

Appendix 3.4

Level 2 summaries for issues impacting less than 10% of SGCN

Non-Timber Crops (2.1)

Non-timber crop production affects 6% of SGCN overall and disproportionately impacts Amphibians and Reptiles (42%) and Fish (29%) (Table 3.21). Runoff from fertilized fields introduces nitrogen and phosphorus into aquatic systems, resulting in eutrophication and hypoxia that degrade habitat quality for Fish (Griffith & Gobler, 2020). Pesticide exposure can impair development and immune function in vernal pool amphibians such as the Marbled Salamander and Northern Leopard Frog (Thompson et al., 2022).

Grassland conversion and chemical use also reduce wildflower abundance and floral diversity, affecting native pollinators such as the American Bumble Bee and, indirectly, insectivorous species like the Eastern Meadowlark (NRC et al., 2007; Jankielson, 2023). Buffer removal along field margins eliminates cover for small mammals and reptiles, increasing predation risk and exposure to environmental extremes. While vegetated buffers and integrated pest management practices offer mitigation potential, uptake remains uneven across agricultural landscapes (TCI & NEFWDT, 2023).

Plantations (2.2)

Plantations affect 2% of Connecticut's SGCN and can displace native habitats with low-diversity monocultures. In areas where plantations replace upland forest or shrub-dominated wetlands, habitat suitability declines for ground-dwelling species such as the Eastern Red Bat and Woodland Vole, which rely on heterogeneous vegetation structure (TCI & NEFWDT, 2023). Intensive management can suppress native plant regeneration and reduce understory complexity, degrading conditions for invertebrates and amphibians.

Genetic risks are also a concern for nearby wild flora. For example, plantation-grown Swamp White Oak or hybrid poplars may cross-pollinate with native populations, potentially altering genetic integrity (Laikre et al., 2010). Additional pressures arise from herbicide use, mechanical soil disturbance, and altered water retention. These changes may reduce the hydroperiod of shallow wetlands or depress groundwater recharge, with cascading effects on species such as the Jefferson Salamander and Wood Frog. While wildlife-friendly plantation design is possible, it is not the norm in Connecticut (TCI & NEFWDT, 2023).

Livestock and Poultry Farming (2.3)

Livestock operations affect 5% of all SGCN and have marked impacts on Fish (26%) and Amphibians and Reptiles (29%) (Table 3.21). Manure runoff from pastures and holding

areas introduces nutrients, pathogens, and pharmaceuticals into streams and wetlands (Ramos et al., 2005; Galindo et al., 1997; Thayer et al., 2012), degrading habitat for species such as the American Eel, Dwarf Wedgemussel, and Yellow Lampmussel (TCI & NEFWDTC, 2023). Streambank trampling by livestock also increases erosion and sedimentation, which smothers spawning gravels and reduces macroinvertebrate diversity.

Wetland-breeding amphibians such as the Spotted Turtle and Northern Leopard Frog are susceptible to direct mortality or nest destruction from trampling in seasonally flooded pastures (Schmutzer et al., 2008; Burton et al., 2009; Howell et al., 2019). In upland fields, the removal of hedgerows and woody cover reduces structural habitat needed by early-successional species like the New England Cottontail. While fencing and rotational grazing systems can reduce impacts, adoption remains variable and is seldom mandated (TCI & NEFWDTC, 2023).

Marine and Freshwater Aquaculture (2.4)

Aquaculture affects 3% of all SGCN but disproportionately impacts Fish (32%) and Amphibians and Reptiles (29%). The escape of farmed fish poses genetic risks to native populations, such as Brook Trout, by promoting interbreeding and reducing local adaptation (Laikre et al., 2010). Genetic mixing has also been reported in stocked Eastern Oysters and may affect nearby wild stocks of shellfish such as Bay Scallops (Bradbury et al., 2020).

Disease transmission is another persistent concern. Parasites, such as sea lice, and bacterial pathogens can spread from aquaculture facilities into adjacent nursery habitats, affecting juvenile Striped Bass and other estuarine species (Johnson et al., 2004; Costello, 2009). Facilities located near tidal marshes and coastal wetlands may also disturb sediment and hydrology, indirectly affecting benthic invertebrates and filter feeders. While sterilization protocols and siting regulations exist, compliance is inconsistent, and monitoring capacity remains limited (TCI & NEFWDTC, 2023).

Oil and Gas Drilling (3.1)

Though direct oil and gas extraction is minimal in Connecticut, the legacy effects of fossil fuel infrastructure remain relevant. Hydrocarbons, heavy metals, and polycyclic aromatic hydrocarbons can enter aquatic systems through accidental leaks, runoff, and atmospheric deposition, leading to chronic sublethal effects in aquatic and semi-aquatic organisms. These pollutants can bioaccumulate in long-lived taxa such as turtles and predatory fish, impairing reproductive success and immune function (Ober, 2010; Sanders et al., 1980). Oil spills and petroleum product residues also threaten coastal invertebrates, plants, and birds through internal toxicity and external fouling of feathers or cuticles (Kingston, 2002; Silliman et al., 2012).

Fish, Amphibians & Reptiles, and Mammals are the taxa most affected by oil and gas–related impacts, at 35%, 6%, and 18% respectively. While relatively few Connecticut species are affected by active oil drilling, regional transport corridors and accidental discharges still pose risks to estuarine and riparian habitats. The Clean Water Act has improved overall water quality, but oil-derived contaminants remain persistent in sediment and wetland systems (Keiser and Shapiro, 2019). Because these pollutants are slow to degrade, even low-frequency events can result in long-term habitat degradation (TCI & NEFWDTC, 2023).

Mining and Quarrying (3.2)

Mining and quarrying affect 4% of all SGCN in Connecticut, 29% of Fish, 13% of Amphibians & Reptiles, and 12% of Mammals (Figure 3.10; Table 3.17). Though the scale of extraction is smaller in Connecticut compared to other states, localized mining operations, especially sand, gravel, and trap rock quarries, disrupt groundwater hydrology and remove critical upland or aquatic habitat. These activities may dry out breeding wetlands, contaminate aquifers, and convert intact forests into unvegetated or compacted sites.

Acid mine drainage, a significant threat in some Northeastern states, is less prevalent in Connecticut due to the absence of extensive coal mining. Nonetheless, sedimentation and heavy metal runoff from gravel and stone extraction can alter pH and turbidity in downstream systems (Ray & Dey, 2020). Amphibians with permeable skin, such as the Jefferson Salamander and Northern Leopard Frog, are especially sensitive to shifts in water chemistry. Similarly, groundwater-dependent mussels and crayfish may experience declines due to water table changes induced by quarry dewatering or aquifer drawdowns (Burns, 2022).

Utility and Service Lines (4.2)

While less widespread than road mortality, utility corridors affect 19% of Amphibians and Reptiles and 18% of Mammals (Table 3.15) by contributing to habitat fragmentation and altering thermal and hydrological regimes. These linear clearings remove canopy cover, facilitating the encroachment of invasive vegetation and modifying soil moisture, which impacts vernal pool-breeding amphibians, such as the Jefferson Salamander (Baldwin et al., 2006). For reptiles that thermoregulate via basking, such as the Eastern Hognose Snake, shifts in shading and humidity within utility corridors may create ecological traps.

In forested ecosystems, utility corridors represent a persistent source of early-successional openings, which can benefit edge-tolerant species while excluding interior-

forest specialists. For Birds, edge-dwelling species such as Indigo Bunting may use these areas, but fragmentation often limits territory size and increases brood parasitism for species such as Wood Thrush and Worm-eating Warbler (TCI & NEFWDTC, 2023). Management of utility corridors with periodic mowing or herbicide application may also reduce habitat suitability for pollinators and native plant communities (CT DEEP, 2020).

Shipping Lanes (4.3)

Shipping activity and vessel traffic in Long Island Sound and coastal estuaries affect 44% of Fish and 17% of Invertebrate SGCN (Table 3.15). The most direct threat is physical disturbance and noise pollution from commercial shipping lanes, which may displace or disrupt behavior in demersal fish such as Winter Flounder. Invertebrates, including estuarine crustaceans and larval stages of marine fish, may also be affected by vessel turbulence, substrate disturbance, and sediment resuspension (Collie et al., 2000).

Several marine bird species, such as Common Loon and Long-tailed Duck, forage in nearshore zones that overlap with commercial vessel corridors. While only 4% of Birds are explicitly assigned to this threat, disturbance and collision risk may be underassessed due to the need for more seabird monitoring in Connecticut state waters (see Chapter 4). Light pollution from vessels and coastal infrastructure may disorient nocturnal migrants or disrupt foraging in nocturnal seabirds (for more on this, see the section on Pollution above). Future offshore development should consider the cumulative effects of vessel traffic, wind infrastructure, and noise pollution on coastal and marine taxa (e.g., Murray et al., 2015).

Flight Paths (4.4)

Although flight paths affect a relatively small proportion of SGCN statewide (1% overall), localized impacts may be significant for selected species. Bat species using bridges or culverts in airport corridors for roosting may face increased exposure to noise and habitat modification (Sparks et al., 2019). Birds, particularly raptors and shorebirds, are susceptible to aircraft strikes and disturbance near airports and military installations. Black Skimmer and other beach-nesting species may exhibit elevated nest abandonment near low-altitude flight paths.

The broader threat associated with flight paths includes sensory disturbance, which can alter habitat use patterns or displace sensitive species from key breeding or foraging areas. While relatively few Connecticut SGCN are directly documented as impacted by flight paths, this is likely a reflection of limited monitoring and reporting rather than the absence of risk. Integrating conservation planning into airport management and airspace

coordination could reduce direct mortality and minimize spatial displacement (TCI & NEFWDTC, 2023).

Hunting and Collecting Terrestrial Animals (5.1)

Hunting and collecting affect 1.6% of SGCN overall but are more pronounced for Amphibians and Reptiles (12.9%) and Birds (5.1%) (Table 3.19). Unregulated collection for the pet trade remains a primary concern for species such as the Spotted Turtle, Wood Turtle, and Eastern Box Turtle. Both are targeted for illegal export and domestic sale due to their appearance and long lifespan, and populations are slow to recover due to late maturity and low reproductive rates (Schlaepfer et al., 2005; Easter et al., 2023; Easter & Carter, 2024). The United States now ranks among the global hotspots for freshwater turtle trafficking, with Northeast states like Connecticut heavily affected since the early 2000s. While direct persecution has declined for many taxa, unintentional mortality still occurs. For example, regional herpetologists have noted incidental take of Spotted Turtles during upland game hunting or through habitat trampling. Additionally, ground-nesting Birds such as the American Woodcock may be disturbed or unintentionally harvested in mixed-use areas (Sabatier et al., 2015; Wilson et al., 2005).

Logging and Wood Harvesting (5.3)

Logging affects 5.1% of Connecticut SGCN, with especially high impacts on Mammals (35.3%), Amphibians and Reptiles (19.4%), and Birds (10.1%). Some modern forestry practices, including clearcutting and whole-tree removal, can sometimes simplify forest structure and reduce coarse woody debris, which may adversely affect species such as the Wood Thrush, Eastern Red Bat, and Jefferson Salamander, which depend on canopy cover and moist microhabitats (Otto et al., 2013; TCI & NEFWDTC, 2023). Fragmentation from logging roads and canopy gaps also exacerbates edge effects, thereby increasing the colonization of invasive plants (Thompson et al., 2017). Implementing a variety of forestry practices across the landscape, which retain connectivity and limit edge effects, can create a diverse forest mosaic that benefits wildlife. For example, various forest practices, ranging from selective harvest to seed tree retention, as well as the retention of woody debris, can help mitigate ecological impacts and enhance plant and animal diversity. Best management practices can lead to enhanced habitat diversity and resilience, and effective incentives and collaboration can ensure that these practices are effectively implemented on private lands.

Fishing and Harvesting Aquatic Resources (5.4)

Fishing and aquatic resource harvest impact 7.8% of Connecticut's SGCN, with particularly high vulnerability among Fish (76.5%), Mammals (17.6%), and Invertebrates (8.7%). Targeted harvest, bycatch, and incidental mortality affect diadromous species such as

American Eel, River Herring, and Atlantic Sturgeon, as well as other species, including the Diamondback Terrapin, which experience substantial pressure during migratory periods and face low recruitment across many systems (Rook et al., 2010; Kennelly et al., 2010; Courmane et al., 2013). Shortnose Sturgeon, though legally protected, remains susceptible to gear interactions in estuarine habitats.

Bycatch of non-target species, including the Tidewater Mucket and Bridle Shiner, occurs during bait harvest and recreational angling in shallow systems. Gear such as fyke nets and crab pots can also entangle turtles and small mammals (Bury, 2011; Rook et al., 2010; Larocque et al., 2012). Although exclusion devices and seasonal closures reduce risk in some fisheries, enforcement and compliance remain uneven. Climate-driven changes in migration timing may also reduce the efficacy of current bycatch reduction measures (Staudinger et al., 2019).

War, Civil Unrest, and Military Exercises (6.2)

Military training activities affect 2.1% of all SGCN, with pronounced effects on Fish (26.5%) and Mammals (11.8%). Though spatially limited, exercises involving vehicle maneuvers, amphibious crossings, or live fire introduce habitat disturbance, noise, vibration, and sedimentation in training areas. In estuarine systems near military installations, species such as the Shortnose Sturgeon and American Eel may be exposed to increased turbidity and noise, which can disrupt foraging or migration (TCI & NEFWDTC, 2023).

Nighttime lighting or canopy removal may disturb mammals using training areas, such as the Northern Long-eared Bat. While many installations maintain large tracts of undeveloped habitat, land use is often rotational and can temporarily displace wildlife from key areas. Coordination between military land managers and conservation agencies has improved recently; however, temporal restrictions do not always align with the seasonal sensitivity of species (TCI & NEFWDTC, 2023).

Fire and Fire Suppression (7.1)

Fire suppression affects 5.6% of all SGCN, with the strongest effects on Amphibians and Reptiles (12.9%) and Fish (20.6%) (Table 3.9). In upland systems, the near-total exclusion of fire has reduced the extent of dry shrublands and oak-pine barrens that support early-successional herpetofauna and plants. Species such as the Eastern Box Turtle and Eastern Towhee rely on the open canopy conditions and patchy ground cover that have been historically maintained by fire and anthropogenic clearing (CT DEEP, 2020; Staudinger et al., 2024).

In fire-adapted landscapes, suppression also disrupts soil chemistry, light regimes, and nutrient cycling, with cascading effects on herbaceous diversity and pollinator assemblages (Nowacki & Abrams, 2008; TCI & NEFWDT, 2023; Kreider et al., 2024). Where fire is absent, mechanical substitutes such as mowing or timber harvest are inconsistently applied and often lack the patch dynamics or seasonality of natural disturbance regimes. For taxa like the New England Cottontail and Eastern Whip-poor-will, fire-based management offers one of the few viable mechanisms for maintaining large blocks of structurally suitable habitat, yet regulatory, liability, and public perception barriers frequently limit its use (CT DEEP, 2020; TCI & NEFWDT, 2023).

Dams and Water Management/Use (7.2)

Dams and regulated flow regimes affect 21.6% of all SGCN, with particularly high impacts on fish (52.9%), Amphibians and Reptiles (35.5%), and Invertebrates (12.7%).

Connecticut's legacy of small dams and flood control structures has fragmented nearly every major watershed, impeding the upstream and downstream movement of anadromous Fish such as American Eel, river herring, and Sea Lamprey (Limburg & Waldman, 2009; TCI & NEFWDT, 2023). These barriers disrupt spawning migrations, limit access to coldwater refugia, and prevent gene flow between subpopulations. Altered flow regimes from hydroelectric operations and flood storage impoundments also depress peak flows, modify sediment transport, and increase summer water temperatures, further affecting cold-adapted taxa such as Brook Trout (Hogg et al., 2015).

In wetlands and vernal pools, water withdrawal and altered hydroperiods reduce breeding success for amphibians such as the Jefferson Salamander and Northern Leopard Frog, which depend on seasonal inundation and hydroclimatic cues for reproduction (TCI & NEFWDT, 2023). Aquatic invertebrates, such as freshwater mussels, may also suffer from dewatering and increased sedimentation below dams. While dam removals have accelerated in recent years, many structures remain undocumented or excluded from state inventories, and permitting remains a barrier to large-scale flow restoration (CT DEEP, 2022; TCI & NEFWDT, 2023).

Problematic Native Species (8.2)

Problematic native species affect 8.7% of SGCN, particularly Fish (29.4%), Birds (22.8%), and Amphibians and Reptiles (19.4%). In many cases, these species have expanded their range or increased in abundance due to human-altered landscapes, disrupted trophic dynamics, or the suppression of natural disturbance regimes. For example, an overabundance of White-tailed Deer contributes to forest regeneration failure and limits structural diversity, negatively affecting understory-nesting birds and native herbaceous plants (Dolman and Waber, 2008; CT DEEP, 2020; TCI & NEFWDT, 2023).

Mesopredators such as raccoons, skunks, and opossums—whose populations are elevated by suburban development—heavily depredate turtle nests and amphibian egg masses (Fischer et al., 2012). Native species, like Eastern Chipmunks and Blue Jays, may also exert additive pressures on shrubland-nesting birds when predator assemblages are unnaturally skewed (Wilson & Peter, 1988). In aquatic systems, altered flow regimes and reduced predation have enabled aggressive native species, such as Eastern Chain Pickerel, to expand into habitats historically dominated by Redfin Pickerel (TCI & NEFWDC, 2023).

Introduced Genetic Material (8.3)

Introduced genetic material affects 0.2% of all SGCN but disproportionately impacts Fish (2.9%) and amphibian populations with small, isolated distributions (Table 3.7). The hybridization of hatchery-raised salmonids with native trout is a significant concern, leading to genetic introgression (the transfer of genetic material from hatchery-raised and wild populations) and reduced local adaptation (Zimmerman et al., 2019, 2024). Such genetic impacts can have long-lasting consequences, potentially persisting for decades, especially in smaller watersheds where stocking practices were historically common (TCI & NEFWDC, 2023).

In amphibians, the introduction of Bullfrogs into vernal pools has raised concerns about displacement or indirect pathogen spread to species like the Jefferson Salamander and Blue-spotted Salamander (Simberloff, 1996; TCI & NEFWDC, 2023). Even with stricter enforcement of live-release and bait regulations, past genetic mixing is still evident in many watersheds, potentially reducing the resilience of local genotypes to climate-driven stressors and disease (Fitzpatrick et al., 2010).

Pathogens and Microbes (8.4)

Pathogens affect 4.9% of SGCN, with the most severe impacts occurring among Amphibians and Reptiles (29.0%) and Fish (17.6%) (Table 3.7). Amphibians are especially affected by pathogens (Schilliger et al., 2023) and their populations across the region have been affected by chytridiomycosis (caused by *Batrachochytrium dendrobatidis*) and Ranavirus, with confirmed mortality in species such as Northern Leopard Frog and Marbled Salamander (TCI & NEFWDC, 2023). Wetland-breeding amphibians are especially susceptible due to high-density larval aggregation and environmental stress.

Turtles such as the Spotted Turtle are increasingly affected by shell and respiratory infections, which reduce reproductive success and increase mortality in populations already limited by low fecundity (TCI & NEFWDC, 2023). For Fish, hatchery-borne pathogens such as *Myxobolus cerebralis* and bacterial gill disease pose potential risks under warming and low-flow conditions, although their presence in Connecticut is still limited. Climate change is expected to exacerbate disease dynamics in both aquatic and

terrestrial systems (Altizer et al., 2013; Carlson et al., 2013; Lindauer et al., 2020; Staudinger et al., 2024).

Intrinsic Biological Limitations (8.5)

Intrinsic biological limitations affect 3.1% of SGCN statewide, including 14.7% of Fish, 11.8% of Mammals, and 6.5% of Amphibians and Reptiles. These include delayed maturity, low fecundity, narrow environmental tolerances, and poor dispersal capacity. Turtles, like Spotted Turtles and Eastern Box Turtles, are particularly constrained by slow growth and infrequent reproduction, which limits recovery from disturbance or mortality (Edmonds et al., 2021; Manzo et al., 2021; TCI & NEFWDT, 2023).

Fish such as Slimy Sculpin have narrow thermal and flow requirements, making them especially vulnerable to warming and stream alteration. Similarly, some Plant, Invert, and Amphibian & Reptile SGCN tied to trap rock ridges, dunes, or fens exhibit low colonization ability, reducing their capacity to shift ranges under climate pressure (CT DEEP, 2020; TCI & NEFWDT, 2023; Klemens et al., 2021). These biological traits are not threats in isolation but interact with other pressures to elevate extinction risk.

11.5 Storms and Severe Weather

Extreme weather affects 9% of all SGCN overall, but disproportionately impacts Mammals (53%), Herpetofauna (35%), and Birds (14%) (Table 3.3). Increased storm frequency and intensity threaten SGCN across all habitat types, often by compounding habitat instability and reproductive failure. Beach-nesting species, such as the Piping Plover and Least Tern, are vulnerable to storm surge and nest flooding, with higher wave action reducing fledging success and eliminating suitable nesting substrates (Craig et al., 2015; Bourque et al., 2015; Seavey et al., 2010). Saltmarsh Sparrow populations are partly declining due to the increasing frequency of nest inundations linked to storm-driven high tides and sea-level rise (Shriver et al., 2015; Field et al., 2016). In upland forests, high-wind events associated with severe storms can damage canopy structure, fragment breeding territories for forest birds, and alter microclimates essential to amphibian and invertebrate communities.

Freshwater systems are similarly impacted. Flash floods and streambank failure increase sediment loads and alter channel morphology, degrading spawning grounds for fish and mussels. Terrestrial reptiles such as the Wood Turtle may be displaced during intense precipitation events in floodplain habitats. Extreme winter weather, including freeze-thaw cycles, can damage vegetation and affect overwintering conditions for herpetofauna (Clark et al., 2011; Biber et al., 2023). Additionally, post-storm human responses, such as debris clearing and erosion control infrastructure, may further degrade

habitat structure. Given projections of more intense tropical and extratropical storms in the Northeast, the frequency of these ecological disruptions is likely to increase across both coastal and inland systems (Staudinger et al., 2024).

Resource Needs (12.2)

Resource constraints were cited for multiple Plant SGCN and a smaller number of Mammals and Amphibians & Reptiles. These limitations include insufficient funding for land stewardship, lack of implementation capacity among conservation partners, and inadequate support for private landowner engagement. The 2020 Connecticut Forest Action Plan identified persistent staffing shortages, weak coordination with non-profit and municipal actors, and insufficient incentives for conservation management on private lands as key barriers to success (CT DEEP, 2020). These challenges are especially acute for plant taxa that rely on fire management, invasive species control, or hydrologic restoration; actions that require sustained funding and multiyear commitment.

Education and Outreach (12.3)

Outreach gaps were identified for several SGCN, particularly those reliant on voluntary landowner cooperation or landscape-level habitat management. Species with low public visibility, such as many of Connecticut's rare plants, are often overlooked in conservation planning or deprioritized in local land-use decisions. The Connecticut Forest Action Plan emphasized the need for public engagement strategies, including demonstration areas, interpretive materials, and expanded citizen science efforts to promote understanding and stewardship of declining native species (CT DEEP, 2020). Multilingual outreach and curriculum integration were also critical for building long-term support.

Administrative Needs (12.4)

Administrative barriers noted for a handful of SGCN include inconsistent application of state-level policies, limited interagency coordination, and local regulations that discourage habitat management. For example, forest management permitting processes and municipal ordinances may unintentionally hinder the creation of early-successional habitats or the use of prescribed fire, both of which are essential to the persistence of certain plant and shrubland species (CT DEEP, 2020). The lack of stable funding mechanisms for cross-jurisdictional projects and insufficient staff time for long-range planning further restrict conservation efforts.

Unknown or Data Deficient (12.6)

A small subset of species, including 1% of all SGCN and 12% of listed Mammals, were flagged as "unknown" or "data deficient" concerning major threats. These designations reflect uncertainty regarding habitat use, population trends, or threat exposure, rather than

confirmed absence of risk. In many cases, these species may be rare, nocturnal, or occupy poorly studied habitats, underscoring the importance of targeted monitoring and research to inform future threat assessments (TCI & NEFWDT, 2023). However, it should be noted that the Taxa Teams identified Monitoring and Basic Research as the top priority Action for Connecticut's SGCN, SAPS, and Habitats (see Chapter 4), so just because many SGCN did not have this identified as an Issue, it does remain one of the most important actions for many species in the State. For more on monitoring Connecticut's SGCN, SAPS, and habitats, see Chapter 5.

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