Chapter 3

Issues Affecting Connecticut's SGCN, SAPS, and Habitats

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Summary

Connecticut's Species of Greatest Conservation Need (SGCN), State Assessment Priority Species (SAPS), and associated habitats face complex and interacting issues now and in the future. Residential and commercial development, modifications to natural systems, invasive species, pollution, and shifting environmental conditions represent the most pervasive stressors, collectively affecting all major taxonomic groups. Among these, recent and anticipated shifts in temperature and precipitation patterns have become the most far-reaching issue, directly and indirectly affecting ecological systems by amplifying the severity of other threats. Recent droughts, for example, have contributed to widespread oak mortality during Spongy Moth outbreaks and have intensified the effects of invasive species and disease in forested and wetland habitats, impacting species such as the Northern Long-eared Bat, Eastern Box Turtle, and Eastern Pondmussel.

Patterns of threat exposure vary across taxa but demonstrate consistent vulnerabilities, particularly for Fish, Amphibians & Reptiles, and Mammals. Ninety-seven

percent of fish SGCN are susceptible to pollution impacts, and over 70% are vulnerable to temperature and precipitation shifts. Water flow alterations from dams, ditching, and insufficient flow regulation affect 82% of Fish species and over half of Amphibians and Reptiles, limiting habitat availability and connectivity for SGCN such as Brook Trout, River Herring, and Jefferson Salamander. Amphibians face intersecting pressures from habitat desiccation, land conversion, and exposure to pathogens. Similarly, nearly 60% of mammal SGCNs are affected by invasive species and diseases, including white-nose syndrome, which has led to regional declines in bat populations. Overabundant deer and predators have altered forest structure and increased nest predation pressure for species such as Wood Thrush and Spotted Turtle. While data gaps remain for many Invertebrates and Plants, available assessments indicate high exposure to development, invasive species, and the decline of disturbance-maintained habitats. These include Sandplain Flax and Slender Blue Flag, which rely on active management to maintain early successional or edaphic conditions.

Addressing these threats will require coordinated, taxon-specific strategies grounded in landscape-scale habitat protection, restoration of ecological processes, and adaptation to shifting environmental baselines. Many SGCN depend on habitats shaped by historical disturbance, such as fire and land clearing, which have declined markedly due to land abandonment and management constraints. For example, cessation of active maintenance affects 35% of Bird SGCN and 16% of Amphibians and Reptiles, including New England Cottontail and Eastern Whip-poor-will. Many fish and wetland amphibians remain impeded by structural legacies such as dams and undersized culverts, which fragment watersheds and alter flow regimes. The cumulative nature of these stressors, many now intensified by changing environmental conditions, will require integrated planning across land-use, water management, and conservation sectors. For more on the Actions that will benefit Connecticut's SGCN, SAPS, and Habitats, see Chapter 4. This chapter synthesizes updated assessments from state agencies, regional partners, and expert Taxa Teams to support implementation of Element 3 of the 2025 Wildlife Action Plan and guide conservation action over the next decade.

Overview of Issues Affecting Connecticut's SGCN, SAPS, and Habitats

Chapter Overview

Connecticut's 2015 Wildlife Action Plan and subsequent state and regional assessments have painted a troubling picture: the state's Species of Greatest Conservation Need face a consistent set of mounting threats. The most relentless of these remains habitat loss and fragmentation driven by development pressure. The numbers tell the story; between 1985 and 2010, Connecticut lost over 115,000 acres of forest, with development claiming roughly 18 acres every single day (CT DEEP, 2015). This wave of residential, commercial, and recreational development has altered the landscape, reducing not just the size but also the quality of core habitats that forest, shrubland, and wetland species depend on. Roads and utility corridors slice through what remains, creating a patchwork of isolated fragments where edge effects penetrate deeper and connectivity, which is critical for wide-ranging, disturbance-sensitive species, becomes increasingly scarce. Meanwhile, our waterways have been straightened, dammed, and diverted, fundamentally altering the flow regimes that fish, mussels, and other freshwater species evolved with over millennia (CT DEEP, 2018; CT Water Planning Council, 2018).

But habitat loss tells only part of Connecticut's conservation story. Invasive species, forest pests, and emerging diseases have become equally destructive forces, often striking forests, by far the state's most common habitat type (see Chapter 2), with devastating efficiency. Ash trees fall to Emerald Ash Borer, hemlocks succumb to Woolly Adelgid, and oaks die in waves during Spongy Moth outbreaks, especially when drought stress leaves them vulnerable (CT DEEP, 2020). In our lakes and rivers, invasive aquatic plants have transformed entire ecosystems, while white-nose syndrome has quietly decimated bat populations, with the Little Brown Bat among the hardest hit (TCI & NEFWDTC, 2023). What makes these threats particularly challenging is how they amplify one another. Drought-stressed trees become easy targets for invasive pests, while shifting temperature and precipitation patterns create conditions that favor non-native species over the natives that evolved here (Burgio et al., 2024). While originally framed as an emerging issue in the 2015 Plan, shifting patterns in temperature and precipitation is now recognized as a pervasive force driving change across nearly all habitat types. Warmer temperatures, shifting precipitation patterns, and increased frequency of extreme events disrupt phenology, hydrology, and species interactions. For example, in eastern Connecticut, a multi-year Spongy Moth outbreak from 2015 to 2019, exacerbated by drought, caused widespread oak mortality after natural fungal controls failed to establish (CT DEEP, 2020; Staudinger et al., 2024). These local observations reflect broader regional trends: across the Northeast, 74% of species of “Very High Concern” are affected by shifting environmental conditions, often in combination with invasive species or pollution (TCI & NEFWDTC, 2023). The convergence of these stressors has reshaped habitat conditions and accelerated declines for many species across the state.

Past planning efforts have consistently emphasized that addressing these threats requires targeted, habitat-based actions and coordinated cross-sector strategies. The 2015

Wildlife Action Plan outlined core conservation actions, including protecting large habitat blocks, restoring degraded wetlands and early successional habitats, controlling invasive species, and improving landscape connectivity (CT DEEP, 2015). The 2020 Forest Action Plan prioritized resilience-based forest management, focusing on diversifying age structure, mitigating pest impacts, and reducing fragmentation (CT DEEP, 2020). The State Water Plan called for integrated watershed management, restoration of natural flow regimes, and alignment of ecological needs with human water demands (CT Water Planning Council, 2018). Regionally, Staudinger et al. (2024) identified a need to incorporate projections of anticipated temperature and precipitation shifts into species and habitat management, prioritize actions that address compounding threats, and expand monitoring to detect shifts in behavior, distribution, and the timing of events, such as migration.

Chapter 3 addresses Element 3 by providing a comprehensive and updated overview of issues facing Connecticut's SCGN, SAPS, and Habitats since the publication of the 2015 Wildlife Action Plan. First, a section describes how shifting environmental conditions, a rapidly emerging threat, can act as both a direct and indirect threat to wildlife and plants, further complicating conservation efforts. Next, the Issues affecting Connecticut's SGCN, SAPS, and Habitats are presented in order of the issues affecting the most species, to the least. Subsequently, more targeted, prioritized taxon-specific sections follow. Information about the 2025 Connecticut SGCN and SAPS can be found in Chapter 1, and Connecticut's habitats and an overview of the threats they face are outlined in Chapter 2. All Issues affecting each of Connecticut's SGCN and SAPS are listed in Appendix 3.

What are the Issues, and How Were They Identified?

Definitions

To ensure consistency across the entire Northeast region, Issues (referred to as "Threats") are defined in the Northeast Lexicon (Crisfield and NEFWDTC, 2022), a modified version of the Conservation Measures Partnership (CMP) Threats Classification (2016). Issues are presented in a hierarchical structure, with the broadest category (Level 1; see Table 3.1) subdivided into more specific categories (Level 2), which are further subdivided into the most specific actions (Level 3). For the full list of Level 3 Issues, see Table S1 in Appendix 3.

Table 3.1. List of Level 1 and 2 Threats (Issues) (CMP, 2016)

CMP Direct Threats Classification v 2.0

1. Residential & Commercial Development
- 1.1 Housing & Urban Areas
- 1.2 Commercial & Industrial Areas
- 1.3 Tourism & Recreation Areas

2. Agriculture & Aquaculture
- 2.1 Annual & Perennial Non-Timber Crops
- 2.2 Wood & Pulp Plantations
- 2.3 Livestock Farming & Ranching
- 2.4 Marine & Freshwater Aquaculture

3. Energy Production & Mining
- 3.1 Oil & Gas Drilling
- 3.2 Mining & Quarrying
- 3.3 Renewable Energy

4. Transportation & Service Corridors
- 4.1 Roads & Railroads
- 4.2 Utility & Service Lines
- 4.3 Shipping Lanes
- 4.4 Flight Paths

5. Biological Resource Use
- 5.1 Hunting & Collecting Terrestrial Animals
- 5.2 Gathering Terrestrial Plants
- 5.3 Logging & Wood Harvesting
- 5.4 Fishing & Harvesting Aquatic Resources

6. Human Intrusions & Disturbance
- 6.1 Recreational Activities
- 6.2 War, Civil Unrest & Military Exercises
- 6.3 Work & Other Activities

7. Natural System Modifications
- 7.1 Fire & Fire Suppression
- 7.2 Dams & Water Management / Use
- 7.3 Other Ecosystem Modifications
- 7.4 Removing / Reducing Human Maintenance

8. Invasive & Problematic Species, Pathogens & Genes
- 8.1 Invasive Non-Native / Alien Plants & Animals
- 8.2 Problematic Native Plants & Animals
- 8.3 Introduced Genetic Material
- 8.4 Pathogens & Microbes

9. Pollution
- 9.1 Household Sewage & Urban Waste Water
- 9.2 Industrial & Military Effluents
- 9.3 Agricultural & Forestry Effluents
- 9.4 Garbage & Solid Waste
- 9.5 Air-Borne Pollutants
- 9.6 Excess Energy

10. Geological Events
- 10.1 Volcanoes
- 10.2 Earthquakes / Tsunamis
- 10.3 Avalanches / Landslides

11. Climate Change
- 11.1 Ecosystem Encroachment
- 11.2 Changes in Geochemical Regimes
- 11.3 Changes in Temperature Regimes
- 11.4 Changes in Precipitation & Hydrological Regimes
- 11.5 Severe / Extreme Weather Events

Step 1 – Data Collection

Vulnerability to Recent and Anticipated Shifts in Temperature and Precipitation

During the initial data collection to identify Connecticut's SGCN and SAPS in the Fall of 2023, Taxa Teams were asked to assess the vulnerability of each of these species to the effects of changing temperatures, altered precipitation patterns, rising coastal water levels, and other factors. For more details on the data collection process, refer to Chapter 1. Vulnerability assessments are provided in each taxon-specific section below.

Issues Affecting Each of Connecticut's SGCN and SAPS

After updating the SGCN and SAPS lists, the first step in identifying the key issues for Connecticut's SGCN, the Taxa Teams were provided with a database (see Chapter 1) of existing information for each SGCN and a survey asking these state experts to confirm or update data on relevant issues affecting each SGCN and SAPS over the next ten years. The Taxa Teams included 50 wildlife experts from academia, conservation stakeholder groups, and state agencies (See Appendix 1.1 for a complete list of Taxa Team members and their affiliations). CT DEEP and its consultants organized virtual workshops for the Taxa Teams in January 2024. These workshops were designed to help navigate the existing data and the associated Qualtrics survey. From January to May 2024, Taxa Teams provided issue data to CT DEEP consultants. In May 2024, CT DEEP consultants compiled the data and sent the results back to each Taxa Team, which met in late May 2024 to discuss them. The data was again collated and returned to the Taxa and CT DEEP Advisory teams in July 2024 for final approval. Issues were tabulated by identifying each instance where the issue was assigned to a species and summed.

Step 2 – Public and Partner Feedback

CT DEEP and its consultants posted a public feedback form on their website in September 2024, asking the public to identify the most important issues to address for Connecticut's flora, fauna, and habitats. Four hundred thirty-eight individuals submitted a form between September and November 2024. Similarly, CT DEEP consultants surveyed their conservation partners in December 2024 using a Qualtrics survey to determine which actions they are currently working on and which they believe are most important. Over 180 conservation partners filled out surveys. For more information on public and partner outreach, please refer to Chapter 6.

Connecticut's 2025 Top Issues (Across Taxa)

Summary

Taxa Teams identified shifting environmental conditions as the most pervasive threat facing SGCN, affecting 77% of Fish, 71% of Mammals, and 69% of Amphibians & Reptiles (Figure 3.1; Table 3.2). These impacts manifest through chronic stressors, such as warming stream temperatures, shifting precipitation patterns, and sea-level rise, as well as acute events like droughts and extreme storms. For instance, Brook Trout and American Eel are highly sensitive to thermal and flow regime changes, while drought-induced wetland desiccation poses increased risks for species such as the Jefferson Salamander. Among Mammals, environmental stressors linked to temperature and precipitation changes compound the effects of White-nose Syndrome in bat populations. While a smaller proportion of Bird (41%) and Plant (37%) SGCN are currently classified as threatened by these changing conditions, many, including Saltmarsh Sparrow and Coastal Plain Blue-eyed Grass, occupy habitats at high risk of inundation, saltwater intrusion, or altered disturbance dynamics (Shriver et al., 2015; CT DEEP, 2022).

Natural System Modifications represent the second most widespread threat, impacting 80% of Fish, 49% of Invertebrates, 45% of Birds, and 44% of Amphibians and Reptiles (Figure 3.1; Table 3.2) across Connecticut. These threats often involve the loss or disruption of ecological processes such as natural hydrologic regimes, fire, and sediment transport. Diadromous Fish, including river herring and Sea Lamprey, cannot navigate past dams and channelized streams. Meanwhile, decades of fire suppression and the abandonment of disturbance-dependent landscapes have reduced habitat suitability for species such as the Eastern Whip-poor-will and Frosted Elfin. Pollution ranks as the third most prevalent issue, affecting nearly all Fish SGCN (94%), particularly those in degraded river systems, and presents problems for 59% of Mammals and 56% of Amphibians and Reptiles. Road runoff, heavy metals, nutrient loading, microplastics, pharmaceuticals, endocrine disruptors, pesticides, and legacy contaminants all work together to degrade water quality and subject aquatic species, including mussels, turtles, and odonates, to chronic stress throughout downstream wetland systems. Even small changes in development can tip the scales; for instance, just 5% impervious cover is enough to harm Brook Trout populations (Stranko et al., 2008)

Development pressure continues to fragment habitat and limit population connectivity across taxa. Residential and commercial development affects more than 65% of Fish and Amphibians & Reptiles and half of all Bird SGCN (Table 3.2), particularly those reliant on forest interior habitat, riparian corridors, or early successional habitat. Invasive species, pathogens, and problematic genes are most significant for Mammals (59%) and Amphibians and Reptiles (50%), including impacts from White-nose Syndrome, Ranavirus, and competition from non-native turtles. Genetic swamping and interspecific competition also affect bird species such as the Golden-winged Warbler. Invertebrates face a different but equally concerning pattern: moderate exposure across multiple issues, particularly habitat modification and development, with pollinators and wetland-dependent taxa among the most vulnerable. But this statewide overview (Figure 3.1) only tells part of the story. Other stressors add layers of complexity. Agricultural runoff, energy infrastructure, and recreational disturbance all chip away at the resilience of many SGCN, SAPS, and their habitats, often in ways that don't show up clearly in broad assessments but matter enormously at the local level. More detailed information and citations are provided in the threat summaries and the taxon-specific syntheses below.

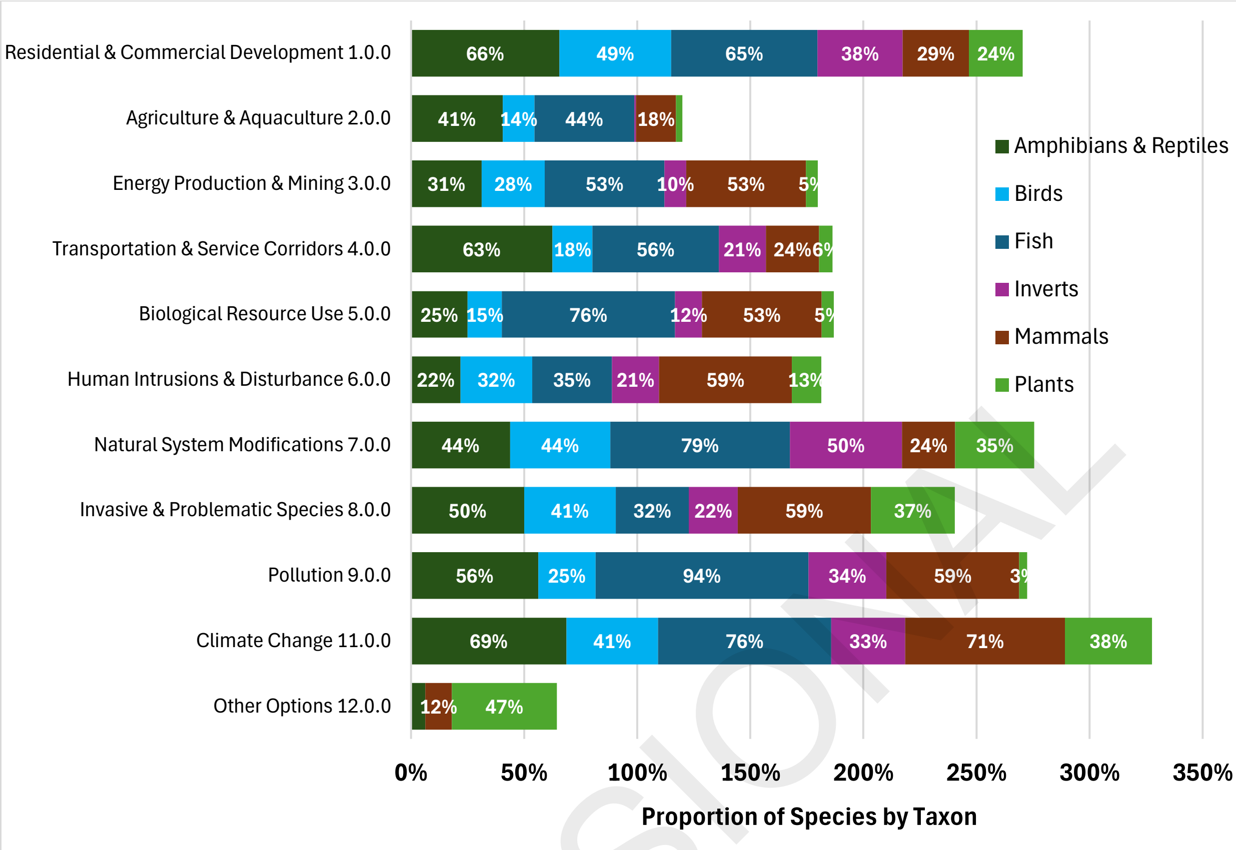

Figure 3.1 – Proportion of SGCN affected by the Level 1 threat categories, summarized by taxonomic group. Values represent the percentage of assessed species within each group that are exposed to each broad threat type. These data highlight shifting environmental conditions, natural systems modifications, and pollution as the most widespread pressures across taxa.

Table 3.2 – Percentage of SGCN affected by each Level 1 threat category, organized by major taxonomic group.

Issue	Birds	Fish	Herps	Inverts	Mammals	Plants	*All SGCN*
Climate Change (11.0)	41%	77%	69%	33%	71%	37%	***42%***
Natural System Modifications (7.0)	45%	80%	44%	49%	24%	34%	***42%***
Pollution (9.0)	26%	94%	56%	34%	59%	4%	***23%***
Residential & Commercial Development (1.0)	50%	66%	66%	37%	29%	23%	***35%***
Invasive & Problematic Species (8.0)	41%	34%	50%	21%	59%	37%	***35%***
Biological Resource Use (5.0)	15%	77%	25%	12%	53%	5%	***15%***
Transportation Service Corridors (4.0)	18%	54%	63%	21%	24%	6%	***17%***
Energy Production & Mining (3.0)	28%	54%	31%	10%	53%	5%	***15%***
Human Intrusions & Disturbance (6.0)	32%	34%	22%	21%	59%	11%	***20%***
Agriculture & Aquaculture (2.0)	14%	43%	41%	1%	18%	3%	***9%***
Other Issues (12.0)	0%	0%	6%	0%	12%	47%	***24%***

Differences between the 2025 and 2015 Wildlife Action Plans

The criteria for identifying issues (also known as threats) for Connecticut's SGCN and SAPS remained largely unchanged from the 2015 Wildlife Action Plan (see above for methods). One difference is that the Lexicon categories have been updated since 2015 (Crisfield &

NEFWDTC, 2023). Another difference is that Taxa Teams categorized each SGCN and SAPS on their vulnerability to shifting environmental conditions (see the Taxa Specific Overviews below).

What has really changed since 2015 is how we discuss temperature and precipitation shifts. Back then, these changing conditions were recognized as a growing concern but remained mostly theoretical, with limited integration into taxon- or habitat-specific threat narratives (CT DEEP, 2015). Fast forward a decade, and the story has shifted considerably. What we once discussed in abstract terms now sits at the center of conservation planning, supported by extensive empirical evidence and informed by another decade of research (Staudinger et al., 2024). The difference? We've watched these changes happen in real time: range shifts, increased disease outbreaks, altered hydrology, and warming-driven phenological mismatches have taught us much more about just how vulnerable many SGCN really are. As a result, the updated plan integrates these environmental pressures throughout all major threat categories and highlights their role in amplifying the severity and scope of other issues.

Shifting Environmental Conditions (11.0)

Changing temperature and precipitation patterns rank among the biggest issues facing Connecticut's SGCN and SAPS, affecting 42% of all SGCN statewide, and will likely challenge them even more in the future. Impacts span every major taxonomic group, with particularly high vulnerability among Fish (79%), Mammals (71%), and Amphibians & Reptiles (71%), followed by Birds (41%), Plants (37%), and Invertebrates (33%) (Figure 3.2, Table 3.3). These threats work through various mechanisms, including habitat shifts, altered phenology, increased thermal and hydrological variability, and intensified extreme weather events. Together, these stressors can reduce population viability, fragment habitat networks, and disrupt ecological synchrony across entire food webs (Staudinger et al., 2024).

Many SGCN are already experiencing range contractions or behavioral shifts in response to changing temperature and precipitation regimes. For example, shifts in snowpack timing and overwintering conditions affect the survival of reptiles and amphibians, while warming surface waters reduce cold-water refugia for thermally sensitive fish species, such as Brook Trout and Slimy Sculpin (Isaak et al., 2015). Concurrently, phenological mismatches, particularly between flowering plants, pollinators, host plants, and dependent invertebrates, threaten reproductive success and interspecies interactions (Miller-Rushing et al., 2010; Visser and Gienapp, 2019; Bellard et al., 2012). Coastal systems are particularly vulnerable to saltwater intrusion, which contributes to erosion, vegetative dieback, and marsh compression (Hansen and Reiss, 2014; White and

Kaplan, 2017; Costa et al., 2023). These pressures increasingly interact with land use change, reducing the adaptive capacity of already stressed ecosystems (CT DEEP, 2015; TCI & NEFWDTC, 2023). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

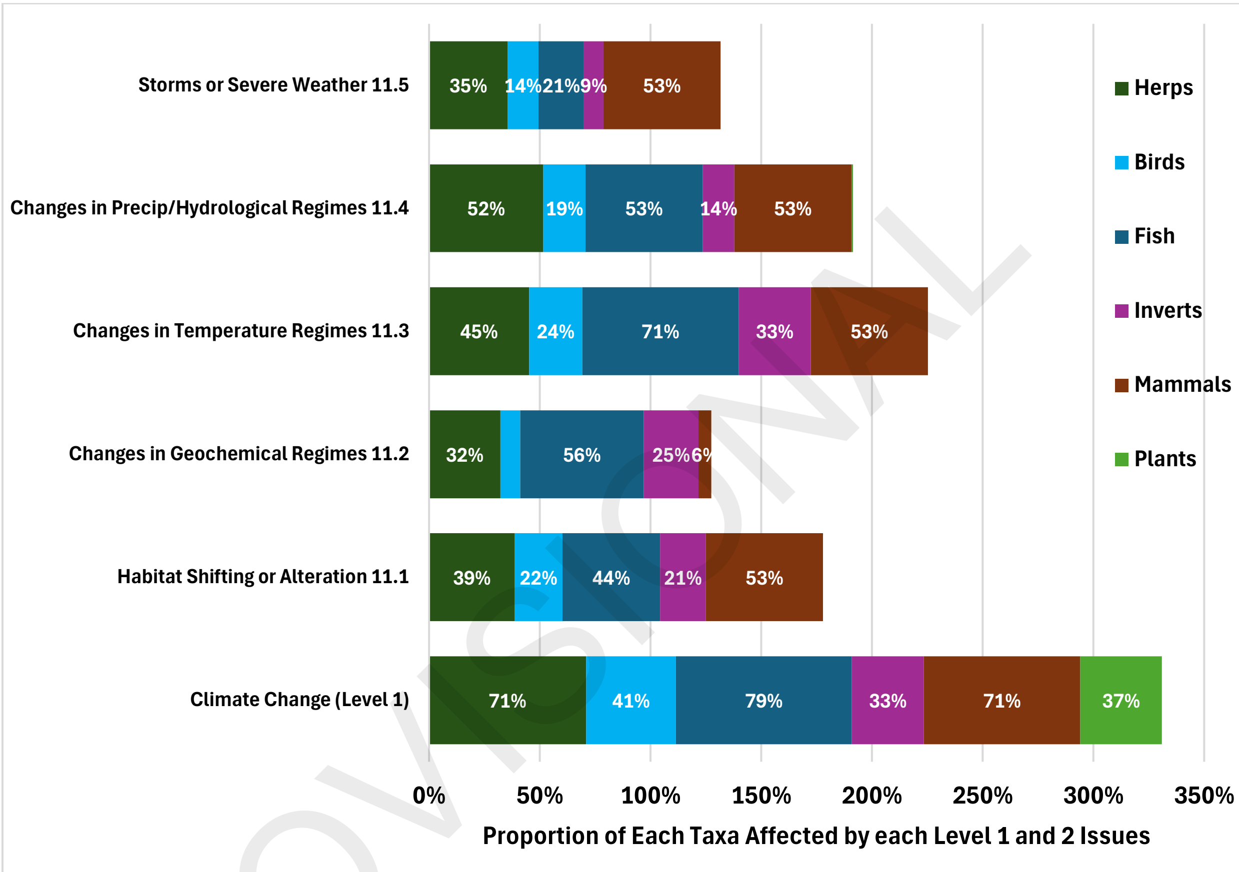

Figure 3.2 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Shifting Environmental Condition category. Note that these are proportions, not raw counts of the number of species affected. While some issues may affect a greater total number of species, this graph shows how each taxonomic group is affected relative to one another.

Table 3.3 – The percentages of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Shifting environmental conditions

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Climate Change 11.0.0		22 (71%)	32 (41%)	27 (79%)	41 (33%)	12 (71%)	106 (37%)	240 (42%)
	Habitat Shifting Alteration 11.1	12 (39%)	17 (22%)	15 (44%)	26 (21%)	9 (53%)	0 (0%)	79 (14%)
	Changes Geochemical Regimes 11.2	10 (32%)	7 (9%)	19 (56%)	31 (25%)	1 (6%)	0 (0%)	68 (12%)
	Changes Temperature Regimes 11.3	14 (45%)	19 (24%)	24 (71%)	41 (33%)	9 (53%)	1 (0%)	108 (19%)
	Changes Precipitation Hydrological Regimes 11.4	16 (52%)	15 (19%)	18 (53%)	18 (14%)	9 (53%)	2 (1%)	78 (14%)
	Storms Severe Weather 11.5	11 (35%)	11 (14%)	7 (21%)	11 (9%)	9 (53%)	0 (0%)	49 (9%)

Table 3.4 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Shifting Environmental Conditions. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Climate Change 11.0.0		1	3	10	33	8	53	108
	Habitat Shifting Alteration 11.1	0	3	7	32	2	0	44
	Changes Geochemical Regimes 11.2	0	0	4	2	0	0	6
	Changes Temperature Regimes 11.3	1	3	9	32	6	4	55
	Changes Precipitation Hydrological Regimes 11.4	0	0	8	19	6	4	37
	Storms Severe Weather 11.5	0	0	2	17	1	0	20

Habitat Shifting and Alteration

Habitat shifts and vegetation transitions affect 14% of all SGCN, including 39% of Amphibians and Reptiles, 44% of Fish, and 22% of Birds (Table 3.3). The timing problems get especially tricky for species that depend on precise ecological choreography. The Mottled Duskywing offers a perfect example of how things can go wrong. This butterfly may be vulnerable to asynchronous timing between the emergence of New Jersey Tea in the Spring and larval development, a mismatch projected to intensify under warming scenarios (Solga et al., 2014). Shrubland birds, such as the Prairie Warbler and Eastern Towhee, face a double whammy: environmental changes shrink their habitat while reduced management of early successional systems makes things worse (Staudinger et al., 2024). Coastal species, like Saltmarsh Sparrows and Seaside Dragonlets, find themselves trapped between habitat loss from saltwater intrusion and development, often referred to as “coastal squeeze” (Shriver et al., 2015; Burgio et al., 2024). Marsh migration can also be constrained by topography, but may also contribute to coastal forest dieback in some cases, reducing habitat diversity in those areas (Field, 2016).

Move inland, and the problems shift but don't disappear. Forest compositional changes threaten amphibians, such as the Jefferson Salamander, that rely on intact vernal pool complexes. Warmer, drier conditions are shrinking these critical pools, while vegetative shifts favor species-poor, thermophilic communities that can't support the intricate relationships these salamanders have evolved to depend on. Connecticut's coastal dune, sandplain, and wetland plants tell a similar story of displacement under altered disturbance and saltwater intrusion regimes. Here's what it comes down to: without active habitat management, these vegetation shifts will continue to fragment populations and degrade structural habitat quality across multiple taxa.

11.2 Changes in Geochemical Regimes

The chemistry of Connecticut's waters and soils is changing, and wildlife is paying the price. Geochemical shifts affect 12% of all SGCN, which might not sound like much until you see where the damage is concentrated: Fish (56%), Mammals (6%), Amphibians and Reptiles (32%), and Invertebrates (25%) (Table 3.4). In freshwater systems, decades of acid rain and contaminated runoff have made these waters increasingly difficult for amphibians such as Spotted Salamander and Wood Frog, making it harder for tadpoles to survive and putting surviving adults under constant stress (Pierce, 1985; Leuven et al., 1986). Along the coast, saltwater is creeping into places it doesn't belong, changing salinity regimes in marshes, beach ridges, and forested wetlands, and completely reshaping vegetation and soil chemistry. Take the Northern Diamond-backed Terrapin, which now faces a cascade of problems as salinity levels shift upward and upland retreat gets blocked by development, which results in changes in prey availability and fewer suitable nesting sites Amphibians and Reptiles(Mazhar et al., 2022; Roosenburg et al., 2014; Southwood-Williard et al., 2019).

Plant species aren't faring much better. Salinity increases are making it harder for plant SGCN, such as Saltmeadow Cordgrass and Seaside Goldenrod, to germinate and survive the stress. These plant struggles ripple through entire food webs by altering detrital inputs, microhabitat quality, and floral resource availability (Linhoss et al., 2014). When marshes try to migrate inland, they run into a wall of topography and development, which accelerates forest dieback and reduces habitat diversity (Shriver et al., 2015). While we don't have extensive monitoring data for Connecticut specifically, regional trends from Long Island Sound and similar systems paint a clear picture: rapid biogeochemical changes are already affecting estuarine invertebrates, fish, and birds (Staudinger et al., 2024).

Changes in Temperature Regimes

Rising temperatures are reshaping Connecticut's ecosystems in ways that would have seemed impossible just decades ago. Thermal changes affect 19% of all SGCN statewide, including 71% of Fish, 53% of Mammals, 45% of Amphibians and Reptiles, and 24% of Birds (Table 3.3). Cold-water fish like Brook Trout and Slimy Sculpin are watching their world shrink as reduced baseflow and warming stream temperatures eliminate the cool refugia they need to survive, particularly in fragmented or urbanized watersheds (Isaak et al., 2015). Spring Salamanders tell a similar story of sensitivity to elevated temperatures and may soon find themselves pushed out of thermally marginal headwaters. Even tiny invertebrates feel the heat. Species with temperature-sensitive development stages, such as odonates and microlepidoptera, now risk producing skewed sex ratios and missing critical emergence cues under extreme heat events (Staudinger et al., 2024).

For reptiles that depend on soil temperature to determine the sex of their offspring, warming spells trouble. Reptiles such as Eastern Box Turtle and Spotted Turtle, which exhibit temperature-dependent sex determination, produce heavily skewed clutches as nesting conditions warm up (Roberts et al., 2023; Burgio et al., 2024). Changes in thermal uplift and phenological cues may reduce migratory efficiency for species like the Broad-winged Hawk (Scacco et al., 2019; Burnside et al., 2021). Warmer winters might sound appealing, but they're creating serious problems for freeze-sensitive Amphibians and

Reptiles and throwing off dormancy patterns that species have relied on for millennia. Aerial insectivores like Tree Swallow and Eastern Whip-poor-will are discovering that timing is everything when earlier insect emergence leaves their chicks hungry at critical moments, reducing reproductive success (Shipley et al., 2022; Callery, 2020; Staudinger et al., 2024).

Changes in Precipitation and Hydrological Regimes

Water is becoming both more scarce and more abundant in Connecticut, often at exactly the wrong times. Changes in precipitation and hydrology affect 14% of all SGCN, including 53% of Fish and Mammals, 52% of Amphibians and Reptiles, and 19% of Birds (Table 3.4). Connecticut is already living through more variable and intense precipitation, including higher frequency of heavy rainfall events and summer droughts (CT DEEP, 2024; Staudinger et al., 2024, see Chapter 2). These shifts hit hardest for species that depend on water showing up at predictable times. Amphibians that depend on seasonal wetlands, such as Jefferson and Marbled Salamanders, need a consistent window of inundation for their larvae to develop, and mismatched or shortened hydroperiods can reduce recruitment (Klemens et al., 2021). Freshwater mussels and macroinvertebrates are affected by high-flow scouring events and sediment deposition during storm-driven floods, and then face the opposite extreme during droughts that leave them high and dry.

On land and along the coast, precipitation extremes are rewriting the rules for erosion, saltwater intrusion, and soil nutrient leaching, with serious implications for habitat quality and plant persistence. When storms hit, overland runoff becomes a toxic delivery system, carrying pollutants and sediments into sensitive systems and degrading water quality for aquatic species such as Eastern Pondmussel and Bridle Shiner. Meanwhile, changes in baseflow are eliminating coldwater refugia and cranking up thermal stress for stream fishes. Drought conditions shrink productivity in wet meadows and vernal pools, cutting into pollinator abundance and threatening the survival of larval amphibians. As these hydrological extremes become the new normal, many habitat types, particularly headwater streams, vernal pools, and salt marshes, may no longer be able to provide the conditions needed to support historically present SGCN assemblages.

Vulnerability to Shifting Environmental Conditions of Connecticut's SGCN and SAPS

The numbers paint a sobering picture of how Connecticut's species are likely to fare under changing conditions. Forty-eight percent of all of Connecticut's 574 SGCN were classified as "More Vulnerable" to shifting environmental conditions by the Taxa Teams, while 4.5% were classified as "Less Vulnerable." Very few species got good news with classifications of either "Potentially Resilient" (~ 2%) or "Potentially Increasing" (~1%), while nearly half of all species, about 45%, remain question marks due to insufficient information (Figure 3.3).

This knowledge gap is a problem in itself, suggesting that, in addition to actions related to environmental adaptation, more monitoring and basic research are needed to assess all these species and determine whether management strategies for changing conditions would benefit them. Plants are especially understudied, since ~73% of species were categorized as having insufficient information, reflecting the broader information disparity between Connecticut's wildlife and plant SGCN. Each taxon faces its own specific challenges, discussed in detail below. For more information on actions related to environmental adaptation and research, please refer to Chapter 4.

It's worth remembering that environmental changes can trigger indirect or cascading effects that may not be captured in Environmental Vulnerability Assessments, potentially leading to over- or underestimation of vulnerability scores (Staudinger et al., 2024). Furthermore, species that appear stable today may still face environmental threats, but these threats may not yet cross critical thresholds, or we simply don't know where the tipping point lies (Wiens, 2016; Staudinger et al., 2024).

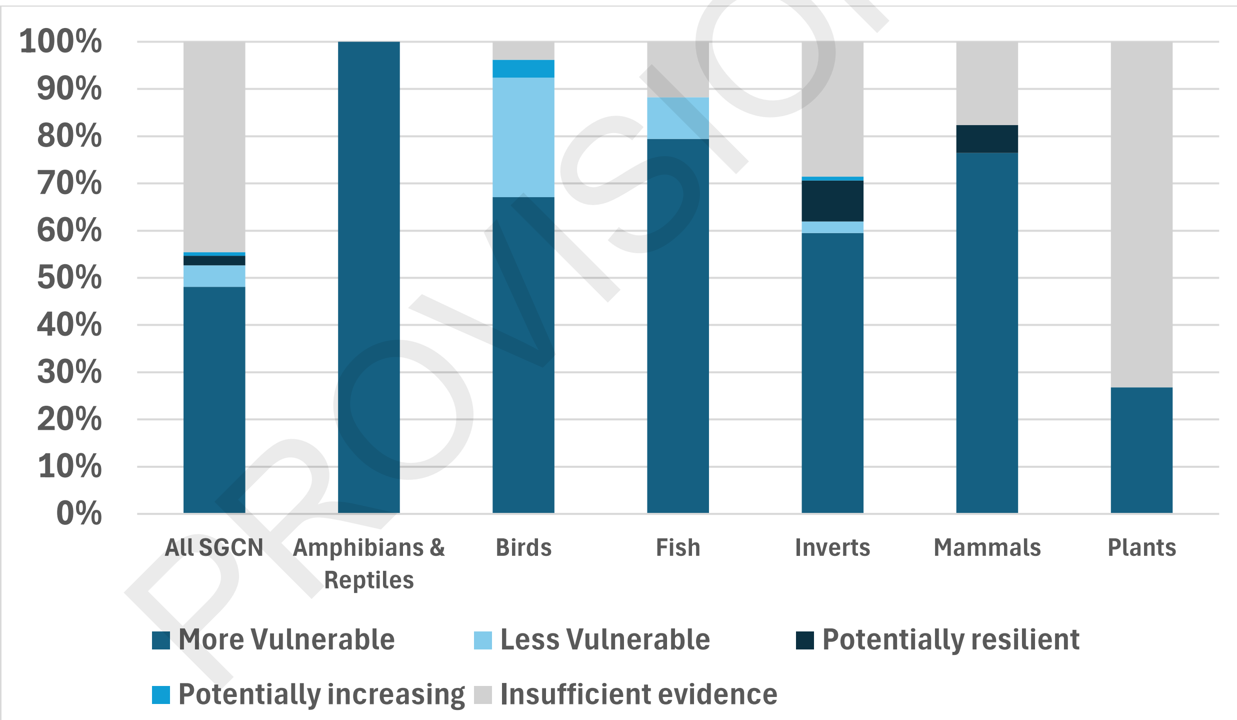

Figure 3.3 – Proportion of all SGCN and each taxonomic group that fall into each Shifting Environmental Conditions vulnerability category.

Pollution (9.0)

Pollution is a pervasive and multifaceted threat to SGCN and SAPS, affecting 23% of all assessed taxa. Aquatic species feel these impacts most directly, with 97% of Fish and over half of amphibians, reptiles, and Mammals struggling with water quality issues. Chronic stress also affects Invertebrates (34%) and some Birds (25%). These contaminants do more than cloud the water; they alter water chemistry, disrupt food webs, and cause acute and chronic physiological effects. The sources are varied: road salt, fertilizers, industrial effluents, plastics, heavy metals, and excess nutrients collectively contribute to cumulative exposure, particularly in closed-basin wetlands and freshwater systems (TCI & NEFWDTC, 2023; CT DEEP, 2022).

Connecticut's Integrated Water Quality Report documents persistent problems with nutrient enrichment, pathogens, and dissolved oxygen impairment in over 40% of the state's monitored waterbodies (CT DEEP, 2022). The Long Island Sound has been struggling with seasonal hypoxia, driven by nitrogen loading from wastewater treatment and stormwater runoff, for years. These conditions take a real toll on sensitive species, such as the American Eel and Winter Flounder, and reflect broader declines in estuarine water quality. Changing precipitation patterns are exacerbating the situation: as temperature and precipitation shifts intensify storms, more pollutants are washed from impervious surfaces and nonpoint sources into Connecticut's waterways, underscoring the need for integrated watershed-level interventions (CT DEEP, 2022). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

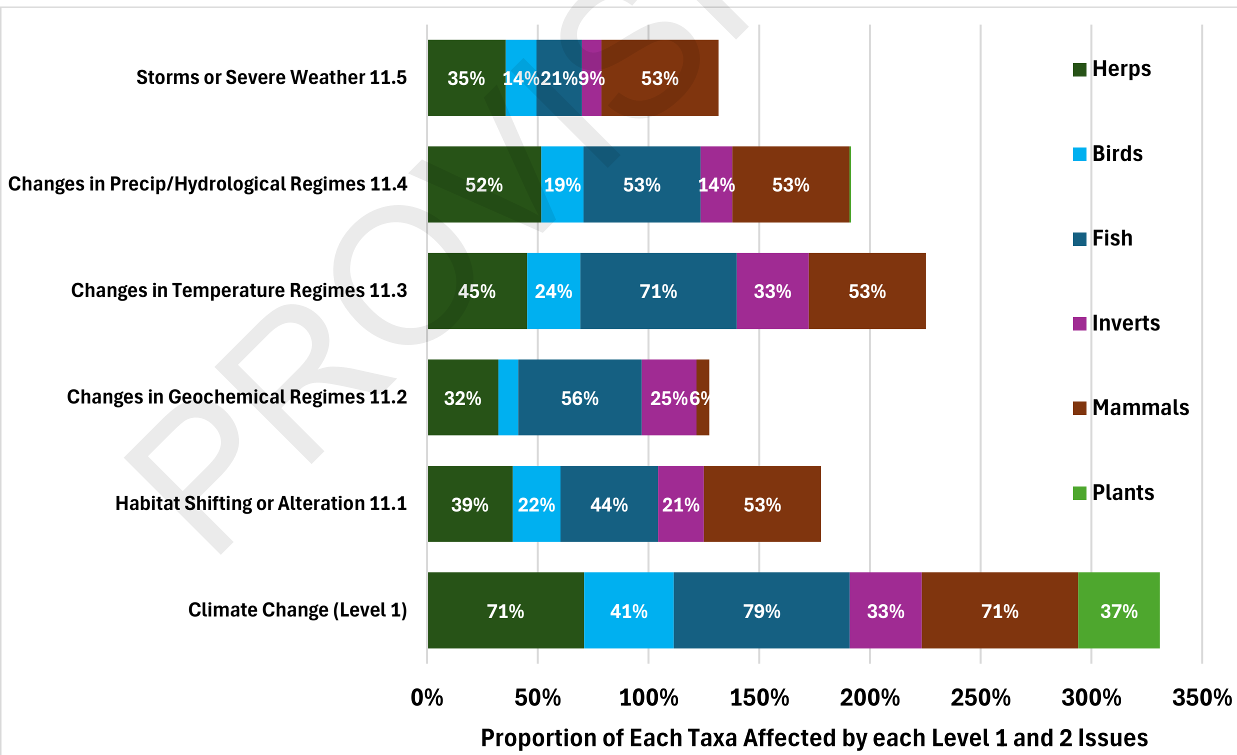

Figure 3.4 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Pollution category. Note that these are proportions and not raw counts of the number of species affected, so while

some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another.

Table 3.5 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Pollution.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Pollution 9.0.0		18 (58%)	20 (25%)	33 (97%)	43 (34%)	10 (59%)	10 (3%)	134 (23%)
	Domestic Urban Waste Water 9.1	13 (42%)	9 (11%)	33 (97%)	41 (33%)	3 (18%)	0 (0%)	99 (17%)
	Industrial Military Effluents 9.2	9 (29%)	6 (8%)	33 (97%)	31 (25%)	8 (47%)	0 (0%)	87 (15%)
	Agricultural Forestry Effluents 9.3	16 (52%)	13 (16%)	33 (97%)	41 (33%)	7 (41%)	0 (0%)	110 (19%)
	Garbage Solid Waste 9.4	7 (23%)	7 (9%)	26 (76%)	28 (22%)	4 (24%)	0 (0%)	72 (13%)
	AirBorne Pollutants 9.5	8 (26%)	2 (3%)	23 (68%)	29 (23%)	1 (6%)	0 (0%)	63 (11%)
	Excess Energy 9.6	5 (16%)	3 (4%)	27 (79%)	19 (15%)	5 (29%)	0 (0%)	59 (10%)

Table 3.6 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Shifting environmental conditions. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Pollution 9.0.0		0	4	11	19	3	0	37
	Domestic Urban Waste Water 9.1	0	1	11	8	0	0	20
	Industrial Military Effluents 9.2	0	0	10	2	1	0	13
	Agricultural Forestry Effluents 9.3	0	4	11	17	3	0	35
	Garbage Solid Waste 9.4	0	0	6	0	0	0	6
	AirBorne Pollutants 9.5	0	0	6	8	0	0	14
	Excess Energy 9.6	0	1	10	3	0	0	14

Domestic and Urban Wastewater

Every time we flush a toilet or wash dishes in Connecticut, we add to a growing problem affecting the state's aquatic life. Domestic wastewater affects 97% of Fish SGCN, 42% of Amphibians & Reptiles, and 18% of Mammals (Table 3.5). What's going down our drains has changed dramatically over the decades. Modern wastewater carries a complex mix of nutrients, pharmaceuticals, heavy metals, and emerging contaminants that alter aquatic food webs and disrupt physiological processes in wildlife. The scope of the problem is staggering; untreated or partially treated effluent, especially from combined sewer overflows, continues to impair water quality in over 600 miles of rivers and 30 square miles of estuarine habitat (CT DEEP, 2022). Winter brings its own complications when road salt drives chloride concentrations well above EPA guidelines in many suburban streams and vernal pools, killing amphibian embryos (Green et al., 2019) like Spotted Salamander and Wood Frog before they even have a chance to hatch.

The timing makes these problems especially damaging. Sewage overflows and stormwater surges dump contaminants (Ahmed et al., 2019; Matsui and Miki, 2023) and fuel eutrophication (Bhat and Qayoom, 2021), particularly during spring breeding periods when amphibians and migratory fish are most vulnerable (Holeton et al., 2011). Anyone who's tried to dig clams or oysters in Connecticut knows the frustration: shellfish beds get shut down regularly due to bacterial contamination from urban wastewater, while long-term projections estimate that over $5 billion in infrastructure upgrades are needed to meet clean water standards (CT DEEP, 2022). Species with narrow tolerance ranges suffer most from these discharges, especially coldwater and estuarine taxa that can't really adapt fast enough to contaminated conditions.

Industrial and Military Effluents

Decades of industrial activity have left Connecticut's waterways with a legacy of contamination that continues to harm wildlife today. Industrial effluents, including PCBs, PFAS, mercury, and hydrocarbons, affect 97.1% of Fish, 47.1% of Mammals, and 29% of Amphibians & Reptiles (Table 3.5). Mercury works its way up the food chain, bioaccumulating in fish-eating birds and mammals, where it can impair reproduction and damage developing nervous systems, while legacy PCBs persist in sediments and benthic food webs. Due to these concerns, CT DEEP maintains fish consumption advisories for specific segments of the Connecticut, Housatonic, and Quinnipiac Rivers due to elevated contaminant loads (CT DEEP, 2022). These warnings reflect industrial discharges from decades past, many of which continue to affect habitat recovery long after the factories have closed.

Industrial facilities also change the basic physics of aquatic habitats. Thermal discharge from industrial outfalls can alter stream temperature regimes and dissolved oxygen dynamics (Daniil et al., 1991). Coldwater species like Brook Trout and Slimy Sculpin have nowhere to hide from these temperature spikes, which may render previously suitable habitat uninhabitable (McCullough, 2011). These thermal impacts get worse when combined with nutrient enrichment (Ramachandra et al., 2014) and sedimentation (CT

DEEP, 2022) from adjacent land uses. The combination of sewage overflows, stormwater surges, and residential lawn runoff creates a perfect storm of contamination (Grimm et al., 2008) that exacerbates eutrophication, particularly during spring breeding periods for amphibians and migratory fish, when these species are most vulnerable (Holeton et al., 2011).

Agricultural and Forestry Effluents

Agricultural runoff is among the most geographically widespread sources of aquatic pollution in the state, affecting nearly all Fish (97.1%), over half of Amphibians & Reptiles (51.6%), and 32.5% of Invertebrates (Table 3.5). Nutrient loading from manure and fertilizers contributes to algal blooms, hypoxia, and altered macrophyte communities (Ramachandra et al., 2014). The CT DEEP (2022) lists agricultural runoff as a primary cause of impairment in 17% of impaired river miles and nearly one-third of lakes and reservoirs statewide. These impacts disproportionately affect species with obligate aquatic larval stages or filter-feeding habits, such as freshwater mussels and odonates (Holeton et al., 2011).

Pesticides such as neonicotinoids and Bt formulations for forest pest suppression also pose risks to Lepidoptera, pollinators, and aerial insectivores. Forestry operations contribute to sediment and herbicides that reduce benthic diversity and impair stream invertebrate emergence. While voluntary best management practices have improved in some watersheds, regulatory gaps persist in addressing nonpoint-source impacts, especially under high-flow conditions (TCI & NEFWDTC, 2023; CT DEEP, 2022).

Garbage and Solid Waste

Connecticut's trash problem extends far beyond overflowing garbage cans. Solid waste affects 76% of Fish and 23% of Amphibians & Reptiles, hitting marine and riparian species particularly hard (Table 3.5). Plastic debris creates serious problems for entangled sea turtles, seabirds, and marine mammals, while fish and invertebrates mistake plastic fragments for food, causing injury or reduced fitness (Subaramaniyam et al., 2023). Scientists have found plastic particles in estuarine fish and mollusks in Long Island Sound (CT DEEP, 2022). But the plastic itself is just the beginning. These materials also soak up chemical pollutants, such as PCBs and flame retardants, turning each piece of trash into a contamination source (Law, 2016).

On land, illegal dumping disrupts natural systems. Piles of trash alter soil chemistry, vegetation structure, and microclimates (Mihai and Taherzadeh, 2017). Species that need open sandy areas or live near roads, such as the Spotted Turtle and the Eastern Box Turtle, face increased predation and disturbance in habitats adjacent to garbage dumps. Dump sites also attract subsidized predators like raccoons, crows, and feral cats, along with invasive scavengers, all of which feed on reptile eggs and disturb the nests of ground-nesting birds (Plaza and Lambertucci, 2017).

Airborne Pollutants

Airborne contaminants, including acid rain, mercury, and nitrogen deposition, affect 68% of Fish, 26% of Amphibians & Reptiles, and 23% of Invertebrates. While we've made progress cutting SO_2 and NOx emissions regionally, the damage from decades of acid rain continues to impact headwater streams and low-alkalinity lakes. Amphibians and mollusks face the greatest challenges because their calcium-rich eggs or shells make them particularly vulnerable to acid-induced reproductive failure (Leuven et al., 1986). Acidic water interferes with basic biology, disrupting calcium uptake and shell formation in mollusks (Byrne and Fitzer, 2019) while causing deformities and harming amphibian embryos (Pierce, 1985).

Mercury presents a particularly challenging problem. Atmospheric mercury deposition creates widespread contamination that works its way up the food chain, bioaccumulating in fish tissue and piscivorous wildlife (Kolipinski et al., 2020). The higher up the food web you go, the more concentrated the contamination becomes, posing serious risks to top predators (Wollenberg & Peters, 2009). CT DEEP still warns people against eating fish from multiple inland lakes and rivers because of mercury contamination. Meanwhile, nitrogen falling from the sky may be shifting plant communities in fens and acidic bogs, with ripple effects for host-dependent invertebrates (TCI & NEFWDTC, 2023).

Excess Energy

Thermal and light pollution affect 79% of Fish and 29% of Mammals, along with 16% of Amphibians & Reptiles (Table 3.5). Thermal loading from wastewater treatment and industrial facilities alters stream temperature regimes, reduces dissolved oxygen, and can shift the seasonal timing of breeding and feeding in coldwater taxa. Streams with altered thermal profiles often lose coldwater-dependent species (CT DEEP, 2022).

Light pollution interferes with nocturnal activity, disorients amphibians, pollinators, and influences plant phenology and hatchling turtle behavior (Forsburg et al., 2021; Jong et al., 2015). It alters predator-prey dynamics, reduces foraging efficiency, and may suppress reproductive behavior in species dependent on acoustic or visual cues (Gaston et al., 2014). These stressors are especially problematic in coastal and suburban ecosystems with high densities of lighting infrastructure.

Invasive and Problematic Species, Genes, Diseases (8.0)

Connecticut's native wildlife is facing an invasion on multiple fronts. Invasive and problematic species, genetic material, and pathogens affect 35% of SGCN, particularly impacting Mammals (59%), Amphibians and Reptiles (52%), and Birds (41%) (Table 3.5). This threat comes in many forms, including both non-native taxa and aggressive native species, as well as impacts related to hybridization, disease transmission, and inherent biological limitations. One especially noteworthy invasive species is Hydrilla, an aquatic plant first found in the Connecticut River in 2016. Aquatic invasive species are especially problematic because they outcompete native vegetation, can deplete oxygen in the water, and spread very easily to any freshwater environment. The mechanisms vary, but the result is often the same: many SGCN get squeezed by multiple invasive pressures at once, often on top of habitat loss and changing environmental conditions (Staudinger et al., 2024).

Some of these invaders were guests who overstayed their welcome. Many invasive species were intentionally introduced or hitchhiked along with agricultural, horticultural, or aquacultural activities, and now dominate landscape-scale ecosystems. Others have taken advantage of the changes we've made to Connecticut's environment, proliferating under anthropogenic disturbance regimes, including altered fire cycles, hydrology, or predator-prey dynamics (TCI & NEFWDTC, 2023). While prevention and control programs have slowed the spread in some areas, keeping these species in check over the long term remains a constant battle. Furthermore, novel invasions are likely to accelerate under future environmental scenarios (CT DEEP, 2020; Staudinger et al., 2024). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

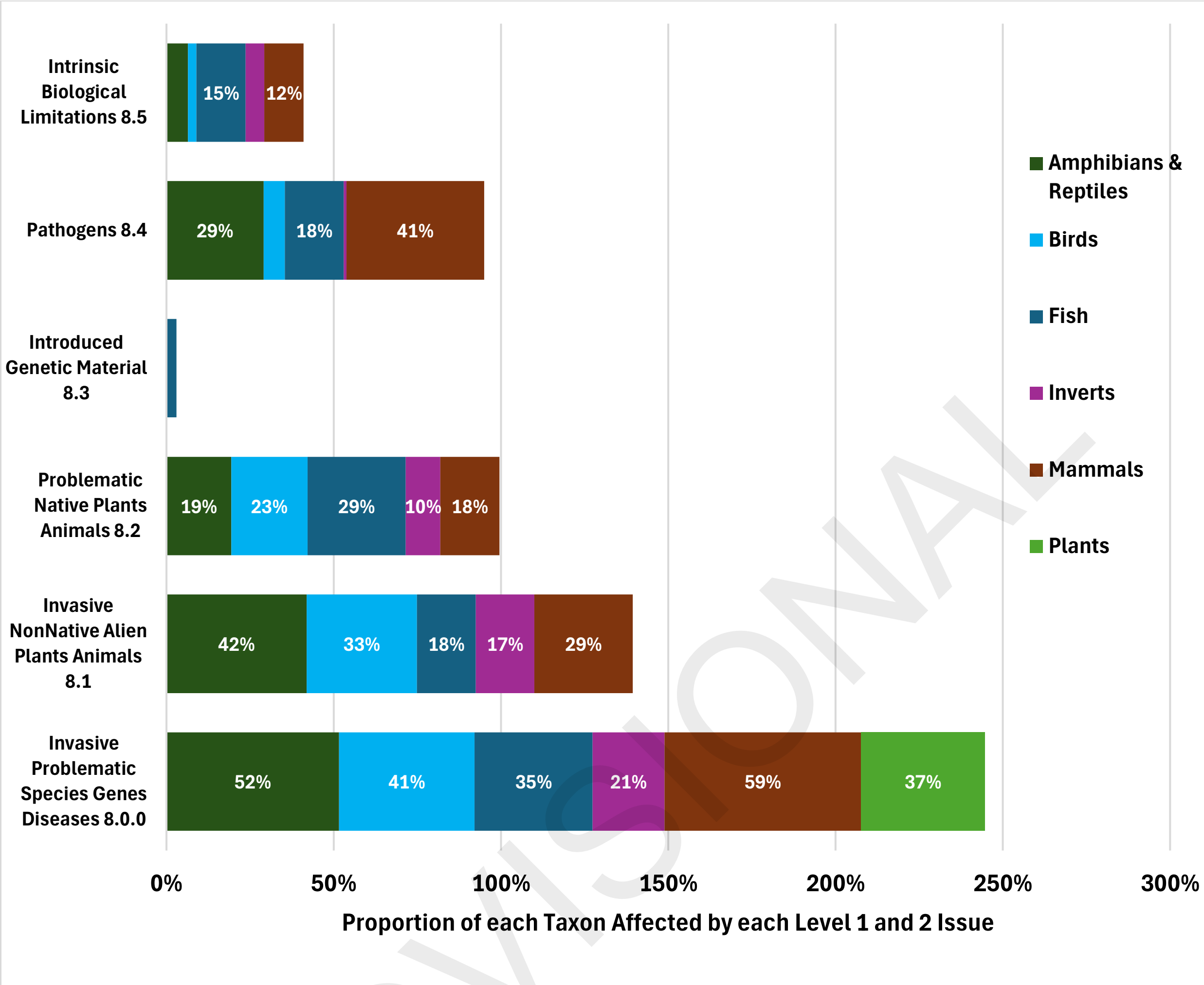

Figure 3.5 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Invasive and Problematic Species category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.7 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Invasive and Problematic Species.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Invasive Problematic Species Genes Diseases		16 (52%)	32 (41%)	12 (35%)	27 (21%)	10 (59%)	106 (37%)	203 (35%)
	Invasive NonNative Alien Plants Animals 8.1	13 (42%)	26 (33%)	6 (18%)	22 (17%)	5 (29%)	0 (0%)	72 (13%)
	Problematic Native Plants Animals 8.2	6 (19%)	18 (23%)	10 (29%)	13 (10%)	3 (18%)	0 (0%)	50 (9%)
	Introduced Genetic Material 8.3	0 (0%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)
	Pathogens 8.4	9 (29%)	5 (6%)	6 (18%)	1 (1%)	7 (41%)	0 (0%)	28 (5%)
	Intrinsic Biological Limitations 8.5	2 (6%)	2 (3%)	5 (15%)	7 (6%)	2 (12%)	0 (0%)	18 (3%)

Table 3.8 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Invasive and Problematic Species. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Invasive Problematic Species Genes Diseases		1	4	3	28	6	0	42
	Invasive NonNative Alien Plants Animals 8.1	0	2	2	23	3	0	30
	Problematic Native Plants Animals 8.2	0	1	3	21	6	0	31
	Introduced Genetic Material 8.3	0	0	0	0	0	0	0
	Pathogens 8.4	1	1	2	2	3	0	9
	Intrinsic Biological Limitations 8.5	0	0	1	10	0	0	11

Invasive Non-Native/Alien Plants and Animals

Walk through Connecticut's forests and wetlands today, and you'll see landscapes increasingly dominated by species that don't really belong here. Invasive plants, aquatic species, and animals affect 12% of SGCN, with Amphibians and Reptiles taking the biggest hit (42%) along with Mammals (29%) (Table 3.7). Non-native vegetation doesn't just crowd out native plants; it fundamentally changes the habitat structure, light availability, and trophic interactions, particularly in forest understories and wetland edges. Thick walls of Japanese Knotweed (*Fallopia japonica*) and multiflora rose (*Rosa multiflora*) often blanket areas where turtles once basked and nested. These invasive stands reduce habitat for SGCN like Eastern Box Turtles and choke out native plant diversity that pollinators need. Along the coast, Phragmites (*australis*) has been steadily taking over, degrading marshes andF beach-dune systems used by Diamondback Terrapin and Saltmarsh Sparrow, reducing food availability and increasing entrapment risk (Benoit & Askins, 1999; Cook et al., 2017; Roberts et al., 2019). Managing invasives has become one of the biggest challenges for nature conservation (Lazzaro et al., 2023).

Invasive species bring their own set of problems, often with serious consequences for native species. The introduction of predatory fish has devastated recruitment of native species such as the Bridle Shiner, while feral cats and non-native game birds continue to take a toll on ground-nesting and shrubland birds and mammals (Loss et al., 2013; Doherty et al., 2016; Yam et al., 2015). Even in the soil, the invasion continues. In forests, invasive earthworms are quietly reshaping soil structure and leaf litter layers, degrading microhabitats that Eastern Red-backed Salamanders and other forest-floor amphibians call home (Staudinger et al., 2024).

Natural Systems Modifications (7.0)

Connecticut's landscapes tell the story of centuries of human efforts to control nature, and wildlife is still living with the consequences. Natural system modifications affect 42% of

SGCN, with particularly high impacts to Fish (82%), Invertebrates (49%), and Amphibians and Reptiles (45%) (Figure 3.6; Table 3.9). We're talking about hydrologic, successional, and land-use legacies that alter fundamental ecological processes such as fire, flow, sediment delivery, groundwater recharge, and disturbance regimes. While many of these modifications made sense at the time to enhance agriculture, control floods, or make things safer for people, they continue to influence habitats and the species that live in them throughout the state (CT DEEP, 2020; TCI & NEFWDTC, 2023).

Structural modifications like dams, impoundments, and ditching have fragmented habitats and reduced seasonal connectivity essential for many freshwater species. On land, we've created a different set of problems. Fire suppression and land abandonment have shifted many habitats away from the periodic disturbance that species such as grassland birds and early-successional plants require to thrive (Li & Waller, 2014; Stone et al., 2022). The ripple effects reach everywhere. These changes affect vegetation structure and alter pollinator communities, nutrient cycling, and microclimate regulation, increasing vulnerability to changing environmental conditions (Kreider et al., 2024). Some modifications can be addressed through approaches like dam removal or prescribed fire, while others are so woven into our land use patterns or infrastructure systems that they make restoration more complex (Connell et al., 2019; Kreider et al., 2024). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

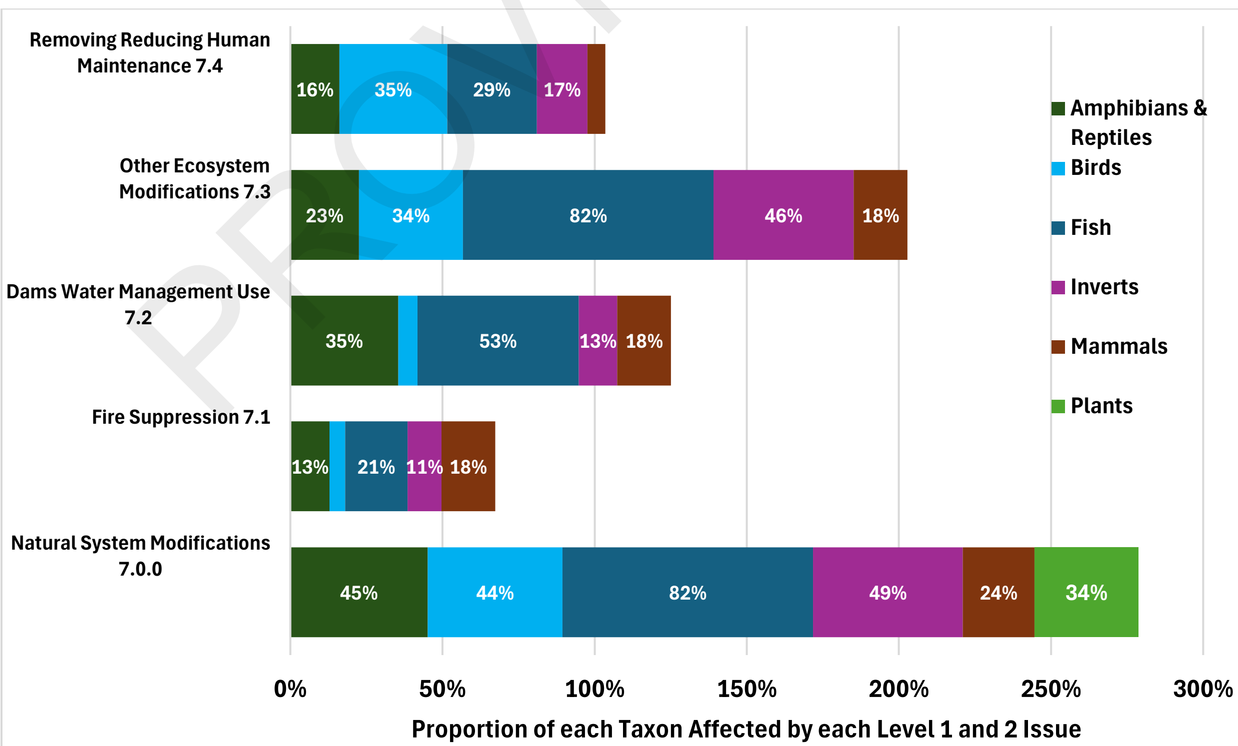

Figure 3.6 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Natural Systems Modifications category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.9 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Natural Systems Modifications.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Natural System Modifications 7.0.0		14 (45%)	35 (44%)	28 (82%)	62 (49%)	4 (24%)	98 (34%)	241 (42%)
	Fire Suppression 7.1	4 (13%)	4 (5%)	7 (21%)	14 (11%)	3 (18%)	0 (0%)	32 (6%)
	Dams Water Management Use 7.2	11 (35%)	5 (6%)	18 (53%)	16 (13%)	3 (18%)	0 (0%)	53 (9%)
	Other Ecosystem Modifications 7.3	7 (23%)	27 (34%)	28 (82%)	58 (46%)	3 (18%)	1 (0%)	124 (22%)
	Removing Reducing Human Maintenance 7.4	5 (16%)	28 (35%)	10 (29%)	21 (17%)	1 (6%)	0 (0%)	65 (11%)

Table 3.10 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Natural Systems Modifications. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Natural System Modifications 7.0.0		0	3	11	51	5	1	71
	Fire Suppression 7.1	0	0	3	37	5	0	45
	Dams Water Management Use 7.2	0	0	6	9	2	0	17
	Other Ecosystem Modifications 7.3	0	3	11	51	0	1	66
	Removing Reducing Human Maintenance 7.4	0	0	0	40	1	0	41

Other Ecosystem Modifications

Other modifications, including ditching, draining, water diversions, and channelization, affect 9% of all SGCN but are especially impactful for Fish (82.4%), Invertebrates (46%), and Amphibians and Reptiles (23%) (Table 3.9). Historical efforts to drain wetlands for agriculture or mosquito control persist in many of Connecticut's floodplains and coastal marshes, reducing habitat complexity and altering hydroperiods. For example, ditching in forested wetlands can lower water tables and reduce amphibian breeding pool availability, affecting obligate pool-breeders like the Spotted Salamander and Wood Frog (Calhoun et al., 2005; TCI & NEFWDTC, 2023). Coastal marsh alterations also affect hydrology, nutrient cycling, and plant community structure, with consequences for tidal marsh birds such as the Saltmarsh Sparrow.

Beaver removal and flow control infrastructure further modify wetland dynamics by reducing impoundment persistence and limiting the natural variability critical to many wetland species (TCI & NEFWDTC, 2023). These modifications often transform wetlands from amphibian- and invertebrate-rich habitats to drier, less diverse systems dominated by generalist vegetation. In rivers, channel straightening and hard bank stabilization reduce habitat heterogeneity and alter thermal regimes, which has a huge effect on species such as the Bridle Shiner and the American Eel. Although many of these changes are long-standing, strategic culvert replacements and wetland restoration projects have begun to mitigate localized impacts (CT DEEP, 2022).

Removing or Reducing Human Maintenance

Cessation of human maintenance affects 11% of all SGCN, including 35% of Birds and 16% of Amphibians and Reptiles (Table 3.9). Species dependent on disturbance-maintained habitats, such as shrublands, grasslands, and old fields, have declined as formerly active landscapes undergo succession, contributing to biotic homogenization and a loss of regional biodiversity (Li and Waller, 2014). Field abandonment leads to rapid encroachment of woody vegetation, eliminating nesting and foraging habitat for species such as Eastern Meadowlark, American Kestrel, and American Bumble Bee, contributing to declines in grassland bird populations across North America (Hubbard et al., 2006; Stanton et al, 2017). These changes also reduce sun-exposed microhabitats for reptiles such as the Eastern Hognose Snake and the Wood Turtle.

In many cases, these species' habitats were created or maintained by agriculture, mowing, or other non-natural processes. As these activities decline across the state, so too does the availability of structurally suitable habitat, particularly in early-successional uplands and open wet meadows (Li and Waller, 2014; TCI & NEFWDTC, 2023). Conservation efforts in these systems now rely on costly interventions, such as prescribed fire, mechanical clearing, and rotational mowing, to replicate historic disturbance, which often require frequent repetition and are constrained by competing land-use priorities (CT DEEP, 2020).

Residential and Commercial Development (1.0)

Residential and commercial development represents a growing threat to SGCN and SAPS in Connecticut. At the Level 1 category, this threat affects over one-third (35%) of all SGCN statewide, including 68% of Amphibians and Reptiles, 68% of Fish, and nearly half of all Birds (49%) (Figure 3.7; Table 3.11). Residential and commercial expansion drives habitat loss, fragmentation, hydrologic alteration, and increased exposure to anthropogenic disturbance, with compounding effects across terrestrial and aquatic taxa. Development disproportionately reduces habitat area, increases population isolation, and creates edge environments that disrupt community structure and ecological processes (Laurance et al., 2002; Haddad et al., 2015). These impacts are especially pronounced in Connecticut, where over 65% of the land area lies within the wildland-urban interface (Radeloff et al., 2005).

Species most impacted by this threat include forest and wetland obligates with limited dispersal ability or narrow habitat associations. Vernal pool-breeding amphibians such as the Jefferson Salamander and Spotted Salamander rely on large intact wetland-upland mosaics, yet residential construction and road density frequently compromise these systems (Calhoun et al., 2005). Forest-dwelling Birds like the Wood Thrush are similarly sensitive to fragmentation and edge effects, exhibiting declines in patchy or peri-urban habitats (Laurance et al., 2002). For Fish, increased impervious surface cover reduces water quality, alters thermal regimes, and changes streamflow dynamics, negatively impacting coldwater species like Brook Trout. Though often perceived as terrestrial in scope, development-driven watershed changes have cascading effects on aquatic taxa (CT DEEP, 2020; Staudinger et al., 2024). Coastal dunes, estuarine edges, and floodplain habitats are also at risk of infill or alteration during commercial expansion, affecting multiple taxonomic groups, including nesting Shorebirds, estuarine Fish, and wetland Invertebrates. For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

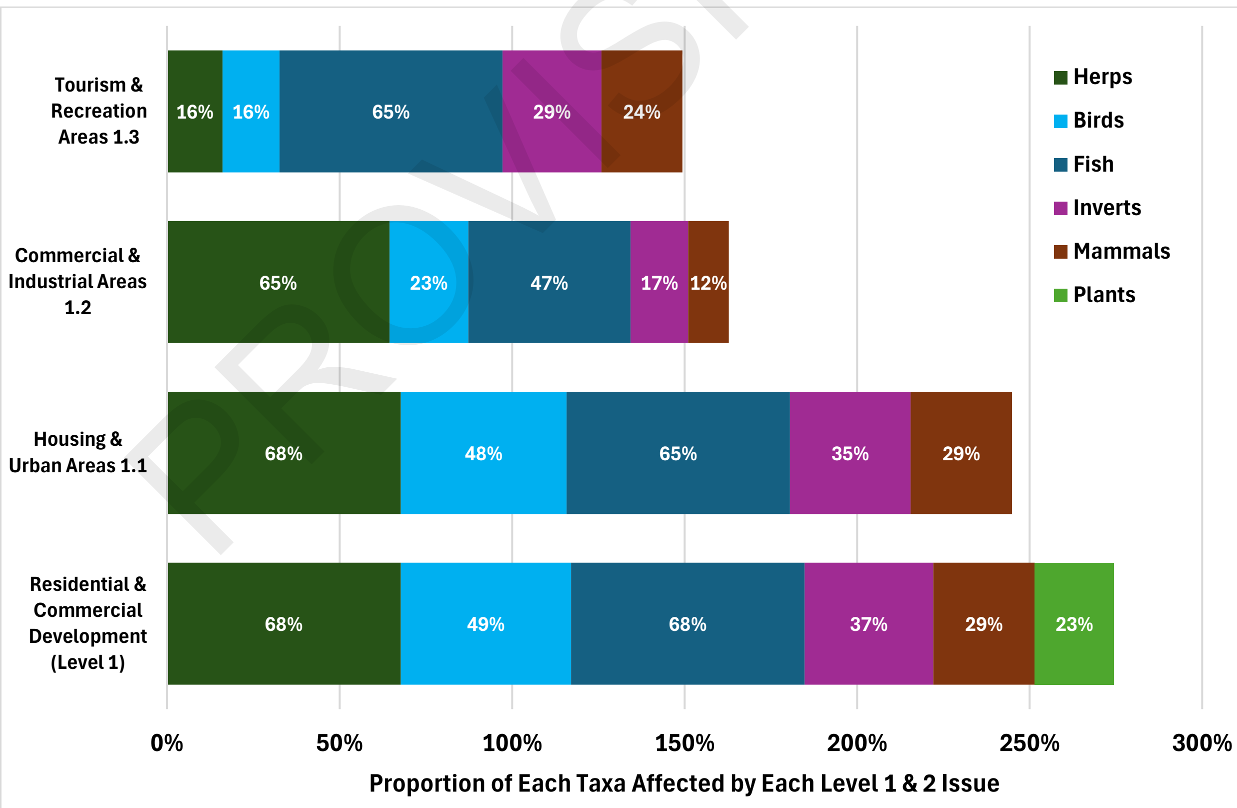

Figure 3.7 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Residential and Commercial Development category. Note that these are proportions and not raw counts of the number of

species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another.

Table 3.11 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Residential and Commercial Development.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Residential Commercial Development 1.0.0		21 (68%)	39 (49%)	23 (68%)	47 (37%)	5 (29%)	66 (23%)	201 (35%)
	Housing Urban Areas 1.1	21 (68%)	38 (48%)	22 (65%)	44 (35%)	5 (29%)	0 (0%)	130 (23%)
	Commercial Industrial Areas 1.2	20 (65%)	18 (23%)	16 (47%)	21 (17%)	2 (12%)	0 (0%)	77 (13%)
	Tourism Recreation Areas 1.3	5 (16%)	13 (16%)	22 (65%)	36 (29%)	4 (24%)	0 (0%)	80 (14%)

Table 3.12 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Residential and Commercial Development. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Residential Commercial Development 1.0.0		1	6	10	37	6	0	60
	Housing Urban Areas 1.1	1	6	10	37	6	0	60
	Commercial Industrial Areas 1.2	1	2	5	5	6	0	19
	Tourism Recreation Areas 1.3	1	2	10	24	1	0	38

Housing & Urban Areas

Connecticut's steady march toward suburbanization has significantly altered the way wildlife can survive in the state. The Housing and Urban Areas threat affects 23% of all SGCN, but the impacts are concentrated where they hurt most: 68% of Amphibians and Reptiles and 65% of Fish feel the effects of suburban sprawl (Table 3.11). When we build houses, shopping centers, and even parks and lawns, we're not just changing the scenery. Urban development, including lawns and parks, replaces native vegetation with impervious surfaces, disrupting runoff regimes, elevating surface temperatures (Shepherd et al., 2013), and fragmenting formerly contiguous habitats (Haddad et al., 2015). Forest and other habitat conversions not only remove habitat but also introduce stressors such as artificial light, noise, and domestic predators. Smaller and isolated forest patches support fewer species, experience more edge effects, and reduce the long-term viability of metapopulations for taxa that depend on interior conditions (Laurance, 2000; Laurance et al., 2002; Chetcuti et al., 2020).

In the wildland-urban interface, development can also exacerbate human-wildlife conflicts, increase exposure to pollution, and promote the spread of invasive species (Bar-Massada et al., 2014). Suburban infill into wetlands and forest margins results in physical loss of breeding sites and increased edge densities where predation and desiccation risks are higher (Birnie-Gauvin et al., 2016). In addition, thermal impacts from impervious surfaces and degraded riparian buffers alter stream temperatures and reduce dissolved oxygen, contributing to Fish stress and mortality (CT DEEP, 2020). Without strong regulatory setbacks and land-use controls, urban development will continue undermining habitat resilience and recovery prospects for numerous SGCN.

Commercial & Industrial Areas

When it comes to finding places to build, developers often end up in the spots that wildlife needs most. Commercial and industrial development affects 13% of SGCN, with especially high impacts for Fish (47%) and Amphibians and Reptiles (65%) (Table 3.11). The problem starts with location. These facilities often occupy low-lying areas near transportation corridors and waterways, which means they're taking out wetlands and degrading water quality in places that serve as critical habitat (TCI & NEFWDTC, 2023). Every parking lot and warehouse roof becomes a source of contaminated runoff, introducing pollutants, heavy metals, and sediment into aquatic systems that species like Wood Turtle, American Eel, and estuarine nursery fish depend on. Industrial zones also create ecological dead zones, replacing mosaic landscapes that once supported diverse communities with large, non-habitat areas.

The damage extends well beyond the buildings themselves. Studies suggest that these effects reach into surrounding areas through increased noise, vibration, and light pollution, which alter animal behavior and foraging efficiency (Laurance et al., 2002; Birnie-Gauvin et al., 2016). Industrial lighting disrupts the migration patterns of birds and prevents amphibians from moving safely at night. Semi-aquatic species get hit particularly hard. The long-term viability of turtles such as the Spotted Turtle faces serious threats when seasonal wetlands and adjacent uplands get converted to commercial infrastructure (Klemens et al., 2021).

Tourism & Recreation Areas

Connecticut's natural areas draw people seeking outdoor experiences, but wildlife often bears the brunt of our recreational activities. Though less frequently cited overall (14% of SGCN), tourism and recreation development still affect a broad range of taxa, including 29% of Invertebrates and 24% of Mammals (Table 3.11). The challenge is that we tend to recreate in exactly the places wildlife needs most. Recreational infrastructure often overlaps with ecologically sensitive areas, such as beaches, marshes, and trails through forested wetlands, and the impacts can accumulate even without permanent structures. Just having people around changes how animals behave. Disturbance from human presence can result in reduced occupancy or altered behavior, particularly in nesting birds like Piping Plover and in Amphibians & Reptiles that are active during the day (Dertien, et al., 2021).

The COVID-19 pandemic offered an unexpected lesson in how much pressure our natural areas were already under. Increased recreation during this period exposed a lack of management capacity and highlighted the sensitivity of some species to elevated visitation (Wolf et al., 2019; Miller-Rushing et al., 2021). Even seemingly minor additions like lights, noise, and new trails can force wildlife to change their entire way of life, especially for edge-sensitive birds and forest-floor amphibians (Sumanapala & Wolf, 2022). Some species prove remarkably adaptable to recreational corridors, while others, especially habitat specialists, decline rapidly when their routines get disrupted. Management strategies such as temporal closures, vegetated buffers, and boardwalks can mitigate some of these effects, but they require ongoing funding and cooperation from recreational users.

Human Intrusions and Disturbances (6.0)

Sometimes the biggest threat to wildlife isn't what we build, but simply where we go. Human intrusions and disturbance affect 20% of SGCN, with particularly high impacts on Mammals (59%), Fish (35%), Birds (32%), and Amphibians and Reptiles (23%) (Figure 3.8; Table 3.13). Some examples of human intrusions are recreational use of natural areas, military or civil operations, and infrastructure-related activities that might seem harmless on their own. But even though these disturbances are often scattered across the landscape and seasonal, they can add up to serious problems for fitness, reproduction, and habitat use, particularly for species that rely on undisturbed refugia during key life stages (Cross et al., 2021; Dertien et al., 2021; Dornelas et al., 2010). Hunting and angling come with risks such as entanglement in discarded fishing line or toxicity to scavengers from lead ammunition fragments.

Most of the time, these impacts don't involve direct mortality. Instead, human presence changes how wildlife behaves, where they go, and how they move through the landscape (Larson et al., 2016). Consider how Northern Long-eared Bats reduce foraging activity near recreational trails, or how Wood Turtles spend less time basking and nesting near high-use areas (TCI & NEFWDTC, 2023). Even a few people walking on a beach can cause breeding shorebirds to abandon their nests, leaving eggs vulnerable to predators. The COVID-19 pandemic brought these issues into sharp focus when increased visitation to beaches, parks, and trails revealed just how unprepared we were to manage human-wildlife interactions (Miller-Rushing et al., 2021). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

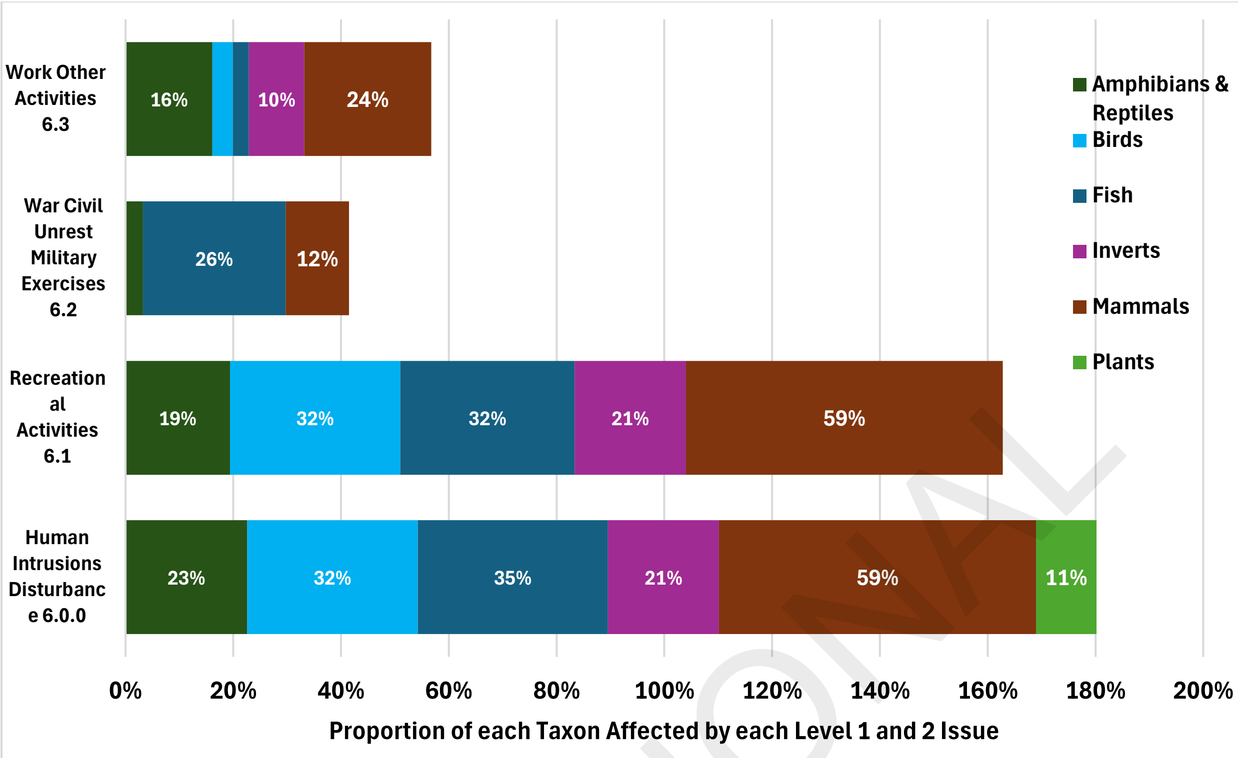

Figure 3.8 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Human Intrusions and Disturbances category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.13 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Human Intrusions and Disturbances.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Human Intrusions Disturbance 6.0.0		7 (23%)	25 (32%)	12 (35%)	26 (21%)	10 (59%)	32 (11%)	112 (20%)
	Recreational Activities 6.1	6 (19%)	25 (32%)	11 (32%)	26 (21%)	10 (59%)	1 (0%)	79 (14%)
	War Civil Unrest Military Exercises 6.2	1 (3%)	0 (0%)	9 (26%)	0 (0%)	2 (12%)	0 (0%)	12 (2%)
	Work Other Activities 6.3	5 (16%)	3 (4%)	1 (3%)	13 (10%)	4 (24%)	1 (0%)	27 (5%)

Table 3.14 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Human Intrusions and Disturbances. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Human Intrusions Disturbance 6.0.0		1	2	6	38	5	1	53
	Recreational Activities 6.1	1	2	3	38	5	1	50
	War Civil Unrest Military Exercises 6.2	0	0	6	0	0	0	6
	Work Other Activities 6.3	0	0	0	32	0	0	32

Recreational Activities

Connecticut's outdoor enthusiasts are inadvertently creating challenges for the wildlife they often come to see. Recreational activities affect 14% of SGCN statewide and are especially impactful to Mammals (59%), Fish (32%), and Birds (32%) (Table 3.13). Activities that feel benign to us can be major disruptions to wildlife. Disturbance from hiking, biking, dog walking, beach use, and off-trail activity can alter behavior, reduce habitat use, or damage critical habitat features (Larson et al., 2016; Dertien et al., 2021). Our trails also become highways for invasive plants, which spread along these new artificial edges. Shore birds face some of the most direct impacts. Nesting Piping Plovers and American Oystercatchers get regularly disrupted by pedestrian activity and off-leash dogs, leading to increased nest abandonment and chick mortality (CT DEEP, 2015). Even small salamanders aren't safe. Spotted Salamanders crossing trails to reach vernal pools risk getting trampled and face changes in surface microclimate that can make their journeys perilous.

Water-based recreation brings its own set of concerns. Aquatic impacts include shoreline erosion, sedimentation, and displacement of sensitive species. The Bridle Shiner, can sometimes get pushed out of shallow rearing areas near popular swimming or boating access points (TCI & NEFWDTC, 2023). On land, mammals are learning to change their schedules around ours; for instance, Bobcats and Eastern Red Bats avoid being active during the day near high-traffic trails. While these effects might not immediately impact the organism, the chronic stress of repeated exposure can reduce fitness or reproductive output, especially in small populations that can't afford to lose individuals (TCI & NEFWDTC, 2023).

Because of the difficulties that some forms of recreation can have on our wildlife, CT DEEP's Statewide Comprehensive Outdoor Recreation Plan (SCORP) provides a strategy and associated actions to emphasize sustainable development of recreational activities and monitor the effects recreational activities have on these species and habitats (CT DEEP, 2023)

Work and Other Activities

Infrastructure maintenance and other human activities affect 5% of SGCN, with elevated impacts to Mammals (24%), Invertebrates (10%), and Amphibians and Reptiles (16.1%) (Table 3.14). Disturbance from brush cutting, ditch maintenance, and habitat management can directly impact SGCN or alter key microhabitats. For example, mowing in old fields during breeding may destroy Eastern Meadowlark nests, and Jefferson Salamanders may be dislodged from overwintering burrows during culvert clearing (TCI & NEFWDTC, 2023).

Freshwater mussels like the Yellow Lampmussel may also be disturbed during sediment removal or mechanical access to wetland margins. Repeated activity, even when low in intensity, can degrade soil structure, alter hydrology, or displace species from seasonally important locations. These impacts are often underestimated due to their association with routine land management, yet they can result in cumulative stress for species with narrow environmental tolerances or limited ranges (TCI & NEFWDTC, 2023).

Transportation & Service Corridors (4.0)

Transportation infrastructure (including roads, railways, utility lines, shipping lanes, and flight paths) fragments habitat, disrupts movement corridors, and exposes wildlife to direct mortality. Among SGCN, 17% are affected by this threat, with impacts most pronounced for Amphibians and Reptiles (65%) and Fish (56%) (Figure 3.9; Table 3.15). Roads bisect wetland-upland mosaics, which are essential for species such as the Wood Turtle and Spotted Turtle, thereby increasing the risk of road mortality during seasonal migrations. The Eastern Box Turtle, Eastern Ratsnake, and Northern Black Racer are also vulnerable to population fragmentation due to roads(Klemens et al., 2021). For low-fecundity, long-lived species, even small increases in adult mortality may drive long-term declines (Morris et al., 2008; Rowe, 2008).

Transportation corridors also degrade habitat quality through runoff, chemical contamination, noise pollution, and the introduction of invasive species. Road salt and other pollutants accumulate in shallow wetlands and vernal pools, thereby elevating chloride concentrations and reducing the survival of amphibian larvae (Karraker et al., 2008). For Fish, barriers such as culverts and bridges alter stream hydrology and restrict connectivity, particularly for coldwater and diadromous species. Coldwater fish are especially sensitive to undersized culverts and reduced summer baseflows in fragmented systems (Kanno et al., 2015). For Bats, the use of bridges and culverts for roosting introduces new vulnerabilities tied to vehicle noise and structural modifications (Sparks et al., 2019). Maintaining connectivity in fragmented landscapes is critical for recovery, requiring landscape-level coordination and mitigation planning (TCI & NEFWDTC, 2023;

Thompson et al., 2015). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

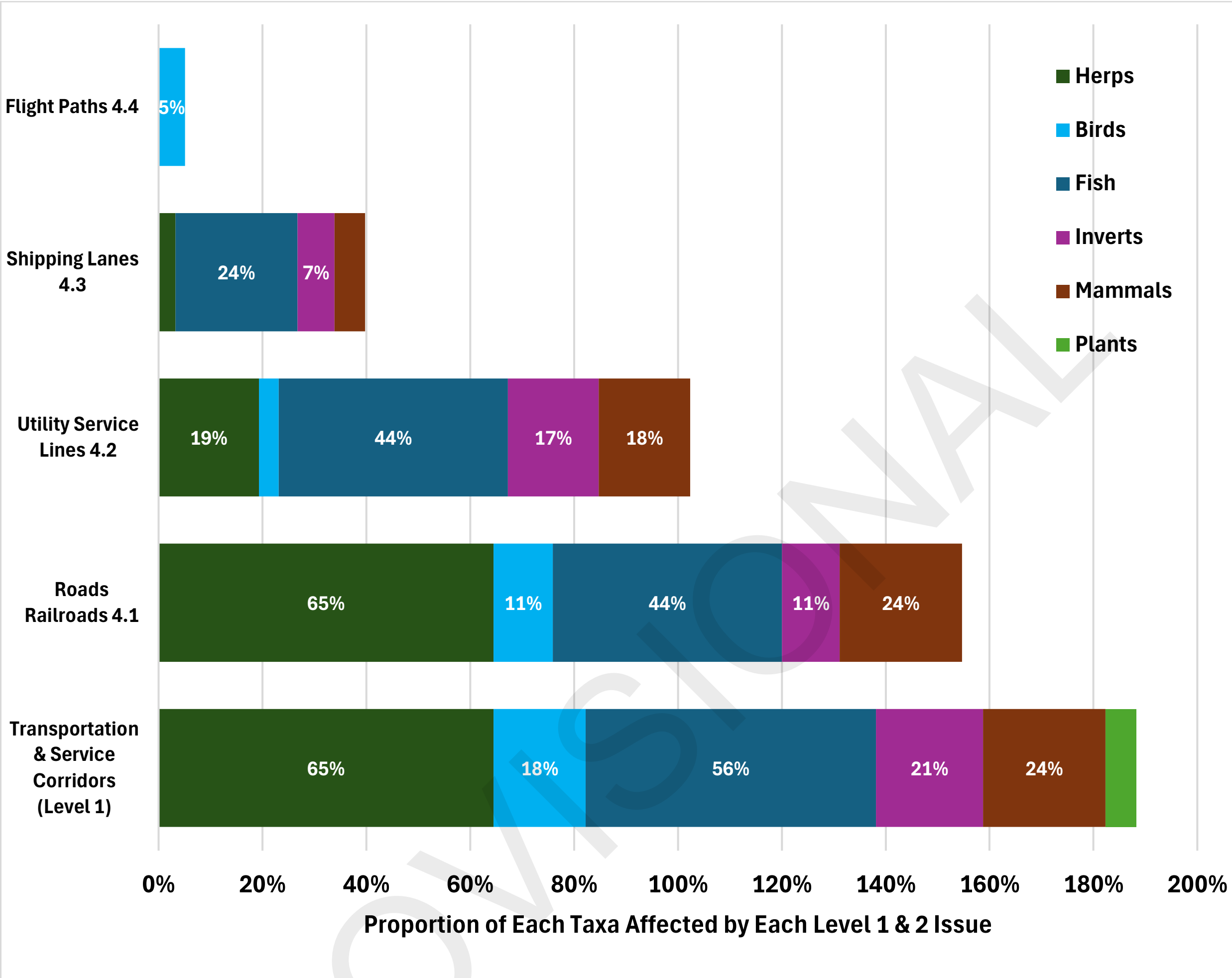

Figure 3.9 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Transportation & Service Corridors category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.15 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Transportation & Service Corridors.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Transportation & Service Corridors 4.0.0		20 (65%)	14 (18%)	19 (56%)	26 (21%)	4 (24%)	17 (6%)	100 (17%)
	Roads & Railroads 4.1	20 (65%)	9 (11%)	15 (44%)	14 (11%)	4 (24%)	0 (0%)	62 (11%)
	Utility Service Lines 4.2	6 (19%)	3 (4%)	15 (44%)	22 (17%)	3 (18%)	0 (0%)	49 (9%)
	Shipping Lanes 4.3	1 (3%)	0 (0%)	8 (24%)	9 (7%)	1 (6%)	0 (0%)	19 (3%)
	Flight Paths 4.4	0 (0%)	4 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (1%)

Table 3.16 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Transportation & Service Corridors. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated, especially beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Transportation & Service Corridors 4.0.0		2	0	6	35	5	0	48
	Roads & Railroads 4.1	2	0	5	4	5	0	16
	Utility Service Lines 4.2	0	0	5	33	3	0	41
	Shipping Lanes 4.3	0	0	4	0	0	0	4
	Flight Paths 4.4	0	0	0	0	0	0	0

Roads and Railroads

Road mortality has the biggest direct impact of transportation infrastructure on wildlife, particularly for Amphibians and Reptiles, where 65% of species are affected (Table 3.15). Seasonal migrations to breeding wetlands expose Spotted Salamanders and Wood Frogs to high mortality, especially where road crossings intersect known movement corridors (Semlitsch & Bodie, 1998). Reptiles such as the Eastern Box Turtle and Wood Turtle are frequently observed as roadkill during nesting migrations (Klemens et al., 2021). Fragmentation from roadways also isolates populations, impairs genetic flow, and increases edge effects and predation pressure.

Among Fish, 44% of species are affected by road-related threats, especially where culverts and bridges restrict passage or alter stream morphology. Freshwater mussels dependent on host fish for larval dispersal, such as the Eastern Pondmussel, are indirectly impacted by barriers to fish movement (Strayer et al., 2004). For Invertebrates, road encroachment into sandplain and grassland systems degrades microhabitat structure and introduces vehicle disturbance to species like the Barrens Dagger Moth. This disturbance can significantly alter plant communities and soil properties, further impacting invertebrate habitats (Uri and Lewis, 1998). Dust generated by road use can also contribute to the road-effect zone, impacting vegetation and potentially altering arthropod distributions (Jones et al., 2015; Cohen et al., 2021). Road density also correlates with higher pollutant loads and the introduction of non-native species, particularly in suburban and urban contexts.

Energy Production and Mining (3.0)

Energy infrastructure development and extractive industries threaten SGCN and SAPS. This threat category affects approximately 15% of all SGCN in the state, with elevated impacts on Fish (56%), Mammals (53%), and Amphibians & Reptiles (32%) (Figure 3.10; Table 3.17). While renewable energy development is often viewed as a climate mitigation strategy, poorly sited or unmitigated infrastructure can fragment habitats, alter hydrology, and displace sensitive species. Conventional oil and gas activities are limited in Connecticut, so many of our SGCN and SAPS may be more affected by these activities beyond our borders while migrating or wintering elsewhere.

Habitat conversion from energy infrastructure is increasingly a concern in forested landscapes, where solar installations, transmission corridors, and bioenergy harvesting result in canopy loss and edge effects. Forest clearing for photovoltaic (PV) arrays can alter soil moisture and reduce structural complexity, particularly in habitats that support vernal pools and upland amphibian dispersal corridors. Hydropower operations, largely located outside Connecticut, continue to influence its diadromous fish populations and impede aquatic connectivity. While dam removals have restored some riverine habitats in the region, many upstream passage barriers persist for species such as American Eel, Sea Lamprey, and river herring. For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

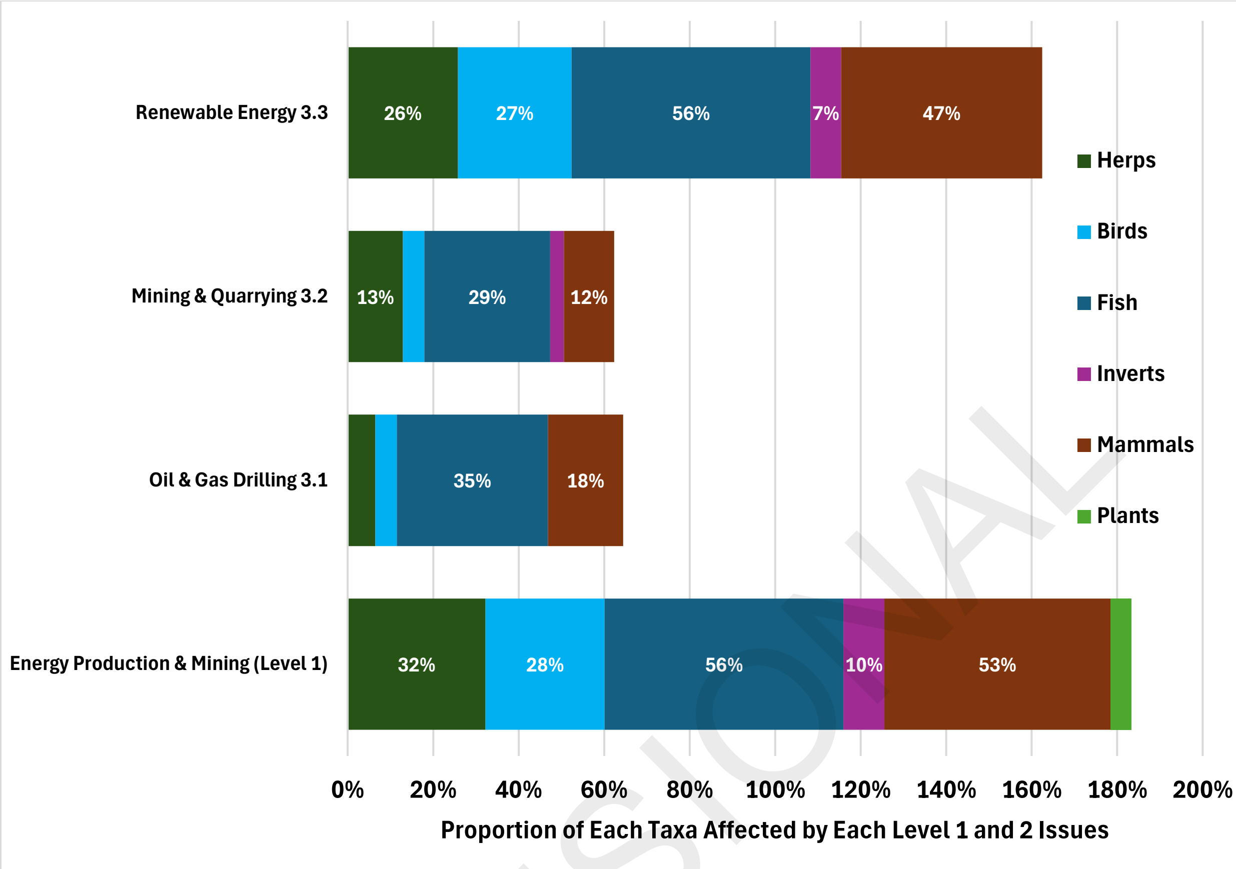

Figure 3.10 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Energy Production and Mining category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.17 – The percentages of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Energy Production and Mining.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Energy Production Mining 3.0.0		10 (32%)	22 (28%)	19 (56%)	12 (10%)	9 (53%)	14 (5%)	86 (15%)
	Oil Gas Drilling 3.1	2 (6%)	4 (5%)	12 (35%)	0 (0%)	3 (18%)	0 (0%)	21 (4%)
	Mining Quarrying 3.2	4 (13%)	4 (5%)	10 (29%)	4 (3%)	2 (12%)	0 (0%)	24 (4%)
	Renewable Energy 3.3	8 (26%)	21 (27%)	19 (56%)	9 (7%)	8 (47%)	0 (0%)	65 (11%)

Table 3.18 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Energy Production and Mining. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated, especially beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Energy Production Mining 3.0.0		1	6	6	3	3	0	19
	Oil Gas Drilling 3.1	0	3	5	0	2	0	10
	Mining Quarrying 3.2	1	2	5	3	2	0	13
	Renewable Energy 3.3	0	6	6	0	3	0	15

Renewable Energy

Renewable energy development—especially solar and wind—accounts for 11% of all SGCN affected, but the impacts are disproportionately high for Fish (56%), Mammals (47%), Birds (27%), and Amphibians & Reptiles (26%) (Figure 3.10; Table 3.17). While these projects are critical for reducing greenhouse gas emissions, they introduce new ecological stressors when poorly planned. Ground-mounted photovoltaic arrays have expanded rapidly in southern New England. In Connecticut, solar arrays have already replaced forested uplands near sensitive wetland complexes, potentially affecting pool-breeding amphibians and forest-interior birds (CT DEEP, 2020); however, Connecticut does have a permitting process in place to help identify and avoid areas of concern (CT DEEP, 2024).

Wind turbines, both onshore and offshore, pose collision and displacement risks to migratory birds and bats. Offshore energy projects in offshore waters may intersect with foraging grounds for marine birds and migratory fish. A relative lack of comprehensive seabird monitoring off the East Coast complicates impact assessment. The challenge lies in balancing energy needs with conservation priorities and applying best practices in siting, cumulative impact analysis, and habitat compensation, particularly in high-priority ecological corridors (Williams et al., 2024; Secor et al., 2025). Connecticut has established strict requirements and best management practices for siting and operating wind turbines within the state (CT DEEP, 2024).

Biological Resource Use (5.0)

Biological resource use affects 15% of SGCN, with disproportionate impacts to Fish (79%), Mammals (53%), and Amphibians and Reptiles (26%) (Figure 3.11; Table 3.19). This is a broad threat category that includes the direct removal of individuals from the wild and collateral impacts associated with resource extraction, such as bycatch, incidental take, and habitat alteration (Wilson, 1989; Pandey et al., 2020). While regulatory frameworks have reduced overharvest risk for many taxa, illegal collection, unsustainable harvest, and unintentional mortality continue to threaten vulnerable species across terrestrial and aquatic ecosystems (TCI & NEFWDTC, 2023).

In some cases, historic exploitation has led to long-term population suppression or constrained recovery despite regulatory protections. This is particularly evident for apex Mammals and large-bodied Fish, whose life histories limit their capacity to rebound from population bottlenecks (Rowe, 2008). Contemporary threats increasingly involve indirect forms of extraction or use, such as selective logging, unregulated bait harvest, and incidental take during recreational fishing, which disproportionately affect species with restricted ranges or specific habitat requirements (TCI & NEFWDTC, 2023). For summaries of Level 2 Issues that did not have broad impacts on SGCN (less than 10%), see Appendix 3.4.

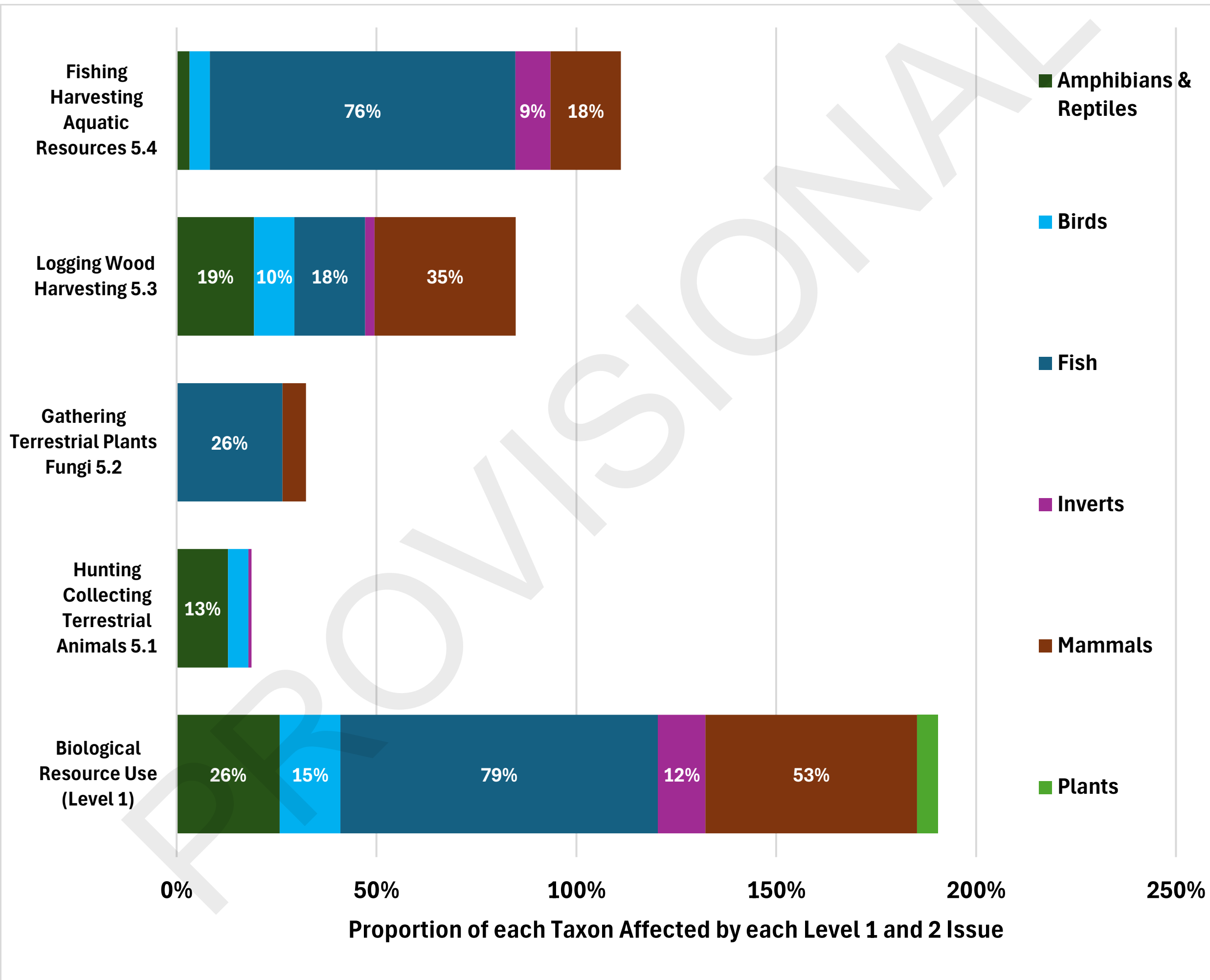

Figure 3.11 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Biological Resource Use category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.19 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Issue for Biological Resource Use.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Biological Resource Use 5.0.0		8 (26%)	12 (15%)	27 (79%)	15 (12%)	9 (53%)	15 (5%)	86 (15%)
	Hunting Collecting Terrestrial Animals 5.1	4 (13%)	4 (5%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	9 (2%)
	Gathering Terrestrial Plants Fungi 5.2	0 (0%)	0 (0%)	9 (26%)	0 (0%)	1 (6%)	0 (0%)	10 (2%)
	Logging Wood Harvesting 5.3	6 (19%)	8 (10%)	6 (18%)	3 (2%)	6 (35%)	0 (0%)	29 (5%)
	Fishing Harvesting Aquatic Resources 5.4	1 (3%)	4 (5%)	26 (76%)	11 (9%)	3 (18%)	0 (0%)	45 (8%)

Table 3.20 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Biological Resource Use. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Biological Resource Use 5.0.0		0	2	5	4	5	0	16
	Hunting Collecting Terrestrial Animals 5.1	0	1	0	0	1	0	2
	Gathering Terrestrial Plants Fungi 5.2	0	0	4	0	1	0	5
	Logging Wood Harvesting 5.3	0	0	4	4	4	0	12
	Fishing Harvesting Aquatic Resources 5.4	0	2	5	0	0	0	7

Gathering Terrestrial Plants and Fungi

Gathering of terrestrial plants and fungi affects 2% of Connecticut's SGCN, primarily through the removal of rare species or disturbance to small populations. Species such as the Large Whorled Pogonia are especially vulnerable due to their rarity, dependence on mycorrhizal associations, and popularity among collectors (TCI & NEFWDTC, 2023). Because many of these taxa occur in isolated, low-density populations, even limited harvest can result in local extirpation. Although these activities remain infrequent and poorly documented, they may increase in frequency as market demand grows. Most state-listed plants receive only passive protection, and enforcement is limited by staff capacity.

Agriculture and Aquaculture (2.0)

While Connecticut's farms and forests may look bucolic, they sometimes create challenges for wildlife. Agricultural and aquaculture activities affect 9% of SGCN, with particularly high impacts on Fish (44%) and Amphibians and Reptiles (42%) (Figure 3.12; Table 3.21). We're looking at direct habitat loss, chemical and nutrient runoff, sedimentation, and genetic contamination associated with crop production, livestock operations, forestry plantations, and aquaculture. A farm may cover only a few hundred acres, but fertilizers and pesticides don't respect property lines. These chemicals and nutrients travel through groundwater and streams, creating lasting problems for wildlife across terrestrial, freshwater, and estuarine systems (Duflot et al., 2021).

Part of the problem is that these impacts are hard to regulate. Many agricultural effects come from nonpoint-source contamination that's difficult to track and control, making it one of the least regulated environmental threats in the region (Ribaudo, 2015; Ribaudo & Shortle, 2019; Keiser & Shapiro, 2019). The places where wildlife and agriculture meet are often the most sensitive. Riparian corridors, vernal pool systems, and shallow floodplain wetlands that support high-priority species such as the Wood Turtle, Jefferson Salamander, and Spotted Turtle feel these effects most acutely (TCI & NEFWDTC, 2023). Even small farming operations can create cumulative stress when they lack a large enough buffer, altering nutrient cycles, hydrology, and the composition of aquatic communities. For Level 2 summaries, see Appendix 3.4.

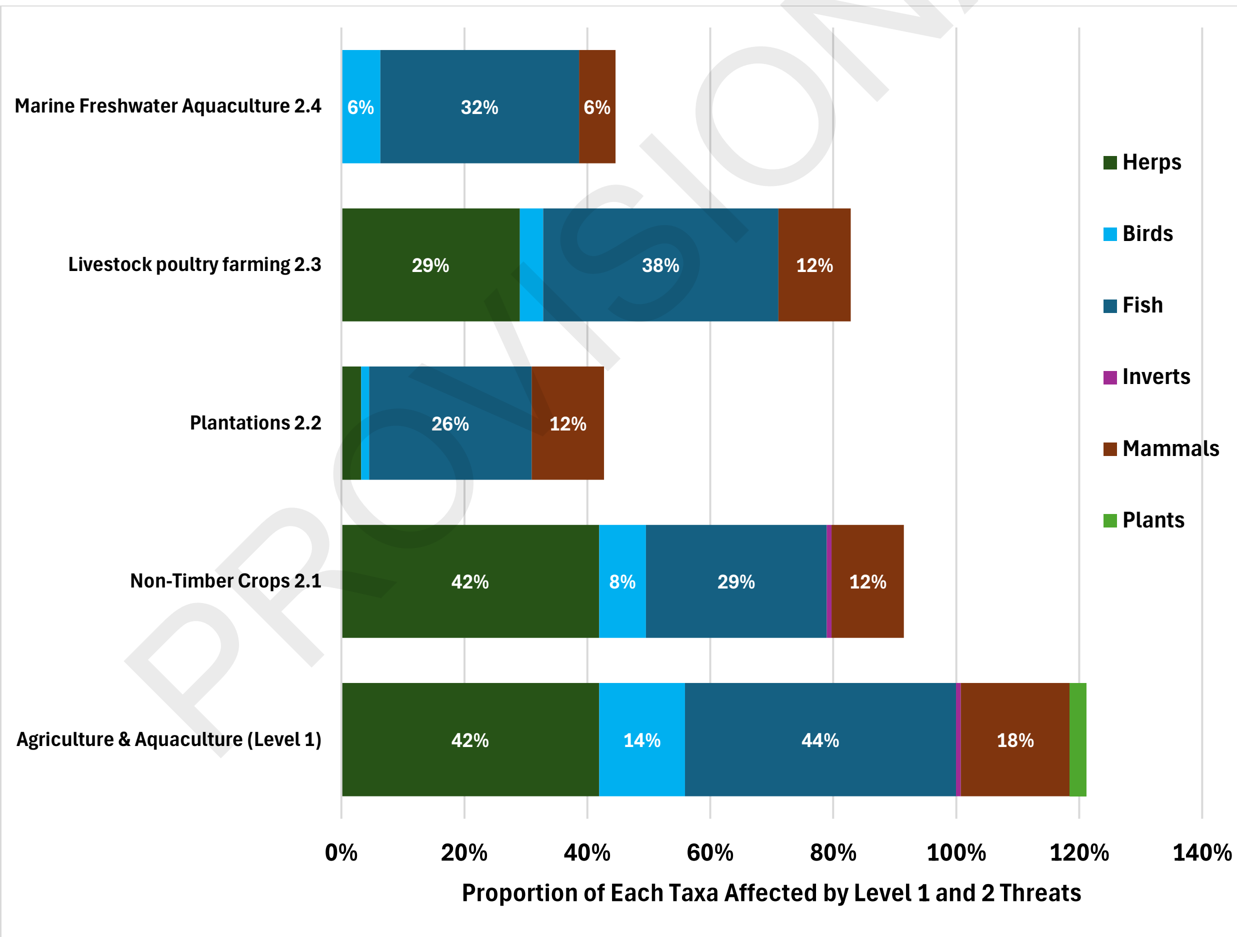

Figure 3.12 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Agriculture and Aquaculture category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another. Bars without a percentage are 6% or less.

Table 3.21 – The percentages of each taxonomic group and all SGCN affected by each Level 1 and 2 Agriculture and Aquaculture.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Agriculture Aquaculture 2.0.0		13 (42%)	11 (14%)	15 (44%)	1 (1%)	3 (18%)	8 (3%)	51 (9%)
	Annual Perennial NonTimber Crops 2.1	13 (42%)	6 (8%)	10 (29%)	1 (1%)	2 (12%)	0 (0%)	32 (6%)
	Plantations 2.2	1 (3%)	1 (1%)	9 (26%)	0 (0%)	2 (12%)	0 (0%)	13 (2%)
	Livestock poultry farming 2.3	9 (29%)	3 (4%)	13 (38%)	0 (0%)	2 (12%)	0 (0%)	27 (5%)
	Marine Freshwater Aquaculture 2.4	0 (0%)	5 (6%)	11 (32%)	0 (0%)	1 (6%)	0 (0%)	17 (3%)

Table 3.22 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Agriculture and Aquaculture. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Agriculture Aquaculture 2.0.0		0	4	6	2	2	0	14
	Annual Perennial NonTimber Crops 2.1	0	0	6	2	2	0	10
	Plantations 2.2	0	0	5	0	0	0	5
	Livestock poultry farming 2.3	0	0	6	2	2	0	10
	Marine Freshwater Aquaculture 2.4	0	4	4	0	0	0	8

Other Threats (12.0)

Sometimes the biggest threat to wildlife isn't what's happening in the field, but what's not happening within organizations or agencies. The "Other Threats" category applies to 24% of all SGCN, with impacts most heavily concentrated among Plants (46%) and, to a lesser extent, Mammals (12%) and Amphibians and Reptiles (6%) (Figure 3.13; Table 3.23). These aren't ecological problems in the traditional sense. Instead, we're talking about systemic barriers to conservation, such as funding gaps, administrative limitations, or outreach challenges that get in the way of effective species protection even when we know what needs to be done. Plant conservation shows this problem most clearly. Connecticut's rare plants often depend on non-regulatory mechanisms and voluntary partnerships for their long-term survival, which makes them particularly vulnerable when resources are tight or priorities shift (TCI & NEFWDTC, 2023). For the Level 2 Issue summaries, see Appendix 3.4.

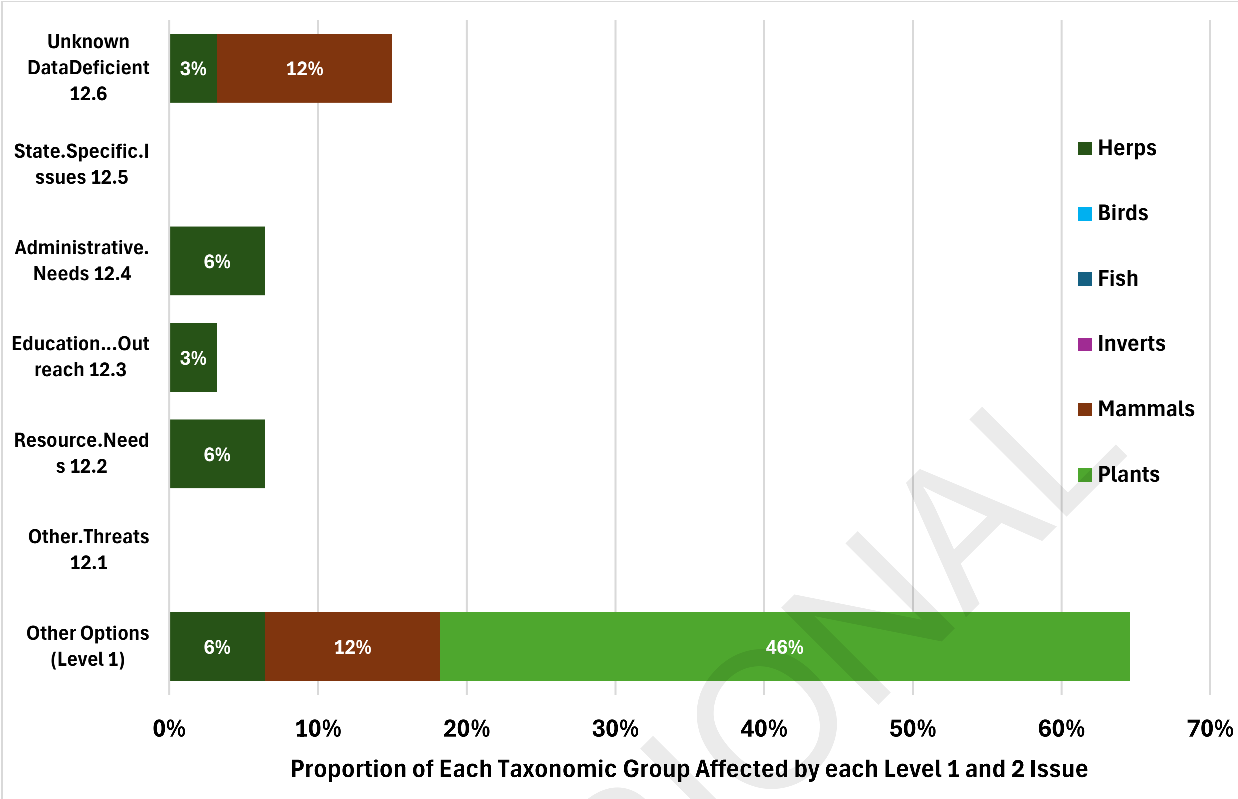

Figure 3.13 – The proportion of each taxonomic group's SGCN affected by each Level 1 and 2 Other Threats category. Note that these are proportions and not raw counts of the number of species affected, so while some issues may affect more total species, this graph shows how each taxonomic group is affected relative to one another.

Table 3.23 – The number (percentages in parentheses) of each taxonomic group and all SGCN affected by each Level 1 and 2 Other Threats.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SGCN
Other Options 12.0.0		2 (6%)	0 (0%)	0 (0%)	0 (0%)	2 (12%)	133 (46%)	137 (24%)
	Other.Threats 12.1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Resource.Needs 12.2	2 (6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0%)
	Education...Outreach 12.3	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)
	Administrative.Needs 12.4	2 (6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0%)
	State.Specific.Issues 12.5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Unknown DataDeficient 12.6	1 (3%)	0 (0%)	0 (0%)	0 (0%)	2 (12%)	0 (0%)	3 (1%)

Table 3.24 – The number of SAPS of each taxonomic group and all SAPS affected by each Level 1 and 2 Issue for Other Threats. The information is presented here as raw numbers instead of proportions since a small proportion of SAP species were evaluated beyond Level 1.

Level 1	Level 2	Herps	Birds	Fish	Inverts	Mammals	Plants	All SAPS
Other Options 12.0.0		0	0	0	0	3	238	241
	Other.Threats 12.1	0	0	0	0	0	0	0
	Resource.Needs 12.2	0	0	0	0	0	0	0
	Education...Outreach 12.3	0	0	0	0	0	0	0
	Administrative.Needs 12.4	0	0	0	0	0	0	0
	State.Specific.Issues 12.5	0	0	0	0	0	0	0
	Unknown DataDeficient 12.6	0	0	0	0	3	0	3

Top Regional Issues

Connecticut's wildlife challenges don't stop at state borders, and the problems facing species across the Northeast paint a sobering picture. Regional Species of Greatest Conservation Need (RSGCN) in the Northeast are facing accelerated declines due to invasive species, natural systems modifications, changing environmental conditions, and water quality degradation. These problems are widespread, affecting species ranging from tiny salamanders to large mammals across the Northeastern region, and they have a troubling tendency to exacerbate one another.

Pollution leads the pack as the most widespread threat, affecting 86% of all RSGCN and Watchlist species, including 85% of those ranked as Very High Concern (TCI & NEFWDTC, 2023). Consider the Four-toed Salamander, a small amphibian that calls Connecticut's forested wetlands home. This salamander, along with many other amphibians, reptiles, and fish, depends on clean, isolated breeding habitats and simply can't survive even modest levels of contamination. The problem gets worse when these sensitive habitats are already chopped up by development or when human activities have altered natural water flow which are both everyday realities in Connecticut's developed landscapes. Even when animal populations manage to persist, long-term exposure to contaminants slowly erodes reproductive success and threatens their future.

Changing environmental conditions come in second regionally, affecting 82% of RSGCN and Watchlist species across the Northeast, and 85% of those of Very High Concern (TCI & NEFWDTC, 2023). But in Connecticut, this threat jumps to first place.

Animals that can't move far or need very specific conditions to survive find themselves in trouble even when environmental shifts seem small to us. Connecticut's freshwater species are getting squeezed by warming temperatures, altered stream flow, and extreme precipitation events (Burgio et al., 2024). What makes environmental changes particularly dangerous is how they amplify everything else; warming conditions give invasive species an edge or make contaminants more toxic, stacking the deck against sensitive species (see Higgins et al., 2024; also see the Shifting Environmental Conditions section above).

Natural systems modifications reveal how profoundly we've changed the basic processes that shaped northeastern ecosystems for millennia. These human alterations, including altered fire regimes, hydrologic modifications, and loss of natural disturbance processes, impact 62% of the 806 RSGCN and Watchlist species in the Northeast (TCI & NEFWDTC, 2023). Even among the region's highest-priority species, the numbers are concerning: 60% of those with high Northeast regional responsibility and 48% of those that are both Very High Concern and high responsibility struggle with these ecological alterations. Connecticut tells this story clearly. Decades of putting out every forest fire have contributed to the decline of early successional habitats essential for species like the New England Cottontail and Eastern Whip-poor-will. Meanwhile, widespread wetland drainage, ditching, and water control structures have disrupted natural hydrology in critical habitats for amphibians, aquatic invertebrates, and plants. All these changes have weakened ecological resilience and left habitats less able to bounce back from or adapt to additional stressors.

Invasive species, pathogens, and disease round out the big four threats, affecting 57% of the RSGCN and Watchlist species across the Northeast with no end in sight (TCI & NEFWDTC, 2023). The region's most vulnerable species bear the heaviest burden: 72% of those classified as Very High Concern and 57% of those that are both Very High Concern and of high Northeast regional responsibility are affected. The numbers may be lower among species with high regional responsibility overall (40%), but when biological invasions and disease outbreaks hit, they can wipe out populations and disrupt ecosystems for generations. White-Nose Syndrome has wiped out bat populations, including the formerly common Little Brown Bat. Underwater, invasive plants such as hydrilla (*Hydrilla verticillata*) take over, degrading habitat structure and altering nutrient dynamics while pushing out invertebrates and amphibians. Similar to the region, Connecticut's forests are highly impacted by invasive species. A parade of invasive insects such as the Spongy Moth, Emerald Ash Borer, Beech Leaf Disease, and Hemlock Woolly Adelgid, keeps changing canopy structure and microclimate conditions, piling stress onto sensitive wildlife (Higgins et al., 2024). These biological invaders often move fast and work together with environmental change and habitat fragmentation to overwhelm native species' ability to survive and function in their ecosystems.

Species/Taxon Specific Issue Overviews

Amphibians & Reptiles

Issues

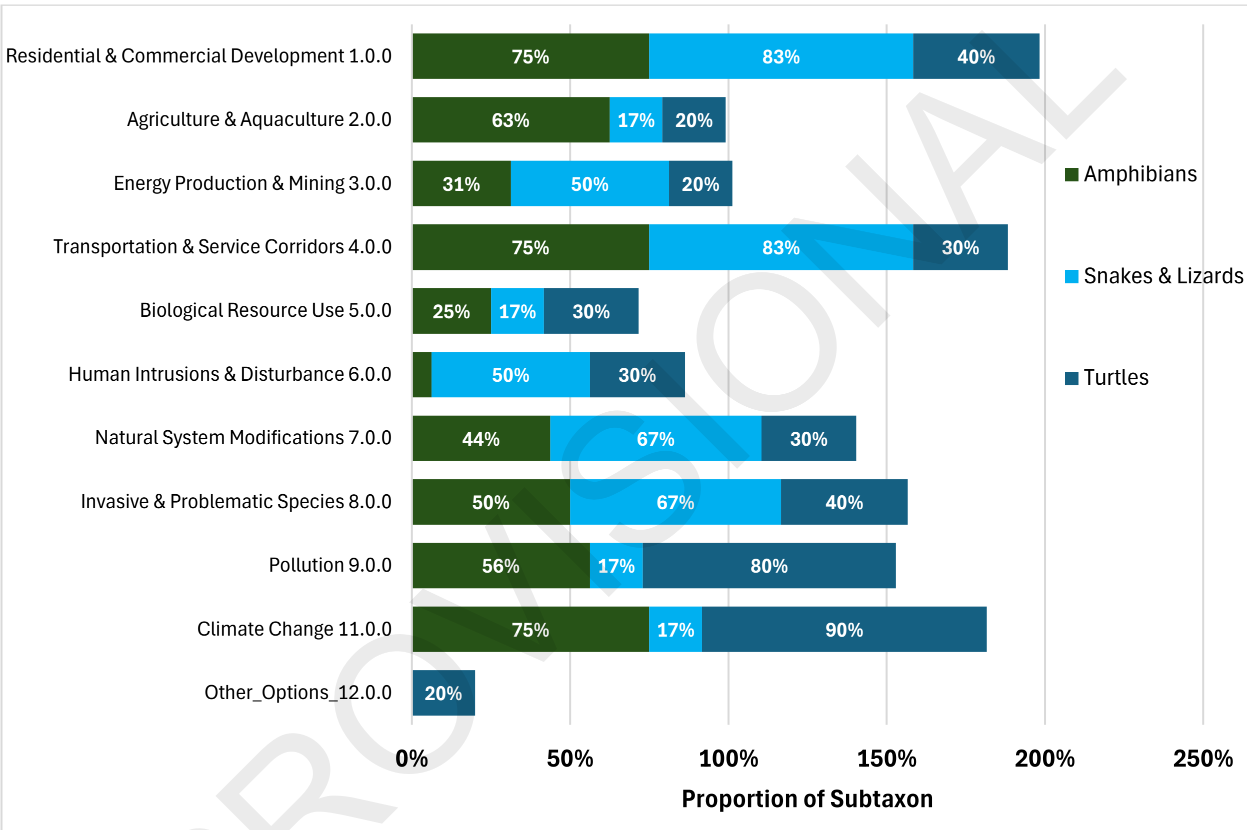

Figure 3.14 - Proportion of Connecticut Amphibian & Reptile SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species. Bars without a percentage are 6% or less.

Connecticut's amphibian and reptile SGCN and SAPS face a complex array of overlapping threats that vary across taxa and landscape context. Widespread habitat loss, road mortality, hydrologic alteration, invasive species, chemical pollution, and climate stress remain the most significant threats across the group. More than two-thirds of species are affected by both residential and commercial development (75%) and transportation infrastructure (75%), while changing environmental conditions affects 68% (Figure 3.14). The sensitivity of many species to spatial configuration, combined with limited dispersal ability, delayed maturity, and strong site fidelity, increases vulnerability to even modest levels of landscape disruption.

For pool-breeding amphibians, multiple-scale habitat loss remains the most critical limiting factor. Vernal pools are essential breeding sites for Jefferson Salamander, Spotted Salamander, and Marbled Salamander and require intact forested buffers of at least 500–750 feet for long-term population viability. Fragmentation of forested buffers reduces juvenile recruitment, alters microclimate, and exposes populations to predation and edge effects. In Sprague, solar development on adjacent upland forest resulted in altered runoff and sediment input into multiple breeding pools (Klemens et al., 2021). As a result, Connecticut has since established stronger permit requirements for stormwater management in solar developments to avoid this issue in future solar projects.

Reptile species with large seasonal ranges are particularly vulnerable to road mortality and landscape fragmentation. Wood Turtles, Spotted Turtles, and Eastern box Turtles rely on extensive wetland-upland mosaics for seasonal movements and are regularly observed as roadkill in fragmented landscapes. Road crossings also isolate terrestrial snakes such as Eastern Ratsnakes and Northern Black Racers, reducing gene flow and increasing susceptibility to local extirpation. Road mortality is an especially acute threat for long-lived, low-fecundity species, where even low annual mortality in adults can result in population declines over time.

Road runoff and chemical pollution impose sublethal but pervasive stress on many species. Suburban and exurban wetlands frequently contain chloride concentrations exceeding 1,000 mg/L, with some sites surpassing 5,000 mg/L levels shown to reduce larval survival in Wood Frogs and Spotted Salamanders. Additional pollutants, including herbicides and pesticides, accumulate in shallow wetlands, posing endocrine and immunological risks to multiple taxa. Closed-basin systems with limited hydrologic turnover are particularly susceptible to bioaccumulation and long retention times, compounding these effects.

Amphibians and reptiles are also highly susceptible to predation and collection pressure. Nest depredation by raccoons and skunks is a leading cause of turtle egg loss, particularly in edge habitats where human activities support predator populations. The illegal collection of Spotted, Wood, and Eastern Box Turtles for the pet trade remains a persistent issue, despite increased outreach and enforcement efforts. Several Amphibian & Reptile species in Connecticut are now represented by small, aging populations with low recruitment and an increasing risk of extinction.

Invasive species and novel ecological stressors further exacerbate vulnerability. Introduced fish and Bullfrogs are major predators of amphibian larvae, particularly in historically fish-free wetlands. Vegetative invasions, such as Phragmites, alter hydroperiod and thermal regimes, displacing critical cover and egg-laying sites for Four-toed and Blue-spotted Salamanders. Snake fungal disease has been documented in Timber Rattlesnakes and is considered an emerging threat across a broader range of reptile species in the region, particularly as warming temperatures expand the viability of the pathogen (Klemens et al., 2021).

Fragmentation and artificial habitat traps remain persistent structural challenges. Species are increasingly observed attempting to use artificial habitats such as roadside ditches and stormwater basins, which mimic natural conditions but present ecological traps due to predation, contamination, or drying. Landscape-scale conservation models recommend conserving wetland-upland complexes of 1,000 acres or more to maintain viable metapopulations, but such blocks are increasingly rare. Although the forest cover in Connecticut has stabilized, the remaining matrix is highly fragmented and bisected by transportation corridors, limiting opportunities for recolonization or gene flow. Since 1992, the number of amphibians and reptiles listed as Endangered, Threatened, or Special Concern in the State has increased by over 80%, underscoring the urgency of reversing these trends (Klemens et al., 2021).

Table 3.25 – The percentages of each sub-taxonomic group and all Amphibian & Reptile SGCN affected by each Level 1 and 2 Other Threats.

Issue	Amphibians	Snakes & Lizards	Turtles	All Herps
Residential & Commercial Development 1.0.0	75%	83%	40%	66%
Agriculture & Aquaculture 2.0.0	63%	17%	20%	41%
Energy Production & Mining 3.0.0	31%	50%	20%	31%
Transportation & Service Corridors 4.0.0	75%	83%	30%	63%
Biological Resource Use 5.0.0	25%	17%	30%	25%
Human Intrusions & Disturbance 6.0.0	6%	50%	30%	22%
Natural System Modifications 7.0.0	44%	67%	30%	44%
Invasive & Problematic Species 8.0.0	50%	67%	40%	50%
Pollution 9.0.0	56%	17%	80%	56%
Climate Change 11.0.0	75%	17%	90%	69%
Other Options 12.0.0	0%	0%	20%	6%

Shifting Environmental Conditions

For Connecticut's amphibians and reptiles, survival has always been about timing, but environmental changes are rewriting the rules they've evolved to follow. Changes in water availability are creating serious problems for obligate pool-breeders such as the Jefferson Salamander and the Eastern Spadefoot. When temperatures warm at the wrong time, salamander larvae may not develop properly, adults may not survive the winter, and breeding may happen when conditions aren't right for success. Turtles face an even stranger problem. Whether a baby turtle becomes male or female depends entirely on how warm its nest gets, and if temperatures rise too much, whole populations could end up with lopsided sex ratios that make reproduction impossible. Northern Diamond-backed Terrapin has additional worries from sea level rise and shoreline hardening, which reduce access to nesting beaches and foraging flats (CTSG, 2023). Just how vulnerable are these species? The answer is stark: every single Connecticut SGCN amphibian and reptile has been categorized as "More Vulnerable" to changing environmental conditions (Figure 3.15).

Salamanders across Connecticut tell a story of species pushed to their limits by warming temperatures and hydrological shifts, particularly those that depend on vernal pools and forested wetlands (Burgio et al., 2024). These animals have evolved around predictable seasonal wetlands for breeding, but they're increasingly finding themselves high and dry. During drought years, seasonal and semi-permanent wetlands lose salamander populations, a trend expected to intensify under future environmental scenarios (Riddell et al., 2018; Currinder et al., 2014), potentially leading to local population declines and range contractions. Warmer winters and shifting precipitation patterns are also disrupting the overwintering and breeding behavior of pool-breeding species, increasing the chances that salamanders will emerge at the wrong time or find unsuitable conditions when they're ready to breed (Sutton et al., 2014; Riddell et al., 2018; Muths et al., 2017; Regosin et al., 2005).

For Connecticut's frogs and toads, getting the timing right has become increasingly difficult. Species such as the Wood Frog are finding it harder to navigate changes in breeding season timing and wetland hydroperiod due to shifting environmental conditions. Wood Frogs are masters of early spring breeding, having evolved to take advantage of snowmelt and temporary pools. But when snowpack melts earlier, rainfall patterns shift, and frost dates become unpredictable, this finely tuned system starts to break down (Miller et al., 2018). An early warm spell might seem like good news for frogs, but it can become a death trap if ponds dry up before tadpoles mature or if late freezes kill developing eggs after breeding has already begun. Amphibians' thin, permeable skin and their need to survive both on land and in water make them particularly sensitive to environmental changes. As the reliability of seasonal wetlands continues to erode, fewer and fewer frogs and toads will be able to reproduce successfully across Connecticut.

Connecticut's turtles face a triple threat due to their long generation times, temperature-dependent sex determination, and inability to move quickly between habitats (Burgio et al., 2024). Species such as the Spotted Turtle and the Eastern Box Turtle need stable thermal and moisture regimes for nesting, hibernation, and foraging. When nesting sites get too warm, turtle populations can end up with too many females and not enough males to sustain reproduction (Böhm et al., 2016). Earlier emergence from hibernation can backfire if it exposes individuals to late frost events or leaves them searching for food at the wrong time of year. Habitat fragmentation makes everything worse by restricting movement between the nesting and aquatic sites these species need, further limiting their ability to adapt to changing conditions.

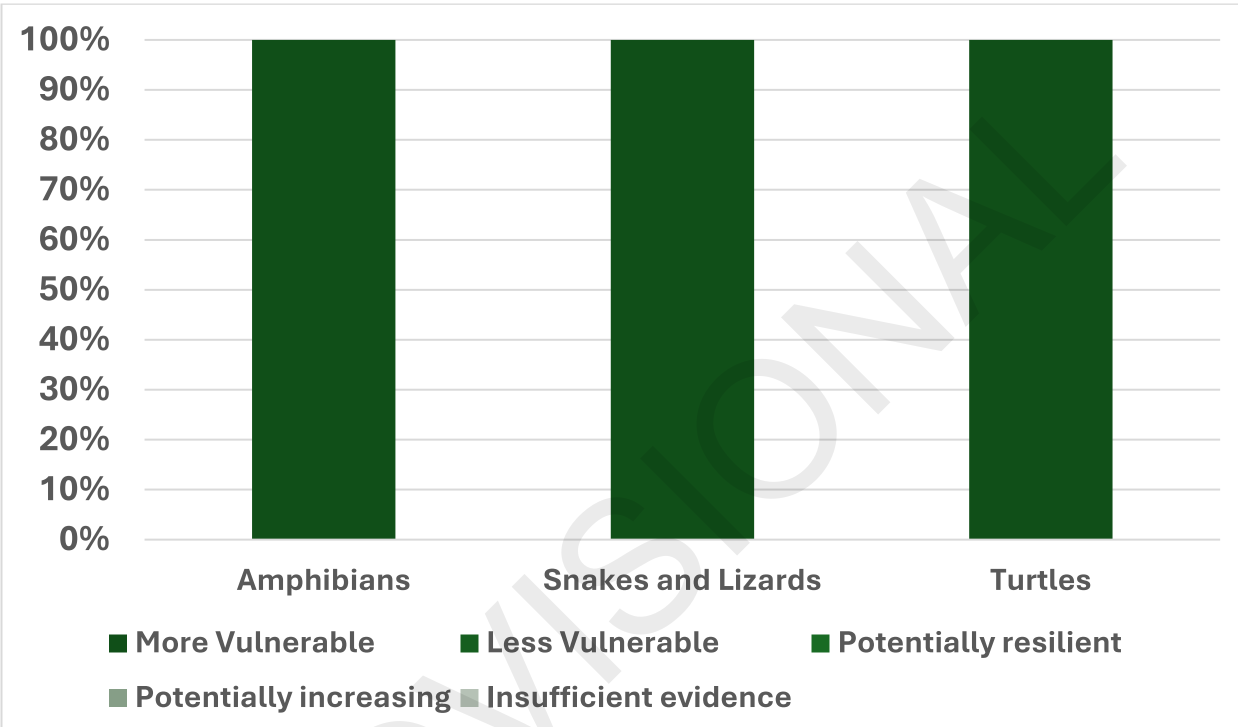

Figure 3.15 - Proportion of all Amphibian and Reptile SGCN and each subgroup that fall into each Environmental Condition Shifts vulnerability category. All have been identified as being "More Vulnerable."

Birds

Issues

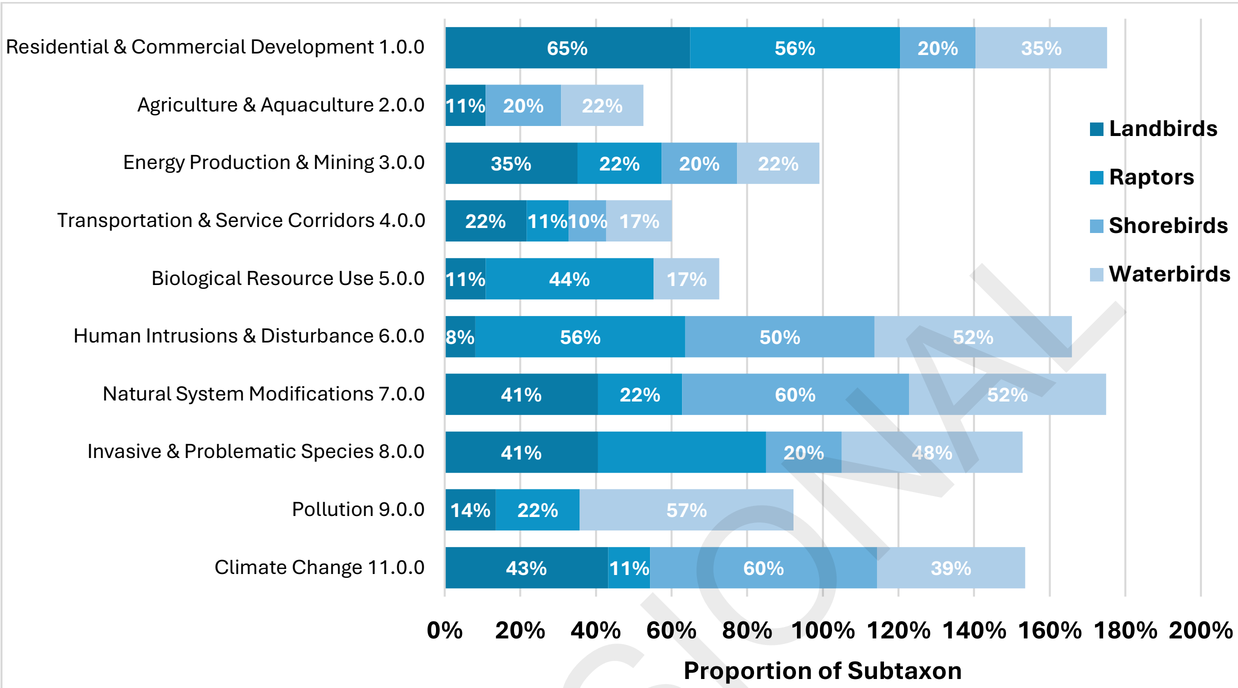

Figure 3.16 - Proportion of Connecticut Bird SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species.

Connecticut's SGCN and SAPS birds are subject to overlapping threats, with habitat degradation, shifting temperature- and precipitation-related range alterations, and data deficiencies emerging as the most significant issues (Figure 3.16; Table 3.26). For all Level 1, 2, and 3 threats affecting Connecticut birds, see Appendix 3. Residential and commercial development is the most frequently assigned threat, affecting 65% of landbirds and 56% of raptors, and also significantly contributes to pressures on shorebirds and waterbirds. This reflects extensive fragmentation of nesting and foraging habitats, increased exposure to edge effects, and the loss of interior forest and wetland systems. These impacts are especially pronounced in wetland and riparian habitats, which are critical to marsh birds, wading birds, and waterfowl. Hydrologic alteration, infill, succession, and development continue to erode habitat quality and extent, suggesting that a shared conservation approach focused on wetland restoration and riparian corridor protection will be essential in addressing these convergent threats across bird taxa (see Chapter 4).

Forest-dependent species are increasingly limited by the loss of midstory structure and the fragmentation of large forest blocks. Although not yet rare, species such as the Baltimore Oriole and Worm-eating Warbler exhibit declining trends in both the Connecticut Bird Atlas and regional Breeding Bird Survey data. The Baltimore Oriole, although still widespread, is showing signs of decline even within its core forest habitats. Similarly, Northern Mockingbird, once common in urban and suburban edges, has declined sharply across much of the state and is now absent from many formerly occupied areas. These patterns are linked to habitat simplification, urban land conversion, and the spread of invasive vegetation. Taxa team experts emphasized that forest birds requiring structural complexity or disturbance-maintained understory are at greatest risk. Conservation strategies that support structural diversity, patch integrity, and intact core habitat will likely yield the greatest benefit for this group (see Chapter 4).

Coastal and marine birds are affected by the combined effects of human disturbance, habitat loss, saltwater intrusions, and offshore infrastructure development. More than half of shorebirds and waterbirds are vulnerable to direct disturbance (Figure 3.26), including recreational pressure on beaches and boat traffic near foraging and nesting areas. Beach-nesting species, such as the Piping Plover and American Oystercatcher, face nest failure due to trampling, off-leash dogs, and artificially elevated predator densities near development. Nesting success is often episodic; for example, the Bird Taxa Team pointed out that Black Skimmers nesting at Sandy Point in West Haven successfully fledged chicks during pandemic-related closures in 2020 but experienced total nest failure following the resumption of beach access. Coastal squeeze, where armoring and rising seas eliminate upper beach zones, exacerbates these pressures. Offshore, sea ducks such as Surf Scoter and Long-tailed Duck are declining in the Long Island Sound, yet wintering distributions remain poorly documented. While mid-winter surveys suggest significant declines, there is a lack of dedicated monitoring in state waters. Without improved data, spatial planning efforts for offshore wind siting will remain reactive and may inadequately account for sensitive marine-associated birds (TCI and NEFWDTC, 2023).

Wetland birds, including the American Bittern and Sora, face ongoing declines due to hydrologic alteration, invasive vegetation, and inadequate wetland buffers. Herbaceous wetlands and vernal pools are particularly vulnerable to drainage, groundwater drawdown, and succession. Stands of invasive Phragmites displace native emergent vegetation and reduce nesting opportunities for secretive marsh birds. These issues reflect broader national trends; the loss of vegetated wetlands in the U.S. has increased by over 50% in recent decades, primarily due to agricultural and development activities (Audubon Society, 2025). In Connecticut, freshwater wetland protection remains inconsistent, and many priority bird species lack dedicated monitoring or management in these systems.

Among landbirds, the synchrony between insect emergence and breeding periods is a particular concern for migratory insectivores. Recent changes in temperature and precipitation patterns have decoupled these processes, which can reduce food availability during critical reproductive periods (Mayor et al., 2017). Landbirds with narrow habitat preferences or dietary specialization are likely to be disproportionately affected, particularly where fragmentation and management reduce habitat buffering capacity (Burgio et al., 2024). Raptors, such as the Broad-winged Hawk, may be impacted by shifts in thermal and wind conditions that facilitate energy-efficient migration (Bildstein, 2006), while the Northern Goshawk may be indirectly affected by changes in prey availability and forest composition (Burgio et al., 2024). As a slow-reproducing species tied to large tracts of mature forest, the Goshawk is considered especially vulnerable to long-term structural shifts in northeastern forest systems (Squires et al., 2020).

Table 3.26 – The percentages of each sub-taxonomic group and all Bird SGCN affected by each Level 1 and 2 Other Threats.

Issue	Landbirds	Raptors	Shorebirds	Waterbirds	All Birds
Residential & Commercial Development (1.0)	65%	56%	20%	35%	49%
Agriculture & Aquaculture (2.0)	11%	0%	20%	22%	14%
Energy Production & Mining (3.0)	35%	22%	20%	22%	28%
Transportation Service Corridors (4.0)	22%	11%	10%	17%	18%
Biological Resource Use (5.0)	11%	44%	0%	17%	15%
Human Intrusions & Disturbance (6.0)	8%	56%	50%	52%	32%
Natural System Modifications (7.0)	41%	22%	60%	52%	44%
Invasive & Problematic Species Genes Diseases (8.0)	41%	44%	20%	48%	41%
Pollution (9.0)	14%	22%	0%	57%	25%
Climate Change (11.0)	43%	11%	60%	39%	41%

Shifting Environmental Conditions

Connecticut's birds are living through a period of environmental upheaval that's reshaping where and how they can survive. Shifting environmental conditions are a growing and cross-cutting threat across all bird groups. This challenge hits hardest for shorebirds (60%) and waterbirds (39%) and affects 43% of landbirds (Figure 3.16). Species that evolved in Connecticut's cooler, higher places are finding themselves with nowhere to go. Take the Yellow-rumped Warbler, which once bred in northwest Connecticut but disappeared from a high-elevation banding station over a 15-year period despite what looked like perfectly good habitat. Other cool-adapted species, such as the White-throated Sparrow and the Hermit Thrush, appear to be following a similar path. But the changes aren't all about leaving Connecticut. Species like the Blue-gray Gnatcatcher are expanding northward into Connecticut's warming landscapes. For birds that travel thousands of miles each year, the challenges multiply. Long-distance migrants and shorebirds face timing mismatches and shrinking stopover sites that can make or break their journeys. The Ruddy

Turnstone is projected to decline by 50% by 2050, and 85% of shorebird species are currently declining across their range (TCI and NEFWDTC, 2023). Many depend on very specific habitats during migration, which makes them vulnerable when even small areas get disturbed.

Connecticut's major bird SGCN groups are among the most thoroughly studied, so we have relatively few knowledge gaps (Figure 3.17). For landbirds, one of the most critical issues is whether insects and birds can stay synchronized. Migratory insectivores time their breeding to coincide with peak insect availability, but if warming temperatures throw off these natural rhythms, nesting birds may struggle to find enough food for their chicks (Mayor et al., 2017). Birds with narrow habitat preferences or specialized diets will likely feel these changes most acutely, particularly as environmental shifts interact with ongoing habitat fragmentation and forest management practices (Burgio et al, 2024).

Raptors face their own set of environmental challenges. Take the Broad-winged Hawk, a long-distance migrant that depends on Connecticut's forests and relies on thermal currents for efficient travel. Changes in thermal formation and wind patterns could force these birds to expend more energy during migration, affecting their survival and breeding success (Bildstein, 2006). The Northern Goshawk faces more subtle but potentially devastating changes from shifting prey availability and forest composition (Burgio et al., 2024). As a slow-reproducing species that prefers mature, intact forest, this hawk may be especially vulnerable to long-term environmental shifts in northeastern forest structure (Squires et al., 2020).

Shorebirds are getting hit from multiple directions in Connecticut, particularly from sea level rise and increased storm intensity. The Saltmarsh Sparrow tells one of the most urgent stories. This bird nests in high marsh vegetation but is watching its world disappear beneath rising waters. Populations are declining by approximately 5% per year due to nest flooding, and if current trends continue, the species faces extinction by 2035 (Field et al., 2017; Shriver et al., 2015). Piping Plovers are caught in a similar squeeze, where rising sea levels and shoreline development are eliminating the upper beach areas where they nest (Brudney et al., 2013). Both species remain stubbornly loyal to their traditional nesting sites and have limited ability to relocate, which makes them especially vulnerable to rapid environmental change.

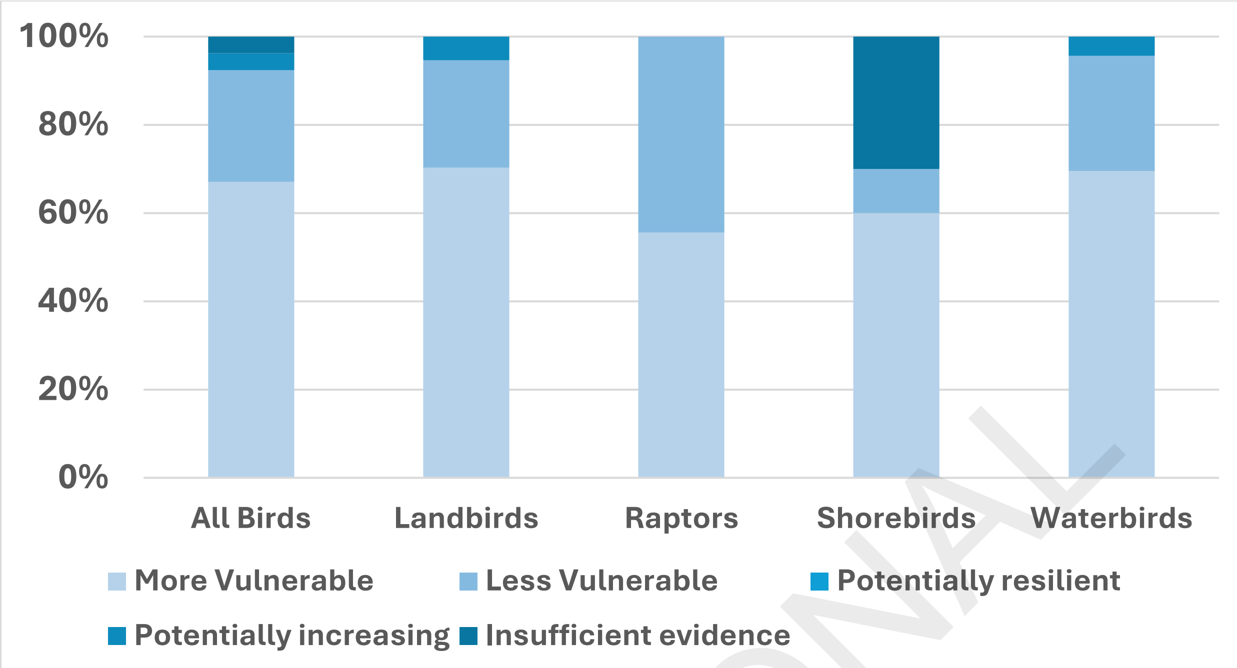

Figure 3.17 - Proportion of all Bird SGCN and each subgroup that fall into each Shifting Environmental Conditions vulnerability category

Fish

Issues

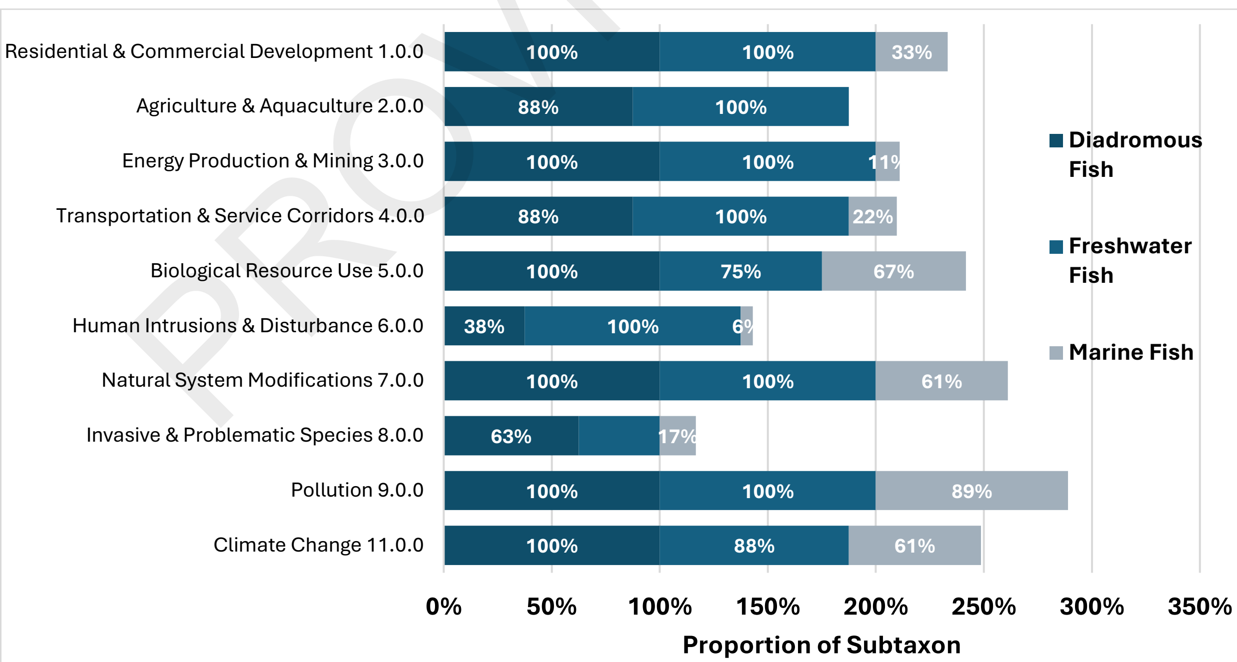

Figure 3.18 - Proportion of Connecticut Fish SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon

assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species.

Connecticut's fish Species of Greatest Conservation Need (SGCN) face a broad suite of threats that vary across aquatic ecosystems. The most frequently assigned threats include shifting environmental conditions (76%), pollution (94%), and residential and commercial development (65%) (Figure 3.18; Table 3.27). These stressors disproportionately affect freshwater and diadromous taxa, while marine SGCN are often under-documented due to limited monitoring coverage (TCI and NEFWDTC, 2023).

For diadromous fish, dams and hydrologic barriers remain the most widely recognized impediment to recovery. All Regional SGCN diadromous fish are threatened by hydroelectric dams and water management, including American Shad, Alewife, Blueback Herring, American Eel, and Sea Lamprey (TCI and NEFWDTC, 2023). These barriers fragment migration corridors, delay upstream passage, and expose downstream migrants to the risk of turbine mortality. The American Eel faces high juvenile and adult mortality at turbines, as well as low upstream passage efficiency, even when ladders are present (Brown et al., 2009; Hitt et al., 2012). While dam removals have accelerated in parts of the Northeast, few long-term studies assess post-removal recovery trajectories (Burroughs et al., 2010). Taxa team members noted that even where passage structures exist, cumulative delays and poor attraction flows may still limit successful migration.

Freshwater species are subject to many of the same connectivity challenges, particularly in headwater and small stream systems. Road crossings and undersized culverts limit movement and isolate populations, especially for small-bodied species. These issues are often compounded by sedimentation from land clearing and poorly managed stormwater, which increases turbidity and degrades spawning substrates. Coldwater-dependent fish, including Brook Trout and Slimy Sculpin, are further constrained by low dissolved oxygen, elevated temperatures, and stream channel instability during late-summer low flows (Wehrly et al., 2012; Kanno et al., 2015). Degraded riparian conditions and thermal inputs from impoundments also reduce the extent of viable coldwater habitat, especially in fragmented systems.

Marine and estuarine species face a distinct but overlapping set of threats. Offshore energy development, including cable corridors and wind farms, alters seafloor structure, introduces anthropogenic noise, and generates electromagnetic fields, with potential behavioral effects on demersal species such as Winter Flounder (Gill, 2005; Snyder and Kaiser, 2009). In nearshore areas, trawling and habitat modification degrade foraging and nursery habitat, while warming temperatures, hypoxia, and nutrient enrichment disrupt recruitment and estuarine dynamics. In particular, long-term data from Norwalk Bay and other embayments indicate that Winter Flounder populations are declining due to warming bottom waters, low dissolved oxygen, and shifts in prey availability (Bell et al., 2014; Crosby et al., 2018). These trends reflect broader ecosystem-level changes that may not be detected in single-species monitoring efforts.

Data gaps remain a limiting factor for many marine and estuarine SGCN. Small-bodied forage fish and species associated with benthic invertebrates are underrepresented in standard surveys and often fall below detection thresholds. Bridle Shiner, for instance, is difficult to detect using electrofishing and may be absent from sites where suitable habitat remains (Roberts et al., 2013). Marine SGCN assessments are also constrained by migratory behavior, offshore distribution, and limited jurisdictional coordination. The Fish Taxa Team emphasized that regional collaboration will be critical to assess changes in occupancy and abundance, particularly for species that span multiple estuaries or cross into federal waters (TCI and NEFWDTC, 2023).

Restoring aquatic connectivity, reducing thermal and chemical stress, and maintaining hydrologic function are key conservation needs across all fish taxa. The Taxa Team emphasizes that this is one of the most important things that can be done to help mitigate the impacts of shifting environmental conditions on Connecticut's fish, enabling them to find cold refugia and recolonize streams after dry periods. Dam removal and culvert replacement remain essential for both diadromous and freshwater species. Protection of coldwater refugia, improved riparian condition, and stormwater management will enhance stream resilience under projected climate scenarios. For marine SGCN, conservation actions include maintaining sediment and salinity regimes in estuarine systems and increasing support for offshore monitoring and environmental impact assessments. As regional climate and land use pressures intensify, a watershed-scale approach to fish conservation will be critical to address cross-boundary stressors and ecological thresholds.

Table 3.27 – The percentages of each sub-taxonomic group and all Fish SGCN affected by each Level 1 and 2 Other Threats.

Issue	Diadromous Fish	Freshwater Fish	Marine Fish	All Fish
Residential & Commercial Development 1.0.0	100%	100%	33%	65%
Agriculture & Aquaculture 2.0.0	88%	100%	0%	44%
Energy Production & Mining 3.0.0	100%	100%	11%	53%
Transportation & Service Corridors 4.0.0	88%	100%	22%	56%
Biological Resource Use 5.0.0	100%	75%	67%	76%
Human Intrusions & Disturbance 6.0.0	38%	100%	6%	35%
Natural System Modifications 7.0.0	100%	100%	61%	79%
Invasive & Problematic Species 8.0.0	63%	38%	17%	32%
Pollution 9.0.0	100%	100%	89%	94%
Climate Change 11.0.0	100%	88%	61%	76%

Shifting Environmental Conditions

Shifting environmental conditions are the most pervasive and cross-cutting threat, and it was the top-ranked issue across all fish SGCN in Connecticut (Figure 3.18). Coldwater fish, especially Brook Trout, are projected to lose substantial habitat due to thermal stress, reduced groundwater inputs, and increased frequency of low-flow events (Isaak et al., 2020). High-intensity rainfall events may increase sediment delivery and alter stream morphology, while reduced summer baseflows could lead to seasonal drying in lowland and marginal habitats (Goode et al., 2013; Hain et al., 2018). Additionally, more frequent high flow events in wintertime after spawning are also anticipated to cause population declines of Brook Trout (Swenka & Wagner, 2022). Taxa team members also raised concerns that warming stream temperatures and the displacement (and replacement) of Brook Trout and non-native Brown Trout in transitional zones complicate native trout conservation.

Approximately 80% of all fish SGCN are in "More Vulnerable" to shifting environmental conditions and are fairly consistent across fish groups (Figure 3.19). Diadromous fish in Connecticut, including Alewife, Blueback Herring, American Shad, Atlantic Salmon, and American Eel, are vulnerable to altered streamflow, rising temperatures, and phenological shifts (Burgio et al., 2024). Alewife migrations in nearby systems began 12 days earlier than in the 1970s (Ellis and Vokoun 2009, Dalton et al., 2022). These shifts can misalign reproduction with optimal habitat conditions. Reduced spring flows and increased thermal stress also limit upstream access and survival, particularly where barriers persist. For American Eels, ocean warming influences larval drift and estuarine entry, with implications for recruitment timing and success (Burgio et al., 2024).

Freshwater fish, such as Brook Trout, American Brook Lamprey, Burbot, and Slimy Sculpin, are impacted by warming stream temperatures, reduced baseflows, and an increased frequency of low-flow periods. Brook Trout are already restricted to cold, high-quality headwaters in Connecticut and are expected to experience range contraction as thermal thresholds are increasingly exceeded (Chambers et al., 2017). Habitat fragmentation further limits their capacity to shift ranges in response to warming. Flooding and sedimentation during extreme precipitation events also reduce reproductive success for fall-spawning species (Burgio et al., 2024).

Marine fish in Long Island Sound, including Winter Flounder and Atlantic Herring, undergo distributional changes in response to warming sea temperatures, earlier stratification, and hypoxia (Burgio et al., 2024). Winter Flounder have declined due to reduced recruitment tied to warmer bottom temperatures and habitat degradation in estuaries. Atlantic Herring are influenced by shifts in zooplankton availability during their larval stages, which are highly sensitive to changes in temperature and productivity (Rheuban et al., 2018). Longer stratification periods reduce vertical mixing and exacerbate hypoxic events in nearshore waters, further limiting habitat suitability for demersal and pelagic species.

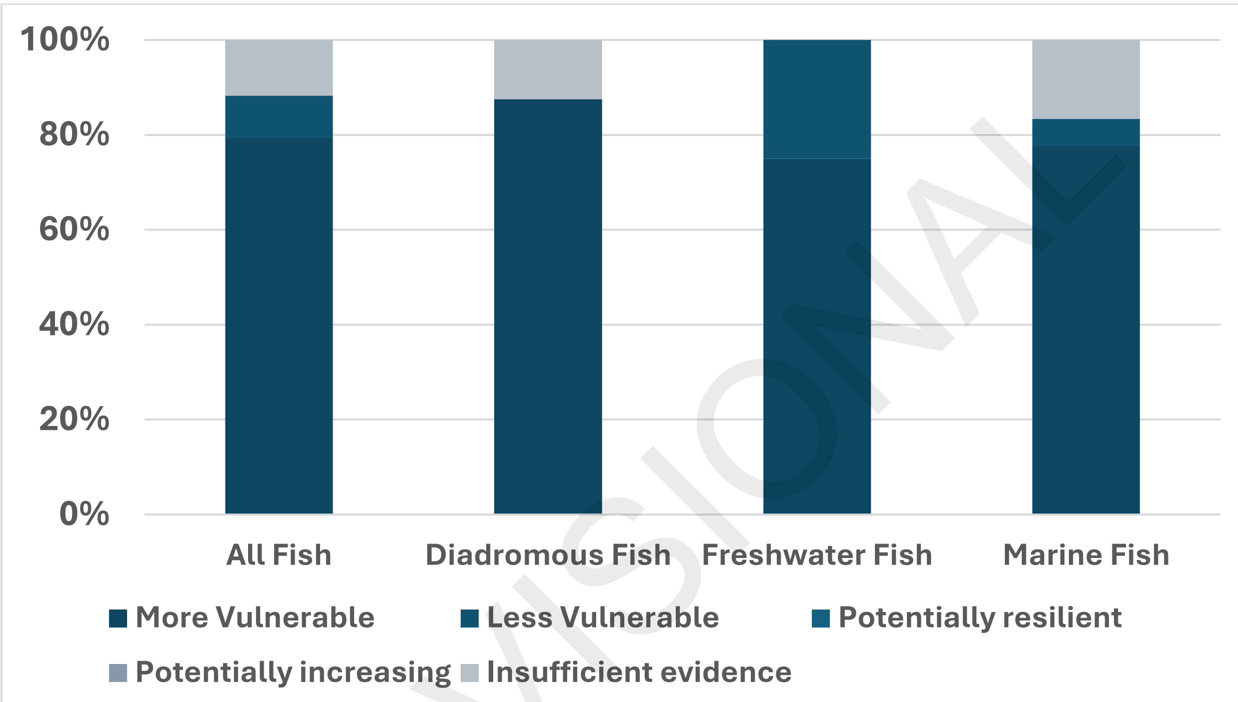

Figure 3.19 - Proportion of all Fish SGCN and each subgroup that fall into each Shifting Environmental Conditions vulnerability category

Invertebrates

Issues

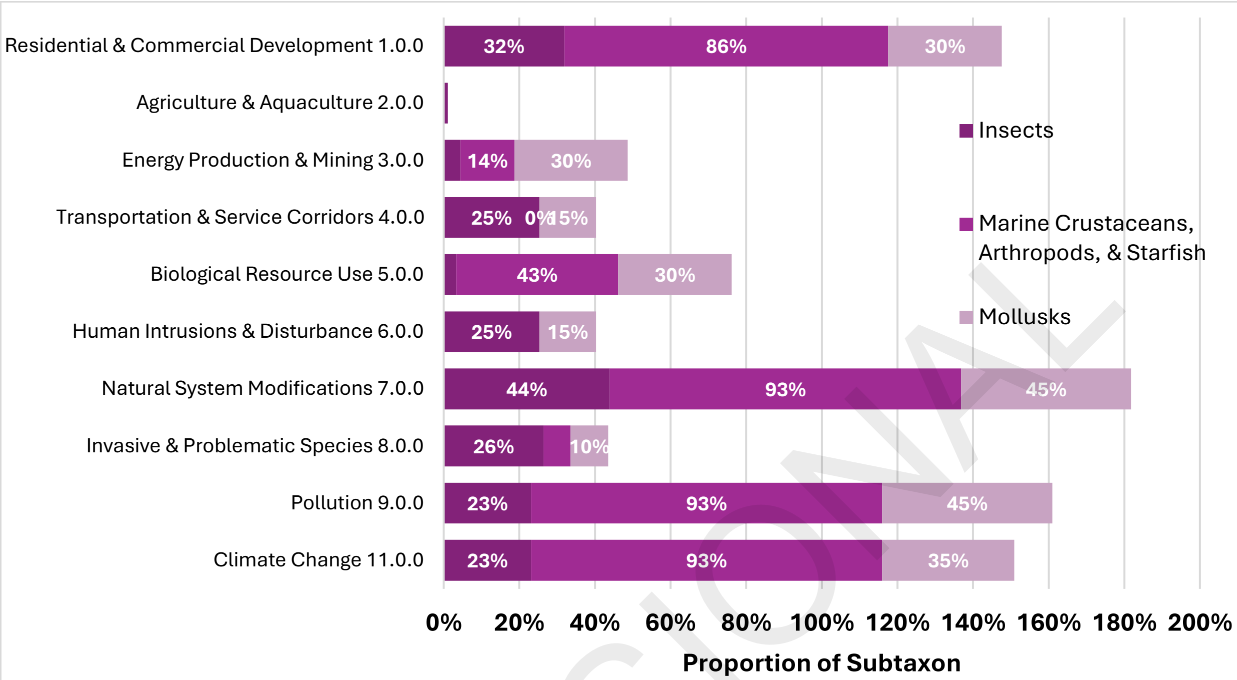

Figure 3.20 - Proportion of Connecticut Invert SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species. Bars without a percentage are 6% or less.

Connecticut's invertebrate Species of Greatest Conservation Need (SGCN) span freshwater, terrestrial, and coastal systems, with especially high representation among Lepidoptera, Coleoptera, Odonata, and Unionidae. Species frequently exhibit narrow habitat specificity, short-lived adult stages, and limited dispersal capacity, which compound their vulnerability to land-use change and climate stress. The most commonly assigned threats include residential and commercial development (72%), shifting environmental conditions (64%), and agriculture and aquaculture (48%) (Figure 3.20).

Habitat loss and degradation are Connecticut's most pervasive threats to invertebrate SGCN. Insect specialists of early successional and xeric systems, such as the Barrens Dagger Moth and Bog Tiger Moth, have declined due to fire suppression, canopy closure, and development, which reduce the extent and structural diversity of suitable habitats (Crisfield et al., 2023). Taxa team members emphasized that high-quality examples of pitch pine–scrub oak barrens and other fire-maintained systems have largely disappeared, highlighting the urgency of restoring disturbance-dependent habitat processes. Coastal invertebrates, including the Seaside Dragonlet and Eastern Beach Tiger

Beetle, are restricted to increasingly fragmented dunes and saltmarsh edges. Development, shoreline hardening, and off-road vehicle use further degrade these habitats (Knisley and Fenster, 2005). Mussel species such as Alewife Floater and Eastern Pondmussel are affected by stream fragmentation, sedimentation, and the loss of host fishes in impounded or degraded systems. In statewide surveys by CT DEEP, Alewife Floater is the least common mussel in the most suitable habitats in rivers and streams outside of the Connecticut River. There is a demonstrated decline of their host fish, the Alewife, which has declined by over 95% in the Connecticut River system between 1981 and 2008.

Invasive species further exacerbate stress on both aquatic and terrestrial systems. Non-native crayfish—including Rusty, Virile, and Red Swamp Crayfish—are displacing native species and altering freshwater habitats across the Northeast, including several SGCN in Connecticut (TCI & NEFWDTC, 2023). Invasive plants and woody encroachment reduce the suitability of early successional and edge habitats for many Lepidoptera and pollinators, particularly host specialists dependent on native forbs and shrubs. Members of the Invertebrate Taxa Team noted that invasive shrub dominance, routine mowing along roadsides, and heavy deer browsing are contributing to the elimination of host plants and simplification of vegetation structure in sandplain and coastal habitats. These indirect effects have been linked to localized declines in moths, beetles, and wild, native bees (Brousseau et al., 2013; Rooney & Waller, 2003; TCI & NEFWDTC, 2023).

Many invertebrate SGCN depend on habitats maintained by natural or anthropogenic disturbances, which are now functionally absent or mismanaged. Barrens moths, tiger beetles, and other xeric-adapted taxa require open, sparsely vegetated conditions historically maintained by wildfire, grazing, or periodic clearing. In the absence of these disturbances, succession and invasive encroachment render such habitats unsuitable. Connecticut's inland sandplains and traprock ridges are increasingly dominated by closed-canopy forest or woody overgrowth. Coastal species such as the Dune Noctuid Moth also rely on dynamic processes like overwash and shifting vegetation structure. However, these disturbance-maintained systems are poorly represented in the state's conservation land base and rarely benefit from active management (CT DEEP, 2020).

Pollution and chemical contamination represent sublethal yet widespread stressors across invertebrate taxa. In freshwater systems, conductivity, turbidity, and nutrient loading from road salt and agricultural runoff degrade habitat quality for mussels, mayflies, and caddisflies. Substrate instability and sediment deposition further impair habitat suitability for filter-feeding and burrowing taxa. In terrestrial systems, broad-spectrum insecticides, including neonicotinoids and pyrethroids, have been linked to declines in specialist and generalist pollinators (Goulson, 2013; Pisa et al., 2015). The Invertebrate Taxa Team raised concerns that pesticide drift may contribute to bumblebee declines in Connecticut, although toxicological data remain limited and difficult to obtain.

Data deficiency remains a large barrier to assessing trends and implementing conservation measures. Many invertebrate SGCN are known from single records or historical collections, and their current distribution or abundance remains unknown. This includes freshwater snails, grassland moths, and microlepidoptera, which are seldom encountered in volunteer or agency surveys. According to the taxa team, even among SGCN and SAPS that have been formally prioritized, approximately half lack usable abundance or occupancy data from the past two decades. Habitat fragmentation, short adult life spans, low detectability, and unresolved taxonomy all limit the effectiveness of monitoring and reduce the capacity to detect population changes or evaluate conservation outcomes (TCI and NEFWDTC, 2023). The broader integration of invertebrates into habitat-based planning and standardized monitoring will be essential for closing these information gaps.

Table 3.28 – The percentages of each sub-taxonomic group and all Invert SGCN affected by each Level 1 and 2 Other Threats.

Issue	Insects	Marine Crustaceans, Arthropods, & Starfish	Mollusks	All Inverts
Residential & Commercial Development 1.0.0	32%	86%	30%	38%
Agriculture & Aquaculture 2.0.0	1%	0%	0%	1%
Energy Production & Mining 3.0.0	4%	14%	30%	10%
Transportation & Service Corridors 4.0.0	25%	0%	15%	21%
Biological Resource Use 5.0.0	3%	43%	30%	12%
Human Intrusions & Disturbance 6.0.0	25%	0%	15%	21%
Natural System Modifications 7.0.0	44%	93%	45%	50%
Invasive & Problematic Species 8.0.0	26%	7%	10%	22%
Pollution 9.0.0	23%	93%	45%	34%
Climate Change 11.0.0	23%	93%	35%	33%

Shifting Environmental Conditions

Environmental changes are creating new pressures across all habitat types, and Connecticut's invertebrates are feeling the squeeze. In coastal systems, saltwater intrusion is shrinking high marshes and changing community composition. Species like coastal dragonflies and tiger beetles are running out of room as suitable habitat gets squeezed between the advancing shoreline and immovable development. Inland species confront different but equally serious challenges. Take the Mottled Duskywing, which has evolved to time its life cycle in synch with New Jersey Tea. If warming temperatures throw off this carefully choreographed relationship, the butterfly's larvae may emerge when their host plant isn't ready for them (Forister et al., 2010). Connecticut's freshwater mollusks and aquatic insects face their own version of environmental stress as reduced baseflows, thermal stress, and streams that dry up completely hit smaller upland waterways particularly hard.

For butterflies and other insects, survival often comes down to split-second timing. Species like the Monarch and Regal Fritillary are struggling with shifts in temperature, precipitation, and host plant timing. Monarchs depend on finding milkweed along their incredible migration routes and in breeding areas, but earlier springs may mean larvae emerge when their host plants aren't yet available (Lemoine, 2015). Insect life cycles have evolved around precise environmental cues, which makes them especially vulnerable to warming, altered precipitation patterns, and seasonal mismatches (Burgio et al., 2024). Connecticut's insect SGCN are among the best-studied when it comes to environmental vulnerability, and the findings are concerning: most are highly vulnerable (Figure 3.21).

Aquatic invertebrates face a cascade of problems as freshwater mussels and damselflies struggle with sedimentation, streams that stop flowing, and temperature-driven changes in water quality (Burgio et al., 2024). Shifting flow patterns disrupt larval dispersal and filter-feeding efficiency, while warming can decrease dissolved oxygen levels and make organisms more sensitive to pollutants. Many benthic species depend on host fish for part of their life cycles, but those fish may themselves be declining or moving to different areas. These ripple effects compound the direct habitat degradation caused by more frequent floods and droughts.

In Connecticut's marine waters, shellfish are confronting an invisible threat as ocean acidification makes it harder for mollusks to build and maintain their shells. Bay Scallops and Atlantic Sea Scallops face significant risks from ocean acidification, which impairs larval shell formation and increases mortality, with projected biomass declines exceeding 50% under high-emissions scenarios in the Northeast (Cooley et al., 2015; Rheuban et al., 2018). While most mollusk SGCN need more study to understand their vulnerability (Figure 3.21), scallops and other shellfish are most vulnerable during their early life stages, when even small increases in acidity can be lethal. For other marine species like crustaceans, arthropods, and starfish, we simply don't know enough to assess their vulnerability to environmental change (Figure 3.21), creating a significant knowledge gap that requires monitoring and further research (see Chapter 4).

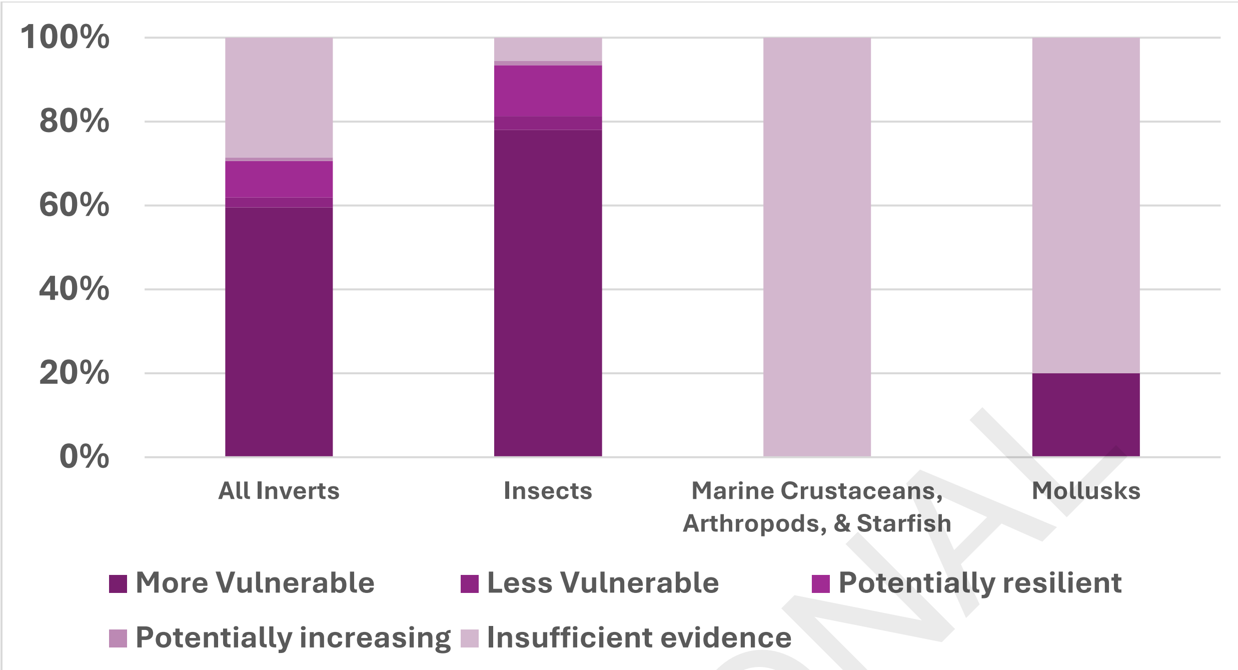

Figure 3.21 - Proportion of all Invert SGCN and each subgroup that fall into each shifting environmental conditions vulnerability category

Mammals

Issues

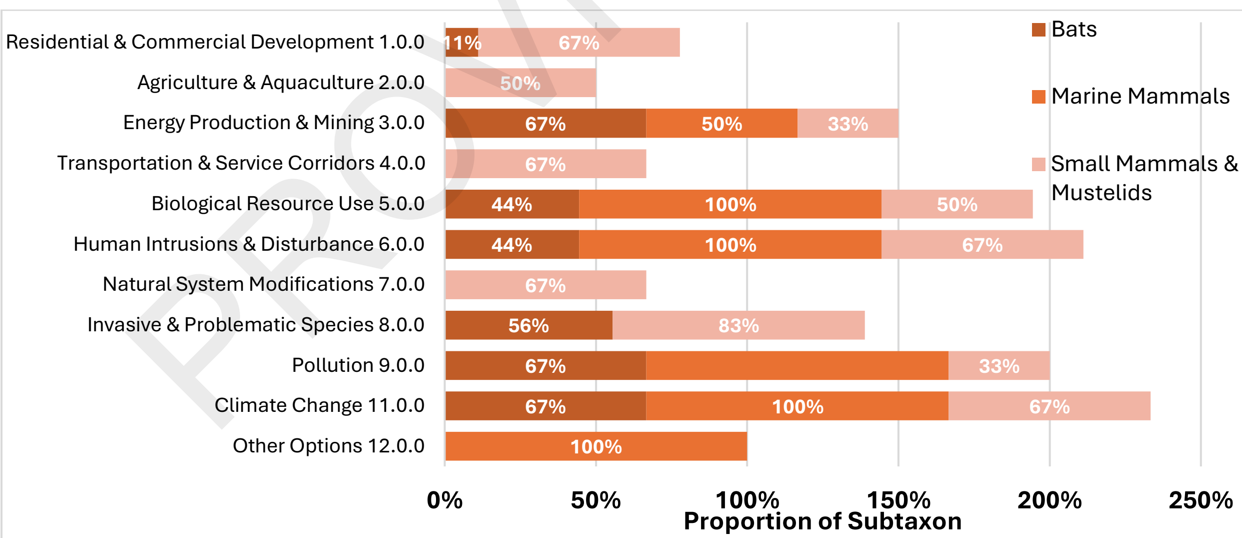

Figure 3.22 - Proportion of Connecticut Mammal SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species. Bars without a percentage are 6% or less.

Connecticut's Mammal SGCN and SAPS face multiple interacting threats that vary across subtaxa but converge around several major themes. Among these are habitat fragmentation and degradation, driven by suburban expansion, road construction, and the development of energy infrastructure. While total forest loss has slowed in recent years, with a net loss of only 52 acres between 2010 and 2015, the long-term trend remains concerning. The state lost approximately 115,000 acres of forest between 1985 and 2015, and large, unbroken forest blocks continue to decline (CLEAR, 2016; CT DEEP, 2020). As of 2020, only 53% of forestland met the definition of core forest, with the remaining areas increasingly fragmented by residential development.

Energy and transportation infrastructure further compound fragmentation pressures. More than 50% of Connecticut's Mammal SGCN and SAPS are affected by energy development, and nearly 30% are impacted by roads and service corridors. The Eastern Water Shrew, which occupies cold, high-gradient streams and wetland margins, is considered vulnerable to hydrological alteration and habitat fragmentation caused by culverts and road crossings. The Mammal Taxa Team noted that detection data confirm its presence in eastern and northwestern Connecticut; however, trapping success is low, and habitat degradation remains a concern. Habitat loss from solar installations and utility-scale development also threatens mammal communities reliant on early successional or interior forest conditions, such as the New England Cottontail. The cumulative effects of fragmentation reduce functional connectivity and elevate extinction risk for small or specialized populations (TCI and NEFWDTC, 2023).

A second major theme is the growing impact of invasive species and altered ecological processes, particularly in forest systems undergoing compositional change. Northern Flying Squirrels may decline due to a combination of habitat loss and competitive displacement by Southern Flying Squirrels. Conifer forests preferred by the northern species have declined in extent and are increasingly surrounded by hard mast-dominated stands that favor their southern congener. Parasite-mediated competition may also contribute to northern declines, as Southern Flying Squirrels are known to carry a nematode (*Strongyloides robustus*) to which the northern species is more susceptible (TCI and NEFWDTC, 2023). These dynamics, combined with forest pests like Hemlock Woolly Adelgid and Emerald Ash Borer, are shifting forest composition and undermining the ecological integrity of mammal habitats statewide (CT DEEP, 2020).

Finally, data deficiency continues to limit conservation planning for multiple species. Experts emphasized the lack of recent, verifiable records for the Southern Bog Lemming, which has had only a single confirmed observation in the past 15 years. Several other small mammals remain poorly documented due to low detection probability or limited survey effort. This lack of basic occurrence data restricts the ability to effectively assess population status, detect declines, and target conservation actions effectively. While not a direct threat, these information gaps compound the risks posed by ecological stressors and highlight the need for expanded taxon-specific monitoring and habitat-based assessments.

Table 3.29 – The percentages of each sub-taxonomic group and all Mammal SGCN affected by each Level 1 and 2 Other Threats.

Issue	Bats	Marine Mammals	Small Mammals & Mustelids	All Mammals
Residential & Commercial Development 1.0.0	11%	0%	67%	29%
Agriculture & Aquaculture 2.0.0	0%	0%	50%	18%
Energy Production & Mining 3.0.0	67%	50%	33%	53%
Transportation & Service Corridors 4.0.0	0%	0%	67%	24%
Biological Resource Use 5.0.0	44%	100%	50%	53%
Human Intrusions & Disturbance 6.0.0	44%	100%	67%	59%
Natural System Modifications 7.0.0	0%	0%	67%	24%
Invasive & Problematic Species 8.0.0	56%	0%	83%	59%
Pollution 9.0.0	67%	100%	33%	59%
Climate Change 11.0.0	67%	100%	67%	71%
Other Options 12.0.0	0%	100%	0%	12%

Shifting Environmental Conditions

Connecticut's mammals are facing a mosaic of environmental pressures that's pushing many species toward the brink. Taxa Teams identified changing environmental conditions as affecting the most Mammal SGCN (71%; Figure 3.22). Bats are getting hit hardest, with species including the Little Brown Myotis and Eastern Small-footed Myotis struggling with the combined effects of disease and environmental change. Every single Connecticut bat SGCN is listed as "More Vulnerable to changing environmental conditions" (Figure 3.23). White-nose Syndrome has already devastated bat populations, and warmer winters are making the situation worse by causing bats to wake up more often during hibernation, burning through energy reserves they need to survive until spring (Frick et al., 2010). Earlier spring warming creates another trap: bats may emerge from hibernation when there aren't enough insects available to sustain them. Tree-roosting species like the Hoary Bat face additional challenges from heat stress and disrupted migration timing, though we still don't know enough about most migratory bat species (Burgio et al., 2024). All these pressures combined put bat populations at serious risk of continued decline across the Northeast.

Small mammals and rodents are finding their worlds transformed as the New England Cottontail and Eastern Water Shrew struggle with environmental shifts in vegetation structure, hydrology, and snow cover, with 80% of Connecticut's small mammal SGCN categorized as "More Vulnerable" (Figure 3.23). The New England Cottontail illustrates how complex these challenges can be. This rabbit depends on dense early successional shrubland, a habitat type that's sensitive to both land-use changes and environmental shifts in plant community composition (TCI & NEFWDTC, 2023). Reduced snowpack and earlier melt can leave cottontails more exposed to predators by eliminating cover and making temperature regulation more difficult. The Eastern Water Shrew faces its own set of problems as this tiny mammal requires cold, fast-flowing streams but may find rising water temperatures and unstable water flow making suitable habitat increasingly rare (Burgio et al., 2024). The common thread among Connecticut's small mammals is that most have very specific habitat needs and can't move far when conditions change, making it unlikely they can adapt to rapid environmental shifts without targeted habitat protection and management.

Marine mammals like the Harbor Seal may seem insulated from terrestrial environmental changes, but they're not immune to shifts in prey distribution, ice cover, and ocean productivity that ripple through marine ecosystems. While we don't have enough information to assess how vulnerable Connecticut's marine mammals are to environmental change (Figure 3.23), regional marine mammal populations clearly respond to ecosystem-level shifts in the Northwest Atlantic (Burgio et al., 2024).

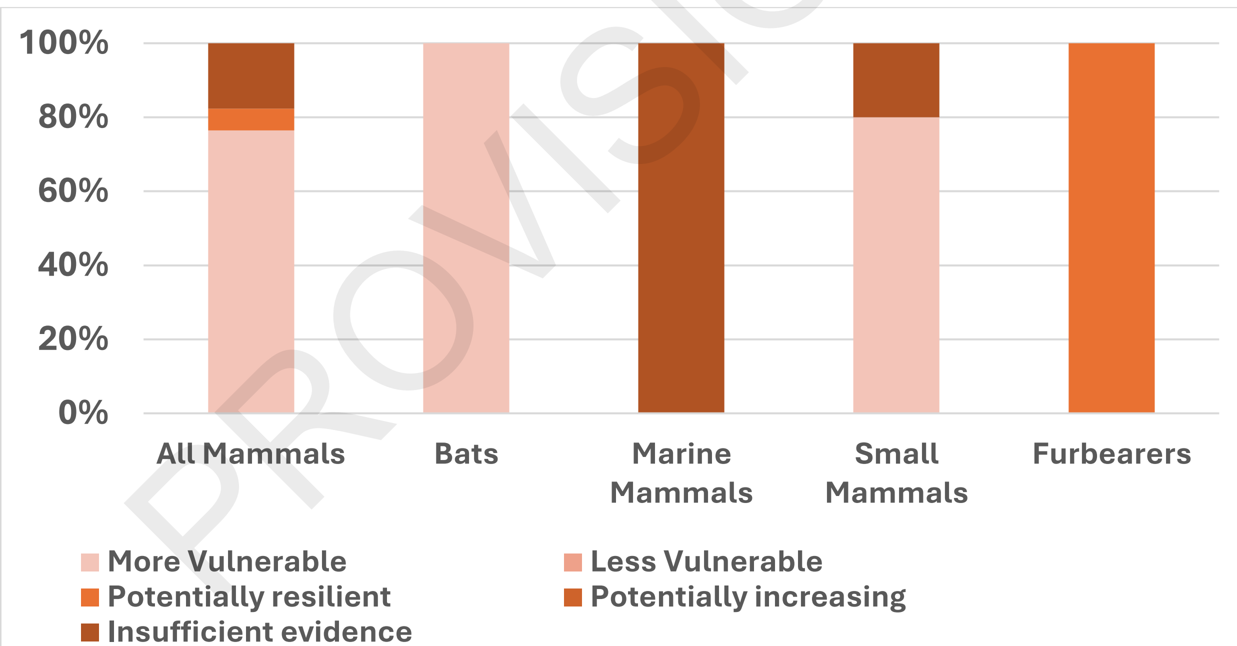

Figure 3.23 - Proportion of all Mammal SGCN and each subgroup that fall into each shifting environmental change vulnerability category

Plants

Issues

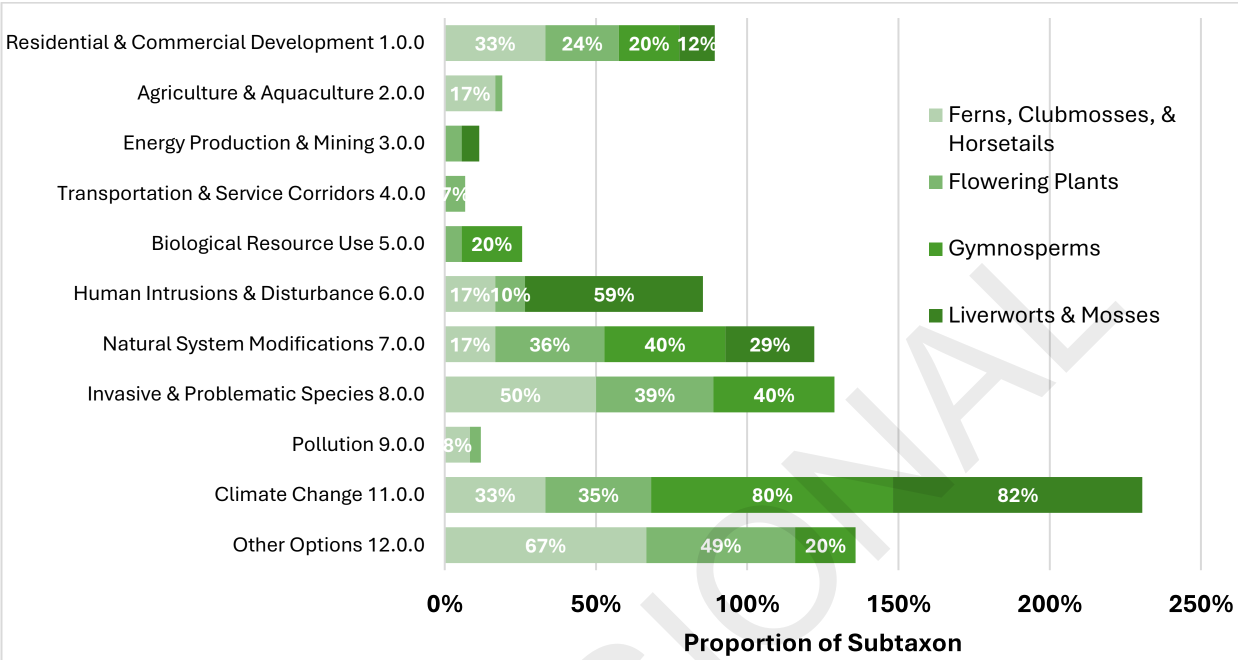

Figure 3.24 - Proportion of Connecticut Plant SGCN affected by each Level 1 threat category, disaggregated by major avian subgroups. Each horizontal bar represents the percentage of species within each sub-taxon assigned a given threat during the 2025 SWAP revision process. Multiple threats may apply to individual species. Bars without a percentage are 6% or less.

Connecticut's native plant Species of Greatest Conservation Need (SGCN) face an array of persistent and interacting threats, most of which stem from long-term patterns of habitat loss, ecological disruption, and underinvestment in botanical conservation. Many of the state's rarest species are habitat specialists—restricted to particular soil types, disturbance regimes, or hydrologic conditions—and are thus highly sensitive to changes in land use or community structure. In upland systems, fire suppression and forest succession have reduced habitat suitability for several disturbance-adapted taxa. The Plant Taxa Team identified species such as Scrub Oak and Dwarf Chinquapin Oak as ecologically important due to their role as host plants for numerous SGCN invertebrates, yet these oaks are declining across much of the state due to shading and competition from invasive shrubs. Similarly, Pitch Pine is threatened not only by habitat succession but by the northward spread of Southern Pine Beetle, now documented in Connecticut and expected to increase under projected warming scenarios (CT DEEP, 2020).

Coastal and wetland habitats support a disproportionate share of Connecticut's rare plant flora but are under acute threat from development, hydrologic modification, and sea level rise. Species such as Saltpond Grass and American Beachgrass occupy dynamic, narrow coastal zones increasingly constrained by infrastructure and erosion. While American Beachgrass is often used in dune restoration, planted populations may not support native invertebrates and can obscure declines in remnant native stands. Atlantic White-cedar swamps and other wetland complexes are particularly vulnerable to altered precipitation regimes and drainage, with both the Forest Action Plan and Plant Diversity report emphasizing the need to protect and restore hydrologically intact systems. These habitats are also underrepresented in the conservation land base and may be overlooked during acquisition and management planning (CT DEEP, 2020; NEPCoP, 2021).

Invasive species were consistently identified by the Plant Taxa Team as a top-tier threat, particularly in forest understories, wetlands, and disturbed edges. Invasive shrubs, vines, and forbs suppress native recruitment and alter ecological function. Species such as Garlic Mustard, Japanese Barberry, and Oriental Bittersweet are widespread across the state and difficult to manage at scale. This pressure is particularly severe for species with limited distributions or single-population status, such as the Two-flower Dwarf-dandelion, which persists at only one known site. In many areas, roadside mowing and utility corridor maintenance further favor invasives while simultaneously degrading habitat for native plants. The Forest Action Plan notes that invasive species now dominate the understory in many forest types and are often left unaddressed due to capacity shortfalls in land stewardship (CT DEEP, 2020).

Underlying these threats is a chronic deficit in botanical survey coverage, seed banking, and restoration infrastructure. The *Conserving Plant Diversity in New England* report identifies Connecticut as lacking sufficient ex-situ conservation resources and habitat management programs targeted to plant taxa, relative to regional benchmarks. The Plant Taxa Team highlighted unresolved taxonomic questions, especially for species such as Black Maple and Virginia Three-seed Mercury, as well as major data gaps for cryptic, annual, or grass- and sedge-dominated species. Traprock ridgelines, coastal edges, and early successional habitats remain poorly surveyed, and long-term monitoring is largely absent. Without robust data on status and trend, conservation attention risks being misallocated, and extirpation may go undetected. These capacity and infrastructure gaps are as limiting to plant conservation as ecological stressors and must be addressed for long-term recovery.

Table 3.30 – The percentages of each sub-taxonomic group and all Plant SGCN affected by each Level 1 and 2 Other Threats.

Issue	Ferns, Clubmosses, & Horsetails	Flowering Plants	Gymnosperms	Liverworts & Mosses	All Plants
Residential & Commercial Development 1.0.0	33%	24%	20%	12%	24%
Agriculture & Aquaculture 2.0.0	17%	2%	0%	0%	3%
Energy Production & Mining 3.0.0	0%	6%	0%	6%	5%
Transportation & Service Corridors 4.0.0	0%	7%	0%	0%	6%
Biological Resource Use 5.0.0	0%	6%	20%	0%	5%
Human Intrusions & Disturbance 6.0.0	17%	10%	0%	59%	13%
Natural System Modifications 7.0.0	17%	36%	40%	29%	35%
Invasive & Problematic Species 8.0.0	50%	39%	40%	0%	37%
Pollution 9.0.0	8%	4%	0%	0%	3%
Climate Change 11.0.0	33%	35%	80%	82%	38%
Other Options 12.0.0	67%	49%	20%	0%	47%

Shifting Environmental Conditions

Connecticut's plant communities are undergoing a transformation that would have been unimaginable just a few decades ago. While most Connecticut's plant SGCN don't have enough research to determine their relative vulnerability to environmental change (Figure 3.25), many are clearly feeling increasing pressure from shifts in temperature, precipitation, and disturbance frequency. A longer growing season might sound like good news for plants, and it may temporarily boost photosynthesis, but the reality is more complicated. Higher temperatures also speed up plant respiration, reduce carbon storage during heat waves, and increase the risk of damage from late frosts and soil freezing (Jeong et al., 2011; Norby et al., 2003; Richardson et al., 2018). These stresses reduce plant productivity and increase mortality, especially for species already struggling in fragmented or degraded habitats (CT DEEP, 2020).

Perhaps no threat to Connecticut's plants has been more dramatic or visible than the wave of insect and disease outbreaks, many of which are getting worse as temperatures warm. Connecticut's ash trees tell one of the most devastating stories. White Ash, Green Ash, and Black Ash are disappearing across the state due to infestation by the Emerald Ash Borer (*Agrilus planipennis*), which has now reached most of Connecticut and has killed ash trees in both natural and urban forests (CT DEEP, 2020). Eastern Hemlock is following a similar path, driven by the Hemlock Woolly Adelgid (*Adelges tsugae*), a tiny pest that survives better in warmer winters. This invasive insect is now present in every town in Connecticut, and infestations often bring additional problems like elongate hemlock scale and hemlock looper (CT DEEP, 2020).

The oak mortality that swept through eastern Connecticut between 2015 and 2019 shows how multiple stressors can combine with devastating effect. Consecutive years of drought weakened oak trees, making them vulnerable to repeated attacks by the Spongy Moth (Lymantria dispar), with some areas losing nearly their entire forest canopy (CT DEEP, 2020). In 2017 alone, over one million acres suffered Spongy Moth defoliation across the state (CT DEEP, 2020). Drought conditions, intensified by environmental changes, disrupted the fungus (*Entomophaga maimaiga*) that normally keeps Spongy Moth populations in check, allowing the pest to multiply unchecked. Weakened oak trees then became targets for the native Two-lined Chestnut Borers, which delivered the final blow to many stands and accelerated canopy decline (CT DEEP, 2020; Coleman et al., 2023). For more detailed information about Spongy Moth impacts and environmental change, see Staudinger et al. (2024).

Some of Connecticut's most important tree species have already been lost to disease. American Chestnut and Butternut, both once vital parts of the state's forests, have collapsed due to introduced fungal diseases. American Chestnut once made up as much as 25% of Connecticut's forests but now survives only as a resprouting understory shrub due to chestnut blight. Scientists at the Connecticut Agricultural Experiment Station are working to breed and reintroduce blight-resistant trees (CT DEEP, 2020). Butternut has been hit hard by butternut canker, which has further reduced its abundance and long-term viability (CT DEEP, 2020).

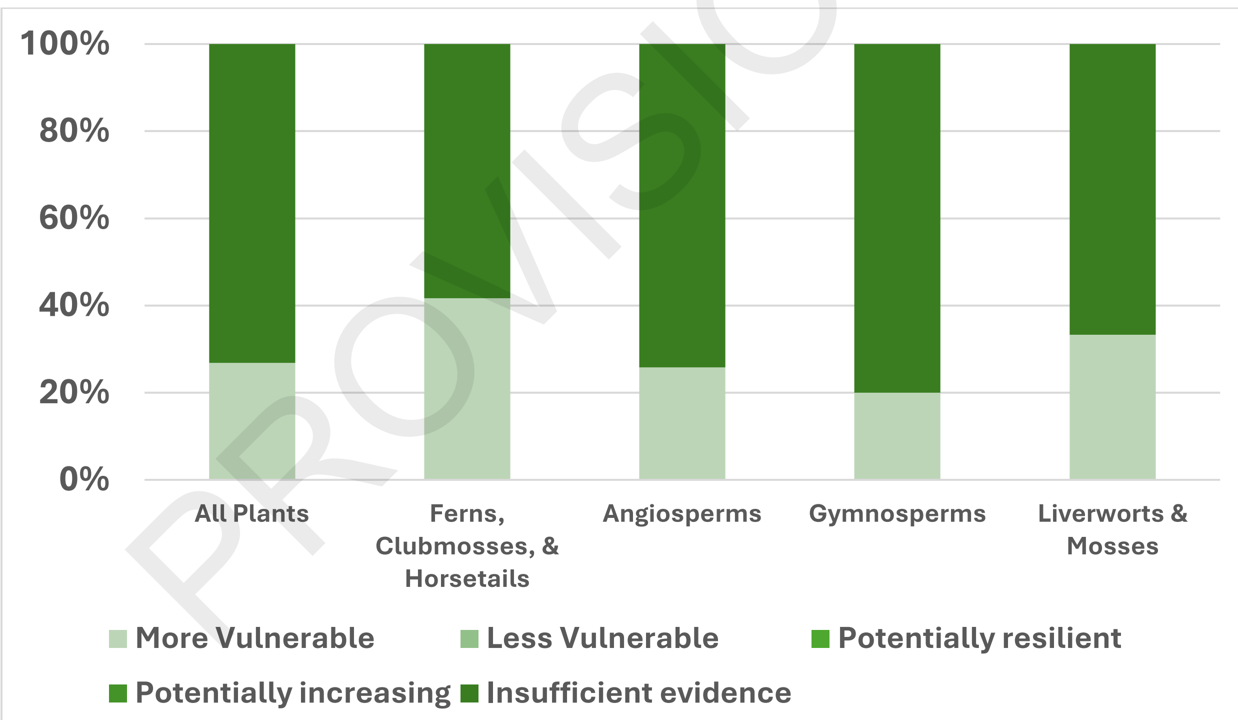

Figure 3.25 - Proportion of all Plant SGCN and each subgroup that fall into each shifting environmental change vulnerability category

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