wildland fires

The Northeast Climate Science Center has developed a synthesis of regional information on Climate Change (USGS 2015; http://necsc.umass.edu/). This will be applied over the next decade through implementation of the WAP along with actions in the Connecticut Climate Preparedness Plan.

To help communities plan for the impacts of climate change, federal, state, and local governments, universities, and non-profit organizations have developed various tools that pertain to Connecticut including:

- DEEP Coastal Hazards Mapping Tool to provide a sea level rise visualization tool and coastal hazards information (http://www.ct.gov/deep/cwp/view.asp?a=2705&q=480782&deepNav_GID=2022 /);
- Environmental Protection Agency (EPA) Long Island Sound Study/CT DEEP/ICLEI Local Governments for Sustainability– Groton Coastal Climate Change Adaptation Project (http://www.groton-ct.gov/depts/plandev/docs/Final%20Report_Groton%20Coastal%20Climate%20Change%20ProjectJP.pdf);

- The Nature Conservancy Coastal Resilience Program an ecological and socio-economic planning tool for Long Island Sound (www.coastalresilience.org); and
- Long Island Sound Sea Level Affecting Marshes Model project resources (http://longislandsoundstudy.net/).

The outcomes measured for the planning and climate change preparedness conservation actions below include:

1. Percent of planning and climate preparedness actions implemented as planned;
2. Evidence that clear planning needs and outcomes have been identified with input from relevant users;
3. Evidence that the planning clearly provides relevant information and process to relevant audiences to achieve the desired response;
4. Evidence that planning is reducing key threats; and
5. Response of the SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Highest Priority Actions:

- Coordinate the conservation actions in the WAP with those recommended by the Connecticut Climate Preparedness Plan and the Northeast Climate Science Center.
  Measure: Number of conservation actions in the WAP to address potential impacts from climate change; number of implemented conservation actions in the WAP that address the impacts from climate change.
- Develop tools to enhance information sharing and integrate the WAP with other partners' planning efforts.
  Measure: Number of tools developed; number of other partners' planning efforts that utilize the tools.
- Coordinate the conservation actions in the WAP with other statewide and regional planning initiatives to maximize conservation impacts.
  Measure: Number of actions identified in the WAP included in other planning initiatives statewide and region-wide; number of other planning initiatives statewide and region-wide that include the WAP conservation actions.
- Communicate key components of the WAP to towns and encourage its use at the local level.
  Measure: Number of key components of the WAPs communicated to towns; number of key components of the WAP utilized at the local level.
- Work with conservation partners to conserve GCN species and key habitats statewide.
  Measure: Number of GCN species and key habitats conserved statewide with conservation partners; number of conservation partners working to conserve GCN species and key habitats.
- Develop comprehensive management plans for public lands that include wildlife diversity conservation.
  Measure: Number of comprehensive management practices and plans developed for public lands; number of public lands where comprehensive management practices for wildlife diversity are implemented.

Law, Policy, and Enforcement

Creating laws and policies to ensure fish, wildlife, and their habitats persist in the future is another important role of DEEP. These laws and policies can prevent detrimental impacts to wildlife and their habitats and promote conservation practices through financial incentives or generating funding.

Outcomes measured for the law and policy conservation actions below include:

1. Percent of law and policy actions implemented as planned;
2. Evidence that law and policy change/ action is reducing key threats;
3. Degree to which target GCN species or key habitats respond as expected from new or improved law and policy changes; and
4. Response of the SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Highest Priority Actions:

- Develop additional stable funding mechanisms to pay for the conservation of GCN species and habitats.
  Measure: Number of stable funding sources developed to protect GCN species and key habitats; number of GCN species and key habitats protected with additional stable funding sources.
- Develop legal strategies to address the sale of cultivars of prohibited plants and internet trade in prohibited plant species.
  Measure: Number of legal strategies developed to address the sale of cultivars of prohibited plant species and internet trade in prohibited plant species; number of plant cultivars prohibited for sale and internet trade.
- Develop legal strategies to minimize the impacts of residential and industrial development on GCN species.
  Measure: Number of legal strategies developed to minimize the impacts of residential and industrial development on GCN species; number of impacts on GCN species minimized by legal strategies.
- Create or support legal strategies to conserve key habitats.
  Measure: Number of legal strategies adopted to conserve or preserve key habitats in the state; number of acres of important key habitat conserved or preserved by adopted legal strategies.
- Develop and enforce regulations to prevent all-terrain vehicle (ATV) damage to wildlife areas.
  Measure: Number of regulations developed to prevent ATV damage to wildlife areas; number of regulations enforced to prevent ATV damage to wildlife areas.
- Enhance conservation of illegally collected species by improving monitoring of sites and law enforcement efforts.
  Measure: Number of law enforcement patrols and monitoring of sites where susceptible and personally and commercially desirable GCN species can be illegally collected; number of collectable GCN species preserved.

- Enhance enforcement of off-leash dogs, especially in areas with ground nesting birds.
  Measure: Number of patrols of ground nesting bird areas, during the nesting season, by law enforcement to enforce leash laws for dogs; number of nests of ground nesting birds preserved.

Education and Outreach

There is a continuing need for increased communication and outreach to diverse audiences, including private landowners, state and federal regulatory agencies, land trusts, other NGOs, municipalities, schools, and the public. Such actions support conservation objectives through informing Connecticut's public and stakeholders about wise conservation practices and ways to actively be involved in the conservation of wildlife and their habitats. It is necessary to develop cost-effective ways to create effective outreach to parties who can assist with wildlife conservation. Workshops and other methods may allow contact with several entities at once and thereby facilitate information exchange regarding conservation of GCN species and key habitats.

Outcomes measured for the education and outreach conservation actions below include:

1. Percent of education and outreach actions implemented as planned;
2. Evidence that education and outreach clearly provides relevant information and format to relevant audiences to achieve increased awareness, behavior change and other desired response; and
3. Response of the GCN species and their habitats would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Highest Priority Actions:

- Develop educational materials for in-classroom curricula and outdoor activities that emphasize conservation of GCN species and their key habitats.
  Measure: Number of in-classroom educational materials and curricula developed regarding the conservation of GCN species and key habitats; number of classrooms that request the developed educational materials.
- Develop a top ten list of invasive plants and Best Management Practices for removing/treating them.
  Measure: Number of Best Management Practices developed to remove or treat the top ten invasive plants; number of acres of invasive plants removed or treated.
- Develop a tool kit for use by municipalities and land managers to enhance local land use decisions regarding GCN species and their habitats (partner with DOT and UConn Extension/Nonpoint Education for Municipal Officials).
  Measure: Number of GCN species and key habitat enhancing tool-kits assembled for municipalities; number of municalities and land managers that request and use the tool kit.
- Increase public outreach and education for private landowners regarding the importance of managing lands to conserve common and uncommon species.
  Measure: Number of outreach materials developed to increase public awareness and education for private landowners regarding the need to manage lands to conserve both common and uncommon species; number of developed outreach materials distributed.

- Develop outreach materials to inform the public about ways to prevent the spread of wildlife diseases such as white-nose syndrome and ranavirus.
  Measure: Number of outreach materials developed to address wildlife disease issues; number of developed outreach materials distributed.
- Provide information to local governments, watershed associations, and the public to increase awareness of environmental issues affecting GCN species and key habitats.
  Measure: Number of public awareness informational compilations regarding GCN species and key habitats distributed to the public.
- Expand the Teaming With Wildlife Coalition, which supports wildlife conservation funding, to assist with funding sources and policy issues at the local level.
  Measure: Number of increased Teaming With Wildlife coalition members; number of increased funding sources and policy issues addressed at the local level by Teaming with Wildlife coalition members.
- Develop a native plant initiative to increase the use of native species in landscape designs.
  Measure: A native plant initiative developed to increase the use of native species in landscape designs; number of landscape designs using native plant species.
- Develop statewide citizen science action networks by taxonomic group to locate, identify, observe, describe, and map GCN species and their key habitats.
  Measure: Number of statewide citizen science action networks created by taxonomic group; number of GCN species and their key habitats mapped.
- Develop an online system, using DEEP Natural Diversity Data Base forms, to enhance the reporting of sightings of GCN species by the research community and citizen scientists.
  Measure: A public online distribution and abundance database created for all GCN species with data submitted by the scientific community, and locational information supplied from this database to land planners; number of land planners supplied with locational information.
- Develop media outreach initiatives to promote wildlife stewardship ethics. Distribute conservation success stories to the media.
  Measure: Number of media outreach initiatives developed to promote wildlife stewardship ethics, conservation issues and success stories; number of conservation stories distributed.
- Engage non-traditional partners, such as business leaders and the business community in wildlife conservation projects.
  Measure: Number of non-traditional partners cultivated to engage in wildlife conservation projects; number of wildlife conservation projects where non-traditional partners engaged.
- Promote public awareness about urban and suburban GCN species and their habitats.
  Measure: Number of outreach materials developed promoting public awareness and understanding of urban and suburban GCN species, their key habitats, and their behaviors; number of developed outreach materials distributed.

- Educate outdoor users regarding the impacts of litter to GCN species and incorporate this information into programs such as Conservation Education/Firearm Safety, Connecticut Aquatic Resources Education, Master Wildlife Conservationists and No Child Left Inside.
  Measure: Number of programs that include education to outdoor users about the impacts of litter and the importance of stewardship to GCN species and their key habitats.
- Maintain or expand the Master Wildlife Conservationist Program.
  Measure: Number of volunteer Master Wildlife Conservationists maintained or increased.
- Cultivate support for conservation among government leaders.
  Measure: Number of government leaders cultivated to support conservation; number of conservation projects supported by government leaders.
- Promote a public connection to wildlife by conveying conservation stories through enhanced visual elements of the DEEP website such as slide shows and video clips.
  Measure: Number of visits by the public to the DEEP Wildlife website to view conservation stories that promote a public connection developed through the enhancement of visual elements such as slideshows, video clips; number of enhanced visual elements of the DEEP Wildlife website that promote a public connection to wildlife.
- Increase public awareness of GCN species by installing or enhancing existing signs at state Wildlife Management Areas and incorporating new technology whenever possible.
  Measure: Number of interpretive signs at state owned lands developed or enhanced by incorporating new technology to increase the public awareness of GCN species.
- Increase the availability of fishing line receptacles to promote proper disposal of line and educate anglers and the public about the associated risks to wildlife.
  Measure: Number of additional fishing line receptacles available to promote proper disposal of line and educate anglers and the public about the associated risks to wildlife.

Technical Assistance

This category of actions addresses developing support for the conservation objectives through informing and partnering with key public and private conservation entities in the state. There are a number of programs within the Natural Resources Conservation Service (NRCS), USFWS, the Department of Transportation (DOT), and other agencies designed to promote opportunities for private landowners and other entities to enhance wildlife conservation and habitat management. Landowners may be eligible for funding to conduct wildlife conservation work, but may be unaware of the many partners' programs that offer financial and technical assistance. Working with local, state, regional, and federal partners facilitates a coordinated landowner outreach effort and maximizes the conservation program delivery to preserve the integrity of these important parcels and focal areas.

DEEP can provide technical assistance to DOT and municipalities to mitigate the effects of roads. Roads constrain the extent and mobility of wildlife populations whether through direct mortality or acting as impassable barriers (Trombulak and Frissell 2000). Roadways serve as conduits for the introduction of contaminants, invasive species, and other secondary effects of

human infrastructure. For example, deicing salts from road runoff can affect amphibian larvae and eggs (Karraker 2008), lighting attracts and leads to the demise of night-flying moths, and traffic noise can create behavioral barriers leading to unoccupied habitat. Although some of these effects cannot be removed entirely, there are options for mitigation in many cases. Mitigating actions can include: replacement of stream culverts to improve fish passage; strategic road placement to minimize the spread of invasive species, especially on state lands; reducing drainage and other road runoff into nearby wetlands; and establishing connections across or underneath roads to maintain or enhance connectivity between habitat blocks. Providing technical assistance to minimize the impacts of roads on habitat connectivity is essential to helping species adapt to climate changes.

DEEP can provide other types of technical assistance. For example, Best Management Practices (BMPs) are established guidelines for minimizing adverse impacts to fish, wildlife, or environmental factors (e.g., water quality) that land owners can follow to ensure that their activities benefit or have minimal negative impacts to the environment. BMPs could be created to address widespread issues such as invasive species or to encourage practices that enhance wildlife conservation by the public in their own backyards. For each of the conservation actions below, the response of the species of GCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Outcomes measured for technical assistance actions below include:

1. Number of individuals receiving technical assistance sorted by topic/action;
2. Percent of target audience met across project sorted by topic/action;
3. Percent of initiatives that show a reduction in key threats being addressed; and
4. Response of the SGCN and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Highest Priority Actions:

- Provide WAP maps and web-based tools such as GIS mapping for use by DEEP personnel and partners.
  Measure: Number of WAP maps and web-based tools provided; number of DEEP personnel and partners using the WAP maps and web-based tools.
- Provide Best Management Practices to benefit GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them; number of state, municipal, and local landowners educated on the Best Management Practices and implementation.
- Develop guidelines to minimize the impacts of residential and industrial development on GCN species.
  Measure: Number of guidelines developed to minimize the impacts of residential and industrial development on GCN species.

- Provide technical assistance guidance, developed collaboratively by DEEP and DOT, to local governments and private organizations regarding wildlife conservation considerations for the design of multi-use trails.
  Measure: Number of multi-use trails designed by local governments and private organizations with technical assistance guidance provided by DEEP and DOT; number of local governments and private organizations requesting technical assistance guidance.
- Enhance efforts to provide current information and guidance on GCN species and key habitats to land use planners, decision-makers, and the public at the local, regional and statewide scales.
  Measure: Number of current informational materials or guidance provided on GCN species and key habitats to land use planners, decision-makers, and the public at the local, regional and statewide scales; number of land use planners, decision-makers, and the public requesting current informational materials or guidance.
- Develop Best Management Practices for municipalities to address invasive species and encourage the use of reduced risk pesticides.
  Measure: Number of Best Management Practices developed for municipalities to address invasive species and encouraging the use of reduced-risk pesticides; number of municipalities requesting or using the developed Best Management Practices.
- Develop, in collaboration with Department of Transportation, Best Management Practices to manage roadside vegetation to reduce impacts to GCN species and their habitats.
  Measure: Number of Best Management Practices developed to manage roadside vegetation; number of roadside managers requesting or using the developed Best Management Practices.
- Develop and implement Best Management Practices to advance green energy initiatives consistent with the conservation of GCN species and their habitats.
  Measure: Number of Best Management Practices developed for energy applications that facilitate conservation of GCN species and their habitats; number of requests received for the Best Management Practices.

Data Collection and Analysis

Data collection (research, inventory, survey, monitoring) needs were identified for many GCN species and key habitats. As data collection and management improves, key habitat and landscape-level maps and tools can be created to assist local boards and commissions considering land-use changes that may adversely impact GCN species or their key habitats. More comprehensive wildlife data and the use of GIS will support the development of improved statewide strategies for habitat enhancements on state and private lands. Management guidelines can then be designed to benefit GCN wildlife and address and balance the competing needs of different taxonomic groups. Providing this information to partners, private landowners, municipal land managers, and other land-use decision-making bodies is crucial to addressing the problems created by continued development in sensitive areas.

Scientific inventories and geospatial data in Connecticut are improving, yet significant gaps in distributions of select species, key habitats, and associated vegetative communities remain.

Field inventories to provide the data and expand mapping capabilities remain a priority research and general planning need.

From 2008 through 2010, DEEP undertook an ambitious campaign to map key habitats and develop geospatial databases for GCN species. A total of 36,000 acres were mapped representing 110 sites throughout the state. A statewide assessment of grassland habitat was also conducted, which used known grassland habitat characteristics to identify additional sites throughout the state. As a result, several new breeding and nesting sites for many of Connecticut's GCN birds were identified. The project also produced web pages on grasslands and grassland management including one hosted by Nonpoint Education for Municipal Officials (NEMO) to reach local land use officials and community groups. In another mapping effort, approximately 163,000 acres of state forests were digitized by forest stand.

In addition, UConn developed geospatial maps that address and display the extent of key habitats in Connecticut using the Northeast Habitat Classification Systems (NEHCS) (Terrestrial: Gawler 2008; Aquatic: Olivero and Anderson 2008) in accordance with the Northeast Lexicon and Synthesis Reports (Terwilliger et al. 2013) and assessed the relative conditions of key habitats in coordination with habitat experts within DEEP or other experts identified by DEEP. These maps are presented in following sections, and methods are summarized here.

For terrestrial habitats the NEHCS-Terrestrial was aligned with the forest classification system used by DEEP, which is based on the Forest Inventory and Analysis Forest Type Codes and the Northeast Decision making model (NED). DEEP provided Key Habitat Descriptions and completed the first cross-walk of NEHCS-Terrestrial Ecological Systems with WAP Key Habitats, Sub-Habitats, and Vegetative Communities (Appendix 2).

The NEHCS-Terrestrial encompassed many of the sub-habitats and vegetative communities defined by DEEP, but not all. In particular, rare communities, such as Fens and Coastal Plain Ponds, and stand characteristics, such as age or successional stage, were better captured using the Critical Habitats map developed by Metzler and Barrett (2006) and the early successional vegetation map developed by Rittenhouse (2014). Priority was given to these supplemental maps over the NEHCS-Terrestrial when there was overlap, so that all habitat maps have the highest level of detail.

Some data sources were used to map multiple sub-habitat types. For example, the U.S. Geological Survey's National Land Cover Database (NLCD) agricultural classes 81-82 were used to map Warm Season Grasslands, Cool Season Grasslands, Wet Meadows, and Agricultural Lands. Inclusion of NLCD agriculture classes over-represented the amount of Grassland and Wet Meadow sub-habitats. From this, DEEP used soils information to screen and identify Inland Wetland Soils and Hydric soils within NLCD agricultural classes. Soils information was obtained from the Inland Wetland Soils and "Hydric Soils" layers available here: http://www.ct.gov/deep/cwp/view.asp?a=2698&q=322898&deepNav_GID=1707%20

The following data sources were used to refine these sub-habitats:

- The Wet Meadows sub-habitat was refined to include only the NLCD agriculture 81-82 types that occur on inland wetland soils or hydric soils.
- The Grassland sub-habitat classes were refined to exclude hydric or inland wetland soils, and thus constitute only NLCD agriculture 81-82 that do not occur on inland wetland soils or hydric soils.

- The Agriculture sub-habitat class continues to include all NLCD agriculture 81-82 types, regardless of soils.

DEEP refined the Upland Forest Key Habitat category with roads information. Many secondary and smaller roads in Connecticut have forest cover that extends over the road or continues across the road. This can be problematic when determining extent of contiguous forest as roads are present, but not accounted for, in the Upland Forest map. DEEP overlaid roads on the Upland Forest map and assigned a non-forest value to cells where roads overlapped with forests. Roads information was obtained from the U.S. Census, available here: https://www.census.gov/cgi-bin/geo/shapefiles2014/main. The roads information was used to identify primary and secondary roads, as well as all roads (inclusive of primary, secondary and all other roads). The Upland Forest Key Habitat map was produced with the all roads information.

Several sub-habitats were not represented in the NEHCS-Terrestrial, Critical Habitats, or NLCD classifications and thus maps were not produced. These include: Mixed Hardwoods, Calcareous Spring Fens, Caves and other Subterranean Features, Seeps and Surface Springs, and Vernal Pools. At present, information sources that would enable mapping these sub-habitats are not readily available.

Improved mapping of key habitats statewide will target surveys of GCN species, particularly invertebrates. Mapping of ecological landscapes can identify and delineate land areas with similar topography, bedrock type, soils, surface hydrology, vegetation, and land use to further focus field surveys. This will facilitate analyses of the key habitats within their ecological contexts and develop a framework for their conservation.

Continuing collaboration with UConn to collect and analyze spatial data on Connecticut's landscape will provide improved information and an opportunity to assess and monitor the extent and condition of key habitats. Additional assessment and monitoring information, such as forest health and water quality, will be evaluated to develop an effective monitoring framework for application to GCN species and key habitats, as well as monitoring their spatial and temporal effectiveness.

Habitat fragmentation and loss continue to be the greatest threats to Connecticut's biota, with many existing conservation areas too small to preserve area-sensitive species. To achieve the goal of protecting the full complement of biotic diversity, species aggregations and focal areas will be used to stimulate conservation action. The use of indicator species to focus or evaluate conservation actions has been discussed repeatedly in the literature (e.g., Lovejoy and Oren 1981, Landres et al. 1988, Lambeck 1997). The 2015 plan will continue to use these strategies and models in conservation planning.

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies these actions as "Data Collection and Analysis." WAP indicators and performance measures for projects that involve Data Collection and Analysis include the following and are a component of the WAP database (see Chapter 5):

1. Evidence that clear management needs and outcomes have been identified with input from relevant data users;
2. Evidence that the researcher clearly provides answers to relevant questions;
3. Evidence that data are reaching relevant audiences;

4. Evidence that data collection effort resulted in conservation action recommendations; and
5. Evidence data are being used to inform conservation actions.

Highest Priority Actions:

- Compile baseline information for all GCN species for which information is lacking such as: ecology, biology, behavior, population dynamics, distribution, abundance, condition, and limiting factors using regionally consistent protocols where possible.
  Measure: Number of GCN species for which baseline information is compiled; number of regionally consistent protocols used to compile baseline information.
- Develop long-term monitoring protocols, consistent with regional protocols where possible, and implement research and management activities to conserve GCN species.
  Measure: Number of long-term monitoring protocols developed and implemented; number of research and management activities implemented.
- Conduct surveys of declining GCN species.
  Measure: Number of surveys conducted of declining GCN species; number of surveyors conducting surveys of declining GCN species.
- Map key habitats at the landscape level. Use periodic reviews of maps to monitor their status and condition.
  Measure: Number of key habitats mapped at the landscape level; number of maps reviewed.
- Research the impacts of chemical contaminants on GCN species and their habitats such as brook and brown trout, snapping turtles, aquatic insects, and other vulnerable species.
  Measure: Number of research projects conducted that study the impacts of chemical contaminants on GCN species and their key habitats; number of researchers participating in the project.
- Determine and monitor the distribution, abundance, habitat use, and condition of GCN aquatic species.
  Measure: Number of GCN aquatic species for which the distribution, abundance, habitat use and condition is determined; number of participants in the monitoring projects.
- Work closely with academic institutions to accomplish research-oriented actions for GCN species and key habitats.
  Measure: Number of research-oriented actions accomplished in conjunction with academic institutions for GCN species and key habitats; number of academic institutions participating in research-oriented actions.
- Develop and implement inventory, survey and monitoring protocols to determine and track the status and condition of key habitats and GCN plant species.
  Measure: Number of inventory, survey and monitoring protocols developed to determine and track the status and condition of key habitats and GCN plant species; number of inventory, survey and monitoring protocols implemented to determine and track the status and condition of key habitats and GCN plant species.

- Map the location of key habitats of GCN species to evaluate potential impacts to those sites from activities such as drainage and development.
  Measure: Number of mapped areas surrounding GCN species locations for which potential impacts were evaluated.
- Monitor key GCN species' migratory routes especially along the coastline through the enhanced use of remote technology such as nanotransmitter receiver towers.
  Measure: Number of migratory routes of key GCN species monitored through the enhanced use of remote technology.
- Evaluate the impact of invasive species on GCN species and their habitats and implement management strategies.
  Measure: Number of studies conducted evaluating the impact of invasive species on GCN species and their key habitats, and the number of management strategies developed and implemented to minimize the impact.
- Develop an improved data collection, management, and retrieval system to track the status of GCN species and key habitats.
  Measure: An improved data collection, management, and retrieval system developed to track the status of GCN species and key habitats.
- Investigate the effects and impacts of climate change on GCN species.
  Measure: Number of studies initiated to investigate how climate change will affect and impact GCN species.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.
  Measure: Number of key habitat areas assessed for level of existing degradation, threats for future degradation and opportunities for conservation.
- Work closely with regional and state partners to accomplish research-oriented actions that address emerging issues that may adversely affect wildlife and habitats.
  Measure: Number of research-oriented actions accomplished to address emerging issues.

Direct Management of Natural Resources

AFWA (2011) defined direct management of natural resources as "stewardship of terrestrial and aquatic species, habitats and/or natural processes to maintain populations or restore ecological functions." These activities include conserving, managing, and restoring fish and wildlife populations and their habitat. Direct management of natural resources is one of the primary missions of DEEP.

Many factors influence the management of natural resources, including staffing, budgets, and policies. Public support or understanding of resource management (e.g., creating early successional habitat) may be lacking due to a lack of knowledge regarding species status, habitat needs, or conflicting land uses.

The spread of invasive species represents a major threat to wildlife conservation. Understanding invasive species impacts and invasion processes is essential for determining management actions. New invasive species continue to appear and more can be expected given that increasing temperature and other climate change factors exacerbate invasion processes (MCCS and NWF 2013). Overabundance of white-tailed deer also promotes the spread of invasive species. Recent studies (Eschtruth and Battles 2008) are providing evidence that white-tailed deer herbivory on native plants can accelerate the invasion of exotic plants, especially on sites where tree canopy removal provides the disturbed conditions that also promote invasion. Global commerce and travel have also exacerbated the spread of non-native, invasive organisms.

Direct Management in Action

Human activities may result in direct physical damage to wildlife and habitats. For example, at sandy beaches used for nesting by piping plovers and terns, human activity (trampling nests and young) impacts the reproductive success of these ground-nesting species.

The DEEP developed a management program to protect these areas.The program involves permanent and temporary staff, volunteer monitors, and educators. Partner support has been tremendous and thousands of volunteer hours have been provided. Partners include, but are not limited to: Connecticut Audubon Society, The Nature Conservancy, The City of Bridgeport, DEEP Parks, The USFWS Stewart B. McKinney National Wildlife Refuge, Audubon Connecticut, and the Roger Tory Peterson Institute.

Over the past nine years, approximately 43 plover pairs per year have nested in the state averaging 75 young fledged per year. During the same time period, approximately 213 least tern pairs averaged 69 young fledged per year. These important protection actions will continue as a high priority for implementation over the next decade.

The close proximity of many northeastern states has engendered a long history of cooperative and complementary management approaches. Within the Northeast Association of Fish and Wildlife Agencies (NEAFWA), a long history exists of exchanging ideas and developing common approaches to wildlife issues.

The Northeast Fish and Wildlife Diversity Technical Committee (NEFWDTC), charged by NEAFWA, identified priorities for regional conservation. NEFWDTC also identified the need for an approach to enhance regional implementation. The Regional Conservation Needs (RCN) Program, funded collaboratively by the northeastern states, formalizes this cooperative approach to address GCN species needs across multiple states. The purpose of the RCN program is to develop, coordinate, and implement conservation actions that are regional in

scope, and build upon the many regional initiatives that already exist. The RCN projects allow Northeast states to identify and respond to emerging issues, such as invasive species and diseases that can best be addressed at the regional or landscape level. The RCN funded projects have served as the foundation and catalyst for significant additional supplemental work on these critical regional issues.

The State Wildlife Grants Program (SWG) and the Competitive State Wildlife Grants (SWG-C) programs have provided additional funding for regional conservation priorities. Recent RCN and SWG project examples include research into white-nose syndrome in bats, Rana virus, and fungal disease in snakes. Emerging invasive species issues and partnerships to address them include the Asian longhorn beetle and the emerald ash borer. As a result of this collaborative funding and partnership strategy, state fish and wildlife agencies of the Northeast lead the country in the spectrum and diversity of regionally coordinated conservation efforts. Since 2007, thirty-seven projects have been selected. The resulting reports and products can be found at RCNgrants.org. Direct action priorities for the region and Connecticut-specific actions for this 2015 WAP follow. For the conservation actions below, the response of GCN species and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies actions in this category as a "Direct Management of Natural Resources." WAP indicators and performance measures for projects that involve Direct Management of Natural Resources include the following and are a component of the WAP database (see Chapter 5):

1. Percent management actions implemented as planned;
2. Evidence that direct management action is reducing key threats;
3. Degree to which target GCN species respond as expected from direct management actions;
4. Degree to which target habitats/processes respond as expected from direct management actions;
5. Species Measures (e.g., population size, reproductive success); and
6. Habitat Measures (e.g., size, condition).

Highest Priority Actions:

- Develop and implement conservation actions that are most effectively addressed at a regional/multi-state scale, with the input and involvement of partners engaged in the creation and implementation of the state WAPs.
  Measure: Number of conservation action/research projects selected and completed with partners.
- Prioritize management for GCN species and habitats on state lands with a focus on rare and declining habitats.
  Measure: Number of prioritized rare and declining key habitats for GCN species managed on state land.
- Increase invasive plant and animal control on public lands, especially state wildlife management areas, and on private lands.
  Measure: Number of invasive plant and animal species controlled on public and private lands.

- Evaluate and implement options to minimize impacts from over-browsing by deer to the habitat of GCN species.
  Measure: Number of options implemented and evaluated to minimize key habitat impacts from over-browsing by deer to GCN species.
- Continue to incorporate new guidance and information from the Northeast Climate Science Center at the national, regional, and local levels to implement actions to enhance stability, connectivity, and habitat health so GCN species can adapt to climate change.
  Measure: Number of actions implemented that enhance stability, connectivity, and habitat health so GCN species can adapt to climate change.

Land and Water Acquisition and Protection

Land acquisition and protection are essential elements necessary to counterbalance habitat loss due to development and habitat degradation. The WAP recognizes that conservation needs to be conducted at all spatial scales, from broad landscapes to the smallest backyard. Every municipality, land trust, and citizen has the capacity to contribute to conservation of the state's fish and wildlife.

In Connecticut, most existing tracts of land set aside or managed for wildlife are not large enough to support some vulnerable species, due to pressures from public use and indirect influences from surrounding land uses. Therefore, a strategy of increasing the size of tracts of land and connecting them to other conserved areas is needed. If acquisitions are prioritized with wildlife conservation as a primary goal, then issues such as habitat management, human disturbance, mortality of animals, and connectivity can be more strategically addressed.

Protection of aquatic systems is also challenging because inputs generated throughout an entire watershed, including contaminants and invasive species, can impact aquatic habitats at great distances from their sources. Freshwater aquatic systems are used for power generation, drinking water, and irrigation, which puts additional stresses on these systems. Programs to restore stream connectivity and improve or maintain flow rates and water quality must be expanded. An example of conservation at this scale is the Connecticut River Watershed Council, an ongoing collaborative effort that implements watershed conservation priorities. The Council advocated for the establishment of the Silvio O. Conte National Wildlife Refuge, led the successful effort to have the Connecticut River designated as a federal "American Heritage River," created a River Steward Program to have on-site advocates in the valley, helped protect over 8,000 acres of land in the watershed, supported the removal of dams to restore anadromous fish habitat, and worked to restore salmon to the river and its tributaries.

The Connecticut River was named the first National Blueway in May 2012. The designation was part of President Obama's America's Great Outdoors Rivers Initiative to establish a community-driven conservation and recreation agenda for the 21st century. The Connecticut River National Blueway designation recognizes the collaborative leadership of more than 40 partner organizations under the umbrella of the Friends of the Silvio O. Conte National Fish and Wildlife Refuge and the cumulative successes of the Connecticut River Watershed Council, states, and many other partners.

Another example is the Connecticut River Watershed Landscape Conservation Design Pilot, a 2014 collaborative effort facilitated by the USFWS and supported by the North Atlantic

Landscape Conservation Cooperative (NALCC) to plan and design such a large landscape conservation project. The Pilot is led by a team of conservation partners composed of federal and state agencies, including DEEP, and private organizations working at various scales in the Connecticut River watershed. The Pilot will use the best available science to help partners set goals and measurable objectives for representative species of fish and wildlife (and supporting ecosystems), and translate those goals and objectives into projections of the amount, type and distribution of habitat needed to sustain fish and wildlife.

The Connecticut Open Space Initiative originated in 1998 as a result of collaboration between the Governor, the Connecticut General Assembly, the Blue Ribbon Task Force on Open Space, and the DEP. In 2001, the DEP published *"The Green Plan: Guiding Land Acquisition and Protection in Connecticut"* outlining achievements of the Open Space Initiative to date and a strategy for conserving at least 21 percent of the state's land area as open space by 2023. In the first three years of the program (1998-2001), 103.5 million dollars were allocated via the Recreation and Natural Heritage Trust Fund, the Open Space and Watershed Land Acquisition Grant Program, and the Charter Oak Open Space Trust to purchase additional state lands and provide matching funds for municipalities, nonprofit land conservation organizations, and water utility companies to purchase open space lands. *"The Green Plan: Guiding Land Acquisition and Protection in Connecticut 2007-2012"* is Connecticut's Comprehensive Open Space Plan, which was revised in 2007 and is being revised again for 2014 through 2019 (www.ct.gov/deep/openspace). Information in the September 2014 draft indicates that DEEP currently has 80 percent of the 320,576 acres targeted for open space acquisition and conservation partners hold 68 percent of the 352,634 acres targeted for partner open space preservation. This totals 15 percent of Connecticut's land area currently held as open space. In December 2012, awards of more than nine million dollars in Open Space and Watershed Land Acquisition grants were made to support 35 communities in purchasing 2,732 acres to be preserved as open space. The program, administered by DEEP, assists land purchase using state bonds and funding from the 2005 Community Investment Act. Land purchases will help Connecticut achieve the goal to protect 673,210 acres of land by 2023. Connecticut has 496,182 acres designated as state or local open space lands, 73.7 percent of the goal. More than 109 million dollars in state funding has been awarded to municipalities, nonprofit land conservation organizations, and water companies to assist in the purchase of 27,440 acres of land in 128 cities and towns.

The program continues to make significant progress towards its 2023 goals, focusing on lands that protect water access sites, natural areas, greenways, scenic and historically significant properties, forests, and habitat for native plant or animal species listed as threatened, endangered, or of special concern, Class I or Class II watershed and areas that protect water quality, and sites in urban areas and that preserve local agricultural heritage.

The Association of Fish and Wildlife Agencies' 2011 report on Effectiveness Measures for State Wildlife Grants classifies actions in this category as "Acquisition/ Easement/Lease." The WAP indicators and performance measures for projects are listed below and are a component of the WAP database:

1. Percent of prioritized land purchased, leased, or put into easement;
2. Percent of protected land with management and monitoring plans that outline steps required to achieve desired conservation results;
3. Percent of land acquisition actions in which management plans are being implemented;

4. Percent of initiatives that show a reduction in key threats being addressed by management plan;
5. Percent of protected lands at the time of renewal that are renewed, converted from lease to easement, or acquired; and
6. Percent of easements or leases in compliance.

For the conservation actions below, the response of GCN species and key habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Highest Priority Actions:

- Map, prioritize, acquire and protect key terrestrial and aquatic habitats for GCN species; especially coastal habitats, cold water streams, headwater habitats, grasslands, inland wetlands, connective corridors, and buffers to climate change.
  Measure: Number of key land and water habitats, of importance to GCN species, mapped, prioritized, protected or acquired.
- Develop additional funding sources for in-fee land aquisition purchases to acquire more land to benefit GCN species and their habitats.
  Measure: A funding source developed to purchase land in fee that benefits GCN species and key habitats.
- Acquire important, high quality areas of land to add to the state wildlife management area and forest system that will benefit both common and GCN species.
  Measure: Number of acres of important, high quality areas of land added to the state wildlife management area and state forest system that will benefit both common and GCN species.

TAXON AND SPECIES-SPECIFIC ACTIONS

In addition to the previous actions that apply to GCN species and key habitats statewide, the following list of conservation actions and research, inventory and monitoring needs was developed to address threats to species or species groups. This list also reflects actions and needs identified in partners' plans for Connecticut's GCN species groups (Appendix 1). It is impractical to repeat all those actions here, so they are incorporated by reference in this document and addressed more specifically in step-down taxa plans and annual work plans. The GCN ranking for each species presented in chapter 1 (Most Important, Very Important, and Important) was considered and is reflected in the acton ranking. Only highest priority actions are presented here. Additional taxa actions are listed in Appendix 4. For the conservation actions listed below, the response of GCN species and key habitats would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Mammals

- **Administration:** Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN mammals such as Indiana bat, northern long-eared bat, New England cottontail, and marine mammals.
  Measure: Number of regional conservation efforts participated in for GCN mammals.

- **Technical Assistance:** Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
  Measure: Number of best management practices developed for GCN bat species for use by federal, state, municipal and private land managers that conserve and enhance GCN bat populations.

Birds

- **Administration:** Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN birds such as golden-winged warbler, cerulean warbler, piping plover, roseate tern, and saltmarsh sparrow.
  Measure: Number of regional conservation efforts participated in for GCN birds.
- **Data Collection and Analysis:** Monitor wetland birds in coordination with Partners in Flight and Colonial Bird Monitoring and other avian conservation initiatives.
  Measure: Number of monitoring surveys of wetland bird species conducted in coordination with Partners in Flight, Colonial Bird Monitoring, or other avian conservation groups.
- **Data Collection and Analysis:** Assess the effects of wetland restorations on the distribution and abundance of black ducks.
  Measure: Number of monitoring surveys conducted to assess the effects of restoration activities on the distribution and abundance of black ducks.
- **Direct Management of Natural Resources:** Conserve populations of avian species for which Connecticut has a global responsibility for conservation such as blue-winged warbler, saltmarsh sparrow, greater scaup, and worm-eating warbler.
  Measure: Number of populations of avian species conserved for which Connecticut has a global responsibility for conservation such as blue-winged warbler, saltmarsh sparrow, greater scaup, and worm-eating warbler.
- **Land and Water Acquisition and Protection:** Identify, conserve and improve key stopover habitats important to migratory GCN birds.
  Measure: Number of stopover habitats for migratory GCN birds identified and conserved.
- **Technical Assistance:** Develop outreach materials to increase public awareness of threats posed to GCN birds from window strikes and lighting design. Develop Best Management Practices for architects, engineers, and building managers to minimize the impacts to GCN birds.
  Measure: Number of outreach materials developed to increase public awareness of threats posed to GCN birds from window strikes and lighting design; number of Best Management Practices developed to minimize the impacts of window strikes on GCN birds.

Reptiles and Amphibians

- **Administration:** Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN herpetofauna such as timber rattlesnake, Northern leopard frog, and diamond-backed terrapin.
  Measure: Number of regional conservation efforts participated in for GCN herpetofauna.
- **Data Collection and Analysis:** Determine and map the distribution of blue-spotted salamander (diploid) populations.
  Measure: Number of monitoring surveys conducted to determine and map the distribution of blue-spotted salamander (diploid) populations.
- **Land and Water Acquisition and Protection:** Conserve vernal pool breeding sites and their surrounding upland habitats.
  Measure: Number of vernal pool breading sites and their surrounding upland habitats conserved.
- **Technical Assistance:** Develop Best Management Practices and provide technical assistance to municipalities and private landowners regarding the conservation of GCN reptiles and amphibians and their habitats.
  Measure: Number of Best Management Practices developed and technical assistance provided to municipalities and private landowners to conserve GCN reptiles and amphibians and their key habitats.
- **Technical Assistance:** Develop standards for road crossings and road designs (e.g., curbs, box culverts) to reduce the mortality of GCN herpetofauna species.
  Measure: Number of standards for road crossings and road designs developed to reduce the mortality of GCN herpetofauna species.

Fish

- **Administration:** Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN fish such as Atlantic sturgeon, shortnose sturgeon, American eel, and winter flounder.
  Measure: Number of regional conservation efforts participated in for GCN fish.
- **Data Collection and Analysis:** Determine contaminant effects on spawning success of GCN fish such as Atlantic sturgeon, shortnose sturgeon, tautog, and winter flounder.
  Measure: Number of monitoring surveys conducted to determine whether contaminants are affecting spawning success of GCN species.
- **Data Collection and Analysis:** Determine the site fidelity to habitats such as spawning areas, overwintering areas, or summer habitats of all GCN fish.
  Measure: Number of monitoring surveys conducted to determine fidelity of GCN fish to individual sites.
- **Data Collection and Analysis:** Research population dynamics of GCN marine fish including the effects of density dependent and density independent factors.
  Measure: Number of monitoring surveys conducted to examine population dynamics of GCN marine fish.

- **Data Collection and Analysis:** Monitor fish stock structure, species movements, and abundance and distribution, by life stage.
  Measure: Number of monitoring surveys conducted to examine stock structure, species movements, abundance and distribution, by life stage.
- **Data Collection and Analysis:** Use genetic testing to determine stock composition of key GCN fish species such as Atlantic sturgeon, shortnose sturgeon, tautog, winter flounder, burbot, and American brook lamprey.
  Measure: Number of genetic tests conducted to examine stock composition of fish populations.
- **Data Collection and Analysis:** Investigate the causes of reduced fish stocks and determine if specific life stages are limited by the distribution and abundance of key habitats.
  Measure: Number of monitoring surveys conducted to investigate the causes of reduced fish stocks including whether specific life stages are limited by distribution and abundance of key habitats.

Invertebrates

- **Administration:** Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN invertebrates such as puritan tiger beetle, monarchs, and native pollinators (e.g., bees, butterflies, moths, beetles, and flies).
  Measure: Number of regional conservation efforts for GCN invertebrates.
- **Data Collection and Analysis:** Facilitate submission of data on seasonal activity, distribution, and abundance of GCN invertebrate species from the scientific community. Develop an online database that provides this information to the public, especially land planners.
  Measure: A public on-line distribution and abundance database created for GCN invertebrate species with data submitted by the scientific community, and locational information supplied from this database to the public, especially land planners.
- **Data Collection and Analysis:** Manage and restore habitats for native pollinators. Specifically, identify and map areas where migration stopover habitats for native pollinator species can be established or restored.
  Measure: Number of areas mapped and designated to establish or restore migratory stopover habitat for native pollinators.
- **Data Collection and Analysis:** Assess the status and distribution of bees and other native pollinators and assess threats such as the use of pesticides, especially neonicotinoids.
  Measure: Number of status and distribution assessments done for bees and native pollinators and the effects of pesticides on them.
- **Data Collection and Analysis:** Research population dynamics of GCN marine invertebrates including the effects of density dependent and density independent factors.
  Measure: Number of monitoring surveys conducted to examine population dynamics of GCN marine invertebrates.

- **Direct Management of Natural Resources:** Enhance inventory and conservation efforts for Odonate species.
  Measure: Number of inventory and conservation efforts enhanced for Odonate species.
- **Direct Management of Natural Resources:** Enhance inventory and conservation efforts for freshwater mussels.
  Measure: Number of inventory and conservation efforts enhanced for freshwater mussels.
- **Education and Outreach:** Develop and implement community outreach programs to enhance conservation and stewardship of native pollinators.
  Measure: Number of community outreach programs developed and implemented to enhance conservation and stewardship of native pollinators.
- **Land and Water Acquisition and Protection:** Identify, conserve, and improve key stopover habitats important to migratory GCN invertebrates.
  Measure: Number of stopover habitats for migratory GCN invertebrates identified, conserved, and improved.

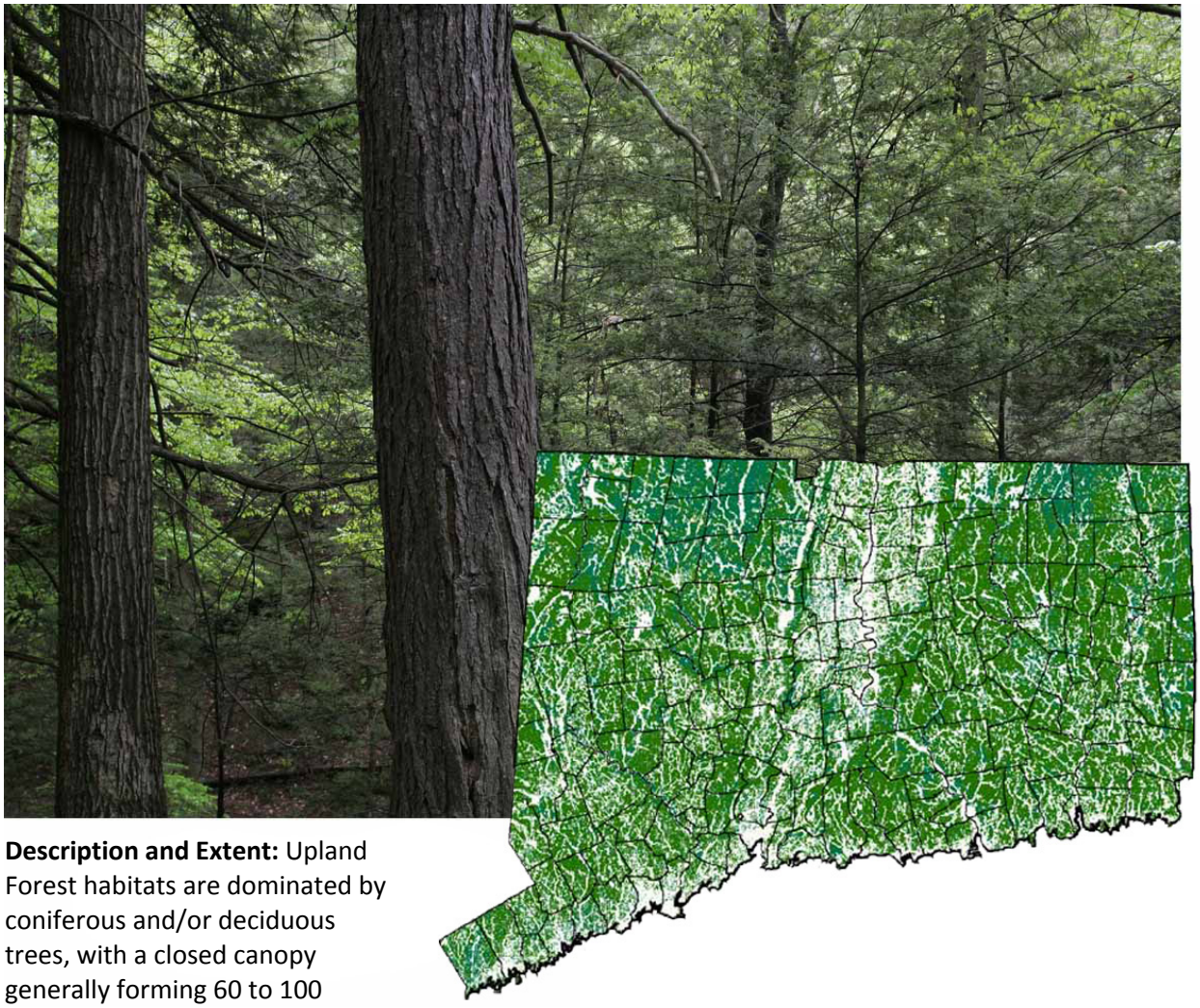
Plants

- **Data Collection and Analysis:** Collaborate with partners to investigate the germination requirements and autecology of GCN plant species and facilitate the increased collection of seed from local GCN plant populations for the purpose of supporting in-state restoration efforts.
  Measure: Number of studies conducted on the germination and habitat requirements of GCN plant species and the number of seed collections from local GCN plant populations.
- **Data Collection and Analysis:** Collaborate with partners to predict and investigate the current distributions of GCN plant species.
  Measure: Number of predictive distribution models developed and botanical site surveys conducted for GCN plant species.
- **Direct Management of Natural Resources:** Conduct habitat management to maintain or restore site conditions appropriate for GCN plant species.
  Measure: Number of habitat management practices completed for GCN plant species.
- **Education & Awareness:** Develop a native plant initiative to increase the use of native species in landscape designs.
  Measure: A native plant initiative developed to increase the use of native species in landscape designs; number of landscape designs using native plant species.

Conservation Actions to Conserve Key Habitats and GCN Species

For each of the ten key habitats, GCN species are listed as Most Important, Very Important, or Important. Threats, priority actions, and research/survey/monitoring needs are identified for each habitat type. Proposed actions may be specific to a habitat, sub-habitat, or GCN species.

Upland Forest Habitat



Description and Extent: Upland Forest habitats are dominated by coniferous and/or deciduous trees, with a closed canopy generally forming 60 to 100 percent canopy cover. Sub-habitats within this key habitat classification include: (a) Oak Forests, (b) Calcareous Forests, (c) Coniferous Forests, (d) Old Growth Forests, (e) Northern Hardwood Forests, (f) Mixed Hardwood Forests, (g) Young Forests, and (h) Maritime Forests.

Upland Forest habitats are characterized by deciduous trees and coniferous trees. A well-developed understory is generally present, but often lacks diversity. The understory may be absent in forests composed of shade tolerant trees or in forests with over-abundant white-tailed deer populations.

Found throughout Connecticut except for lowlands and ridge tops, Upland Forest is the most prominent habitat in the state. Representative examples of Upland Forests occur in Housatonic State Forest in the northwest corner and Meshomasic State Forest in central Connecticut.

Relative Condition: The condition of Upland Forests varies throughout the state depending upon stand age, diversity, deer population density, invasive species, and fragmentation.

Upland Forest Sub-habitats:

a. Oak Forest - Forests dominated (greater than 50% total stocking) by oaks (*Quercus spp.*) with various mixtures of other hardwoods or pine. Species of oak present depend on soils, which range from excessively well drained to somewhat poorly drained. Relative Condition: Good to Fair.

b. Calcareous Forest - Forests found on pH-neutral soils often associated with limestone bedrock. They are characterized by sugar maple, red oak, and red cedar, with white ash and tulip poplar being found at the base of slopes. Relative Condition: Fair.

c. Coniferous Forests - Forests dominated (greater than 50% total stocking) by white pine (*Pinus strobus*) or eastern hemlock (*Tsuga canadensis*). Plantations of older red pine (*Pinus resinosa*), spruce (*Picea spp.*), and other conifers are included due to the similar structure and habitat they provide. Relative Condition: Fair.

d. Old Growth Forests - Late successional forests that are not manipulated from their natural state of growth; includes both coniferous and deciduous forests. Late successional forests are often characterized by large mature trees. Relative Condition: Fair.

e. Northern Hardwood Forest - Forests dominated (greater than 50% total stocking) by northern hardwoods such as Sugar maple (*Acer saccharum*), Yellow birch (*Betula alleghaniensis*), and American beech (*Fagus grandifolia*), occasionally mixed or co-dominated by Eastern hemlock (*Tsuga canadensis*). Relative Condition: Fair.

f. Young Forest - Young Forests are characterized by seedling sapling trees smaller than 4.9 inches diameter at breast height (DBH), usually composed of late seral stage species (oak, hickory, maple, beech, ash) but may include “pioneer” type species, including cherry, aspen, and birch. Young Forests may be either coniferous, deciduous, or both, having trees less 0-20 years in age. These forests are characterized by high stem density (hardwood species typically), often interspersed with patches of herbaceous plants and briars growing up shortly after disturbance. Relative Condition: Poor.

g. Maritime Forests - Dry to moist coastal forests mostly showing the effects of salt spray with low-statured, gnarled trees and numerous lianas. Characteristic canopy trees include black oak (*Quercus velutina*), serviceberry (*Amelanchier canadensis*), sassafras (*Sassafras albidum*), scarlet oak (*Quercus coccinea*), white oak (*Quercus alba*), and blackgum (*Nyssa sylvatica*). Maritime forests often occur as a strand community, occupying a narrow band between other maritime and upland communities. These forests can also grade into maritime shrublands. Relative Condition: Poor.

TABLE 4.3: GCN SPECIES OF UPLAND FOREST HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Least Shrew	*Cryptotis parva*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
New England Cottontail	*Sylvilagus transitionalis*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
Deer Mouse	*Peromyscus maniculatus*	Very Important
Northern Flying Squirrel	*Glaucomys sabrinus*	Very Important
Hairy-Tailed Mole	*Parascalops breweri*	Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Southern Red-backed Vole	*Clethrionomys gapperi*	Important
Woodland Vole	*Microtus pinetorum*	Important
Birds		
American Kestrel	*Falco sparverius*	Most Important
American Woodcock	*Scolopax minor*	Most Important
Northern Goshawk	*Accipiter gentilis*	Most Important
Prairie Warbler	*Dendroica discolor*	Most Important
Sharp-shinned Hawk	*Accipiter striatus*	Most Important
Whip-poor-will	*Caprimulgus vociferus*	Most Important
Wood Thrush	*Hylocichla mustelina*	Most Important
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Very Important
Black-throated Blue Warbler	*Dendroica caerulescens*	Very Important
Broad-winged Hawk	*Buteo platypterus*	Very Important
Brown Thrasher	*Toxostoma rufum*	Very Important
Canada Warbler	*Wilsonia canadensis*	Very Important
Cerulean Warbler	*Setophaga cerulea*	Very Important
Chestnut-sided Warbler	*Dendroica pensylvanica*	Very Important
Chimney Swift	*Chaetura pelagica*	Very Important
Eastern Towhee	*Pipilo erythrophthalmus*	Very Important
Least Flycatcher	*Empidonax minimus*	Very Important
Long-eared Owl	*Asio otus*	Very Important
Louisiana Waterthrush	*Seiurus motacilla*	Very Important
Northern Flicker	*Colaptes auratus*	Very Important
Ruffed Grouse	*Bonasa umbellus*	Very Important

Common Name	Scientific Name	Tier*
Scarlet Tanager	*Piranga olivacea*	Very Important
Worm-eating Warbler	*Helmitheros vermivorus*	Very Important
Yellow-billed Cuckoo	*Coccyzus americanus*	Very Important
Yellow-breasted Chat	*Icteria virens*	Very Important
Bald Eagle	*Haliaeetus leucocephalus*	Important
Baltimore Oriole	*Icterus galbula*	Important
Black-and-white Warbler	*Mniotilta varia*	Important
Blackburnian Warbler	*Dendroica fusca*	Important
Brown Creeper	*Certhia americana*	Important
Eastern Wood-pewee	*Contopus virens*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Northern Parula	*Setophaga americana*	Important
Northern Saw-whet Owl	*Aegolius acadicus*	Important
Ovenbird	*Seiurus aurocapillus*	Important
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Important
Veery	*Catharus fuscescens*	Important
Yellow-crowned Night-heron	*Nyctanassa violacea*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Timber Rattlesnake	*Crotalus horridus*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Common Five-lined Skink	*Plestiodon fasciatus*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Hognose Snake	*Heterodon platirhinos*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Jefferson Salamander "Complex"	*Ambystoma jeffersonianum*	Very Important
Northern Slimy Salamander	*Plethodon glutinosus*	Very Important
Northern Spring Salamander	*Gyrinophilus porphyriticus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Copperhead	*Agkistrodon contortrix*	Important
Eastern Newt	*Notophthalmus viridescens*	Important
Eastern Racer	*Coluber constrictor*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Gray Treefrog	*Hyla versicolor*	Important
Marbled Salamander	*Ambystoma opacum*	Important
Northern Dusky Salamander	*Desmognathus fuscus*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Wood Frog	*Lithobates sylvatica*	Important
Invertebrates		
Appalachian Blue	*Celastrina neglectamajor*	Most Important
Atlantis Fritillary Butterfly	*Speyeria atlantis*	Most Important

Common Name	Scientific Name	Tier*
Brick-red Borer Moth	*Papaipema marginidens*	Most Important
Columbine Borer	*Papaipema leucostigma*	Most Important
Columbine Duskywing	*Erynnis lucilius*	Most Important
Common Roadside Skipper	*Amblyscirtes vialis*	Most Important
Herodias Underwing	*Catocala herodias gerhardi*	Most Important
Little 17-year Periodical Cicada	*Magicicada septendecula*	Most Important
Aureolaria Seed Borer	*Pyrrhia aurantiago*	Very Important
Yellow-banded Bumble Bee	*Bombus terricola*	Very Important
American Burying Beetle**	*Nicrophorus americanus*	Important
Ashton's Cuckoo Bumble Bee**	*Bombus ashtoni*	Important
Black Lordithon Rove Beetle**	*Lordithon niger*	Important
Fragile Dagger Moth	*Acronicta fragilis*	Important
Ground Beetle	*Badister transversus*	Important
Ground Beetle	*Carabus vinctus*	Important
Ground Beetle	*Scaphinotus viduus*	Important
Horace's Duskywing	*Erynnis horatius*	Important
Imperial Moth	*Eacles imperialis imperialis*	Important
Long-horned Beetle	*Prionus pocularis*	Important
Monarch	*Danaus plexippus*	Important
Nine-spotted Lady Beetle	*Coccinella novemnotata*	Important
Northern Dusk-singing Cicada	*Tibicen auletes*	Important
Pink Prominent	*Hyparpax aurora*	Important
Purse Web Spider	*Sphodros niger*	Important
Regal Moth**	*Citheronia regalis*	Important
Rusty-patched Bumble Bee**	*Bombus affinis*	Important
Silvery Blue	*Glaucopsyche lygdamus*	Important
Stinging Rose Caterpillar Moth	*Parasa indetermina*	Important
Sugar Maple Borer	*Glycobius speciosus*	Important
Plants		
Small Whorled Pogonia	*Isotria medeoloides*	Most important
American Ginseng	*Panax quinquefolius*	Important
Beaked Hazel	*Corylus cornuta*	Important
Black Bugbane	*Actaea racemosa*	Important
Black Oak	*Quercus velutina*	Important
Common Serviceberry	*Amelanchier arborea*	Important
Fern-leaf False Foxglove	*Aureolaria pedicularia*	Important
Fogg's Goosefoot	*Chenopodium fogii*	Important
Goldenseal	*Hydrastis canadensis*	Important
Highbush Blueberry	*Vaccinium corymbosum*	Important
Nodding Pogonia	*Triphora trianthophora*	Important
Pignut Hickory	*Carya glabra*	Important
Pin Cherry	*Prunus pensylvanica*	Important
Post Oak	*Quercus stellata*	Important

Common Name	Scientific Name	Tier*
Red Pine	*Pinus resinosa*	Important
Roundleaf Ragwort	*Packera obovata*	Important
Showy Aster	*Eurybia spectabilis*	Important
Showy Orchid	*Galearis spectabilis*	Important
Smooth False Foxglove	*Aureolaria flava*	Important
St. Lawrence Grapefern	*Botrychium rugulosum*	Important
Sugar Maple	*Acer saccharum*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Loss of large forest blocks (e.g., 2,000+ acres) with unbroken canopy due to fragmentation through development.
Sub-habitats affected: All

- Action: Develop incentives for towns to conserve key habitats.
  Measure: Number of incentives developed for towns to facilitate conservation of key habitats.

Threat: Lack of stand age, structural diversity, and understory diversity in upland forests.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit upland forest GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Increase the use of prescribed burns to benefit GCN species and their habitats.
  Measure: Number of projects conducted using specialized management techniques such as prescribed fire to benefit upland forest GCN species and their habitats.
- Action: Increase public outreach and education for private landowners regarding the importance of managing upland forest lands to conserve common and uncommon species.
  Measure: Number of outreach materials developed to increase public awareness and education for private landowners regarding the need to manage lands to conserve both common and uncommon species.

Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

Threat: Insufficient or inappropriate upland forest habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit upland forest GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them.

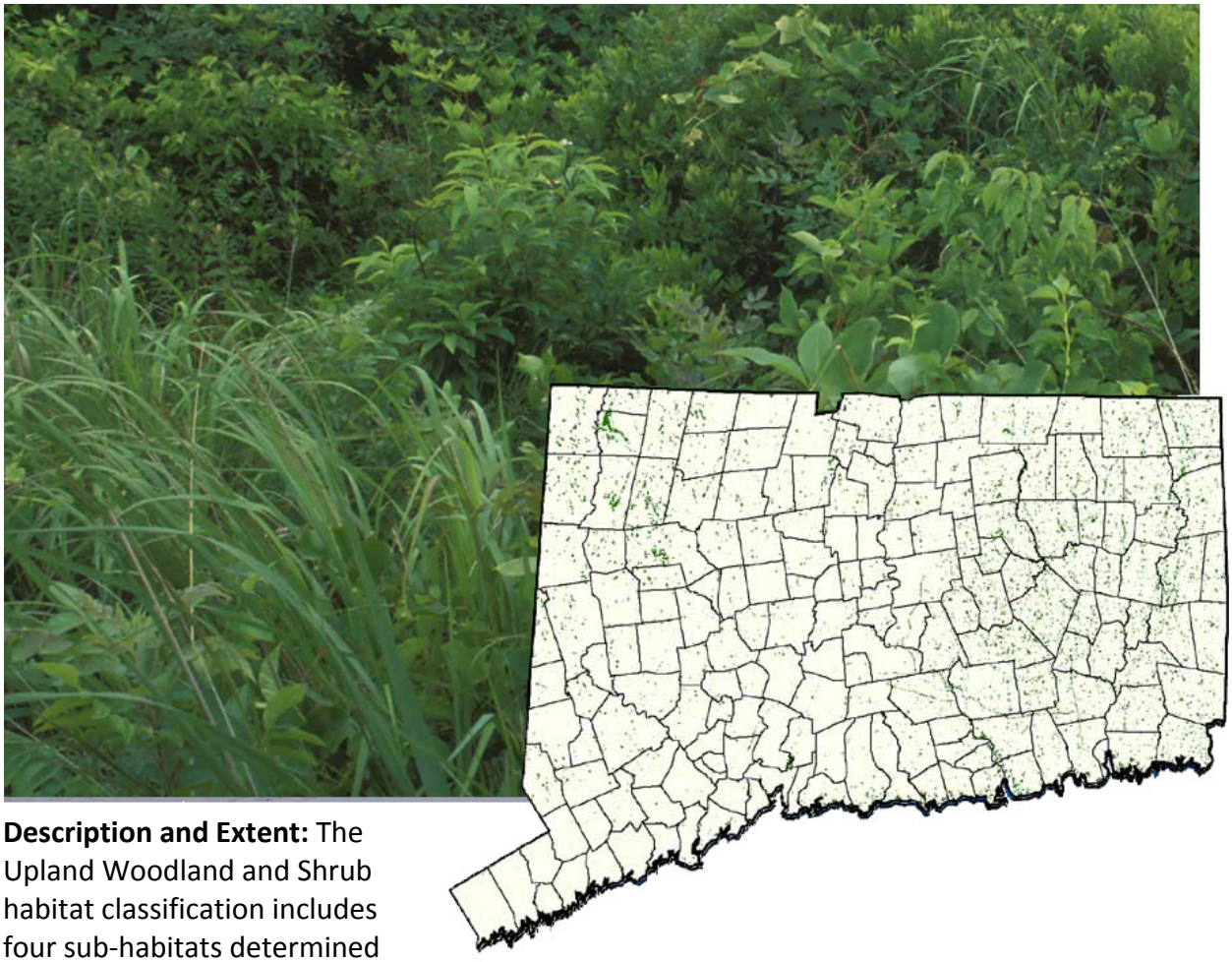
Threat: Degradation of upland forest habitat from over-browsing by deer.
Sub-habitats affected: All

- Action: Evaluate and implement options to minimize impacts from over-browsing by deer to the upland forest habitat of GCN species.
  Measure: Number of options implemented and evaluated to minimize key habitat impacts from over-browsing by deer to GCN species.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Monitor and conserve breeding populations of GCN forest interior birds.
  Measure: Number of breeding population of GCN forest interior birds that are monitored and conserved.

Upland Woodland and Shrub Habitat



Description and Extent: The Upland Woodland and Shrub habitat classification includes four sub-habitats determined to be important to wildlife: (a) Red Cedar Glades, (b) Pitch Pine and Scrub Oak Woodlands, (c) Maritime Shrublands, and (d) Reverting Field and Early Successional Shrubland.

Upland Woodland and Shrub habitats are characterized by open forests where tree crowns usually do not touch each other (i.e., at least 25% canopy cover). These woodlands are dominated by evergreen and or deciduous trees with a variety of shrubs, herbs, and nonvascular plants in the understory and groundcover. Representative examples of Upland Woodland and Shrub Habitat occur at Bluff Point Coastal Reserve and at Meigs Point and Willard Island in Hammonassett State Park.

Relative Condition: The overall status of Upland Woodlands and Shrub habitats in Connecticut is not well known at this time.

Upland Woodland and Shrub Sub-habitats:

a. Red Cedar Glades - Red Cedar Glades are found on exposed summits, ledges, and outcrops and include red cedar (*Juniperus virginiana*), low shrubs, and medium-tall grasses/herbs, such as little bluestem (*Schizachyrium scoparium*). In the western Marble Valleys, red cedar is mixed with hop hornbeam (*Ostrya virginiana*) and hickories (*Carya spp.*), with a diverse herbaceous understory that is a unique mixture of plants characteristic of dry sites and those limited to calcareous soils. Relative Condition: Fair.

b. Pitch Pine –Scrub Oak Woodlands - Dry woodlands found on sand and gravel or bedrock, typically including pitch pine, bear oak, and lowbush blueberry. Relative Condition: Poor.

c. Maritime Shrubland - Shrubland community occurring on seaside bluffs and open headlands exposed to winds and salt spray. Characteristic species include bayberry (*Morella pensylvanica*), Shining sumac (*Rhus copallinum*), black huckleberry (*Gaylussacia baccata*), and beach plum (*Prunus maritima*). These shrublands may also include dense growth of catbrier (*Smilax rotundifolia*) or areas of dwarf shrubs (heathland). Maritime Shrublands may grade into other communities, including 'maritime forest' and 'coastal beaches and dunes.' Relative Condition: Poor.

d. Reverting Field and Early Successional Shrubland - Reverting Fields are formerly cleared lands composed of a mix of grasses and herbaceous growth with not more than 75 percent woody vegetation in the form of shrubs, saplings, and pole size trees. They are characterized by red cedar, spirea, cherry, birch, and scattered brush and/or shrub species. Early Successional Shrublands are formerly cleared land growing back to greater than 50 percent shrub cover and less than 30 percent tree cover. Native shrublands are characterized by dogwoods, viburnums, blueberry, and alder. Non-native shrublands are often dominated by autumn and Russian olive, multiflora rose and honeysuckle. Relative Condition: Fair.

TABLE 4.4: GCN SPECIES OF UPLAND WOODLAND AND SHRUB HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Least Shrew	*Cryptotis parva*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
New England Cottontail	*Sylvilagus transitionalis*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
Meadow Jumping Mouse	*Zapus hudsonius*	Very Important
Long-tailed Weasel	*Mustela frenata*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Southern Red-backed Vole	*Clethrionomys gapperi*	Important
Woodland Vole	*Microtus pinetorum*	Important
Birds		
American Kestrel	*Falco sparverius*	Most Important
American Woodcock	*Scolopax minor*	Most Important
Barn Owl	*Tyto alba*	Most Important
Blue-winged Warbler	*Vermivora pinus*	Most Important

Common Name	Scientific Name	Tier*
Golden-winged Warbler	*Vermivora chrysoptera*	Most Important
Northern Harrier	*Circus cyaneus*	Most Important
Prairie Warbler	*Dendroica discolor*	Most Important
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Most Important
Whip-poor-will	*Caprimulgus vociferus*	Most Important
Brown Thrasher	*Toxostoma rufum*	Very Important
Chestnut-sided Warbler	*Dendroica pensylvanica*	Very Important
Eastern Towhee	*Pipilo erythrophthalmus*	Very Important
Field Sparrow	*Spizella pusilla*	Very Important
Indigo Bunting	*Passerina cyanea*	Very Important
Least Flycatcher	*Empidonax minimus*	Very Important
Northern Flicker	*Colaptes auratus*	Very Important
Ruffed Grouse	*Bonasa umbellus*	Very Important
Worm-eating Warbler	*Helmitheros vermivorus*	Very Important
Yellow-billed Cuckoo	*Coccyzus americanus*	Very Important
Yellow-breasted Chat	*Icteria virens*	Very Important
Baltimore Oriole	*Icterus galbula*	Important
Black-and-white Warbler	*Mniotilta varia*	Important
Eastern Kingbird	*Tyrannus tyrannus*	Important
Eastern Wood-pewee	*Contopus virens*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Ipswich Sparrow (Wintering)	*Passerculus sandwichensis princeps*	Important
Peregrine Falcon	*Falco peregrinus*	Important
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Important
Savannah Sparrow	*Passerculus sandwichensis*	Important
Short-eared Owl (Wintering)	*Asio flammeus*	Important
White-eyed Vireo	*Vireo griseus*	Important
Willow Flycatcher	*Empidonax traillii*	Important
Yellow-crowned Night-heron	*Nyctanassa violacea*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Timber Rattlesnake	*Crotalus horridus*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Common Five-lined Skink	*Plestiodon fasciatus*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Hognose Snake	*Heterodon platirhinos*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Copperhead	*Agkistrodon contortrix*	Important
Eastern Racer	*Coluber constrictor*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important

Common Name	Scientific Name	Tier*
Marbled Salamander	*Ambystoma opacum*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Invertebrates		
Barrens Chytonix	*Chytonix sensilis*	Most Important
Black-eyed Zale	*Zale curema*	Most Important
Buck Moth	*Hemileuca maia maia*	Most Important
Columbine Duskywing	*Erynnis lucilius*	Most Important
Herodias Underwing	*Catocala herodias gerhardi*	Most Important
Macropis Cuckoo	*Epeoloides pilosula*	Most Important
New Jersey Tea Inchworm	*Apodrepanulatrix liberaria*	Most Important
Northern Metalmark	*Calephelis borealis*	Most Important
Persius Duskywing	*Erynnis persius persius*	Most Important
Silvery Checkerspot**	*Chlosyne nycteis*	Most Important
Apamea Moth	*Apamea inordinata*	Very Important
Barrens Itame	*Speranza exonerata*	Very Important
Brown-bordered Geometer	*Eumacaria latiferrugata*	Very Important
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	Very Important
False Heather Underwing	*Drasteria graphica atlantica*	Very Important
Frosted Elfin	*Callophrys irus*	Very Important
Gray Spring Zale**	*Zale submediana*	Very Important
Noctuid Moth	*Zanclognatha theralis*	Very Important
Pine Barrens Zanclognatha	*Zanclognatha martha*	Very Important
Pine Sphinx	*Lapara coniferarum*	Very Important
Pink Sallow	*Psectraglaea carnosa*	Very Important
Scrub Euchlaena	*Euchlaena madusaria*	Very Important
Sleepy Duskywing	*Erynnis brizo*	Very Important
Slender Clearwing	*Hemaris gracilis*	Very Important
Toothed Apharetra Moth	*Sympistis dentata*	Very Important
Yellow-banded Bumble Bee	*Bombus terricola*	Very Important
American Bumble Bee	*Bombus pennsylvanicus*	Important
Ashton's Cuckoo Bumble Bee**	*Bombus ashtoni*	Important
Barrens Dagger Moth**	*Acronicta albarufa*	Important
Barrens Metarranthis Moth	*Metarranthis apiciaria*	Important
Bay Underwing Moth	*Catocala badia badia*	Important
Blueberry Gray Moth**	*Glena cognataria*	Important
Corylus Dagger Moth	*Acronicta falcula*	Important
Cow Path Tiger Beetle**	*Cicindela purpurea*	Important
Drasteria Moth**	*Drasteria occulta*	Important
Dune Sympistis	*Sympistis riparia*	Important
Fragile Dagger Moth	*Acronicta fragilis*	Important
Fringed Loosestrife Oil-bee	*Macropis ciliata*	Important
Ground Beetle	*Badister transversus*	Important

Common Name	Scientific Name	Tier*
Ground Beetle	*Carabus vinctus*	Important
Hoary Elfin**	*Callophrys polios*	Important
Horace's Duskywing	*Erynnis horatius*	Important
Lemmer's Noctuid Moth	*Lithophane lemmeri*	Important
Maroonwing Moth**	*Sideridis maryx*	Important
Monarch	*Danaus plexippus*	Important
Mottled Duskywing**	*Erynnis martialis*	Important
Nine-spotted Lady Beetle	*Coccinella novemnotata*	Important
Noctuid Moth	*Eucoptocnemis fimbriaris*	Important
Noctuid Moth	*Schinia spinosae*	Important
Oblique Zale	*Zale obliqua*	Important
Pale Green Pinion Moth	*Lithophane viridipallens*	Important
Pink Prominent	*Hyparpax aurora*	Important
Pink Star Moth	*Derrima stellata*	Important
Pointed Dagger Moth**	*Acronicta lanceolaria*	Important
Purse Web Spider	*Sphodros niger*	Important
Robber Fly	*Laphria cinerea*	Important
Rusty-patched Bumble Bee**	*Bombus affinis*	Important
Short-lined Chocolate	*Argyrostrotis anilis*	Important
Spotted Dart Moth	*Agrotis stigmosa*	Important
Stinging Rose Caterpillar Moth	*Parasa indetermina*	Important
Violet Dart Moth	*Euxoa violaris*	Important
Waxed Sallow	*Chaetaglaea cerata*	Important
Yellow-horned Beaded Lacewing	*Lomamyia flavicornis*	Important
Plants		
Variable Sedge	*Carex polymorpha*	Very important
American Hazel	*Corylus americana*	Important
Bayard's White Adder's Mouth**	*Malaxis bayardii*	Important
Bayberry	*Morella caroliniensis*	Important
Beach Plum**	*Prunus maritima var. gravesii*	Important
Black Oak	*Quercus velutina*	Important
Dwarf Chinkapin Oak	*Quercus prinoides*	Important
Dwarf Serviceberry	*Amelanchier spicata*	Important
Lowbush Blueberry	*Vaccinium angustifolium*	Important
New Jersey Tea	*Ceanothus americanus*	Important
Pin Cherry	*Prunus pensylvanica*	Important
Pitch Pine	*Pinus rigida*	Important
Red Cedar	*Juniperus virginiana*	Important
Roundleaf Ragwort	*Packera obovata*	Important
Scrub Oak	*Quercus ilicifolia*	Important
Smooth Serviceberry	*Amelanchier laevis*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Loss of upland woodland and shrub habitat to natural succession.
Sub-habitats affected: All

- Action: Maintain or increase the use of management techniques to create, restore, and manage upland woodland and shrub habitats to benefit GCN species.
  Measure: Number of acres and range of upland woodland and shrub habitat maintained, restored, or increased using all management techniques.

Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

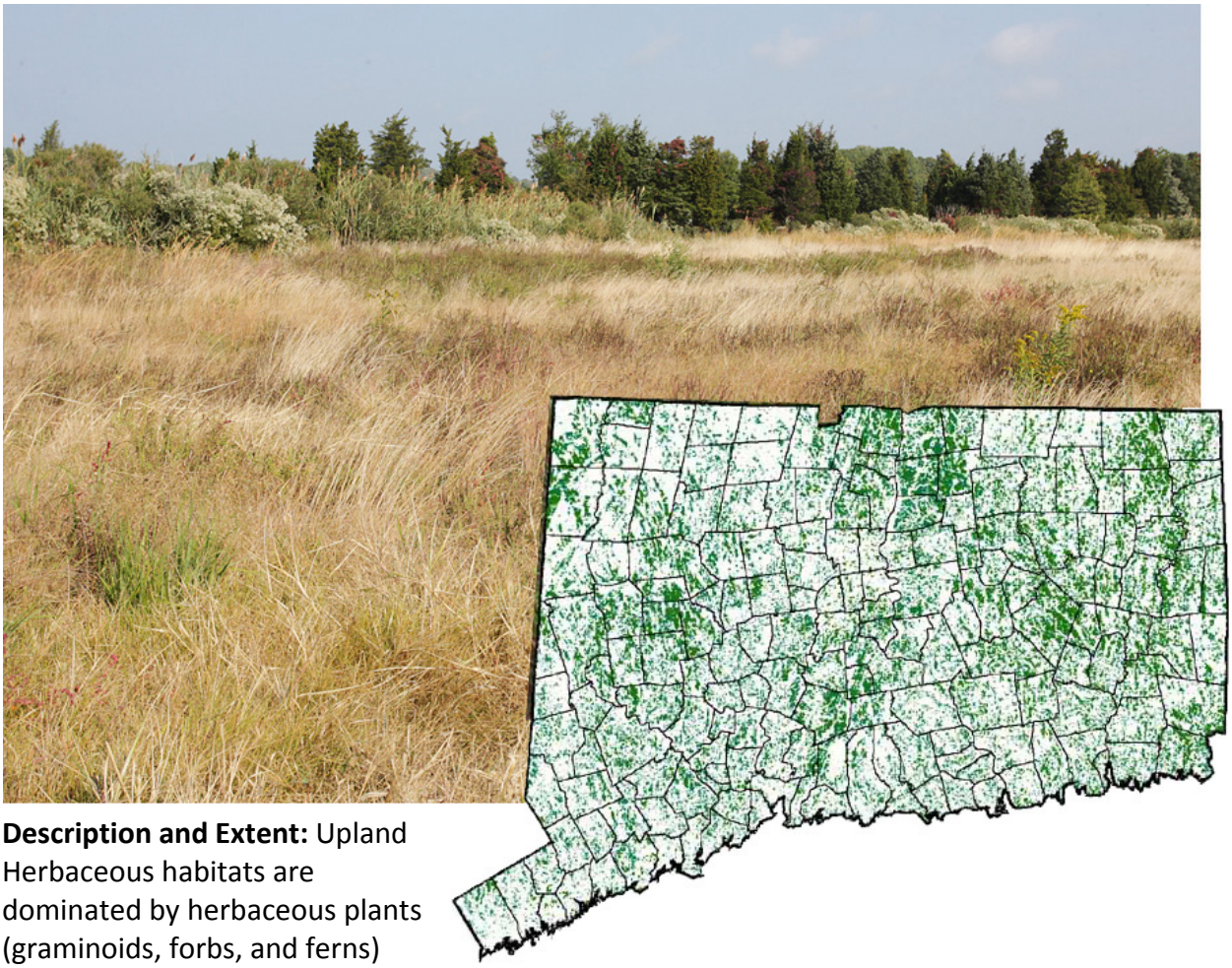
Threat: Lack of fire needed to maintain upland woodland and shrub habitat.
Sub-habitats affected: All

- Action: Increase the use of prescribed burns to benefit GCN species and their habitats.
  Measure: Number of projects conducted using specialized management techniques such as prescribed fire to benefit upland woodland and shrub GCN species and their habitats.

Threat: Insufficient or inappropriate upland woodland and shrub habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit upland woodland and shrub GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting upland woodland and shrub GCN species provided to state, municipal, and local landowners along with education on implementing them.

Upland Herbaceous Habitat



Description and Extent: Upland Herbaceous habitats are dominated by herbaceous plants (graminoids, forbs, and ferns) with at least 25 percent cover. Included in this habitat type are areas with scattered trees, shrubs, and dwarf-shrubs, with coverage less than 25 percent. This key habitat classification includes five sub-habitats determined to be important to wildlife: (a) Coastal Dunes, (b) Grassy Glades and Balds, (c) Sand barrens and Sparsely Vegetated Sand and Gravel, (d) Warm Season Grasslands, and e) Cool Season Grasslands.

Upland Herbaceous habitats are characterized by herbaceous plants such as grasses, herbs, and ferns that form 25 percent or more of the ground cover. Areas with scattered trees, shrubs, and dwarf-shrubs are included where they provide less than 25 percent cover. A representative example of Upland Herbaceous habitat occurs in Higganum Meadows located in the central part of the state along the Connecticut River.

Relative Condition: Three of the five sub-habitats (Coastal Dunes, Grassy Glades, and Balds, and Sparsely Vegetated Sand and Gravel) in this habitat classification were included among the 13 most imperiled ecosystems in Connecticut (Metzler and Wagner 1998).

Upland Herbaceous Sub-habitats:

a. Coastal Beaches and Dunes - These are windswept and wave-washed sandy beaches and their associated dunes along Long Island Sound. Coastal dune vegetation typically includes species such as beach grass (*Ammophila breviligulata*), switchgrass (*Panicum*

virgatum), and seaside goldenrod (*Solidago sempervirens*). Relative Condition: Good to Fair.

b. Grassy Glades and Balds - Grassy Glades and Balds are found on dry exposed summits, ledges, and outcrops, including acidic (gneiss, schist, granite), subacidic (basalt, diabase, calcareous schists), and pH neutral (marble, dolerite) soil types. Grassy Glade and Bald vegetation is typically low shrubs, grasses, and herbs, including bearberry, lowbush blueberry, sand cherry, poverty grass, and little bluestem. Relative Condition: Fair to Poor.

c. Sand Barrens and Sparsely Vegetated Sand and Gravel - Sand Barrens are unconsolidated stable or actively moving sands and/or gravels with sparse vegetation. This sub-habitat includes eroding sandy bluffs and escarpments, active inland dunes, and other open sandy sites. These areas are typically maintained by fire, erosion, or anthropogenic disturbance. Plants are slow to establish, though annuals such as orange grass (*Hypericum gentianoides*) and forked bluecurls (*Trichostema dichotomum*) are typically the first to colonize these areas. Sand barrens often transition into Little bluestem (*Schizachyrium scoparium*) - Poverty grass (*Danthonia spicata*) medium-tall grasslands and may occur among Bear oak (*Quercus ilicifolia*) shrublands. Relative Condition: Fair to Poor.

d. Warm Season Grasslands - Warm Season Grasslands are dominated by native grasses such as Little bluestem (*Schizachyrium scoparium*), Big bluestem (*Andropogon gerardii*), and Indiangrass (*Sorghastrum nutans*), which grow best in the summer heat. These grasslands typically occur on dry glaciofluvial deposits or on shallow soils and ledges of hilltops. Relative Condition: Poor.

e. Cool Season Grasslands - Hayfields and other managed grasslands consisting primarily of naturalized European species. Relative Condition: Good.

TABLE 4.5: GCN SPECIES OF UPLAND HERBACEOUS HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Least Shrew	*Cryptotis parva*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
Meadow Jumping Mouse	*Zapus hudsonius*	Very Important
Birds		
American Kestrel	*Falco sparverius*	Most Important
Barn Owl	*Tyto alba*	Most Important

Common Name	Scientific Name	Tier*
Eastern Meadowlark	*Sturnella magna*	Most Important
Grasshopper Sparrow	*Ammodramus savannarum*	Most Important
Horned Lark	*Eremophila alpestris*	Most Important
Least Tern	*Sternula antillarum*	Most Important
Northern Harrier	*Circus cyaneus*	Most Important
Piping Plover	*Charadrius melodus*	Most Important
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Most Important
Upland Sandpiper	*Bartramia longicauda*	Most Important
American Oystercatcher	*Haematopus palliatus*	Very Important
Bank Swallow	*Riparia riparia*	Very Important
Bobolink	*Dolichonyx oryzivorus*	Very Important
Common Nighthawk	*Chordeiles minor*	Very Important
Long-eared Owl	*Asio otus*	Very Important
Sanderling	*Calidris alba*	Very Important
Semipalmated Sandpiper	*Calidris pusilla*	Very Important
Vesper Sparrow	*Pooecetes gramineus*	Very Important
Common Tern	*Sterna hirundo*	Important
Eastern Kingbird	*Tyrannus tyrannus*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Ipswich Sparrow (Wintering)	*Passerculus sandwichensis princeps*	Important
Osprey	*Pandion haliaetus*	Important
Peregrine Falcon	*Falco peregrinus*	Important
Ruddy Turnstone	*Arenaria interpres*	Important
Savannah Sparrow	*Passerculus sandwichensis*	Important
Short-eared Owl (Wintering)	*Asio flammeus*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Timber Rattlesnake	*Crotalus horridus*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Common Five-lined Skink	*Plestiodon fasciatus*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Hognose Snake	*Heterodon platirhinos*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Copperhead	*Agkistrodon contortrix*	Important
Diamond-backed Terrapin	*Malaclemys terrapin terrapin*	Important
Eastern Racer	*Coluber constrictor*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Marbled Salamander	*Ambystoma opacum*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important

Common Name	Scientific Name	Tier*
Invertebrates		
Appalachian Blue	*Celastrina neglectamajor*	Most Important
Atlantis Fritillary Butterfly	*Speyeria atlantis*	Most Important
Barrens Chytonix	*Chytonix sensilis*	Most Important
Buck Moth	*Hemileuca maia maia*	Most Important
Columbine Duskywing	*Erynnis lucilius*	Most Important
Common Roadside Skipper	*Amblyscirtes vialis*	Most Important
Dune Ghost Tiger Beetle	*Cicindela lepida*	Most Important
Herodias Underwing	*Catocala herodias gerhardi*	Most Important
Macropis Cuckoo	*Epeoloides pilosula*	Most Important
New Jersey Tea Inchworm	*Apodrepanulatrix liberaria*	Most Important
Northern Metalmark	*Calephelis borealis*	Most Important
Persius Duskywing	*Erynnis persius persius*	Most Important
Phyllira Tiger Moth	*Grammia phyllira*	Most Important
Silvery Checkerspot**	*Chlosyne nycteis*	Most Important
Apamea Moth	*Apamea inordinata*	Very Important
Barrens Itame	*Speranza exonerata*	Very Important
Big Sand Tiger Beetle	*Cicindela formosa generosa*	Very Important
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	Very Important
Dark-bellied Tiger Beetle	*Cicindela tranquebarica*	Very Important
False Heather Underwing	*Drasteria graphica atlantica*	Very Important
Frosted Elfin	*Callophrys irus*	Very Important
Grassland Thaumatopsis	*Thaumatopsis edonis*	Very Important
Morrison's Mosaic	*Eucosma morrisoni*	Very Important
Noctuid Moth	*Zanclognatha theralis*	Very Important
Northern Flower Moth	*Schinia septentrionalis*	Very Important
Pink Streak	*Dargida rubripennis*	Very Important
Scrub Euchlaena	*Euchlaena madusaria*	Very Important
Sleepy Duskywing	*Erynnis brizo*	Very Important
Slender Clearwing	*Hemaris gracilis*	Very Important
Toothed Apharetra Moth	*Sympistis dentata*	Very Important
Yellow-banded Bumble Bee	*Bombus terricola*	Very Important
American Bumble Bee	*Bombus pennsylvanicus*	Important
Apamea Moth	*Apamea burgessi*	Important
Ashton's Cuckoo Bumble Bee**	*Bombus ashtoni*	Important
Bay Underwing Moth	*Catocala badia badia*	Important
Bee Fly	*Dipalta banksi*	Important
Bronze Copper	*Lycaena hyllus*	Important
Cow Path Tiger Beetle**	*Cicindela purpurea*	Important
Drasteria Moth**	*Drasteria occulta*	Important
Dune Sympistis	*Sympistis riparia*	Important
Eastern Cactus-boring Moth	*Melitara prodenialis*	Important
Fawn Brown Dart Moth	*Euxoa pleuritica*	Important

Common Name	Scientific Name	Tier*
Fringed Loosestrife Oil-bee	*Macropis ciliata*	Important
Ground Beetle	*Amara chalcea*	Important
Ground Beetle	*Carabus serratus*	Important
Ground Beetle	*Carabus vinctus*	Important
Ground Beetle	*Geopinus incrassatus*	Important
Ground Beetle	*Harpalus caliginosus*	Important
Ground Beetle	*Harpalus erraticus*	Important
Ground Beetle	*Helluomorphoides praeustus bicolor*	Important
Horace's Duskywing	*Erynnis horatius*	Important
Little Beggar	*Eubaphe meridiana*	Important
Maroonwing Moth**	*Sideridis maryx*	Important
Monarch	*Danaus plexippus*	Important
Mottled Duskywing**	*Erynnis martialis*	Important
Nine-spotted Lady Beetle	*Coccinella novemnotata*	Important
Noctuid Moth	*Dichagyris acclivis*	Important
Noctuid Moth	*Eucoptocnemis fimbriaris*	Important
Noctuid Moth	*Schinia spinosae*	Important
Northeastern Beach Tiger Beetle**	*Cicindela dorsalis dorsalis*	Important
Pink Prominent	*Hyparpax aurora*	Important
Pink Star Moth	*Derrima stellata*	Important
Regal Fritillary**	*Speyeria idalia*	Important
Robber Fly	*Nicocles politus*	Important
Robber Fly	*Stichopogon argenteus*	Important
Rusty-patched Bumble Bee**	*Bombus affinis*	Important
Sand Wainscot Moth	*Apamea lintneri*	Important
Scribbled Sallow Moth	*Sympistis perscripta*	Important
Short-lined Chocolate	*Argyrostrotis anilis*	Important
Speyer's Paint**	*Cucullia speyeri*	Important
Spotted Dart Moth	*Agrotis stigmosa*	Important
Stinging Rose Caterpillar Moth	*Parasa indetermina*	Important
Syrphid Fly**	*Mixogaster johnsoni*	Important
Violet Dart Moth	*Euxoa violaris*	Important
Waxed Sallow	*Chaetaglaea cerata*	Important
Yellow-horned Beaded Lacewing	*Lomamyia flavicornis*	Important
Plants		
Sandplain Agalinis	*Agalinis acuta*	Most important
Nantucket Juneberry	*Amelanchier nantucketensis*	Very important
New England Blazing-star	*Liatris novae-angliae*	Very important
Variable Sedge	*Carex polymorpha*	Very important
American Beachgrass	*Ammophila breviligulata*	Important
American Hazel	*Corylus americana*	Important
Beach Pinweed	*Lechea maritima*	Important
Big Bluestem	*Andropogon gerardii*	Important

Common Name	Scientific Name	Tier*
Bushy Frostweed	*Helianthemum dumosum*	Important
Butterfly Milkweed	*Asclepias tuberosa*	Important
Chaffseed**	*Schwalbea americana*	Important
Clasping Milkweed	*Asclepias amplexicaulis*	Important
Common Milkweed	*Asclepias syriaca*	Important
Common Serviceberry	*Amelanchier arborea*	Important
Common Yarrow	*Achillea millefolium*	Important
Dwarf Serviceberry	*Amelanchier spicata*	Important
Eastern Prickly-pear	*Opuntia humifusa*	Important
Flax-leaved Stiff-aster	*Ionactis linariifolia*	Important
Green Milkweed	*Asclepias viridiflora*	Important
Hillside Blueberry	*Vaccinium pallidum*	Important
Indian Paintbrush	*Castilleja coccinea*	Important
Little Bluestem	*Schizachyrium scoparius*	Important
Lowbush Blueberry	*Vaccinium angustifolium*	Important
New Jersey Tea	*Ceanothus americanus*	Important
Oldfield-toadflax	*Nuttallanthus canadensis*	Important
Pignut Hickory	*Carya glabra*	Important
Purple Milkweed	*Asclepias purpurascens*	Important
Sand Cherry	*Prunus pumila*	Important
Sea-beach Amaranth**	*Amaranthus pumilus*	Important
Seabeach Knotweed	*Polygonum glaucum*	Important
Seaside Goldenrod	*Solidago sempervirens*	Important
Showy Aster	*Eurybia spectabilis*	Important
Sickle-leaf Golden-aster	*Pityopsis falcata*	Important
St. Lawrence Grapefern	*Botrychium rugulosum*	Important
Sundial Lupine	*Lupinus perennis perennis*	Important
Switchgrass	*Panicum virgatum*	Important
Wild Lupine	*Lupinus perennis*	Important
Woolly Beach-heather	*Hudsonia tomentosa*	Important
Yellow Wild Indigo	*Baptisia tinctoria*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Adverse impacts, such as direct disturbance, litter, injury, and habitat damage, caused by recreational activities.
Sub-habitats affected: Coastal Beaches and Dunes

- Action: Increase public awareness and stewardship for coastal GCN species' nesting areas using signage and interpretive staff.
  Measure: Number of interpretive signs and staff at coastal GCN species' nesting areas that increase public awareness and stewardship.
- Action: Conserve breeding populations of GCN colonial and beach nesting birds.
  Measure: Number of conservation efforts focused on these species.

Threat: Loss of upland herbaceous habitat to natural succession.
Sub-habitats affected: All

- Action: Maintain or increase the use of management techniques to create, restore, and manage upland herbaceous habitats to benefit GCN species.
  Measure: Number of acres and range of upland herbaceous habitat maintained, restored, or increased using all management techniques.
- Action: Conserve breeding populations of grassland birds.
  Measure: Number of populations of grassland birds conserved.

Threat: Loss of warm season grasslands.
Sub-habitats affected: All

- Action: Increase the use of prescribed burns to benefit GCN species and their habitats.
  Measure: Number of projects conducted using specialized management techniques such as prescribed fire to benefit GCN species and their key habitats.
- Action: Maintain or increase the use of management techniques to create, restore, and manage a variety of upland herbaceous habitats to benefit GCN species.
  Measure: Number of acres and range of upland herbaceous habitat maintained, restored, or increased using all management techniques.

Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

Threat: Lack of fire needed to maintain upland herbaceous habitats.
Sub-habitats affected: All

- Action: Increase the use of prescribed burns to benefit GCN species and their habitats.
  Measure: Number of projects conducted using specialized management techniques such as prescribed fire to benefit GCN species and their key habitats.

Threat: Loss, degradation, or fragmentation of upland herbaceous habitats from development or changes in land use.
Sub-habitats affected: All

- Action: Develop incentives for towns to conserve key upland herbaceous habitat.
  Measure: Number of incentives developed for towns to facilitate conservation of upland herbaceous habitat.

Threat: Insufficient or inappropriate upland herbaceous habitat management or modification on public and private lands.

Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit upland herbaceous GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Work in partnership with the Natural Resources Conservation Service to deliver programs that provide cost-share incentives for private landowners to manage their lands to benefit upland herbaceous GCN species and their habitats.
  Measure: Number of programs delivered, in partnership with Natural Resources Conservation Service, that provide cost-share incentives for private landowners to manage their lands to benefit GCN species and their key habitats.
- *Action:* Develop, in collaboration with Department of Transportation, Best Management Practices to manage roadside vegetation to reduce impacts to GCN species and their habitats.
  Measure: Number of Best Management Practices developed to manage roadside vegetation.

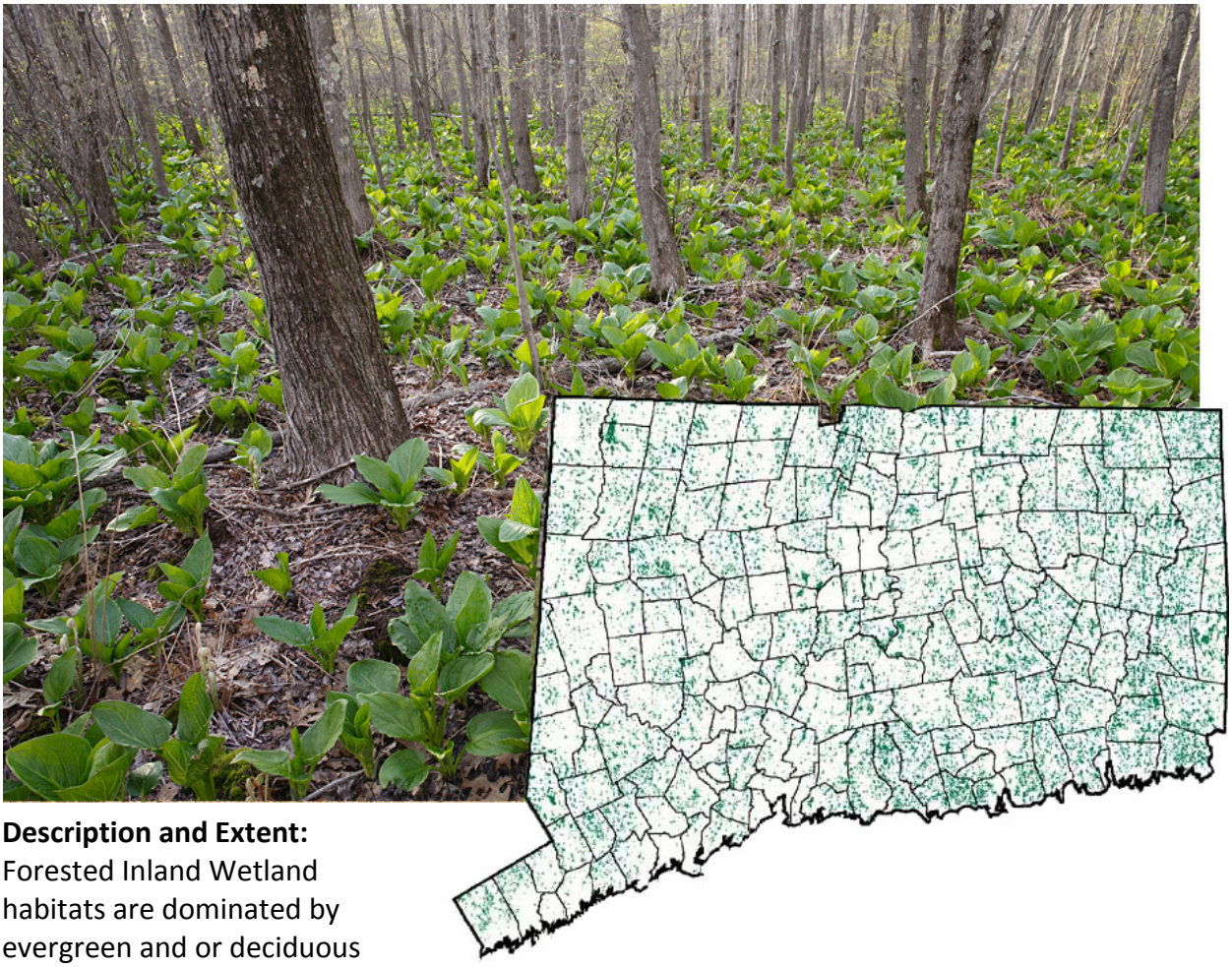
Threat: Loss of pollinator habitat.
Sub-habitats affected: All

- Action: Develop and implement community outreach programs to enhance conservation and stewardship of native pollinators.
  Measure: Number of community outreach programs developed and implemented to enhance conservation and stewardship of native pollinators.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Monitor population trends of grassland birds within Connecticut and as part of regional efforts.
  Measure: Number of monitoring surveys of grassland bird species conducted in Connecticut and as part of regional efforts.

Forested Inland Wetland Habitat



Description and Extent: Forested Inland Wetland habitats are dominated by evergreen and or deciduous trees, with closed canopy generally forming 60-100 percent canopy cover. This key habitat classification includes five sub-habitats determined to be important to wildlife: (a) Atlantic White Cedar Swamps, (b) Red/Black Spruce Swamps, (c) Northern White Cedar Swamps, (d) Floodplain Forests, and (e) Red Maple Swamps.

Forested Inland Wetland habitats are characterized by wetland soils, and dominated by evergreen or deciduous trees with crowns forming 60 to 100 percent canopy cover. Connecticut has about 100,000 acres of Forested Inland Wetlands, with red maple forests being the most common. The Atlantic White Cedar, Red/Black Spruce and Northern White Cedar Swamps are all characterized by having topographical basins containing decomposed peats and mucks with slow-moving or stagnant water. The distinguishing feature among them is the dominant tree species. Representative examples of Forested Inland Wetland occur in Shade Swamp WMA, Great Meadow in Pachaug, Wangunk Meadows WMA, Robbins Swamp WMA.

Relative Condition: The overall status of Forested Inland Wetland habitats in Connecticut is Fair.

Forested Inland Wetland Sub-habitats:

a. Atlantic White Cedar Swamps - Atlantic White Cedar Swamps are seasonally flooded forests dominated by Atlantic white cedar (*Chamaecyparis thyoides*), and include highbush blueberry (*Vaccinium corymbosum*), rosebay rhododendron (*Rhododendron*

maximum), swamp azalea (*Rhododendron viscosum*), red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*). The shrub and herbaceous layer are variable, ranging from poorly to well-developed, depending upon canopy light penetration. Relative Condition: Poor.

b. Red/Black Spruce Swamps - Red/Black Spruce Swamps are saturated bog forests dominated by red spruce (*Picea rubens*) or black spruce (*Picea mariana*). Tree cover is often dense, but can be variable due to blow-downs from storms. Shrub and herbaceous cover is patchy and typically includes mountain holly (*Ilex mucronata*), sheep laurel (*Kalmia angustifolia*), and highbush blueberry (*Vaccinium corymbosum*). Relative Condition: Unknown.

c. Northern White Cedar Swamps - Northern White Cedar Swamps are seasonally flooded forests in which northern white cedar (*Thuja occidentalis*) occurs in nearly pure stands or is mixed with other trees including red maple (*Acer rubrum*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), yellow birch (*Betula alleghaniensis*), black ash (*Fraxinus nigra*), and occasionally larch (*Larix laricina*). Relative Condition: Poor.

d. Floodplain Forests - Floodplain Forests include mesic forests and associated alluvial wetlands which occur on flood-deposited sandy or nutrient-rich silty soils adjacent to rivers or streams. These temporarily flooded, deciduous forests may include silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*), and boxelder (*Acer negundo*). The diversity and cover of shrubs and herbaceous species may vary, though common components include silky dogwood (*Cornus amomum*), spicebush (*Lindera benzoin*), sensitive fern (*Onoclea sensibilis*), and white snakeroot (*Ageratina altissima*). Relative Condition: Good to Fair.

e. Red Maple Swamps – These are seasonally flooded forests dominated by Red maple (*Acer rubrum*), with a variable understory of herbs and shrubs. They Include Red maple/ Skunk cabbage (*Acer rubrum/Symplocarpus foetidus*) seasonally flooded forests, Red maple/Highbush blueberry (*Acer rubrum/Vaccinum corymbosum*) seasonally flooded forests, and Red maple/Pin oak (*Acer rubrum/Quercus palustris*) seasonally flooded forests. Relative Condition: Good.

TABLE 4.6: GCN SPECIES OF FORESTED INLAND WETLAND HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Southern Bog Lemming	*Synaptomys cooperi*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
American Water Shrew	*Sorex palustris*	Very Important
Hairy-Tailed Mole	*Parascalops breweri*	Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Southern Red-backed Vole	*Clethrionomys gapperi*	Important
Birds		
American Woodcock	*Scolopax minor*	Most Important
American Black Duck	*Anas rubripes*	Very Important
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Very Important
Black-throated Blue Warbler	*Dendroica caerulescens*	Very Important
Broad-winged Hawk	*Buteo platypterus*	Very Important
Canada Warbler	*Wilsonia canadensis*	Very Important
Cerulean Warbler	*Setophaga cerulea*	Very Important
Louisiana Waterthrush	*Seiurus motacilla*	Very Important
Northern Flicker	*Colaptes auratus*	Very Important
Yellow-billed Cuckoo	*Coccyzus americanus*	Very Important
Alder Flycatcher	*Empidonax alnorum*	Important
Baltimore Oriole	*Icterus galbula*	Important
Black-and-white Warbler	*Mniotilta varia*	Important
Northern Parula	*Setophaga americana*	Important
Northern Saw-whet Owl	*Aegolius acadicus*	Important
Northern Waterthrush	*Seiurus noveboracensis*	Important
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Important
Veery	*Catharus fuscescens*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Bog Turtle	*Glyptemys muhlenbergii*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important

Common Name	Scientific Name	Tier*
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Eastern Newt	*Notophthalmus viridescens*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Marbled Salamander	*Ambystoma opacum*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Wood Frog	*Lithobates sylvatica*	Important
Fish		
Banded Sunfish	*Enneacanthus obesus*	Most Important
Swamp Darter	*Etheostoma fusiforme*	Most Important
Chain Pickerel	*Esox niger*	Very Important
Redfin Pickerel	*Esox americanus*	Very Important
Golden Shiner	*Notemigonus crysoleucas*	Important
Pumpkinseed	*Lepomis gibbosus*	Important
Invertebrates		
Hessel's Hairstreak	*Callophrys hesseli*	Most Important
Horse Fly	*Hybomitra longiglossa*	Most Important
Lace-winged Horse Fly	*Haematopota rara*	Most Important
Two-spotted Skipper	*Euphyes bimacula*	Most Important
Horse Fly	*Hybomitra trepida*	Very Important
Horse Fly	*Hybomitra typhus*	Very Important
Pink Streak	*Dargida rubripennis*	Very Important
Sedge Skipper	*Euphyes dion*	Very Important
Annointed Sallow Moth**	*Pyreferra ceromatica*	Important
Attenuated Bluet	*Enallagma daeckii*	Important
Bombardier Beetle	*Brachinus cyanipennis*	Important
Bombardier Beetle	*Brachinus patruelis*	Important
Coastal Pond Amphipod	*Synurella chamberlaini*	Important
Eyed Brown	*Lethe eurydice*	Important
Ground Beetle	*Bembidion semicinctum*	Important
Ground Beetle	*Carabus vinctus*	Important
Ground Beetle	*Loxandrus vulneratus*	Important
Ground Beetle	*Scaphinotus viduus*	Important
Henry's Elfin	*Callophrys henrici*	Important
Horse Fly	*Goniops chrysocoma*	Important
Horse Fly	*Hybomitra frosti*	Important
Lemmer's Noctuid Moth	*Lithophane lemmeri*	Important
Mystic Valley Amphipod	*Crangonyx aberrans*	Important
Silvery Blue	*Glaucopsyche lygdamus*	Important
Taper-tailed Darner	*Gomphaeschna antilope*	Important
Plants		
Atlantic White Cedar	*Chamaecyparis thyoides*	Important

Common Name	Scientific Name	Tier*
Bur Oak	*Quercus macrocarpa*	Important
Ram's-Head Lady's-slipper**	*Cypripedium arietinum*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Locate, map, and protect surface springs, seeps, and thermal refuges for GCN species.
  Measure: Number of surface springs, seeps, and thermal refuges identified, mapped, and protected.

Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

Threat: Insufficient or inappropriate habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Implement wetland restoration and enhancement projects that benefit GCN species.
  Measure: Number of acres of key wetland habitat restored or enhanced that benefit GCN species.

Shrub Inland Wetland Habitat

Description and Extent: Shrub Inland Wetland habitats are dominated by shrubs generally greater than 0.5 m tall, with individuals or clumps overlapping to not touching, generally forming more than 25 percent canopy coverage; tree cover is generally less than 25 percent. This key habitat classification includes two sub-habitats determined to be important to wildlife: (a) Bogs and Fens and (b) Shrub Swamps.

Relative Condition: The overall status and distribution of Shrub Inland Wetland habitats in Connecticut is not well known at this time.

Shrub Inland Wetland Sub-habitats:

a. Bogs and Fens - Bogs and fens are natural peatlands that occur in topographic basins influenced by groundwater. Spring fens, which are characterized by groundwater discharge and minimal peat accumulation, are addressed separately. The topography of bogs and fens is generally hummocky, with shrubs and an herbaceous layer that includes wetland plants, grasses, sedges, ferns, and mosses. Typical vegetation may include bog birch, hoary willow, silky dogwood, leatherleaf, highbush blueberry, black huckleberry, sweet gale, bog cinquefoil, sedges, white beak sedge, beaked spikerush, cattails, rushes, bog moss, sundew, marsh St. Johnswort, and cinnamon fern. Relative Condition: Fair.

b. Shrub Swamps - Seasonally or semipermanently flooded areas where shrubs greater than 0.5 meter tall form more than 25 percent canopy coverage. These include Black willow (*Salix nigra*) temporarily flooded shrublands, Speckled alder (*Alnus incana ssp. rugosa*) temporarily flooded shrublands, Highbush blueberry (*Vaccinium corymbosum*) seasonally flooded shrublands, Common buttonbush (*Cephalanthus occidentalis*) semipermanently flooded shrublands, and Swamp loosestrife (*Decodon verticillatus*) semipermanently flooded shrublands. Relative Condition: Unknown.

TABLE 4.7: GCN SPECIES OF SHRUB INLAND WETLAND HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
New England Cottontail	*Sylvilagus transitionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Southern Bog Lemming	*Synaptomys cooperi*	Most Important
American Water Shrew	*Sorex palustris*	Very Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Muskrat	*Ondatra zibethicus*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Birds		
American Woodcock	*Scolopax minor*	Most Important
Canada Warbler	*Wilsonia canadensis*	Very Important
Louisiana Waterthrush	*Seiurus motacilla*	Very Important
Ruffed Grouse	*Bonasa umbellus*	Very Important
Yellow-billed Cuckoo	*Coccyzus americanus*	Very Important
Alder Flycatcher	*Empidonax alnorum*	Important
Northern Waterthrush	*Seiurus noveboracensis*	Important
Sedge Wren	*Cistothorus platensis*	Important
Willow Flycatcher	*Empidonax traillii*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Bog Turtle	*Glyptemys muhlenbergii*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Eastern Newt	*Notophthalmus viridescens*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Gray Treefrog	*Hyla versicolor*	Important
Marbled Salamander	*Ambystoma opacum*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Wood Frog	*Lithobates sylvatica*	Important
Fish		
Banded Sunfish	*Enneacanthus obesus*	Most Important
Swamp Darter	*Etheostoma fusiforme*	Most Important

Common Name	Scientific Name	Tier*
Chain Pickerel	*Esox niger*	Very Important
Redfin Pickerel	*Esox americanus*	Very Important
Golden Shiner	*Notemigonus crysoleucas*	Important
Pumpkinseed	*Lepomis gibbosus*	Important
Invertebrates		
Bog Tiger Moth	*Grammia speciosa*	Most Important
Horse Fly	*Hybomitra longiglossa*	Most Important
Labrador Tea Tentiform Leafminer	*Phyllonorycter ledella*	Most Important
Lace-winged Horse Fly	*Haematopota rara*	Most Important
Noctuid Moth	*Anarta luteola*	Most Important
Pitcher Plant Borer	*Papaipema appassionata*	Most Important
Ringed Boghaunter	*Williamsonia lintneri*	Most Important
Two-spotted Skipper	*Euphyes bimacula*	Most Important
Crimson-ringed Whiteface	*Leucorrhinia glacialis*	Very Important
Horse Fly	*Hybomitra trepida*	Very Important
Horse Fly	*Hybomitra typhus*	Very Important
Horse Fly	*Tabanus fulvicallus*	Very Important
Pitcher Plant Moth	*Exyra fax*	Very Important
Sedge Skipper	*Euphyes dion*	Very Important
Slender Clearwing	*Hemaris gracilis*	Very Important
Tabanid Fly	*Atylotus ohioensis*	Very Important
Tabanid Fly	*Merycomyia whitneyi*	Very Important
Blueberry Gray Moth**	*Glena cognataria*	Important
Bog Copper	*Lycaena epixanthe*	Important
Bronze Copper	*Lycaena hyllus*	Important
Eyed Brown	*Lethe eurydice*	Important
Ground Beetle	*Agonum darlingtoni*	Important
Ground Beetle	*Agonum mutatum*	Important
Ground Beetle	*Bembidion quadratulum*	Important
Henry's Elfin	*Callophrys henrici*	Important
Horse Fly	*Hybomitra frosti*	Important
Horse Fly	*Hybomitra lurida*	Important
Marsh Fern Moth	*Fagitana littera*	Important
New England Buckmoth	*Hemileuca lucina*	Important
Pale Green Pinion Moth	*Lithophane viridipallens*	Important
Ski-tailed Emerald	*Somatochlora elongata*	Important
Slender Walker	*Pomatiopsis lapidaria*	Important
Tabanid Fly	*Atylotus sphagnicolus*	Important
Taper-tailed Darner	*Gomphaeschna antilope*	Important
Plants		
Bog Laurel	*Kalmia polifolia*	Important
Common Hops	*Humulus lupulus var. americanus*	Important
Dragon's-mouth**	*Arethusa bulbosa*	Important

Common Name	Scientific Name	Tier*
Highbush Blueberry	*Vaccinium corymbosum*	Important
Labrador-tea	*Rhododendron groelandicum*	Important
Large Cranberry	*Vaccinium macrocarpon*	Important
Northern Adder's Tongue Fern	*Ophioglossum pusillum*	Important
Purple Pitcherplant	*Sarracenia purpurea*	Important
Schweinitz's Sedge	*Carex schweinitzii*	Important
Small Cranberry	*Vaccinium oxycoccos*	Important
White Meadowsweet	*Spiraea alba*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Loss of early successional habitat to natural succession.
Sub-habitats affected: All

- Action: Maintain or increase the use of management techniques to create, restore, and manage shrub inland wetland habitats to benefit GCN species.
  Measure: Number of acres and range of shrub inland wetland habitats maintained, restored or increased using all management techniques.

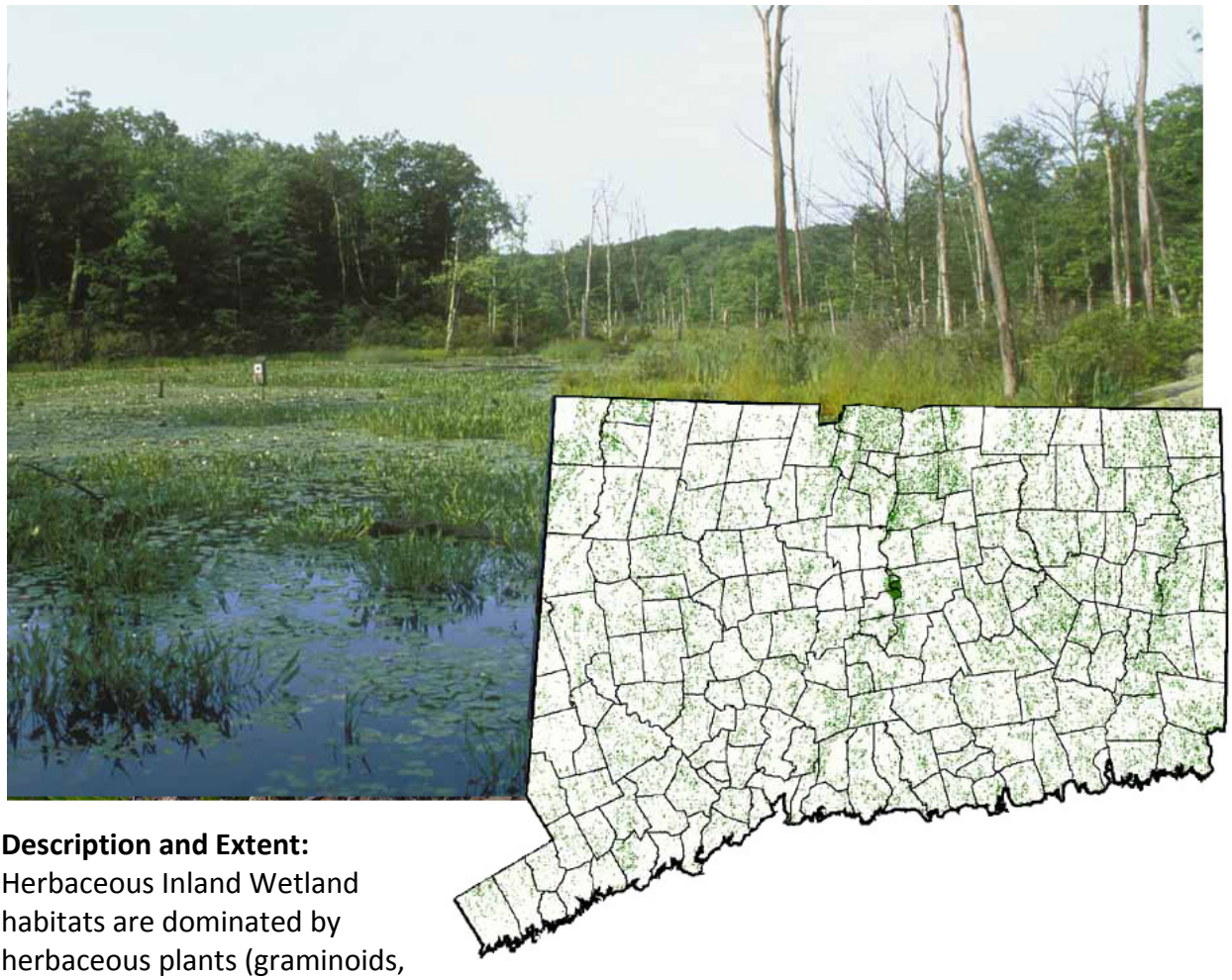
Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

Threat: Insufficient or inappropriate shrub inland wetland habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit shrub inland wetland GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting shrub inland wetland GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Implement wetland restoration and enhancement projects that benefit GCN species.
  Measure: Number of acres of key wetland habitat restored or enhanced that benefit GCN species.

Herbaceous Inland Wetland Habitat



Description and Extent: Herbaceous Inland Wetland habitats are dominated by herbaceous plants (graminoids, forbs, and ferns), with at least 25 percent cover. These wetlands include areas with scattered trees, shrubs, and dwarf-shrubs, with coverage less that 25 percent. This key habitat classification includes three sub-habitats determined to be important to wildlife: (a) Calcareous Spring Fens and (b) Freshwater Marshes, and (c) Wet Meadows.

Herbaceous Inland Wetland habitat is dominated by an herbaceous layer of grasses, forbs, and ferns and includes less than 25 percent of scattered tree, shrub, and dwarf-shrub cover. Freshwater Marshes are vital and irreplaceable resources in Connecticut. Undisturbed wetlands provide significant habitats for fish and wildlife, and act as buffers between terrestrial and aquatic environments. The ability of these unique areas to moderate effects of flooding and drought, and to trap and filter sediments, nutrients, and contaminants makes them essential to the protection of water quality and quantity throughout the state. A representative example of an Herbaceous Inland Wetland occurs at Charter Marsh, Tolland.

Relative Condition: The condition of Herbaceous Inland Wetland habitats is poor and declining in Connecticut. Calcareous Spring Fens are one of the 13 most imperiled ecosystems in Connecticut (Metzler and Wagner 1998).

Herbaceous Inland Wetland Sub-habitats:

a. Calcareous Spring Fens - Calcareous Spring Fens are naturally open wetlands occupying groundwater discharge sites. In the Marble Valleys, the vegetation is influenced by base-rich organic soils with minimal peat accumulation. Typical vegetation includes inland sedge, bristlestalked sedge, and other kinds of sedges, with scattered shrubs, such as bush cinquefoil and gray dogwood. Relative Condition: Poor.

b. Freshwater Marshes - Freshwater Marshes are typically adjacent to rivers and streams, and periodically flooded and influenced by runoff from adjacent upland areas. Basin Freshwater Marshes also are found in glacial kettles. Typical plants include cattail, buttonbush, highbush blueberry, water willow, and swamp loosestrife. This sub-habitat also includes freshwater marshes influenced by tidal action.Typical freshwater tidal marsh vegetation includes wild rice, sweet flag, lake sedge, arrowleaf, sensitive fern, pickerelweed, bluejoint reedgrass, Canadian wild rye, straw-colored nutsedge, and river bulrush. Relative Condition: Unknown.

c. Wet Meadows - Wet meadows are seasonally saturated wetlands dominated by graminoids and forbs. Encroachment by woody vegetation is typically slowed by periodic flooding or fire. In Connecticut, most wet meadows are primarily maintained through cutting or grazing. Relative Condition: Fair.

TABLE 4.8: GCN SPECIES OF HERBACEOUS INLAND WETLAND HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Southern Bog Lemming	*Synaptomys cooperi*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
American Water Shrew	*Sorex palustris*	Very Important
Meadow Jumping Mouse	*Zapus hudsonius*	Very Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Muskrat	*Ondatra zibethicus*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Woodland Vole	*Microtus pinetorum*	Important
Birds		
American Kestrel	*Falco sparverius*	Most Important
American Woodcock	*Scolopax minor*	Most Important
Barn Owl	*Tyto alba*	Most Important
Northern Harrier	*Circus cyaneus*	Most Important

Common Name	Scientific Name	Tier*
Pied-billed Grebe	*Podilymbus podiceps*	Most Important
American Bittern	*Botaurus lentiginosus*	Very Important
American Black Duck	*Anas rubripes*	Very Important
Bobolink	*Dolichonyx oryzivorus*	Very Important
Common Moorhen	*Gallinula chloropus*	Very Important
King Rail (Nesting Population Only)	*Rallus elegans*	Very Important
Least Bittern	*Ixobrychus exilis*	Very Important
Long-eared Owl	*Asio otus*	Very Important
Marsh Wren	*Cistothorus palustris*	Very Important
Alder Flycatcher	*Empidonax alnorum*	Important
Eastern Kingbird	*Tyrannus tyrannus*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Savannah Sparrow	*Passerculus sandwichensis*	Important
Sedge Wren	*Cistothorus platensis*	Important
Short-eared Owl (Wintering)	*Asio flammeus*	Important
Sora	*Porzana carolina*	Important
Virginia Rail	*Rallus limicola*	Important
Willow Flycatcher	*Empidonax traillii*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Bog Turtle	*Glyptemys muhlenbergii*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Northern Spring Salamander	*Gyrinophilus porphyriticus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Gray Treefrog	*Hyla versicolor*	Important
Northern Dusky Salamander	*Desmognathus fuscus*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Fish		
Banded Sunfish	*Enneacanthus obesus*	Most Important
Swamp Darter	*Etheostoma fusiforme*	Most Important
Chain Pickerel	*Esox niger*	Very Important
Redfin Pickerel	*Esox americanus*	Very Important
Golden Shiner	*Notemigonus crysoleucas*	Important
Pumpkinseed	*Lepomis gibbosus*	Important
Invertebrates		
Horse Fly	*Hybomitra longiglossa*	Most Important
Macropis Cuckoo	*Epeoloides pilosula*	Most Important
Two-spotted Skipper	*Euphyes bimacula*	Most Important

Common Name	Scientific Name	Tier*
Sedge Skipper	*Euphyes dion*	Very Important
Tabanid Fly	*Atylotus ohioensis*	Very Important
Tabanid Fly	*Merycomyia whitneyi*	Very Important
Bombardier Beetle	*Brachinus cyanipennis*	Important
Bronze Copper	*Lycaena hyllus*	Important
Eyed Brown	*Lethe eurydice*	Important
Fringed Loosestrife Oil-bee	*Macropis ciliata*	Important
Ground Beetle	*Bembidion pseudocautum*	Important
Harris's Checkerspot**	*Chlosyne harrisii*	Important
Horse Fly	*Hybomitra lurida*	Important
Marsh Fern Moth	*Fagitana littera*	Important
Newman's Brocade	*Meropleon ambifusca*	Important
Regal Fritillary**	*Speyeria idalia*	Important
Slender Walker	*Pomatiopsis lapidaria*	Important
Spartina Borer Moth	*Photedes inops*	Important
Plants		
Barratt's Sedge	*Carex barrattii*	Most important
Spreading Globe Flower	*Trollius laxus*	Most important
Big Bluestem	*Andropogon gerardii*	Important
Greater Water Dock	*Rumex britannica*	Important
Indian Paintbrush	*Castilleja coccinea*	Important
Lakeside Sedge	*Carex lacustris*	Important
Long's Bulrush**	*Scirpus longi*	Important
Showy Lady's-slipper	*Cypripedium reginae*	Important
Swamp Milkweed	*Asclepias incarnata*	Important
Tall White-aster	*Doellingeria umbellata*	Important
White Meadowsweet	*Spiraea alba*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Loss of herbaceous inland wetland habitat to natural succession.
Sub-habitats affected: All

- Action: Maintain or increase the use of management techniques to create, restore, and manage herbaceous inland wetland habitats to benefit GCN species.

Measure: Number of acres and range of herbaceous inland wetland habitat maintained, restored, or increased using all management techniques.

Threat: Effects of residual contaminants in sediments and water such as nutrients, herbicides, industrial contaminants, and pesticides on herbaceous inland wetland habitats.
Sub-habitats affected: All

- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of herbaceous inland wetland GCN species habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Adverse effects from materials used for winter road treatment on herbaceous inland wetland habitats.
Sub-habitats affected: All

- Action: Research the impacts of chemical contaminants on herbaceous inland wetland GCN species and their habitats.
  Measure: Number of research projects conducted that study the impacts of chemical contaminants on GCN species and their key habitats.

Threat: Adverse effects of consumptive withdrawal of surface or groundwater.
Sub-habitats affected: All

- Action: Coordinate efforts among DEEP Divisions, local governments, and other stakeholders to protect herbaceous inland wetland habitats from over-allocation of surface water and groundwater.
  Measure: Number of herbaceous inland wetland habitats protected from over-allocation of surface water and groundwater resources.

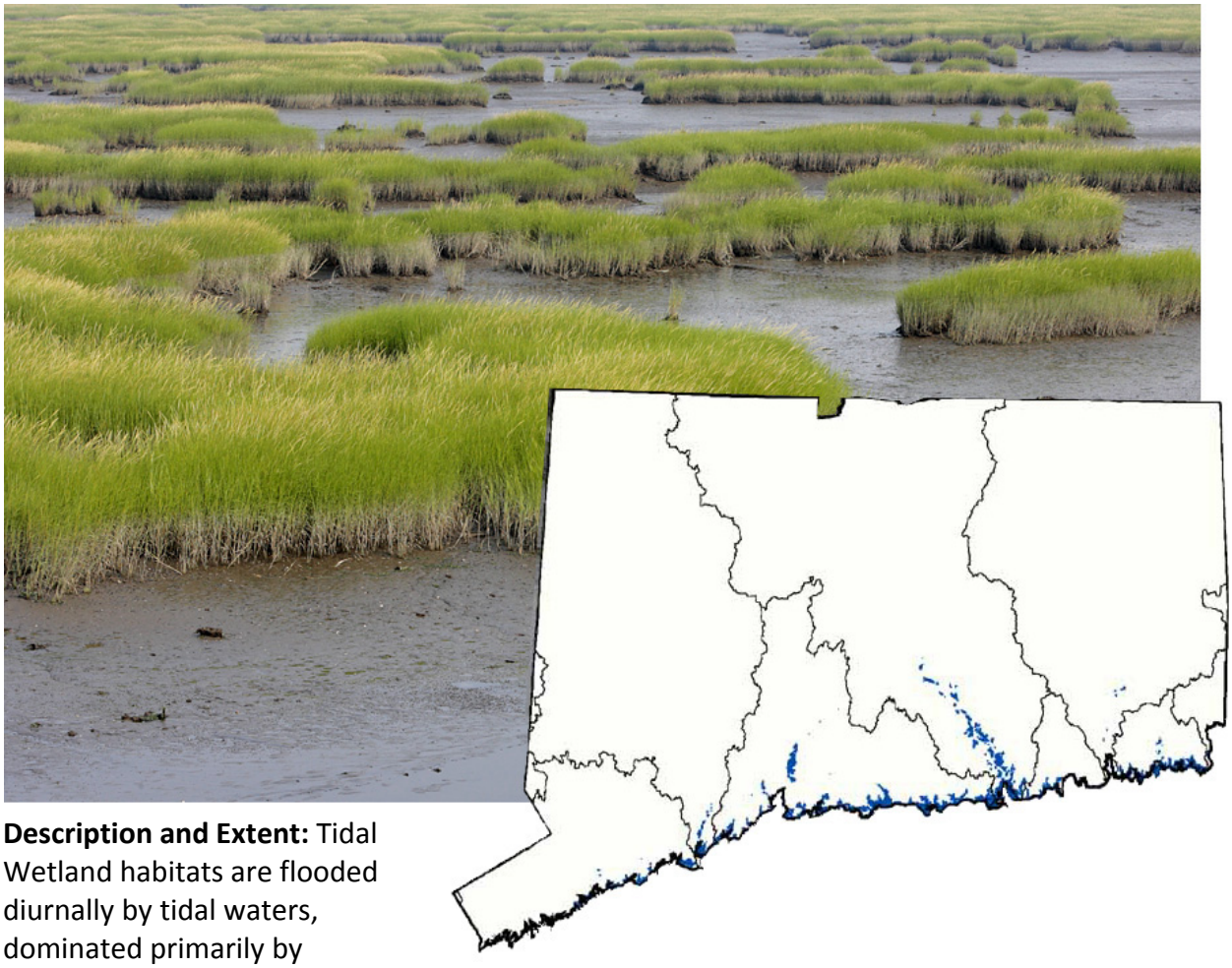
Threat: Habitat fragmentation from transportation and utility corridors.
Sub-habitats affected: All

- Action: Work with DOT and utility companies to minimize habitat fragmentation from transportation and utility corridors.
  Measure: Number of corridor projects for which DEEP provides input on ways to minimize fragmentation.

Threat: Insufficient or inappropriate herbaceous inland wetland habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit herbaceous inland wetland GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting herbaceous inland wetland GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Implement wetland restoration and enhancement projects that benefit herbaceous inland wetland GCN species.
  Measure: Number of acres of herbaceous inland wetland habitat restored or enhanced that benefit GCN species.

Tidal Wetland Habitat



Description and Extent: Tidal Wetland habitats are flooded diurnally by tidal waters, dominated primarily by herbaceous plants (graminoids, forbs, and ferns). This key habitat includes sparsely vegetated areas as well as those dominated by trees and/or shrubs and includes two subhabitats determined to be important to wildlife: (a) Tidal Wetlands and (b) Intertidal Beaches and Shores. Freshwater marshes that are influenced by tidal action are not included under this habitat type. They are addressed separately under the Herbaceous Inland Wetland habitat type.

The Tidal Wetland habitat is characterized by diurnally flooded areas, which are typically dominated by herbaceous plants. However, some may have trees or shrubs or be sparsely vegetated. Representative examples of Tidal Wetland occur in Long Beach and Great Meadow Salt Marsh complex (Stratford); Milford Point and Nells Island Salt Marsh complex (Milford); Mill River and lower Quinnipiac River marsh complex (New Haven); Farm River (East Haven); Hammonasset River marshes (Madison/Clinton); lower Connecticut River and Oyster River marshes (Old Saybrook); Bakers Cove and Mumford Cove marshes (Groton); Barn Island Davis Marsh complex (Stonington).

Relative Condition: Connecticut Tidal Wetlands have been reduced by approximately 50 percent since 1900 through filling, dredging, and ditching activities. Today, there are an estimated 19,300 acres of Tidal Wetland habitat in Connecticut. Past and ongoing activities contribute to Tidal Wetland habitat degradation. Most severe effects result from the runoff of toxic substances from impervious surfaces and industry, causing eutrofication and vegetation die-back; and shoreline paving and armoring (e.g., seawalls, riprap), causing wetland

destruction, erosion, and fragmentation. Increasing Tidal Wetland habitat loss is a result of slow encroachment by overfertilized and mowed residential lawns. In 2012, Connecticut General Statutes were modified to allow for the authorization of shoreline erosion control management structures. These 'living shorelines' may include structural features combined with natural components to attenuate wave energy and currents, thereby helping help to restore, enhance, maintain, or create natural coastal or riparian habitat, functions, and processes.

Tidal Wetland Sub-habitats:

a. Salt and Brackish Marshes - Intertidal Marshes - regularly and irregularly flooded marshes. Includes salt and brackish tidal marshes.
Salt Marsh – This sub-habitat includes Marsh elder (*Iva frutescens*) tidally-flooded shrublands, Saltmarsh cordgrass (*Spartina alterniflora*) tidally-flooded grasslands, Saltmeadow cordgrass (*Spartina patens*) tidally-flooded grasslands and Glasswort (*Salicornia* europaea) tidally-flooded forb vegetation. Species that occur in this habitiat include: Killifish (*Fundulus spp.*), silversides (*Menidia spp.*), and horseshoe crab (*Limulus polyphemus*).
Brackish Marsh – This sub-habitiat includes Saltmarsh cordgrass (*Spartina alterniflora*) tidally-flooded grasslands, Three-square bulrush (*Scirpus pungens*) tidally-flooded grasslands, Narrowleaf cattail (*Typha angustifolia*) tidally-flooded grasslands and Saltmeadow cordgrass tidally-flooded grasslands.
Species that occur in this sub-haibitat include: Killifish (*Fundulus spp.*), sticklebacks (*Gasterostiedae*), and blue crab (*Callinectes sapidus*).

b. Intertidal Beaches, Flats and Shores - These are Intertidal beaches and shores, including saltwater and brackish intertidal beaches and rocky shores and those areas along the Connecticut shoreline inundated by normal daily tides.
Saltwater Intertidal Beaches and Shores – Vegatative community examples include Sea rocket (*Cakile edentula*) tidally-flooded forb vegetation, Pigweed (*Chenopodium album*). Key finfish species include Killifish (*Fundulus spp.*), silversides (*Menidia spp.*) and young-of year (newly hatched) GCN species.
Brackish Intertidal Beaches and Shores – These habitats include Three-square bulrush (*Scirpus pungens*), Arrowhead spp. (*Sagittaria spp.*) tidally flooded grasslands, and Water hemp (*Amaranthus cannabinus*) tidally flooded forb vegetation. Young-of-year GCN finfish species are common.

TABLE 4.9: GCN SPECIES OF TIDAL WETLAND HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Least Shrew	*Cryptotis parva*	Most Important
Mink	*Mustela vison*	Important
Muskrat	*Ondatra zibethicus*	Important
Birds		
Barn Owl	*Tyto alba*	Most Important
Horned Lark	*Eremophila alpestris*	Most Important
Least Tern	*Sternula antillarum*	Most Important
Northern Harrier	*Circus cyaneus*	Most Important

Common Name	Scientific Name	Tier*
Pied-billed Grebe	*Podilymbus podiceps*	Most Important
Piping Plover	*Charadrius melodus*	Most Important
Saltmarsh Sparrow	*Ammodramus caudacutus*	Most Important
Snowy Egret	*Egretta thula*	Most Important
American Bittern	*Botaurus lentiginosus*	Very Important
American Black Duck	*Anas rubripes*	Very Important
American Oystercatcher	*Haematopus palliatus*	Very Important
Clapper Rail	*Rallus longirostris*	Very Important
Great Egret	*Ardea alba*	Very Important
Greater Scaup	*Aythya marila*	Very Important
King Rail (Nesting Population Only)	*Rallus elegans*	Very Important
Least Bittern	*Ixobrychus exilis*	Very Important
Long-eared Owl	*Asio otus*	Very Important
Marsh Wren	*Cistothorus palustris*	Very Important
Sanderling	*Calidris alba*	Very Important
Seaside Sparrow	*Ammodramus maritimus*	Very Important
Semipalmated Sandpiper	*Calidris pusilla*	Very Important
Common Tern	*Sterna hirundo*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Ipswich Sparrow (Wintering)	*Passerculus sandwichensis princeps*	Important
Little Blue Heron	*Egretta caerulea*	Important
Osprey	*Pandion haliaetus*	Important
Peregrine Falcon	*Falco peregrinus*	Important
Ruddy Turnstone	*Arenaria interpres*	Important
Short-eared Owl (Wintering)	*Asio flammeus*	Important
Sora	*Porzana carolina*	Important
Virginia Rail	*Rallus limicola*	Important
Willet	*Catoptrophorus semipalmatus*	Important
Yellow-crowned Night-heron	*Nyctanassa violacea*	Important
Herpetofauna		
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Diamond-backed Terrapin	*Malaclemys terrapin terrapin*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Fish		
American Eel	*Anguilla rostrata*	Most Important
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Most Important
Atlantic Tomcod	*Microgadus tomcod*	Most Important
Rainbow Smelt (Anadromous Populations Only)	*Osmerus mordax*	Most Important
Shortnose Sturgeon	*Acipenser brevirostrum*	Most Important
Tautog	*Tautoga onitis*	Most Important

Common Name	Scientific Name	Tier*
Winter Flounder	*Pseudopleuronectes americanus*	Most Important
American Sand Lance	*Ammodytes americanus*	Very Important
Cunner	*Tautogolabrus adspersus*	Very Important
Fourspine Stickleback	*Apeltes quadracus*	Very Important
Hickory Shad	*Alosa mediocris*	Very Important
Mummichog	*Fundulus heteroclitus*	Very Important
Sea Raven	*Hemitripterus americanus*	Very Important
Windowpane Flounder	*Scophthalmus aquosus*	Very Important
Atlantic Menhaden	*Brevoortia tyrannus*	Important
Atlantic Seasnail	*Liparis atlanticus*	Important
Atlantic Silverside	*Menidia menidia*	Important
Bay Anchovy	*Anchoa mitchilli*	Important
Black Sea Bass	*Centropristes striata*	Important
Clearnose Skate	*Raja eglanteria*	Important
Fourspot Flounder	*Paralichthys oblongus*	Important
Hogchoker	*Trinectes maculatus*	Important
Lined Seahorse	*Hippocampus erectus*	Important
Northern Pipefish	*Syngnathus fuscus*	Important
Northern Searobin	*Prionotus carolinus*	Important
Oyster Toadfish	*Opsanus tau*	Important
Scup	*Stenotomus chrysops*	Important
Sheepshead Minnow	*Cyprinodon variegatus*	Important
Striped Bass	*Morone saxatilis*	Important
Striped Searobin	*Prionotus evolans*	Important
Threespine Stickleback	*Gasterosteus aculeatus*	Important
Invertebrates		
Bay Scallop	*Argopecten irradians*	Most Important
Eastern Oyster	*Crassostrea virginica*	Most Important
Horseshoe Crab	*Limulus polyphemus*	Most Important
Puritan Tiger Beetle	*Cicindela puritana*	Most Important
Slender Flower Moth	*Schinia gracilenta*	Most Important
Blue Crab	*Callinectes sapidus*	Very Important
Blue Mussel	*Mytilus edulis*	Very Important
Channeled Whelk	*Busycotypus canaliculatum*	Very Important
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	Very Important
Dark-bellied Tiger Beetle	*Cicindela tranquebarica*	Very Important
Green Crab	*Carcinus maenas*	Very Important
Knobbed Whelk	*Busycon carica*	Very Important
Lady Crab	*Ovalipes ocellatus*	Very Important
Morrison's Mosaic	*Eucosma morrisoni*	Very Important
Seaside Goldenrod Stem Borer	*Papaipema duovata*	Very Important
Common Razor Clam	*Ensis directus*	Important
Fiddler Crabs	*Uca spp.*	Important

Common Name	Scientific Name	Tier*
Flat Claw Hermit Crab	*Pagurus pollicaris*	Important
Grass Shrimp	*Hippolyte spp.*	Important
Hairy-necked Tiger Beetle	*Cicindela hirticollis*	Important
Maritime Sunflower Borer Moth**	*Papaipema maritima*	Important
Mud Crabs	*Xanthidae spp.*	Important
Northeastern Beach Tiger Beetle**	*Cicindela dorsalis dorsalis*	Important
Robber Fly	*Stichopogon argenteus*	Important
Saltmarsh Tiger Beetle	*Cicindela marginata*	Important
Sand Prairie Wainscot	*Leucania extincta*	Important
Sand Shrimp	*Crangon septemspinosa*	Important
Shore Shrimp	*Palaemonetes spp.*	Important
Spartina Borer Moth	*Photedes inops*	Important
Spider Crab	*Libinia emarginata*	Important
Spotted Dart Moth	*Agrotis stigmosa*	Important
Plants		
Eaton's Beggarticks	*Bidens eatonii*	Very important
Greater Water Dock	*Rumex britannica*	Important
Long's Bitter-cress	*Cardamine longii*	Important
Prairie Cordgrass	*Spartina pectinata*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Adverse impacts, such as direct disturbance, litter, injury, and habitat damage, caused by recreational activities.
Sub-habitats affected: All

- Action: Increase public awareness and stewardship for coastal GCN species' nesting areas using signage and interpretive staff.
  Measure: Number of interpretive signs and staff at coastal GCN species' nesting areas that increase public awareness and stewardship.
- Action: Conserve breeding populations of GCN colonial and beach nesting birds.
  Measure: Number of conservation efforts focused on these species.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Determine the population status and distribution of breeding saltmarsh sparrows.

Measure: Number of monitoring surveys conducted to determine the population status and distribution of breeding saltmarsh sparrows.

Threat: Loss of coastal habitat due to development.
Sub-habitats affected: All

- Action: Protect and monitor regionally important habitats for tidal marsh birds, such as saltmarsh sparrow.
  Measure: Number of regionally important tidal marsh bird habitats that are protected and monitored.
- Action: Minimize disturbance of spawning habitat for key aquatic GCN species such as horseshoe crabs.
  Measure: Number of acres of spawning habitat of GCN species undisturbed.
- *Action:* Encourage property owners to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).
  Measure: Number of property owners encouraged to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).

Threat: Habitat loss due to shoreline modification - armoring, seawalls, riprap.
Sub-habitats affected: All

- Action: Promote effective state and local regulations for the conservation of tidal wetlands.
  Measure: Number of effective local regulations promoted to conserve tidal wetlands.

Threat: Effects of residual contaminants in sediments and water such as nutrients, herbicides, industrial contaminants, and pesticides on tidal wetlands.
Sub-habitats affected: All

- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of tidal wetland GCN species habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Adverse effects of barriers to upstream habitats (e.g., dams, culverts, tide-gates)
Sub-habitats affected: All

- Action: Remove dams and barriers to fish passage where appropriate.
  Measure: Number of dams and barriers removed where appropriate.

Threat: Adverse effects of water quality impairments due to eutrophication.
Sub-habitats affected: All

- Action: Provide information to local governments, watershed associations, and the public to increase awareness of the causes and management of eutrophication and its effect on GCN species.
  Measure: Number of informational documents regarding eutrophication provided to local governments, watershed associations and the public.
- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of GCN species key habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Adverse effects of dredging, ditching, drawdowns, and other water body modifications.
Sub-habitats affected: All

- Action: Protect water quality and the seabed from impacts of dredging and sediment removal and replacement through coordination with DEEP Branch of Environmental Quality, Department of Agriculture, Bureau of Aquaculture, and municipalities.

Measure: Number of impacts from dredging and sediment removal and replacement that are minimized.

- *Action:* Provide technical assistance and Best Management Practices to aquatic habitat managers and planners to minimize degradation of habitats and effects on GCN species due to dredging, drawdowns, entrainment (suspended particles), and other habitat alterations
  Measure: Number of sites where degradation of aquatic habitats from drawdowns, entrainment, and other habitat alterations was minimized as a result of technical assistance and Best Management Practices.

Threat: Insufficient or inappropriate tidal wetland habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit tidal wetland GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting tidal wetland GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Implement wetland restoration and enhancement projects that benefit GCN species.
  Measure: Number of acres of key wetland habitat restored or enhanced that benefit GCN species.

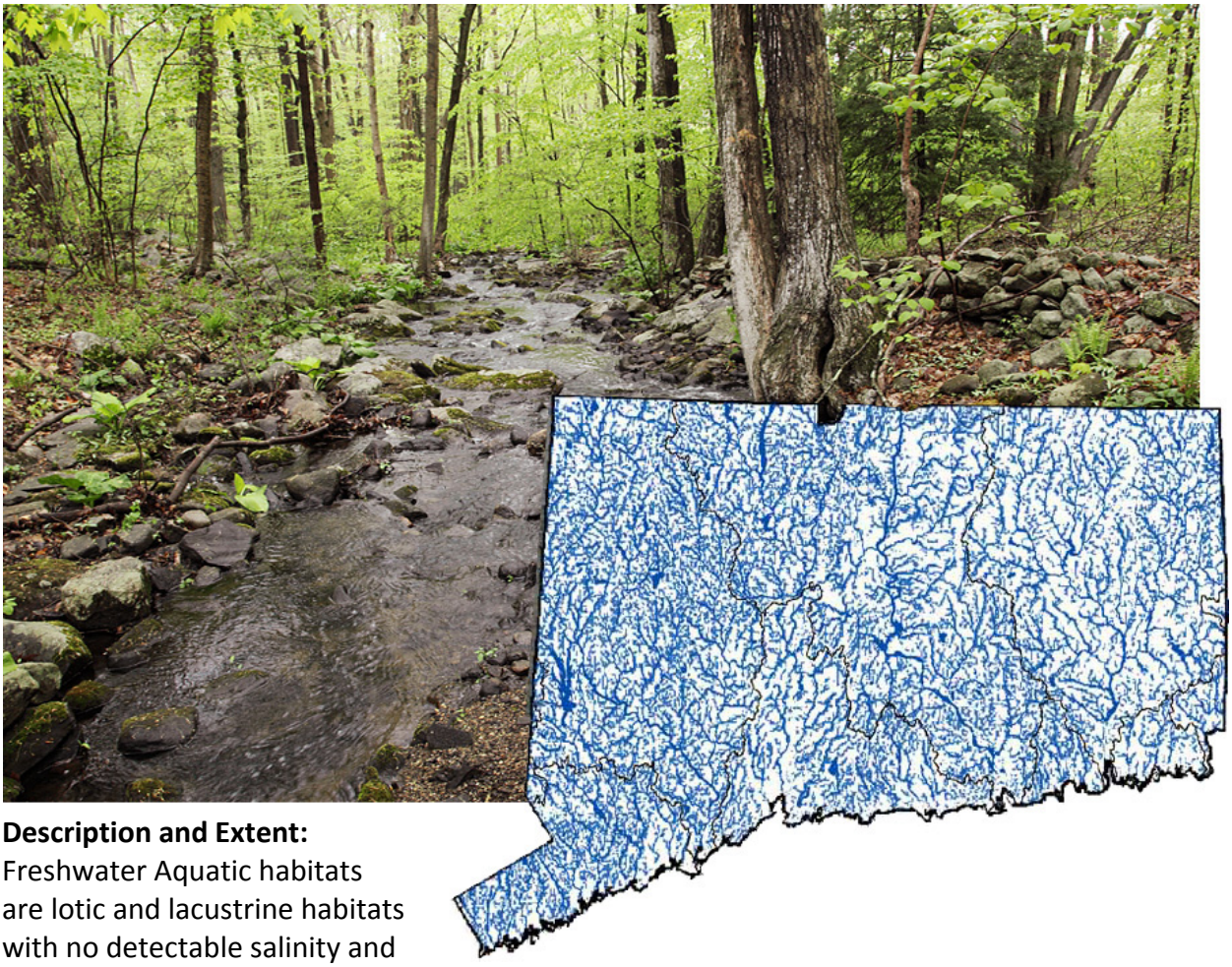
Threat: Degradation and loss of low-lying habitats from sea level rise and saltwater incursion.
Sub-habitats affected: All

- Action: Conduct studies to assess the feasibility of facilitating marsh migration.
  Measure: Number of experiments/studies conducted investigating the feasibility of inland marsh migration.
- Action: Work with the National Oceanic and Atmospheric Administration and the Connecticut Institute for Resilience and Climate Adaptation to enhance coastal resiliency of marsh habitats.
  Measure: Number of marsh habitats identified and conserved with programs aimed at coastal resiliency.

Threat: Adverse effects from materials used for winter road treatment on key habitats.
Sub-habitats affected: All

- Action: Research the impacts of chemical contaminants on tidal wetland GCN species and their habitats.
  Measure: Number of research projects conducted that study the impacts of chemical contaminants on tidal wetland GCN species and their habitats.

Freshwater Aquatic Habitat



Description and Extent: Freshwater Aquatic habitats are lotic and lacustrine habitats with no detectable salinity and their associated shorelines (Riparian Zones). They include vegetated and non-vegetated examples. This key habitat classification includes six sub-habitats determined to be important to wildlife: (a) Large Rivers and Streams and their associated Riparian Zones, (b) Unrestricted Free-flowing Streams, (c) Cold Water Streams, (d) Head-of-Tide, (e) Lakes and their Shorelines, and (f) Coastal Plain Ponds.

Freshwater Aquatic habitats in Connecticut encompass a variety of bodies of water including large rivers, streams, lakes, and ponds. There are both vegetated shorelines and non-vegetated habitats. The vegetation may be either emergent or submerged. Representative examples of Freshwater Aquatic habitats are Natchaug River (free flowing river), Connecticut River (large rivers), Bantam Lake (lakes), Merrick Brook (cold water streams), and Pequetanock cove (head-of-tide).

Relative Condition: Dams, diversions, culverts, and other man-made structures greatly affect the nature of many of these habitats and can represent important tradeoffs of opportunities and threats depending on the species being affected. Development and associated changes to riparian zones and groundwater sources is impacting cold water habitats.

Freshwater Aquatic Sub-habitats:

a. Large Rivers and their Associated Riparian Zones – This sub-habitat includes deep rivers that often support a diverse assemblage of fishes, including those that are resident, diadromous, and marine visitors. Large rivers provide adult holding areas, migration staging areas, and foraging and spawning areas for many fishes. Indicator communities in inland reaches are fishes such as shortnose sturgeon, largemouth bass, smallmouth bass, redbreast sunfish, white and channel catfish, American eel and spottail shiner. Seasonal diadromous indicator fish include Atlantic sturgeon, American shad, blueback herring, alewives, and sea lamprey. Indicator communities in the lower esturaries include marine and estuarine fishes such as striped bass, winter flounder, mummichog, tomcod, and hogchoker. Riverbank riparian zones can be charaterizezd by flood scoured rocky or gravelly riverbanks with annual or perennial vegetation. They also include riverbank beach/shore communities, riverside seeps and riverside outcrops. Riverbank Beach/Shore riparian zones include Black willow (*Salix nigra*) temporarily flooded shrublands, Speckled alder (*Alnus rugosa*) temporarily flooded shrublands, Big bluestem (*Andropogon gerardii*) temporarily flooded grasslands and Twisted sedge (*Carex torta*) temporarily flooded grasslands. Relative Condition: Fair.

b. Unrestricted, Free-Flowing Streams – These are free-flowing waters that support many of the indigenous fishes of Connecticut. Unrestricted free-flowing streams are essential for many fishes to complete their life cycles. Indicator communities include fishes such as white sucker, brown trout, fallfish, creek chub, cutlips minnow, smallmouth bass, redbreast sunfish, American eel and grass pickerel. These communities are impacted by any activity or event that restricts free movement of fish. Relative Condition: Fair.

c. Cold Water Streams – This sub-habitat includes cold streams, ponds and wetlands, surface springs, seeps and thermal refuges. These easily degraded areas provide habitat for many of our cold water-dependent fishes such as slimy sculpin, American brook lamprey, brook trout, brown trout, smelt and burbot. Other community indicator members are white sucker, common shiner, blacknose dace, longnose dace and tessellated darter. Relative Condition: Poor/At Risk.

d. Head-of-Tide and Coastal Streams – This sub-habitat consists of the upstream limit of waters affected by the tide. These are staging areas critical to successful spawning migrations of many diadromous fishes. Indicator communities include diadromous species such as American shad, blueback herring and sea lamprey as well as resident fishes such as shortnose sturgeon (Connecticut River), hogchoker, and mummichog. In addition there is a continuum of fish species communities that straddle the head-of-tide from the fresh to the saltwater side. These include indicator species like several stickleback species, and sheepshead minnow. These areas are critical winter spawning habitat for tomcod, as well as summer feeding areas for sea-run brown trout and summer spawning habitat for bluecrabs. Relative Condition: Fair.

e. Lakes and their Shorelines - This sub-habitat includes lakes and nearshore lake habitats, including areas of emergent and submerged plants and shoreline terrestrial vegetation. This is critical spawning and nursery habitat for many fishes. Indicator communities include largemouth bass, smallmouth bass, chain pickerel, bluegill, pumpkinseed, golden shiner, bullheads and American eel. Shorelines unimpaired by

residential development are rare in most public Connecticut lakes. Relative Condition: Fair.

f. Coastal Plain Ponds – These are ponds associated with coastal-plain sandy substrate areas. Waters are neutral to acidic, often tannic colored. Coastal ponded or slow moving waters support several sensitive fishes such as banded sunfish and swamp darters. Other indicator community members are warm water lake fishes such as largemouth bass, pumpkinseed, golden shiner, bullheads, and American eel. Relative Condition: Poor.

TABLE 4.10: GCN SPECIES OF FRESHWATER AQUATIC HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
American Water Shrew	*Sorex palustris*	Very Important
Woodland Jumping Mouse	*Napaeozapus insignis*	Very Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Muskrat	*Ondatra zibethicus*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Birds		
American Woodcock	*Scolopax minor*	Most Important
Pied-billed Grebe	*Podilymbus podiceps*	Most Important
Snowy Egret	*Egretta thula*	Most Important
American Black Duck	*Anas rubripes*	Very Important
Bank Swallow	*Riparia riparia*	Very Important
Cerulean Warbler	*Setophaga cerulea*	Very Important
Great Egret	*Ardea alba*	Very Important
Greater Scaup	*Aythya marila*	Very Important
Louisiana Waterthrush	*Seiurus motacilla*	Very Important
Bald Eagle	*Haliaeetus leucocephalus*	Important
Cliff Swallow	*Petrochelidon pyrrhonota*	Important
Common Loon	*Gavia immer*	Important
Eastern Kingbird	*Tyrannus tyrannus*	Important
Little Blue Heron	*Egretta caerulea*	Important
Northern Waterthrush	*Seiurus noveboracensis*	Important
Osprey	*Pandion haliaetus*	Important

Common Name	Scientific Name	Tier*
Purple Martin	*Progne subis*	Important
Yellow-crowned Night-heron	*Nyctanassa violacea*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Northern Spring Salamander	*Gyrinophilus porphyriticus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Copperhead	*Agkistrodon contortrix*	Important
Eastern Newt	*Notophthalmus viridescens*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Mudpuppy	*Necturus maculosus*	Important
Northern Dusky Salamander	*Desmognathus fuscus*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important
Fish		
Alewife	*Alosa pseudoharengus*	Most Important
American Brook Lamprey	*Lethenteron appendix*	Most Important
American Eel	*Anguilla rostrata*	Most Important
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Most Important
Atlantic Tomcod	*Microgadus tomcod*	Most Important
Banded Sunfish	*Enneacanthus obesus*	Most Important
Blueback Herring	*Alosa aestivalis*	Most Important
Bridle Shiner	*Notropis bifrenatus*	Most Important
Brook Trout (wild)	*Salvelinus fontinalis*	Most Important
Brown Trout (wild)	*Salmo trutta*	Most Important
Burbot	*Lota lota*	Most Important
Rainbow Smelt (Anadromous Pops.)	*Osmerus mordax*	Most Important
Shortnose Sturgeon	*Acipenser brevirostrum*	Most Important
Slimy Sculpin	*Cottus cognatus*	Most Important
Swamp Darter	*Etheostoma fusiforme*	Most Important
Winter Flounder	*Pseudopleuronectes americanus*	Most Important
American Shad	*Alosa sapidissima*	Very Important
Atlantic Salmon	*Salmo salar*	Very Important
Chain Pickerel	*Esox niger*	Very Important
Creek Chubsucker	*Erimyzon oblongus*	Very Important
Fourspine Stickleback	*Apeltes quadracus*	Very Important
Hickory Shad	*Alosa mediocris*	Very Important
Longnose Sucker	*Catostomus catostomus*	Very Important
Mummichog	*Fundulus heteroclitus*	Very Important

Common Name	Scientific Name	Tier*
Redfin Pickerel	*Esox americanus*	Very Important
Sea Lamprey	*Petromyzon marinus*	Very Important
Atlantic Menhaden	*Brevoortia tyrannus*	Important
Black Crappie	*Pomoxis nigromaculatus*	Important
Blacknose Dace	*Rhinichthys atratulus*	Important
Common Shiner	*Luxilus cornutus*	Important
Cutlips Minnow	*Exoglossum maxillingua*	Important
Fallfish	*Semotilus corporalis*	Important
Golden Shiner	*Notemigonus crysoleucas*	Important
Hogchoker	*Trinectes maculatus*	Important
Largemouth Bass	*Micropterus salmoides*	Important
Longnose Dace	*Rhinichthys cataractae*	Important
Pumpkinseed	*Lepomis gibbosus*	Important
Redbreast Sunfish	*Lepomis auritus*	Important
Sheepshead Minnow	*Cyprinodon variegatus*	Important
Smallmouth Bass	*Micropterus dolomieu*	Important
Striped Bass	*Morone saxatilis*	Important
Threespine Stickleback	*Gasterosteus aculeatus*	Important
White Sucker	*Catostomus commersoni*	Important
Yellow Perch	*Perca flavescens*	Important
Invertebrates		
Brook Floater	*Alasmidonta varicosa*	Most Important
Dwarf Wedgemussel	*Alasmidonta heterodon*	Most Important
Puritan Tiger Beetle	*Cicindela puritana*	Most Important
Two-spotted Skipper	*Euphyes bimacula*	Most Important
American Rubyspot	*Hetaerina americana*	Very Important
Atlantic Bluet	*Enallagma doubledayi*	Very Important
Blue Crab	*Callinectes sapidus*	Very Important
Common Sanddragon	*Progomphus obscurus*	Very Important
Coppery Emerald	*Somatochlora georgiana*	Very Important
Crimson-ringed Whiteface	*Leucorrhinia glacialis*	Very Important
Dark-bellied Tiger Beetle	*Cicindela tranquebarica*	Very Important
Harpoon Clubtail	*Gomphus descriptus*	Very Important
Lanced Phaneta	*Phaneta clavana*	Very Important
Mayfly	*Paraleptophlebia assimilis*	Very Important
Midland Clubtail	*Gomphus fraternus*	Very Important
Pine Barrens Bluet	*Enallagma recurvatum*	Very Important
Rapids Clubtail	*Gomphus quadricolor*	Very Important
Riverine Clubtail	*Stylurus amnicola*	Very Important
Sedge Skipper	*Euphyes dion*	Very Important
Sparkling Jewelwing	*Calopteryx dimidiata*	Very Important
Tidewater Mucket	*Leptodea ochracea*	Very Important
Tiger Spiketail	*Cordulegaster erronea*	Very Important

Common Name	Scientific Name	Tier*
Tusked Sprawler	*Anthopotamus verticis*	Very Important
Yellow Lampmussel	*Lampsilis cariosa*	Very Important
Attenuated Bluet	*Enallagma daeckii*	Important
Banded Pennant	*Celithemis fasciata*	Important
Blue Corporal Dragonfly	*Ladona deplanata*	Important
Bog Copper	*Lycaena epixanthe*	Important
Bombardier Beetle	*Brachinus cyanipennis*	Important
Bombardier Beetle	*Brachinus fumans*	Important
Bombardier Beetle	*Brachinus medius*	Important
Bombardier Beetle	*Brachinus ovipennis*	Important
Bombardier Beetle	*Brachinus patruelis*	Important
Boreal Fossaria**	*Fossaria galbana*	Important
Boreal Turret Snail	*Valvata sincera*	Important
Cobra Clubtail	*Gomphus vastus*	Important
Comet Darner	*Anax longipes*	Important
Common Crayfish	*Cambarus bartonii*	Important
Disc Gyro	*Gyraulus circumstriatus*	Important
Eastern Pearlshell	*Margaritifera margaritifera*	Important
Eastern Pondmussel	*Ligumia nasuta*	Important
Grass Shrimp	*Hippolyte spp.*	Important
Ground Beetle	*Bembidion carinula*	Important
Ground Beetle	*Bembidion lacunarium*	Important
Ground Beetle	*Bembidion planum*	Important
Ground Beetle	*Bembidion pseudocautum*	Important
Ground Beetle	*Bembidion semicinctum*	Important
Ground Beetle	*Bembidion simplex*	Important
Ground Beetle	*Loxandrus vulneratus*	Important
Ground Beetle	*Nebria lacustris lacustris*	Important
Hairy-necked Tiger Beetle	*Cicindela hirticollis*	Important
Horse Fly	*Hybomitra frosti*	Important
Little Bluet	*Enallagma minusculum*	Important
Lymnaeid Snail	*Fossaria rustica*	Important
Martha's Pennant	*Celithemis martha*	Important
Mayfly	*Baetisca lacustris*	Important
Mayfly	*Baetisca obesa*	Important
Mayfly	*Cinygmula subaequalis*	Important
Mayfly	*Leptophlebia bradleyi*	Important
Mustached Clubtail	*Gomphus adelphus*	Important
Precious Underwing Moth**	*Catocala pretiosa pretiosa*	Important
Saltmarsh Tiger Beetle	*Cicindela marginata*	Important
Scarlet Bluet	*Enallagma pictum*	Important
Skillet Clubtail	*Gomphus ventricosus*	Important
Ski-tailed Emerald	*Somatochlora elongata*	Important

Common Name	Scientific Name	Tier*
Slender Walker	*Pomatiopsis lapidaria*	Important
Spartina Borer Moth	*Photedes inops*	Important
Spongillafly	*Sisyra fuscata*	Important
Turret Snail	*Valvata tricarinata*	Important
Virginia River Snail	*Elimia virginica*	Important
Woodland Pondsnail	*Stagnicola catascopium*	Important
Plants		
Ogden's Pondweed	*Potamogeton ogdenii*	Most important
Capillary Pondweed	*Potamogeton gemmiparus*	Very important
Eaton's Beggarticks	*Bidens eatonii*	Very important
Hill's Pondweed	*Potamogeton hillii*	Very important
Parker's Pipewort	*Eriocaulon parkeri*	Very important
Quill-leaved Arrowhead	*Sagittaria teres*	Very important
Creeping St. John's-wort**	*Hypericum adpressum*	Important
Long's Bitter-cress	*Cardamine longii*	Important
Prairie Cordgrass	*Spartina pectinata*	Important
Tidal Spikerush	*Eleocharis aestuum*	Important
Wright's Spikerush	*Eleocharis diandra*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Loss, degradation, or fragmentation of freshwater aquatic habitats from development or changes in land use.
Sub-habitats affected: All

- Action: Minimize disturbance of spawning habitat for shortnose sturgeon and other GCN fish species.
  Measure: Number of acres of spawning habitat of GCN species undisturbed.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Locate, map, and protect cold water streams.
  Measure: Number of cold water streams mapped and protected.
- Action: Quantify and map bottom vegetation and substrates in lakes.
  Measure: Number of delineated areas of lake bottoms mapped and quantified.

Threat: Adverse effects of consumptive withdrawal of surface or groundwater.
Sub-habitats affected: All

- Action: Coordinate efforts among DEEP Divisions, local governments, and other stakeholders to protect key aquatic habitats from over-allocation of surface water and groundwater.
  Measure: Number of key aquatic habitats protected from over-allocation of surface water and groundwater resources.

Threat: Adverse effects of dredging, ditching, drawdowns, and other water body modifications.
Sub-habitats affected: All

- Action: Promote effective state and local regulations for the conservation of wetlands and other aquatic habitats.
  Measure: Number of effective local regulations promoted to conserve key wetlands and other aquatic habitats.
- Action: Provide technical assistance and Best Management Practices to aquatic habitat managers and planners to minimize degradation of habitats and effects on GCN species due to dredging, drawdowns, entrainment (suspended particles), and other habitat alterations
  Measure: Number of sites where degradation of aquatic habitats from drawdowns, entrainment, and other habitat alterations was minimized as a result of technical assistance and Best Management Practices.

Threat: Adverse effects of water quality impairments due to eutrophication.
Sub-habitats affected: All

- Action: Provide information to local governments, watershed associations, and the public to increase awareness of the causes and management of eutrophication and its effect on GCN species.
  Measure: Number of informational documents regarding eutrophication provided to local governments, watershed associations and the public.
- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of GCN species key habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Adverse effects of barriers to upstream habitats (e.g., dams, culverts, tide-gates)
Sub-habitats affected: All

- Action: Remove dams and barriers to fish passage where appropriate.
  Measure: Number of dams and barriers removed where appropriate.

Threat: Effects of residual contaminants in sediments and water such as nutrients, herbicides, industrial contaminants, and pesticides on key habitats.
Sub-habitats affected: All

- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of GCN species key habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Loss of water quality and aquatic habitat due to farm field runoff.
Sub-habitats affected: All

- Action: Promote agricultural plans that include buffer plantings to protect water quality, GCN species, and their habitats.
  Measure: Number of agricultural plans promoted that include buffer plantings to protect water quality, GCN species, and their key habitats.

Threat: Adverse effects to wildlife and habitats from excessive aquatic vegetation control.
Sub-habitats affected: All

- Action: Provide technical assistance and Best Management Practices to aquatic habitat managers.
  Measure: Number of sites where degradation of aquatic habitats was minimized as a result of technical assistance and Best Management Practices.

Threat: Insufficient or inappropriate freshwater aquatic habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit freshwater aquatic GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting freshwater aquatic GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Implement wetland restoration and enhancement projects that benefit freshwater aquatic GCN species.
  Measure: Number of acres of freshwater aquatic habitat restored or enhanced that benefit GCN species.

Threat: Loss of cold water habitat due to warming from habitat modification such as wetlands filling, impoundment, beaver dams, and removal of riparian vegetation.
Sub-habitats affected: Cold Water Streams

- Action: Provide information to local governments, watershed associations, and the public to increase awareness of environmental issues affecting cold water stream GCN species and key habitats.
  Measure: Number of public awareness informational compilations regarding cold water stream GCN species distributed to the public.
- Action: Encourage property owners to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).
  Measure: Number of property owners encouraged to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).
- *Action:* Protect habitat in streams that support cold water fish communities.
  Measure: Number of stream habitats protected that support cold water fish.

Threat: Adverse effects from materials used for winter road treatment on freshwater aquatic habitats.
Sub-habitats affected: All

- Action: Research the impacts of chemical contaminants on GCN species and their habitats such as brook and brown trout, snapping turtles, aquatic insects, and other vulnerable species.
  Measure: Number of research projects conducted that study the impacts of chemical contaminants on GCN species and their key habitats.

Estuarine Aquatic Habitat

Description and Extent: Estuarine Aquatic habitat includes the entire Long Island Sound and freshwater areas of rivers, streams, and ponds that are influenced by tide and/or have intermediate salinity levels (<0.5 ppt). Estuaries are migration corridors for diadromous fishes as well as nursery areas for many diadromous, estuarine, and marine fishes. Over 120 species of finfish have been recorded as resident or migratory species in this habitat. This key habitat classification includes seven sub-habitats determined to be important to wildlife: (a) Coastal Rivers, Coves and Embayments, (b) Vegetation Beds, (c) Hard Bottoms, (d) Sponge Beds, (e) Shellfish Reefs and Beds, (f) Sedimentary Bottoms, (g) Open Water, and (h) Algal Beds.

Estuarine Aquatic habitats of Connecticut include coastal and tidal waters of varying salinity and substrates that are associated with Long Island Sound. All zones of the Sound to upstream areas influenced by tides and with intermediate salinity levels (at least 0.5 ppt) are included. Indicator communities include all resident estuarine and marine species, such as striped bass, bluefish, winter flounder, sea robins, killifish, tomcod, and hogchokers, as well as diadromous migrators, such as American shad, herring, sea lamprey, and smelt. Representative examples of Estuarine Aquatic habitats are the Connecticut River, Norwalk Harbor, Black Rock and Bridgeport Harbor, New Haven Harbor, the Guilford Islands and East River complex, Duck Island Rhoades (Clinton), Thames River and New London Harbor, Mystic River, and Little Narragansett Bay (Stonington).

Relative Condition: Hypoxia is one of the greatest threats to Estuarine Aquatic habitats. The condition is caused by excessive growth of phytoplankton, stimulated by nitrogen loading. When large amounts of phytoplankton eventually die and sink to the bottom, their decomposition uses up available oxygen. The extent of hypoxia varies from year to year, depending on nutrient input and weather conditions that promote stratification or layering of the Sound's waters. Under warm and relatively calm conditions, warmer lighter waters form a

layer over cooler denser waters. Hypoxia occurs in the bottom waters during the summer when stratification seals off these lower layers, preventing them from mixing with and being re-oxygenated by surface waters. This is particularly acute in the western part of the Sound. The stronger and longer the period of stratification, generally the worse the hypoxia in terms of area impacted and minimum levels of oxygen observed.

Estuarine Aquatic Sub-habitats:

a. Coastal Rivers, Coves and Embayments – This sub-habitat comprises those subtidal areas with salinities ranging from 0.5 ppt to full strength saltwater (salinities of 30 to 35 ppt) yet contained within semi-enclosed areas with water depths less than 30 feet. Key finfish species using this habitat as nursery and feeding grounds are winter flounder (*Pseudopleuronectes americanus*) and tautog (*Tautoga onitis*). Relative Condition: Variable.

b. Vegetation Beds – These are subtidal areas with significant cover of aquatic plants, both vascular and non-vascular. Vegetation Beds are highly productive communities that provide critical habitat for a diversity of GCN species at various life stages. These beds form critical nursery habitat for many species of finfish, shellfish, and benthic invertebrates. Submerged aquatic beds enhance sediment stability with their grass-like leaves and extensive root and rhizome systems. Relative Condition: Variable.

c. Hard Bottoms – Hard Bottoms are submerged marine bedrock outcroppings in substrates ranging from cobble to boulders. Most have significant relief and provide a protective substrate for epifauna and infauna. Despite comprising a small percentage of available habitat, Hard Bottoms are likely to be disproportionately important in the production and recruitment of fishes and important commercial invertebrates such as lobster and rock crab. Relative Condition: Variable.

d. Sponge Bed – Sponge Beds are submerged marine communities exhibiting significant three-dimensional relief, often in high energy areas with significant productivity. They include well-developed communities of sponge, such as *Cliona spp*. Relative Condition: Variable.

e. Shellfish Reefs/Beds – This sub-habitat comprises open water areas with concentrations of shellfish and shell hash (loose shell accumulations) forming reefs and extended beds. Common species are Eastern oyster (*Crassostrea virginica*), mussels (*Mytilus edulis, Geukensia demissa and Modiolus modiolus*), and gem clam (*Gemma gemma*). Relative Condition: Variable.

f. Sedimentary Bottoms – These are open water areas with sedimentary bottoms with grain sizes ranging from silt/clays to coarse sands. Relative Condition: Variable.
Three major subdivisions (Sand, Transition, and Mud):
Sand bottom – These are underwater areas having sediment type characterized by Reid et al. (1979) as having less than five percent silt/clay
Transition Bottom – These are underwater areas having sediment type characterized by Reid et al. (1979) as having five to 50 percent silt/clay
Mud Bottom – These are underwater areas having sediment type characterized by Reid et al. (1979) as having greater than 50 percent silt/clay.

g. Open Water – Open Water includes all the deep water areas (>9 m or 30 ft) of the Long Island Sound estuary. Some of this habitat is directly connected to and

influenced by the open Atlantic Ocean water through Block Island Sound or New York Harbor. Open Water provides critical habitat for large migratory marine fish, resident pelagic species as well as GCN mollusks and crustacean species. Relative Condition: Good.

h. Algal Beds – Algal Beds include those subtidal areas with significant cover of submerged non-vascular marine plants, including attached and drift kelp (*Laminaria saccharina*), Irish moss (*Chrondrus crispus*) and sea lettuce (*Ulva spp*). Algal canopy provides predator refuge and enhanced benthic prey critical for a diversity of GCN species at vulnerable larval and juvenile stages. Submerged aquatic beds enhance sediment stability with their grass-like leaves and extensive root and rhizome systems. Relative Condition: Variable.

TABLE 4.11: GCN SPECIES OF ESTUARINE AQUATIC HABITAT.

Common Name	Scientific Name	Tier*
Mammals		
Harbor Porpoise	*Phocoena phocoena phocoena*	Very Important
Harbor Seal	*Phoca vitulina*	Important
Birds		
Least Tern	*Sternula antillarum*	Most Important
Pied-billed Grebe	*Podilymbus podiceps*	Most Important
Roseate Tern	*Sterna dougallii*	Most Important
American Black Duck	*Anas rubripes*	Very Important
American Oystercatcher	*Haematopus palliatus*	Very Important
Clapper Rail	*Rallus longirostris*	Very Important
Great Egret	*Ardea alba*	Very Important
Greater Scaup	*Aythya marila*	Very Important
White-winged Scoter	*Melanitta fusca*	Very Important
Black Scoter	*Melanitta nigra*	Important
Common Loon	*Gavia immer*	Important
Common Tern	*Sterna hirundo*	Important
Osprey	*Pandion haliaetus*	Important
Ruddy Turnstone	*Arenaria interpres*	Important
Surf Scoter	*Melanitta perspicillata*	Important
Herpetofauna		
Atlantic Ridley	*Lepidochelys kempii*	Most Important
Leatherback	*Dermochelys coriacea*	Most Important
Atlantic Green Turtle	*Chelonia mydas*	Very Important
Loggerhead	*Caretta caretta*	Very Important
Diamond-backed Terrapin	*Malaclemys terrapin terrapin*	Important
Fish		
Alewife	*Alosa pseudoharengus*	Most Important
American Eel	*Anguilla rostrata*	Most Important
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Most Important
Atlantic Tomcod	*Microgadus tomcod*	Most Important
Blueback Herring	*Alosa aestivalis*	Most Important

Common Name	Scientific Name	Tier*
Rainbow Smelt (Anadromous Pops.)	*Osmerus mordax*	Most Important
Shortnose Sturgeon	*Acipenser brevirostrum*	Most Important
Tautog	*Tautoga onitis*	Most Important
Winter Flounder	*Pseudopleuronectes americanus*	Most Important
American Sand Lance	*Ammodytes americanus*	Very Important
American Shad	*Alosa sapidissima*	Very Important
Atlantic Salmon	*Salmo salar*	Very Important
Cunner	*Tautogolabrus adspersus*	Very Important
Fourspine Stickleback	*Apeltes quadracus*	Very Important
Hickory Shad	*Alosa mediocris*	Very Important
Mummichog	*Fundulus heteroclitus*	Very Important
Sea Lamprey	*Petromyzon marinus*	Very Important
Sea Raven	*Hemitripterus americanus*	Very Important
Windowpane Flounder	*Scophthalmus aquosus*	Very Important
Atlantic Herring	*Clupea harengus*	Important
Atlantic Menhaden	*Brevoortia tyrannus*	Important
Atlantic Seasnail	*Liparis atlanticus*	Important
Atlantic Silverside	*Menidia menidia*	Important
Bay Anchovy	*Anchoa mitchilli*	Important
Black Sea Bass	*Centropristes striata*	Important
Butterfish	*Peprilus triacanthus*	Important
Clearnose Skate	*Raja eglanteria*	Important
Fourspot Flounder	*Paralichthys oblongus*	Important
Hogchoker	*Trinectes maculatus*	Important
Lined Seahorse	*Hippocampus erectus*	Important
Northern Pipefish	*Syngnathus fuscus*	Important
Northern Searobin	*Prionotus carolinus*	Important
Ocean Pout	*Macrozoarces americanus*	Important
Oyster Toadfish	*Opsanus tau*	Important
Radiated Shanny	*Ulvaria subbifurcata*	Important
Red Hake	*Urophycis chuss*	Important
Sand Tiger Shark	*Carcharias taurus*	Important
Sandbar Shark	*Carcharhinus plumbeus*	Important
Scup	*Stenotomus chrysops*	Important
Sheepshead Minnow	*Cyprinodon variegatus*	Important
Silver Hake	*Merluccius bilinearis*	Important
Smooth Dogfish	*Mustelis canis*	Important
Spiny Dogfish	*Squalus acanthias*	Important
Striped Bass	*Morone saxatilis*	Important
Striped Searobin	*Prionotus evolans*	Important
Threespine Stickleback	*Gasterosteus aculeatus*	Important
Weakfish	*Cynoscion regalis*	Important
Winter Skate	*Leucoraja ocellata*	Important

Common Name	Scientific Name	Tier*
Invertebrates		
American Lobster	*Homarus americanus*	Most Important
Bay Scallop	*Argopecten irradians*	Most Important
Eastern Oyster	*Crassostrea virginica*	Most Important
Horseshoe Crab	*Limulus polyphemus*	Most Important
Blue Crab	*Callinectes sapidus*	Very Important
Blue Mussel	*Mytilus edulis*	Very Important
Channeled Whelk	*Busycotypus canaliculatum*	Very Important
Green Crab	*Carcinus maenas*	Very Important
Knobbed Whelk	*Busycon carica*	Very Important
Lady Crab	*Ovalipes ocellatus*	Very Important
Long-finned Squid	*Loligo pealeii*	Very Important
Mantis Shrimp	*Squilla empusa*	Very Important
Rock Crab	*Cancer irroratus*	Very Important
Soft Shell Clam	*Mya arenaria*	Very Important
Coastal Mud Shrimp	*Upogebia affinis*	Important
Common Razor Clam	*Ensis directus*	Important
Flat Claw Hermit Crab	*Pagurus pollicaris*	Important
Ghost Shrimp	*Gilvossius setimanus*	Important
Grass Shrimp	*Hippolyte spp.*	Important
Mud Crabs	*Xanthidae spp.*	Important
Saltmarsh Tiger Beetle	*Cicindela marginata*	Important
Sand Shrimp	*Crangon septemspinosa*	Important
Shore Shrimp	*Palaemonetes spp.*	Important
Spider Crab	*Libinia emarginata*	Important
Starfish spp.	*Asteriid spp.*	Important
Plants		
Parker's Pipewort	*Eriocaulon parkeri*	Very important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: All

- Action: Investigate fluctuations and declines in bait fish populations, such as herring and menhaden, in Long Island Sound.

Measure: Number of monitoring surveys conducted to investigate fluctuations and declines in bait fish populations in Long Island Sound.

- Action: Identify and map estuarine habitats, especially spawning and nursery habitats, and characterize their relative importance to estuarine species.
  Measure: Number of key estuarine habitats, important to estuarine species like rainbow smelt and tomcod, identified and mapped.
- Action: Research egg and larval mortality of GCN fish species within key areas in Long Island Sound, determine fecundity and egg extrusion/deposition rates for key species such as tautog and winter flounder.
  Measure: Number of monitoring surveys conducted to examine egg and larval mortality of GCN fish species within key areas in Long Island Sound; number of fecundity and local egg extrusion/deposition rates determined for key species such as tautog and winter flounder.
- *Action:* Research the food habits of GCN estuarine fish to determine limiting factors or increased competition.
  Measure: Number of food habitat studies conducted on GCN estuarine fish species.
- Action: Investigate, through monitoring surveys, population fluctuations of marine fish and invertebrates caused by a variety of factors such as climate change, fishing, pollution, and invasive species.
  Measure: Number of monitoring surveys conducted to investigate fluctuations of marine fish (e.g., winter flounder) and invertebrate populations from a variety of factors (e.g., climate change, fishing, pollution, invasive species).

Threat: Effects of residual contaminants in sediments and water such as nutrients, herbicides, industrial contaminants, and pesticides on key habitats.
Sub-habitats affected: All

- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of GCN species key habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Habitat loss due to shoreline modification - armoring, seawalls, riprap.
Sub-habitats affected: All

- Action: Promote effective state and local regulations for the conservation of coastal shorelines.
  Measure: Number of effective local regulations promoted to conserve coastal shorelines.
- Action: Encourage property owners to protect natural shorelines to maintain good habitat.
  Measure: Number of property owners encouraged to protect natural shorelines to maintain good habitat.

Threat: Loss of coastal habitat due to development.
Sub-habitats affected: All

- Action: Minimize disturbance of spawning habitat for key aquatic GCN species such as horseshoe crabs, winter flounder, Atlantic sturgeon and shortnose sturgeon.
  Measure: Number of acres of spawning habitat of GCN species undisturbed.

Threat: Adverse effects of water quality impairments due to eutrophication.
Sub-habitats affected: All

- Action: Provide information to local governments, watershed associations, and the public to increase awareness of the causes and management of eutrophication and its effect on GCN species.
  Measure: Number of informational documents regarding eutrophication provided to local governments, watershed associations and the public.

- Action: Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
  Measure: Number of acres of GCN species key habitat where degradation from the effects of sediment pollution, water contamination, nutrient concentrations, and pesticides was minimized.

Threat: Adverse effects of dredging, ditching, drawdowns and other water body modifications.
Sub-habitats affected: All

- Action: Protect water quality and the seabed from impacts of dredging and sediment removal and replacement through coordination with DEEP Bureau of Environmental Quality branch, Department of Agriculture, Bureau of Aquaculture and municipalities.
  Measure: Number of impacts from dredging and sediment removal and replacement that are minimized.

Threat: Degradation and loss of low-lying habitats from sea level rise and saltwater incursion.
Sub-habitats affected: Coastal Rivers, Coves and Embayments

- Action: Work with the National Oceanic and Atmospheric Administration and the Connecticut Institute for Resilience and Climate Adaptation to enhance coastal resiliency of marsh habitats.
  Measure: Number of marsh habitats identified and conserved with programs aimed at coastal resiliency.

Unique; Natural or Man-Made Habitats

Description and Extent: Unique, Natural or Man-made habitats not discussed in the previous key habitats include eleven sub-habitats determined to be important to wildlife: (a) Traprock Ridges, (b) Offshore Islands, (c) Coastal Bluffs and Headlands , (d) Caves and other Subterranean Habitats, Cultivated Fields, (e) Urban Habitats and Man-Made Features, (f) Cliffs and Talus Slopes, (g) Surface Springs, (h) Vernal Pools, (i) Agricultural Lands, (j) Navigational Channels, and (k) Public Utility Transmission Corridors. These sub-categories may share the characteristics of one or more of the habitats described in detail above, but they have some unique features that require them to be considered separately for evaluation of condition and conservation planning.

Unique; Natural or Man-Made Sub-habitats:

a. Traprock Ridges – Traprock Ridges include a variety of habitats, ranging from dense forest to open rocky summits, cliff faces, consolidated rock, boulders, gravel, talus, or unconsolidated materials. Plants can be scattered or absent, covering less than 26 percent of the substrate if present. Of most significance are large contiguous areas of forest, rich, moist lower slopes, and the rocky summit-cliff-talus complex. Traprock ridges contain many of the habitats of conservation significance that are described in this document, but the extensive, uninterrupted, and undeveloped nature of these ridges and the abundance of GCN species that occur there warrants consideration of these areas as a separate sub-habitat. Relative Condition: Good.

b. Offshore Islands – Offshore islands host a variety of coastal, estuarine, and upland habitats discussed previously, but their relative isolation from the mainland makes them particularly important landscape features. Offshore islands provide an important refuge for colonial-nesting herons and ground-nesting shore birds from predators that feed on nestlings and eggs (e.g., raccoons, foxes, and domestic cats). Falkner Island hosts common tern and roseate tern colonies of national significance. They are one of the 13 most imperiled communities in Connecticut (Metzler and Wagner 1998) as they are being subjected to development pressures and the potentially damaging effects of heavy recreational use. Offshore Islands are critically important for the breeding

success of many shorebirds and long-legged waders, and they provide valuable haul out sites for marine mammals and important stopover sites for migratory species. Relative Condition: Variable.

c. Coastal Bluffs and Headlands – Coastal Bluffs and Headlands include cliffs and escarpments that border Long Island Sound. They can be composed of either consolidated rock (headlands) or unconsolidated sediments such as glacial till (bluffs and escarpments), with the slope and rate of erosion dependent on the substrate and exposure to wave action. Relative Condition: Unknown.

d. Caves and Other Subterranean Habitats – Caves and other Subterranean Habitats are found throughout Connecticut. They include natural limestone caves found in the western marble valley and man-made habitats, such as aqueducts, abandoned mines, and transportation tunnels. Caves, whether natural or manmade, can have more than one entrance type and many different microhabitat zones. Water movement into and through these subterranean habitats has a major influence on the microhabitat of caves. Chambers, domes, or tunnel branches can influence cave temperatures. Crevices, ceiling pockets, fault lines, blast holes, and woody or rocky debris introduce important habitat variables that influence temperature and humidity conditions. Relative Condition: Fair.

e. Urban and Man-Made Features – Urban and Man-made features are characterized by high population density and a high degree of impervious surfaces. City parks and greenways are included in this habitat. Building complexes and transportation infrastructure are also included because various species of wildlife have adapted to use these man-made features. Relative Condition: Poor.

f. Cliffs and Talus Slopes – Cliffs with steep rock faces or slopes formed by masses of fallen rock (talus) at their base. Cliffs may be naturally-occurring or may result from human activities such as quarrying. Plants are usually scattered, covering less than 25 percent of the substrate, and often occurring as small tufts lodged in cracks or crevices. The area may be open or shaded by adjacent overhanging trees. In some areas vegetation may be completely absent depending upon moisture availability and shading. Pioneer species, such as mosses and lichens, may have moderate coverage on cliffs. Herbaceous vegetation is generally perennial and xerophytic, often with adaptations to the movement and weathering of the substrate. Typical vegetation includes mountain spleenwort, wallrue spleenwort, maidenhair spleenwort, purple cliffbrake, bluebell bellflower, red columbine, mosses, narrowleaf pinweed, rusty woodsia, littlebluestem, churchmouse threeawn, rock harlequin, poverty grass, and early saxifrage. Relative Condition: Good.

g. Surface Springs and Seeps – Surface springs and seeps are characterized by saturated wetland soils that receive groundwater discharge throughout the year. Relative Condition: Variable.

h. Vernal Pools – Vernal pools are landscape depressions that periodically fill with water and lack a permanent above ground outlet. These basins fill with the rising water table or with the meltwater and runoff of snow and rain. Vernal pools hold water for a few months in the spring and early summer and are usually dry by late summer. Because of the ephemeral nature of vernal pools, they generally do not support fish. In the absence of fish, many wildlife species, especially amphibians, can thrive in these

habitats, using them as breeding and feeding sites. Vernal pools can be found in a variety of habitats in low areas of a forest, in the floodplain of a river or stream, within a vegetated wetland, in an open field, between coastal dunes, in abandoned quarries or natural rock formations, and in other areas where water pools. Relative Condition: Unknown.

i. Agricultural Lands – Agricultural lands include areas with low impervious cover that are managed for the production of agricultural crops and livestock. This includes cultivated fields, orchards, Christmas tree farms, pastures, and hayfields, among others. It should be noted that pastures or hayfields may also be categorized as Wet Meadow and Warm- or Cool-Season Grassland habitat described previously. Relative Condition: Good.

j. Navigational Channels, Breakwaters, Jetties and Piers – These are channelized areas of coastal rivers, coves, and embayments where tidal effects of current and salinity are augmented by depth and geometry. Few are naturally occurring corridors created and maintained by river flow; most are augmented natural corridors that have been widened, lengthened, or altered to meet navigational needs; some are carved out of tidal marshes or mud flats with no contributing natural tidal flow. Most of these channel areas are frequently disturbed by maintenance dredging, which keeps the benthic and faunal communities in simplified, early successional status. Many serve as connecting corridors of deeper and more saline habitats used by spawning and foraging marine species. GCN species served by this man-made habitat include shortnose sturgeon, Atlantic sturgeon, winter flounder, summer flounder, bluefish, and American lobster.

   Also included in this sub-habitat are areas of altered shoreline geometry creating breakwaters, jetties and piers where tidal effects of current, salinity, and sedimentation are affected by three-dimensional man-made structures. Often these structures provide habitat for benthic organisms favoring hard substrates and slow current, which promote sediment accumulation. GCN species served by this man-made habitat include blue crab, blue mussel, reef fish such as tautog, and forage fish such as three- and four-spine sticklebacks and sheepshead minnow. Relative Condition: Variable.

k. Public Utility Transmission Corridors – In Connecticut, public utility transmission corridors often contain a variety of early successional habitats, which are maintained through periodic vegetation management. Although such management is intended to protect overhead wires or subterranean pipelines, the resulting shrublands, grasslands, and sparsely vegetated areas provide suitable habitat for many GCN species. In some cases, the habitat within transmission corridors has allowed early-successional species to persist in areas that have otherwise reverted to closed-canopy forests. Transmission corridors are also unique in that they form networks of linear habitat that can facilitate species movement across the landscape. Relative Condition: Good to Poor.

TABLE 4.12: GCN SPECIES OF UNIQUE; NATURAL OR MAN-MADE HABITATS.

Common Name	Scientific Name	Tier*
Mammals		
Big Brown Bat	*Eptesicus fuscus*	Most Important
Eastern Small-footed Bat	*Myotis leibii*	Most Important
Hoary Bat	*Lasiurus cinereus*	Most Important
Indiana Bat	*Myotis sodalis*	Most Important
Little Brown Bat	*Myotis lucifugus*	Most Important
New England Cottontail	*Sylvilagus transitionalis*	Most Important
Northern Long-eared Bat	*Myotis septentrionalis*	Most Important
Red Bat	*Lasiurus borealis*	Most Important
Silver-haired Bat	*Lasionycteris noctivagans*	Most Important
Southern Bog Lemming	*Synaptomys cooperi*	Most Important
Tri-colored Bat	*Perimyotis subflavus*	Most Important
American Water Shrew	*Sorex palustris*	Very Important
Meadow Jumping Mouse	*Zapus hudsonius*	Very Important
Woodland Jumping Mouse	*Napaeozapus insignis*	Very Important
Hairy-Tailed Mole	*Parascalops breweri*	Important
Harbor Seal	*Phoca vitulina*	Important
Long-tailed Weasel	*Mustela frenata*	Important
Mink	*Mustela vison*	Important
Short-tailed Weasel	*Mustela erminea*	Important
Woodland Vole	*Microtus pinetorum*	Important
Birds		
American Kestrel	*Falco sparverius*	Most Important
American Woodcock	*Scolopax minor*	Most Important
Barn Owl	*Tyto alba*	Most Important
Least Tern	*Sternula antillarum*	Most Important
Pied-billed Grebe	*Podilymbus podiceps*	Most Important
Piping Plover	*Charadrius melodus*	Most Important
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Most Important
Roseate Tern	*Sterna dougallii*	Most Important
Snowy Egret	*Egretta thula*	Most Important
American Oystercatcher	*Haematopus palliatus*	Very Important
Bank Swallow	*Riparia riparia*	Very Important
Canada Warbler	*Wilsonia canadensis*	Very Important
Common Nighthawk	*Chordeiles minor*	Very Important
Great Egret	*Ardea alba*	Very Important
Greater Scaup	*Aythya marila*	Very Important
Louisiana Waterthrush	*Seiurus motacilla*	Very Important
White-winged Scoter	*Melanitta fusca*	Very Important
Alder Flycatcher	*Empidonax alnorum*	Important
Black Scoter	*Melanitta nigra*	Important
Cliff Swallow	*Petrochelidon pyrrhonota*	Important

Common Name	Scientific Name	Tier*
Common Loon	*Gavia immer*	Important
Common Tern	*Sterna hirundo*	Important
Glossy Ibis	*Plegadis falcinellus*	Important
Little Blue Heron	*Egretta caerulea*	Important
Northern Waterthrush	*Seiurus noveboracensis*	Important
Peregrine Falcon	*Falco peregrinus*	Important
Purple Martin	*Progne subis*	Important
Surf Scoter	*Melanitta perspicillata*	Important
Willet	*Catoptrophorus semipalmatus*	Important
Herpetofauna		
Blue-spotted Salamander (Diploid)	*Ambystoma laterale*	Most Important
Bog Turtle	*Glyptemys muhlenbergii*	Most Important
Eastern Spadefoot	*Scaphiopus holbrookii*	Most Important
Timber Rattlesnake	*Crotalus horridus*	Most Important
Blue-spotted Salamander "Complex"	*Ambystoma laterale*	Very Important
Common Five-lined Skink	*Plestiodon fasciatus*	Very Important
Eastern Box Turtle	*Terrapene carolina carolina*	Very Important
Eastern Hognose Snake	*Heterodon platirhinos*	Very Important
Eastern Ribbon Snake	*Thamnophis sauritus*	Very Important
Jefferson Salamander "Complex"	*Ambystoma jeffersonianum*	Very Important
Northern Leopard Frog	*Lithobates pipiens*	Very Important
Northern Slimy Salamander	*Plethodon glutinosus*	Very Important
Northern Spring Salamander	*Gyrinophilus porphyriticus*	Very Important
Spotted Turtle	*Clemmys guttata*	Very Important
Wood Turtle	*Glyptemys insculpta*	Very Important
Copperhead	*Agkistrodon contortrix*	Important
Diamond-backed Terrapin	*Malaclemys terrapin terrapin*	Important
Eastern Newt	*Notophthalmus viridescens*	Important
Eastern Racer	*Coluber constrictor*	Important
Fowler's Toad	*Anaxyrus fowleri*	Important
Gray Treefrog	*Hyla versicolor*	Important
Marbled Salamander	*Ambystoma opacum*	Important
Northern Dusky Salamander	*Desmognathus fuscus*	Important
Smooth Green Snake	*Opheodrys vernalis*	Important
Spotted Salamander	*Ambystoma maculatum*	Important
Wood Frog	*Lithobates sylvatica*	Important
Fish		
Alewife	*Alosa pseudoharengus*	Most Important
American Eel	*Anguilla rostrata*	Most Important
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Most Important
Blueback Herring	*Alosa aestivalis*	Most Important
Shortnose Sturgeon	*Acipenser brevirostrum*	Most Important
Tautog	*Tautoga onitis*	Most Important

Common Name	Scientific Name	Tier*
Winter Flounder	*Pseudopleuronectes americanus*	Most Important
American Shad	*Alosa sapidissima*	Very Important
Cunner	*Tautogolabrus adspersus*	Very Important
Hickory Shad	*Alosa mediocris*	Very Important
Mummichog	*Fundulus heteroclitus*	Very Important
Sea Raven	*Hemitripterus americanus*	Very Important
Atlantic Menhaden	*Brevoortia tyrannus*	Important
Atlantic Silverside	*Menidia menidia*	Important
Black Sea Bass	*Centropristes striata*	Important
Hogchoker	*Trinectes maculatus*	Important
Oyster Toadfish	*Opsanus tau*	Important
Silver Hake	*Merluccius bilinearis*	Important
Striped Bass	*Morone saxatilis*	Important
Weakfish	*Cynoscion regalis*	Important
Invertebrates		
American Lobster	*Homarus americanus*	Most Important
Bog Tiger Moth	*Grammia speciosa*	Most Important
Columbine Duskywing	*Erynnis lucilius*	Most Important
Fairy Shrimp	*Eubranchipus holmanii*	Most Important
Herodias Underwing	*Catocala herodias gerhardi*	Most Important
Hessel's Hairstreak	*Callophrys hesseli*	Most Important
Horseshoe Crab	*Limulus polyphemus*	Most Important
Macropis Cuckoo	*Epeoloides pilosula*	Most Important
New Jersey Tea Inchworm	*Apodrepanulatrix liberaria*	Most Important
Northern Metalmark	*Calephelis borealis*	Most Important
Persius Duskywing	*Erynnis persius persius*	Most Important
Silvery Checkerspot**	*Chlosyne nycteis*	Most Important
Aureolaria Seed Borer	*Pyrrhia aurantiago*	Very Important
Big Sand Tiger Beetle	*Cicindela formosa generosa*	Very Important
Blue Crab	*Callinectes sapidus*	Very Important
Blue Mussel	*Mytilus edulis*	Very Important
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	Very Important
Frosted Elfin	*Callophrys irus*	Very Important
Green Crab	*Carcinus maenas*	Very Important
Lady Crab	*Ovalipes ocellatus*	Very Important
Northern Flower Moth	*Schinia septentrionalis*	Very Important
Pink Streak	*Dargida rubripennis*	Very Important
Sedge Skipper	*Euphyes dion*	Very Important
Sleepy Duskywing	*Erynnis brizo*	Very Important
Slender Clearwing	*Hemaris gracilis*	Very Important
Tidewater Mucket	*Leptodea ochracea*	Very Important
American Bumble Bee	*Bombus pennsylvanicus*	Important
Apamea Moth	*Apamea burgessi*	Important

Common Name	Scientific Name	Tier*
Barrens Metarranthis Moth	*Metarranthis apiciaria*	Important
Bay Underwing Moth	*Catocala badia badia*	Important
Bronze Copper	*Lycaena hyllus*	Important
Clam Shrimp**	*Eulimnadia agassizii*	Important
Common Crayfish	*Cambarus bartonii*	Important
Corylus Dagger Moth	*Acronicta falcula*	Important
Cow Path Tiger Beetle**	*Cicindela purpurea*	Important
Dune Sympistis	*Sympistis riparia*	Important
Eastern Cactus-boring Moth	*Melitara prodenialis*	Important
Eastern Pondmussel	*Ligumia nasuta*	Important
Equivocal Looper	*Digrammia equivocata*	Important
Fiddler Crabs	*Uca spp.*	Important
Flat Claw Hermit Crab	*Pagurus pollicaris*	Important
Fragile Dagger Moth	*Acronicta fragilis*	Important
Fringed Loosestrife Oil-bee	*Macropis ciliata*	Important
Ground Beetle	*Carabus serratus*	Important
Ground Beetle	*Harpalus caliginosus*	Important
Harris's Checkerspot**	*Chlosyne harrisii*	Important
Hops-stalk Borer Moth**	*Papaipema circumlucens*	Important
Horace's Duskywing	*Erynnis horatius*	Important
Monarch	*Danaus plexippus*	Important
Mottled Duskywing**	*Erynnis martialis*	Important
Mud Crabs	*Xanthidae spp.*	Important
Nine-spotted Lady Beetle	*Coccinella novemnotata*	Important
Noctuid Moth	*Eucoptocnemis fimbriaris*	Important
Noctuid Moth	*Schinia spinosae*	Important
Piedmont Groundwater Amphipod	*Stygobromus tenuis tenuis*	Important
Pink Prominent	*Hyparpax aurora*	Important
Pink Star Moth	*Derrima stellata*	Important
Sand Shrimp	*Crangon septemspinosa*	Important
Scribbled Sallow Moth	*Sympistis perscripta*	Important
Shore Shrimp	*Palaemonetes spp.*	Important
Short-lined Chocolate	*Argyrostrotis anilis*	Important
Slender Walker	*Pomatiopsis lapidaria*	Important
Speyer's Paint**	*Cucullia speyeri*	Important
Spider Crab	*Libinia emarginata*	Important
Spotted Dart Moth	*Agrotis stigmosa*	Important
Starfish spp.	*Asteriid spp.*	Important
Waxed Sallow	*Chaetaglaea cerata*	Important
Plants		
Torrey Mountain-mint	*Pycnanthemum torrei*	Most important
New England Blazing-star	*Liatris novae-angliae*	Very important
Common Milkweed	*Asclepias syriaca*	Important

Common Name	Scientific Name	Tier*
Common Yarrow	*Achillea millefolium*	Important
Dwarf Chinkapin Oak	*Quercus prinoides*	Important
Fern-leaf False Foxglove	*Aureolaria pedicularia*	Important
Indian Paintbrush	*Castilleja coccinea*	Important
Laurentian Fragile-fern	*Cystopteris laurentiana*	Important
Post Oak	*Quercus stellata*	Important
Purple Milkweed	*Asclepias purpurascens*	Important
Sand Cherry	*Prunus pumila*	Important
Smooth False Foxglove	*Aureolaria flava*	Important
Wild Columbine	*Aquilegia canadensis*	Important
Yellow Nutsedge	*Cyperus esculentus*	Important

* Tiers

Most Important - Species of high regional or state conservation responsibility and have populations that are at high risk of declining in the absence of immediate conservation effort to address the threats they face.

Very Important - Species of regional or state conservation responsibility and have populations that are at risk of declining in the absence of near-term (one to ten years) conservation effort to address the threats they face.

Important - Species of regional or state conservation responsibility, or there is a lack of adequate life history information to make management decisions, or whose populations are at risk of declining in the absence of long-term (ten or more years) conservation effort to address the threats they face.

** Believed to be Extirpated

Highest Priority Actions Listed by Associated Threat

For each of these actions, the response of the GCN species and their habitat would be measured to determine if the outcomes were achieved. If not, adaptive management would be applied.

Threat: Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
Sub-habitats affected: Agricultural Lands

- Action: Monitor population trends of grassland birds within Connecticut and as part of regional efforts.
  Measure: Number of monitoring surveys of grassland bird species conducted in Connecticut and as part of regional efforts.

Threat: Loss of early successional habitat to natural succession.
Sub-habitats affected: Agricultural Lands

- Action: Conserve breeding populations of grassland birds.
  Measure: Number of populations of grassland birds conserved.

Threat: Insufficient or inappropriate habitat management or modification on public and private lands.
Sub-habitats affected: All

- Action: Provide Best Management Practices to benefit GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to state, municipal, and local landowners along with education on implementing them.
- Action: Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
  Measure: Number of best management practices developed for GCN bat species for use by federal, state, municipal and private land managers that conserve and enhance GCN bat populations.

- *Action:* Work in partnership with the Natural Resources Conservation Service to deliver programs that provide cost-share incentives for private landowners to manage their lands to benefit GCN species and their habitats.
  Measure: Number of programs delivered, in partnership with Natural Resources Conservation Service, that provide cost-share incentives for private landowners to manage their lands to benefit GCN species and their key habitats.
- Action: Maintain or increase the use of management techniques to create, restore, and manage a variety of early successional habitats to benefit GCN species.
  Measure: Number of acres and range of early successional habitat maintained, restored, or increased using all management techniques.
- *Action:* Encourage property owners to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).
  Measure: Number of property owners encouraged to protect natural shorelines to maintain good habitat (e.g., riparian and shallow water vegetation, downed trees).

Threat: Adverse effects of consumptive withdrawal of surface or groundwater.
Sub-habitats affected: Surface Springs and Seeps, Vernal Pools

- Action: Coordinate efforts among DEEP Divisions, local governments and other stakeholders to protect surface springs, seeps, and vernal pools from over-allocation of surface water and groundwater.
  Measure: Number of surface springs, seeps, and vernal pools protected from over-allocation of surface water and groundwater resources.
- Action: Locate, map, and protect surface springs, seeps, vernal pools, and thermal refuges for GCN species.
  Measure: Number of surface springs, seeps, vernal pools, and thermal refuges identified, mapped and protected.

Threat: Loss to development of buffers around vernal pools, wetlands, and key habitats that may provide migration corridors.
Sub-habitats affected: Surface Springs and Seeps, Vernal Pools

- Action: Promote effective state and local regulations for the conservation of wetlands and other aquatic habitats.
  Measure: Number of effective local regulations promoted to conserve key wetlands and other aquatic habitats.
- Action: Develop incentives for towns to conserve key habitats.
  Measure: Number of incentives developed for towns to facilitate conservation of key habitats.

Threat: Loss of pollinator habitat.
Sub-habitats affected: Urban and Man-Made Features, Agricultural Lands

- Action: Develop and implement community outreach programs to enhance conservation and stewardship of native pollinators.
  Measure: Number of community outreach programs developed and implemented to enhance conservation and stewardship of native pollinators.

Threat: Degradation of agricultural open space due to loss of top soil.
Sub-habitats affected: Agricultural Lands

- Action: Work in partnership with the Natural Resources Conservation Service to deliver programs that provide cost-share incentives for private landowners to manage their agricultural lands to benefit GCN species and their habitats.
  Measure: Number of programs delivered, in partnership with Natural Resources Conservation Service, that provide cost-share incentives for private landowners to manage their agricultural lands to benefit GCN species and their key habitats.
- Action: Promote agricultural plans that include buffer plantings to protect water quality, GCN species, and their habitats.
  Measure: Number of agricultural plans promoted that include buffer plantings to protect

water quality, GCN species, and their key habitats.

Threat: Impacts to wildlife populations by emerging diseases.
Sub-habitats affected: Caves and Other Subterranean Habitats, Surface Springs and Seeps, Vernal Pools

- Action: Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
  Measure: Number of best management practices developed for GCN bat species for use by federal, state, municipal, and private land managers that conserve and enhance GCN bat populations.
- Action: Develop outreach materials to inform the public about ways to prevent the spread of wildlife diseases such as white-nose syndrome and ranavirus.
  Measure: Number of outreach materials developed to address wildlife disease issues.

Threat: Adverse impacts from artificial light and reflective building surfaces.
Sub-habitats affected: Urban and Man-Made Features

- Action: Develop outreach materials to increase public awareness of threats posed to GCN birds from window strikes and lighting design. Develop Best Management Practices for architects, engineers, and building managers to minimize the impacts to GCN birds.
  Measure: Number of outreach materials developed to increase public awareness of threats posed to GCN birds from window strikes and lighting design; number of Best Management Practices developed to minimize the impacts of window strikes on GCN birds.

Threat: Adverse impacts, such as direct disturbance, litter, injury, and habitat damage, caused by recreational activities.
Sub-habitats affected: Offshore Islands, Caves and Other Subterranean Habitats, Surface Springs and Seeps

- Action: Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
  Measure: Number of best management practices developed for GCN bat species for use by federal, state, municipal and private land managers that conserve and enhance GCN bat populations.
- Action: Increase public awareness and stewardship for coastal GCN species' nesting areas using signage and interpretive staff.
  Measure: Number of interpretive signs and staff at coastal GCN species' nesting areas that increase public awareness and stewardship.
- *Action:* Develop outreach materials to inform the public about ways to prevent the spread of wildlife diseases such as white-nose syndrome and ranavirus.
  Measure: Number of outreach materials developed to address wildlife disease issues.
- Action: Conserve breeding populations of GCN colonial and beach nesting birds.
  Measure: Number of conservation efforts focused on these species.

Threat: Conventional farmland may not provide good wildlife habitat unless management practices are taken to increase wildlife diversity.
Sub-habitats affected: Agricultural Lands

- Action: Provide Best Management Practices to benefit GCN species and their habitats to agricultural landowners and provide guidance on their use.
  Measure: Number of Best Management Practices benefiting GCN species provided to agricultural landowners.
- Action: Increase public outreach and education for agricultural landowners regarding the importance of managing lands to conserve common and uncommon species.
  Measure: Number of outreach materials developed to increase public awareness and education for agricultural landowners regarding the need to manage lands to conserve both common and uncommon species.

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