APPENDIX 3: THREATS TO CONNECTICUT'S WILDLIFE AND HABITATS AND THEIR LINKS TO CONSERVATION ACTIONS

This appendix presents the identified threats to Connecticut's GCN species and key habitats and the associated conservation actions, research, inventory and monitoring needs. The WAP uses the IUCN categories of threats (Salafsky et al. 2008) as recommended by the Northeast Lexicon and Synthesis (Crisfield and NEFWDTC 2013; TCI and NEFWDTC 2013).

1. Residential and Commercial Development

1.1. Loss, degradation, or fragmentation of habitats from development or changes in land use.
- Develop incentives for towns to conserve key wildlife habitat.
- Develop and enforce Best Management Practices regarding the annual timing of residential, commercial, and infrastructure development.
- Develop statewide Best Management Practices to minimize the impacts of residential and industrial development and encourage a balance of habitat types.
- Plan and implement management of GCN species in urban and suburban habitats.
- Develop legal strategies to minimize the impacts of residential and industrial development on GCN species.
- 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.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.
- Protect, enhance, and restore pitch-pine habitat to benefit GCN species.
- 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.
- Map key habitats at the landscape level. Use periodic reviews of maps to monitor their status and condition.
- Conserve and increase New England cottontails and their habitats.
- Enhance, restore, and improve habitats for GCN species by seeding and planting areas with appropriate native plants.

1.2. Loss of coastal habitat due to development.
- Conserve breeding populations of GCN freshwater and coastal wetland birds.
- Work with the National Oceanic and Atmospheric Administration and the Connecticut Institute for Resilience and Climate Adaptation to enhance coastal resiliency of marsh habitats.
- Conserve breeding populations of GCN colonial and beach nesting birds.
- Acquire and protect upward migration corridor habitat for coastal habitats.
- Acquire and conserve high marsh habitat for saltmarsh sparrow and other marsh nesting species.
- Enhance, restore, and improve shorelines through erosion control and restoration.
- Conduct studies to assess the feasibility of facilitating marsh migration.
- Minimize disturbance of spawning habitat for key aquatic GCN species such as horseshoe crabs, winter flounder, Atlantic sturgeon, and shortnose sturgeon.

- Identify, protect, and manage diamond-backed terrapin populations.
- Protect habitat in coastal coves and embayments that historically supported bay scallop populations.
- Protect and monitor regionally important habitats for tidal marsh birds, such as saltmarsh sparrow.

1.3. Loss to development of buffers around streams, vernal pools, wetlands, and key habitats that may provide migration corridors.
- Promote agricultural plans that include buffer plantings to protect water quality, GCN species, and their habitats.
- Identify, conserve, and improve key stopover habitats important to migratory GCN species.
- Map vernal pools.
- Provide technical assistance to regulatory staff to ensure head-of-tide habitats are offered maximum protection from degradation by future development.
- Conserve vernal pool breeding sites and their surrounding upland habitats.
- Quantify and map bottom vegetation and substrates in lakes.

1.4. Loss of large forest blocks (e.g., 2,000+ acres) with unbroken canopy due to fragmentation through development.
- Conserve and increase population of ruffed grouse.
- Monitor and conserve breeding populations of GCN forest interior birds.
- 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.

1.5. Loss of cold water habitat and cold hilltop microclimate.
- Enhance, restore, and improve natural stream channels, enhancing spawning habitat for GCN species.
- Locate, map, and protect surface springs, seeps, cold water streams, and thermal refuges for GCN species.
- Inventory and determine the status of headwater stream habitats statewide.

1.6. Degradation of habitat due to impacts of new roads, impervious surfaces, and culverts.
- Develop Best Management Practices for development of parking lots and surrounding areas to minimize impacts to GCN species and their habitats, including reducing surface runoff and increasing infiltration of water.

1.7. Loss of warm season grasslands.
- Establish a grassland working group and create grassland reserves to conserve meadows, fields, and other early successional habitats.
- Conserve breeding populations of grassland birds.

1.8. Loss of pollinator habitat.
- Enhance median strips and roadsides with plantings to support native pollinators and invertebrates.
- 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.
- Develop and implement community outreach programs to enhance conservation and

stewardship of native pollinators.

2. Agriculture and Aquaculture

2.2. Loss of water quantity due to agricultural use.
- Promote agricultural plans that include buffer plantings to protect water quality, GCN species, and their habitats.

2.3. Degradation of agricultural open space due to loss of top soil.
- Promote agricultural plans that include buffer plantings to protect water quality, GCN species, and their habitats.
- 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.

2.4. Conventional farmland may not provide good wildlife habitat unless management practices are taken to increase wildlife diversity.
- Provide Best Management Practices to benefit GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
- Increase public outreach and education for private landowners regarding the importance of managing lands to conserve common and uncommon species.

3. Energy Production and Mining

3.1. Adverse effects from construction of energy production and energy transport facilities (e.g., power plants, pipelines, windmills, transmission corridors).
- Develop and enforce regulation and oversight of biofuel plants to protect GCN species and their habitats.
- Develop Best Management Practices to minimize the impact of wave and tidal energy installations on GCN species and their habitats.
- Provide technical assistance to energy generation and transmission companies to reduce the impacts of wind turbines and transmission lines to GCN species.
- Develop and implement Best Management Practices to advance green energy initiatives consistent with the conservation of GCN species and their habitats.
- Work with conservation partners to conserve GCN species and key habitats statewide.

4. Transportation and Utility Corridors

4.1. Mortality of GCN species (especially amphibians and reptiles) on roads.
- Develop standards for road crossings and road designs (e.g., curbs, box culverts) to reduce the mortality of GCN herpetofauna species.
- Map wetlands bisected by roads; use info to benefit GCN species (e.g., minimize road mortality, contamination by road salt).
- Develop an online system to allow the reporting of wildlife road mortality to enhance information on distribution of difficult-to-sample species and to identify wildlife crossing hotspots (e.g., California Roadkill Observation System or Maine Audubon Wildlife Road Watch).
- Partner with DOT to create and install roadway signage for wildlife viewing areas.
- Install temporary signs at amphibian crossings.

4.2. Habitat fragmentation from transportation and utility corridors.
- Map wetlands bisected by roads; use information to benefit GCN species (e.g., minimize road mortality, contamination by road salt).
- 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.
- Examine and map connectivity corridors and share information with state, local, and private landowners and land trusts to enhance wildlife conservation.
- Enhance median strips and roadsides with plantings to support native pollinators and invertebrates.

4.3. Adverse effects from materials used for winter road treatment on key habitats.
- Develop Best Management Practices for timing and application of chipseal to local roads.
- Map wetlands bisected by roads; use information to benefit GCN species (e.g., minimize road mortality, contamination by road salt).
- Map the location of key habitats of GCN species to evaluate potential impacts to those sites from activities such as drainage and development.

4.4. Degradation of water quality and modification of water flow due to roads.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.

5. Biological Resource Use

5.1. Illegal collection and poaching of plant and animal species.
- Create or support legal strategies to conserve key wildlife habitat.
- Promote public awareness of the vulnerability of Eastern box turtle and wood turtle populations and the negative impacts of removing turtles from the wild.
- Tighten regulations and enforce restrictions on the collection of native wildlife species.
- Enhance conservation of illegally collected species by improving monitoring of sites and law enforcement efforts.

6. Human Intrusions and Disturbance

6.1. Encroachment of humans, dogs, and cats in natural areas.
- Develop outreach materials to encourage 'cats indoors' programs and raise awareness about the threats posed by Trap, Neuter and Release programs.
- Reduce impacts of human disturbance to GCN species.
- Enhance enforcement of off-leash dogs, especially in areas with ground nesting birds.

6.2. Degradation of habitats from off-road vehicles, boats, jet-skis, etc.
- Develop and enforce regulations to prevent all-terrain vehicle (ATV) damage to wildlife areas.
- Develop dedicated areas for ATV use to encourage responsible riding and limit damage to critical habitats.

6.3. Degradation of habitats from blazing of unauthorized trails.
- Determine level of existing degradation, threat of future degradation, and opportunities

for conservation of key habitats.
- Reduce impacts of human disturbance to GCN species.

6.4. Adverse impacts, such as direct disturbance, litter, injury, and habitat damage, caused by recreational activities.
- Minimize disturbance of spawning habitat for key aquatic GCN species such as horseshoe crabs, winter flounder, Atlantic sturgeon and shortnose sturgeon.
- Increase public awareness and stewardship for coastal GCN species' nesting areas using signage and interpretive staff.
- Conserve breeding populations of GCN colonial and beach nesting birds.
- Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
- Develop outreach materials to inform the public about ways to prevent the spread of wildlife diseases such as white-nose syndrome and ranavirus.

7. Natural Systems Modifications

7.1. Loss of early successional habitat to natural succession.
- Conserve breeding populations of GCN early successional birds.
- Maintain or increase the use of management techniques to create, restore and manage a variety of early successional habitats to benefit GCN species.

7.2. Loss and degradation of shoreline habitat due to modification (e.g., armoring, seawalls, riprap).
- Encourage property owners to protect natural shorelines to maintain good fisheries and wildlife habitat (e.g., riparian and shallow water vegetation, downed trees).
- Research effect of riparian buffer width on quality and stability of habitat in aquatic systems.
- Increase spawning habitat for fish near dams and along river edges and encourage natural shorelines versus riprap and hard edges.

7.3. Lack of stand age, structural diversity, and understory diversity in upland forests.
- Conserve and increase population of ruffed grouse.
- Conserve breeding populations of American woodcock.
- Monitor and conserve breeding populations of GCN forest interior birds.

7.4. Lack of fire needed to maintain certain habitats.
- Increase the use of prescribed burns to benefit GCN species and their habitats.
- Conserve breeding populations of GCN early successional birds.
- Maintain or increase the use of management techniques to create, restore, and manage a variety of early successional habitats to benefit GCN species.

7.5. Adverse effects of barriers to upstream habitats (e.g., dams, culverts, tide-gates).
- Conduct research on the contaminants in accumulated silt prior to breaching dams or dredging.
- Build fishways or refine methods for providing upstream passage where appropriate.
- Provide technical assistance to regulatory staff to minimize impacts of fish entrainment at industrial water intakes.
- Develop fish passage projects at barriers.

- Treat or remove silt before breaching dams or dredging to minimize the impacts of GCN species and their habitats due to poor water quality.
- Remove dams and barriers to fish passage where appropriate.
- Identify existing free-flowing aquatic systems at risk.

7.6. Adverse effects of consumptive withdrawal of surface or ground water.
- Develop educational programs that promote responsible stewardship of water resources and associated GCN species.
- Coordinate efforts among DEEP Divisions, local governments, and other stakeholders to protect key aquatic habitats from over-allocation of surface water and groundwater.
- Protect critical habitat, groundwater, and minimum flows for lakes and streams.

7.7. Loss of cold water habitat due to warming from habitat modification such as wetlands filling, impoundment, beaver dams, and removal of riparian vegetation.
- Protect habitat in streams that support cold water fish communities.
- Enhance, restore, and improve natural stream channels, enhancing spawning habitat for GCN species.

7.8. Adverse effects of dredging, ditching, drawdowns, and other water body modifications.
- 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.
- 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
- Develop, promote, and enforce effective drawdowns and chemical vegetation control to minimize impacts on GCN species and their habitats.

7.9. Adverse effects to wildlife and habitats from excessive aquatic vegetation control.
- 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

8. Invasive and Other Problematic Species, Genes, and Diseases

8.1. Degradation of habitat from exotic and invasive insects and plants.
- Increase invasive plant and animal control on public lands, especially state wildlife management areas, and on private lands.
- Evaluate the impact of invasive species on GCN species and their habitats and implement management strategies.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.
- Implement plan to prioritize and address problems caused by invasive aquatic nuisance species.

8.2. Impacts to wildlife populations by emerging diseases.
- Develop outreach materials to inform the public about ways to prevent the spread of

wildlife diseases such as white-nose syndrome and ranavirus.
- Develop Best Management Practices for wildlife rehabbers that include releasing animals where they were captured and controlling the risk of spreading wildlife diseases.
- Research diseases affecting GCN species and their habitats.

8.3. Depredation of wildlife and degradation of habitat by exotic, domestic, or nuisance animals.
- Develop a program for the take-back of unwanted exotic pets to prevent release into the wild.
- Manage nuisance geese populations to benefit GCN species and their habitats.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.
- Avoid stocking domestic trout on top of significant wild populations.

8.4. Encroachment of invasive species on critical habitats.
- Develop a native plant initiative to increase the use of native species in landscape designs.
- Develop a top ten list of invasive plants and Best Management Practices for removing/treating them.
- Monitor invasive and non-native species that negatively impact habitats for GCN species.

8.5. Degradation of habitat from over-browsing by deer.
- Evaluate and implement options to minimize impacts from over-browsing by deer to the habitat of GCN species.
- Educate the public on the negative impacts that high deer populations can have on GCN species and their habitats.

9. Pollution

9.1. Effects of residual contaminants in sediments and water such as nutrients, herbicides, industrial contaminants, and pesticides on key habitats.
- Minimize habitat degradation from sediment pollution, water contamination, nutrient concentrations, and pesticides through coordinated efforts with DEEP Branch of Environmental Quality.
- Determine contaminant effects on spawning success of GCN fish such as Atlantic sturgeon, shortnose sturgeon, tautog, and winter flounder.
- Map the location of key habitats of GCN species to evaluate potential impacts to those sites from activities such as drainage and development.
- Encourage selective vegetation control (minimal and appropriately timed) as opposed to whole lake treatments.

9.2. Loss of water quality and aquatic habitat due to farm field runoff.
- 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.
- Develop Best Management Practices to improve agricultural land for GCN wildlife (e.g., reduce runoff, grazing management).

9.3. Adverse effects of hypoxia and other water quality impairments due to eutrophication.
- 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.
- Develop appropriate management strategies for lake watersheds to reduce eutrophication including stormwater management.
- Quantify and map bottom vegetation and substrates in lakes.

9.4. Adverse impacts from artificial light and reflective building surfaces.
- 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.

9.5. Adverse impacts from mowing, power washing, and other property maintenance.
- Develop media outreach initiatives to promote wildlife stewardship ethics. Distribute conservation success stories to the media.
- Develop outreach materials regarding alternatives to mechanical and chemically intensive lawn care and pest control practices.

10. Climate Change and Severe Weather

10.1. Disruption of wildlife and plant life cycles due to changes in phenology of co-dependent species.
- Develop a funding source to implement measures to mitigate the effects of climate change on GCN species and their habitats.
- Investigate the effects and impacts of climate change on GCN species.

10.2. Degradation and loss of low-lying habitats from sea level rise and salt water incursion.
- Develop strategies to prioritize land acquisition for climate change.
- Work with the National Oceanic and Atmospheric Administration and the Connecticut Institute for Resilience and Climate Adaptation to enhance coastal resiliency of marsh.
- Determine level of existing degradation, threat of future degradation, and opportunities for conservation of key habitats.
- Acquire and protect upward migration corridor habitat for coastal habitats.
- Acquire and conserve high marsh habitat for saltmarsh sparrow and other marsh nesting species.
- Conduct studies to assess the feasibility of facilitating marsh migration.
- Coordinate the conservation actions in the WAP with those recommended by the Connecticut Climate Preparedness Plan and the Northeast Climate Science Center.

10.3. Adverse effects on wildlife and habitats from severe weather events.
- 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.

11. Resource Management Challenges

11.1. Insufficient resources to maintain and enhance wildlife habitat.

- Develop a funding source to implement measures to mitigate the effects of climate change on GCN species and their habitats.
- Develop and implement inventory, survey, and monitoring protocols 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.
- Work with conservation partners to conserve GCN species and key habitats statewide.
- Implement wetland restoration and enhancement projects that benefit GCN species.
- Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
- Conduct a cost-benefit analysis of optimal mowing regimes.
- Develop additional stable funding mechanisms to pay for the conservation of GCN species and habitats.
- Map key habitats at the landscape level. Use periodic reviews of maps to monitor their status and condition.
- Conduct habitat management to maintain or restore site conditions appropriate for GCN plant species.

11.2. Insufficient scientific knowledge regarding wildlife, fish, and their habitats.
- Perform genetic analysis of selected trout populations to identify successful wild and hatchery strains and to determine if native strains still exist.
- Determine and monitor the distribution, abundance, habitat use, and condition of GCN aquatic species.
- Enhance inventory and conservation efforts for freshwater mussels.
- Research population dynamics of GCN marine invertebrates including the effects of density dependent and density independent factors.
- Research egg and larval mortality of GCN fish species within key areas in Long Island Sound and determine fecundity and egg extrusion/deposition rates for key species such as tautog and winter flounder.
- Research the food habits of GCN estuarine fish to determine limiting factors or increased competition.
- Determine the site fidelity to habitats such as spawning areas, overwintering areas or summer habitats of all GCN fish.
- Investigate the causes of reduced fish stock and determine if specific life stages are limited by the distribution and abundance of key habitats.
- Monitor fish stock structure, species movements, and abundance and distribution by life stage.
- 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.
- Use monitoring surveys to investigate population fluctuations of marine fish and invertebrates caused by a variety of factors such as climate change, fishing, pollution, and invasive species.
- Determine demographics and habitat use for GCN herpetofauna species.
- Identify, protect, and manage diamond-backed terrapin populations.
- Increase management of bear population through hunting season.

- Determine and map the current and historic distribution of bog turtles.
- Use genetic markers and molecular techniques to better understand populations of GCN species and their use of key habitats.
- Determine the population status and distribution of breeding populations of common nighthawks.
- Determine distribution and abundance, habitat requirements, and demography of northern water shrews.
- Identify key GCN bat flight and migratory corridors and enhance roosting, nursery, and feeding habitats, and water resources.
- Identify and quantify threats to the survival of GCN species.
- Inventory and determine limiting factors of yellow-billed cuckoo and black-billed cuckoo through regional and full-life-cycle investigations.
- Compile and maintain data necessary for NatureServe S ranks for GCN species.
- Monitor location and nearby streams where fish populations that may have been extirpated were previously found.
- Investigate and delineate current distributions of fishes that spawn or congregate at the head-of-tide (e.g., rainbow smelt, sea lamprey, American eel).
- Determine distribution and abundance, habitat requirements, and demography of Southern bog lemmings.
- Conserve existing populations of least shrews and determine statewide distribution and abundance.
- Stock trout strains most likely to establish self-sustaining wild populations into waters selected for special management.
- Evaluate performance of stocked Atlantic salmon in Connecticut habitat.
- Continue stocking juvenile life stages of Atlantic salmon.
- Collect data on trout populations in rapidly developing watersheds where data are currently unavailable.
- Identify and map estuarine habitats, especially spawning and nursery habitats, and characterize their relative importance to estuarine species.
- Assess the status and distribution of bees and other native pollinators and assess threats such as the use of pesticides, especially neonicotinoids.
- Monitor and conserve breeding populations of GCN forest interior birds.
- Monitor key GCN species' migratory routes, especially along the coastline, through the enhanced use of remote technology such as nanotransmitter receiver towers.
- Investigate fluctuations and declines in bait fish populations, such as herring and menhaden, in Long Island Sound.
- Assess the effects of wetland restorations on the distribution and abundance of black ducks.
- Develop an improved data collection, management, and retrieval system to track the status of GCN species and key habitats.
- Enhance inventory and conservation efforts for Odonate species.
- Assess invertebrate populations occurring in coastal strand, trap rock ridges, and high elevation bald habitats.
- Determine the status and distribution of GCN ground beetle populations and map areas of impact to capture potential conflicts at environmental review stage.

- Map vernal pools.
- Determine Eastern box turtle and wood turtle distribution, habitat use and demographics as well as identify core populations and evaluate their long-term viability.
- Identify, monitor, and develop management plans to protect Puritan tiger beetle populations (for which Connecticut has a global responsibility) and their habitat.
- Periodically monitor fish and invertebrate communities, and key physical and chemical indices in lakes and ponds.
- Determine the life history, abundance, distribution, and habitat requirements for GCN bat species.
- Conduct research on ecosystem-level conservation that will benefit habitat and suites of GCN species.
- Create an inventory of all Best Management Practices benefiting GCN species and their habitats. Combine redundant Best Management Practices, create new Best Management Practices, and create a mechanism to efficiently search and find Best Management Practices.
- Enhance inventory and conservation efforts for butterfly species, especially monarch and northern metalmark.
- Identify and protect areas productive for sand lance.
- Assess the effectiveness of existing facilities to pass fish.
- Conduct an inventory of Northern flickers.
- Conduct surveys of declining GCN species.
- 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.
- Develop long-term monitoring protocol for Connecticut fish species.
- Determine and map the distribution of blue-spotted salamander (diploid) populations.
- Determine the population status and distribution of breeding saltmarsh sparrow.
- Map habitat essential for threatened and endangered GCN species.
- Identify head-of-tide habitat within Connecticut.
- Inventory and determine the status of headwater stream habitats statewide.
- Map potential restoration sites to benefit GCN species and their habitats.
- Conduct research that specifically addresses and informs management of GCN species and their habitats.
- Quantify and map bottom vegetation and substrates in lakes.
- Provide Wildlife Action Plan maps and web-based tools such as GIS mapping for use by DEEP personnel and partners.
- Collaborate with partners to predict and investigate the current distributions of GCN plant species.
- 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.

11.3. Insufficient or inappropriate habitat management or modification on public and private lands.
- Reintroduce native GCN species as appropriate.
- Develop Best Management Practices for municipalities to address invasive species and

encourage the use of reduced risk pesticides.

- Develop, in collaboration with Department of Transportation, Best Management Practices to manage roadside vegetation to reduce impacts to GCN species and their habitats.
- Develop Best Management Practices for conserving and enhancing GCN bat populations.
- Provide technical assistance to local municipalities regarding zoning and dividing parcels of land for development in order to conserve GCN species and their habitats (e.g., encourage group or cluster development initiatives to protect larger blocks of contiguous habitat; plan development and urban growth to minimize impacts to natural resources and wildlife.)
- Improve habitat on small and large acreages.
- Restore caves and mines not currently used by GCN bats species, or create artificial bat hibernacula.
- Plant more native plants species at state parks to benefit GCN species and their habitats.
- Provide technical assistance to commercial property owners in order to enhance the land on their campuses to maximize its benefit to GCN species.
- Install signs for state wildlife management areas similar to signs marking state forests and state parks.
- Install Kestrel boxes on the backs of highway signs.
- Develop comprehensive management plans for public lands that include wildlife diversity conservation.
- Develop Best Management Practices for GCN bats for use by federal, state, municipal, and private land managers to conserve and enhance bat populations.
- Increase the number of areas managed for GCN species.
- Create and monitor an inventory of management plans for GCN species and their habitats. Implement existing management plans.
- Conserve all GCN species for which Connecticut has global responsibility.
- Provide technical assistance to utilities to manage right-of-ways to benefit GCN species and their habitats.
- Implement Best Management Practices developed for GCN species and their habitats on state lands; use as a model for implementation on private or municipal properties.
- 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).
- Prioritize management for GCN species and habitats on state lands with a focus on rare and declining habitats.
- Develop and compile a 'tool kit' for use by municipalities and land managers to enhance local decision making as it relates to GCN species and their habitats.
- Conserve and enhance bog turtle populations and their habitats.

11.4. Insufficient wildlife conservation and management at a regional level.
- Conserve and increase 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.
- Participate in regional conservation efforts, especially Regional Conservation Need

priorities, for Regional Species of Greatest Conservation Need and Connecticut 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.
- Participate in flyway-scale projects for shorebird conservation (Atlantic Flyway Shorebird Initiative, East Coast Marshes Business Plan).
- Monitor population trends of grassland birds within Connecticut and as part of regional efforts.
- Monitor wetland birds in coordination with Partners in Flight and Colonial Bird Monitoring and other avian conservation initiatives.
- Develop long-term monitoring protocols, consistent with regional protocols where possible, and implement research and management activities to conserve GCN species.
- Coordinate efforts regionally and with key partners to address emerging issues that may adversely affect wildlife and habitats, especially regional conservation need priorities and regional species of greatest conservation concern.
- 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.

11.5. Delayed recovery of species with depressed populations due to limited reproductive potential, dispersal ability, or other factors.
- Work closely with academic institutions to accomplish research-oriented actions for GCN species and key habitats.

11.6. New and emerging issues with potential to adversely impact wildlife and habitats (e.g., disease, invasive species).
- Participate in regional conservation efforts, especially Regional Conservation Need projects, for Regional Species of Greatest Conservation Need and Connecticut GCN species.

12. Education and Outreach Challenges

12.1. Public indifference towards conservation.
- 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.
- Cultivate support for conservation among government leaders.
- Develop and compile education, training, and outreach programs and resources for municipalities to highlight and encourage habitat enhancement and conservation opportunity areas (e.g., Tree City USA, Native Plant Lists, IPANE).
- Develop programs to engage families in outdoor activities that promote stewardship and conservation of GCN species and their habitats.
- Increase public awareness and stewardship for coastal GCN species' nesting areas using signage and interpretive staff.
- Develop an online system to enhance reporting of DEEP Natural Diversity Data Base forms and sightings of GCN species by the research community and citizen scientists.

- 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.
- Engage non-traditional partners, such as business leaders and the business community in wildlife conservation projects.
- 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.
- Develop multi-lingual education and outreach initiatives to promote stewardship of GCN species and their habitats.
- Expand use of social media to promote outdoor activities to highlight and promote wildlife conservation projects.
- Promote and enhance biologist presentations to the public and conservation partners regarding various programs and issues relating to GCN species and their habitats.
- Develop educational materials for in-classroom curricula and outdoor activities that emphasize conservation of GCN species and their key habitats.
- 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.
- Increase public outreach and education for private landowners regarding the importance of managing lands to conserve common and uncommon species.
- Expand the use of citizen science and encourage participation of middle and high schools to collect data about GCN species and their habitats.
- Implement programs promoting conservation of GCN species and their habitats.

12.2. Promotion and persistence of inaccurate wildlife myths.
- Develop a forum to provide technical assistance to media regarding Connecticut's wildlife.
- Promote public awareness regarding the importance of 'young habitats' for GCN species and enhance awareness of the role of active management in their survival.
- Increase labeling and marking of plant species on state land to promote education.
- Develop information fact sheets about GCN species and their habitats to increase public stewardship of wildlife.
- Provide information to local governments, watershed associations, and the public to increase awareness of environmental issues affecting GCN species and key habitats.
- Increase public awareness of GCN species by installing or enhancing existing signs at state Wildlife Management Areas and incorporating new technology whenever possible.
- Develop media outreach initiatives to promote wildlife stewardship ethics. Distribute conservation success stories to the media.
- Promote public awareness about urban and suburban GCN species and their habitats.
- Promote public awareness of the vulnerability of Eastern box turtle and wood turtle populations and the negative impacts of removing turtles from the wild.
- Promote increased stewardship, advocacy, and volunteerism by the public for conservation of GCN species and their habitats.
- Develop outreach materials for homeowners to raise awareness of possible GCN bat use of buildings and man-made structures (e.g., powerwashing, gutterwork, shutters, etc.).

- Expand development and publication of fact sheets on conservation status, actions, threats, and habitat and food requirements
- Develop outreach materials to inform the public about ways to prevent the spread of wildlife diseases such as white-nose syndrome and ranavirus.

13. Administrative Challenges

13.1. Insufficient staffing in fish and wildlife agencies to implement wildlife conservation.
- Expand the Teaming With Wildlife Coalition to assist with funding sources and policy issues at the local level.

13.2. Insufficient staffing in fish and wildlife agencies for successional planning to ensure continuity of wildlife conservation.
- Develop a stable, sustainable funding source to implement conservation efforts that benefit the full array of fish and wildlife.
- Hire a professional conservation marketing firm to design a multi-faceted campaign to increase interest in wildlife and fisheries and the necessity to fund actions to support fish and wildlife conservation (seek marketing opportunities using GCN species).

13.3. Public policy focused on goals and interests that adversely affect wildlife and natural resource conservation.
- Develop guidelines for towns to plan their land use to mitigate the impacts of climate change to GCN species and their habitats.
- Develop incentives for towns to conserve key wildlife habitat.
- 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.
- Require and conduct comprehensive permit reviews on all regulated activities in head-of-tide habitat.
- Communicate key components of the Wildlife Action Plan to towns and encourage its use at the local level.
- Develop Best Management Practices for wildlife rehabbers that include releasing animals where they were captured, and controlling the risk of spreading wildlife diseases.
- Develop a system to inform DOT and local municipalities about potential impacts of infrastructure projects on GCN species and key habitats. Communicate non-binding recommendations for minimizing those impacts.

13.4. Need for more effective policy to protect resources.
- Promote changes to local land use policy and regulations to better protect habitats (especially coastal areas) from the impacts of climate change.
- Enhance regulations on residential spraying of herbicides and pesticides.
- Seek means to reduce the use of lead sinkers and lead ammunition.
- Tighten and enforce rules regarding ownership of exotic wildlife species.
- Create or support legal strategies to conserve key wildlife habitat.
- Legislate a fee on lawn chemicals to protect and acquire and manage wetland habitat.
- Pass state legislation governing land use planning to conserve GCN wildlife and habitat on lands under development.

- Promote effective state and local regulations for the conservation of wetlands and other aquatic habitats.
- Develop legal strategies to address the sale of cultivars of prohibited plants and internet trade in prohibited plant species.
- Continue to develop and promote legislation to protect GCN herpetofauna species.
- Develop additional funding sources for in fee land acquisition purchases to acquire more land to benefit GCN species and their habitats.
- Develop additional stable funding mechanisms to pay for the conservation of GCN species and habitats.
- 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.

13.5. Insufficient data exchange and coordination among the public, government, and scientific communities.

- Enhance conservation of GCN invertebrate species by developing an online database that provides information to the public and facilitates the submission of data by the scientific community.
- Increase cooperation with major private conservation entities within the state.
- Facilitate sharing of resource maps between state and federal agencies, municipalities, and NGOs to enhance access to resource mapping data for management decisions.
- Compile and distribute information on funding sources for habitat management to land trusts and similar conservation organizations.
- Work with state and municipal planners to ensure that wildlife resources are routinely incorporated into state and municipal planning in a consistent way.
- Develop a mechanism to connect local nature groups with land managers and planners so that information regarding the distribution and abundance of GCN species can be shared and used.
- Provide wildlife and habitat evaluation and assessment services to private landowners along with recommendations for best managing their property for GCN species and their habitats.
- Facilitate municipal cooperation for landscape-level conservation.
- Work closely with academic institutions to accomplish research-oriented actions for GCN species and key habitats.
- Develop statewide citizen science action networks by taxonomic group to locate, identify, observe, describe, and map GCN species and their key habitats.
- 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.
- Develop an annual meeting for researchers holding scientific collecting permits to discuss their projects and results.
- Develop a portion of the DEEP website where landowners can find Best Management Practices and voluntarily report the use of Best Management Practices or conservation actions that may not be captured through the town permit process.
- Work with municipalities, NGOs and land trusts to identify and protect critical habitat.
- Develop partnerships and cooperation to acquire and protect head-of-tide locations,

particularly those that are relatively non-degraded.

- Expand the CT River Watershed NALCC pilot project and combine with species atlas and monitoring.
- Identify undeveloped parcels and identify landowners and partners to conserve land without purchasing (e.g., leases, cooperative agreements).
- Develop a user friendly BMP template and easily-accessible location for finding Best Management Practices.
- 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.
- Provide Best Management Practices to benefit GCN species and their habitats to state, municipal, and local landowners and provide guidance on their use.
- Develop Best Management Practices and provide technical assistance to municipalities and private landowners regarding the conservation of GCN reptiles and amphibians and their habitats.
- Coordinate the conservation actions in the Wildlife Action Plan with other statewide and regional planning initiatives to maximize conservation impacts.
- Develop best practices for sharing and publication of data to minimize the risk of poaching and collection of rare species.
- Enhance and improve data exchange among division resource managers, biologists, etc.
- Provide direction or BMPs for enhancement of habitat to benefit GCN species.
- Share WAP with local conservation commissions (LCC).
- Develop tools to enhance information sharing and integrate the WAP with other partners' planning efforts.

13.6. Insufficient law enforcement.
- Enhance enforcement of horseshoe crab harvest regulations.
- Enhance enforcement on the compliance with limits and rules governing the collection of horseshoe crabs.
- Enhance enforcement of regulations protecting Long Island Sound (offshore and onshore).
- Tighten regulations and enforce restrictions on the collection of native wildlife species.
- Enhance conservation of illegally collected species by improving monitoring of sites and law enforcement efforts.
- Tighten and enforce rules regarding ownership of exotic wildlife species.

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