

Wildlife Risk Assessment

OVERVIEW

This chapter addresses Element 3 of the NAAT Guidelines, which requires, “descriptions of problems that may adversely affect species identified in Element 1 or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.” New Hampshire’s habitats and wildlife are affected by many challenging issues, ranging from broad-scale threats such as climate change to local-scale threats such as cessation of grassland mowing. Conservation and management programs depend on an objective assessment of the degree of risks posed to species and habitats of greatest concern.

Generally, quantitative data on factors that influence New Hampshire wildlife are lacking. The factors for which data are available are evaluated in chapter 3. This chapter is based on the results of a structured qualitative assessment of factors that influence wildlife and their habitats. Using expert opinion of regional scientists and managers, and scientific literature, New Hampshire sought to meet the following objectives:

- Describe risk factors in a consistent format
- Objectively prioritize conservation actions within and among species and habitats
- Compile an overview of challenging issues

For all habitat assessments, wildlife were assumed to be an integral part of the habitat. Therefore, in this chapter, risks to broad groups of wildlife are considered risks to the habitat at large. Thorough peer-reviewed qualitative assessments were completed for wetland and terrestrial habitats, but assessments are preliminary for aquatic habitats, since the cur-

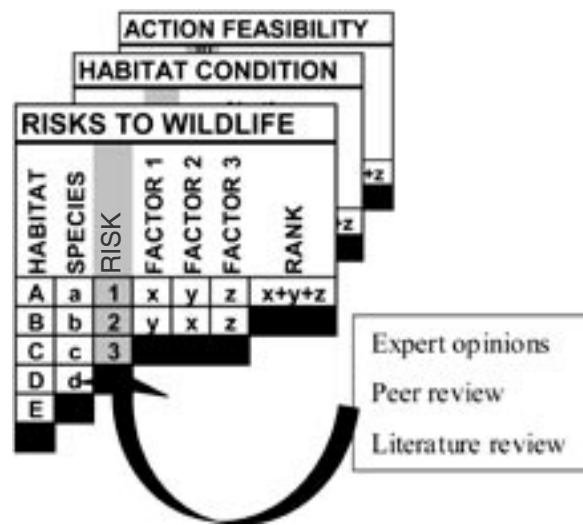


FIGURE 4-1. Risk factor ranking process. Wildlife experts identified risks to wildlife, and scored each risk based on their experience, published literature, and peer review.

rent classification of aquatic habitats is incomplete. Peer-review was somewhat limited for many wildlife species assessments due to the limited availability of taxonomic expertise. Rather than assess threats to individual fish species with poorly known distributions, the assumption was made that these and other aquatic species are similarly influenced by threats to aquatic habitats, which were assessed by watershed group. This approach was intended to shift from a species-specific approach to a more inclusive assessment of aquatic ecosystems in New Hampshire. However, because of the volume of information available and recent initiatives to restore the Atlantic salmon and assess native eastern brook trout populations, we included an analysis of threats to these two fish species.

RISK ASSESSMENT RESULTS

Wildlife habitats and populations are exposed to enormous pressure from human population growth and recreational activities. Urban development is the most challenging issue for most of New Hampshire's wildlife and habitats. Many habitats are rapidly disappearing or are fragmented by roads and dams, and many ecosystems are disrupted by human activities.

Even if all the land necessary to support New Hampshire's critical populations and habitats could be protected from development, without improving air and water quality, the long-term viability of New Hampshire's wildlife will not be sustained. Runoff polluted with agrochemicals and urban waste is toxic for many species, and atmospheric pollution causes broad degradation to all habitats.

Acid deposition leaches nutrients from forest soils, and forests across the Northeast are showing signs of distress, such as compositional shifts and reduced forage quality. Unfortunately, nutrients that are being lost, like calcium, come primarily from bedrock and cannot be replaced. Acid deposition can also aggravate other environmental problems, contributing to widespread ecological damage; mercury accumulates more rapidly in wildlife under acidic conditions, even in remote and relatively unpolluted waterbodies. Mercury can migrate over the land and through forests via insects and their predators. If mercury sources can be curtailed promptly, wildlife may recover before populations are permanently damaged.

Likewise, if climate change is not addressed, New Hampshire's wildlife and natural resources will be altered, particularly those in geographic extremes, such as mountaintops, northern lakes, and coastal islands. To prevent ultraviolet radiation, warmer temperatures, and the many attendant effects of ozone depletion, emissions must be addressed.

RISK FACTOR RANKING PROCESS

All of the challenges that wildlife face can be viewed as having two aspects in common. First, each has certain "risk factors" that potentially have negative impacts on wildlife, and second, each has a series of events or an "exposure pathway" that brings a risk factor to fruition for wildlife. It is more difficult and expensive to repair the damage once it is done than it is to address risk and avoid exposure in the first place.

Addressing underlying causes or factors that pose a risk to wildlife, rather than waiting to manipulate dwindling populations or habitats after the fact, is a powerful and pre-emptive long-term solution. In chapter 2, we identified some of the wildlife and habitats that showed symptoms of declining health. We developed a structured approach to understand the most prevalent risk factors for these declines and to work toward their recovery.

Patterns of cause and effect were organized systematically to diagnose the main exposure pathways for factors that threaten wildlife. Next, species and habitat experts completed scoring forms that ranked five variables (scope, severity, timing, likelihood, and information) for each known threat. The scores given were based on strict criteria, and were subject to a peer-review process. Evidence to support or refute scores was carefully evaluated by NHFG biologists. Finally, scores were cross tabulated and summarized to clarify which sources pose the greatest risk to species and habitats, and which species and habitats are at greatest risk. The process allowed biologists to critically analyze the range of expert opinions and focus on critical problems.

For the purposes of the WAP, NHFG created a list of 18 challenging issues that are most relevant to its habitats and species of conservation concern, and conducted a risk assessment for each one. NHFG developed a two-step process to determine the applicability and severity of different risk factors within each challenging issue, using a numeric scoring system to determine rank and class for comparative purposes. Government, NGO, and academic scientists were contracted to complete the ranking process and write summaries for their species or habitat of expertise, drawing on professional experience and a review of published and unpublished sources.

The summary rank is a planning and decision-making tool, not a true quantitative measure. The purpose of the ranking process was to provide a consistent basis for comparing risk factors across all species and habitats, and for placing those factors into categories of appropriate conservation action. The ranking process formed the basis for the risk assessment summaries presented in this chapter. Although the ranking process can be somewhat subjective, each step of the process was clearly described and fully transparent, allowing NHFG to assess and revise ranks as new information emerges.

RISK FACTOR RANKING PROCESS

Step One: Risk Exposure Form

Working from a list of challenging issues provided by NHFG, experts and expert panels compiled a list of all the associated risk factors relevant to each species and habitat. The experts carefully evaluated the series of events, or exposure pathway, that may cause each factor to become a problem for wildlife.

Step Two: Rank

Risk factors from form 1 were scored and ranked, using categorical criteria to assign numeric scores (1, 2, 3, or 4) (form 2). Each risk factor received five scores for magnitude (scope and severity) and urgency (timing, likelihood, and information). These are described briefly here and more fully in Appendix M.

- Scope: Percent (%) of the statewide distribution of the species/habitat that may be exposed to the risk factor
- Severity: Degree of loss of function in the exposed population/habitat (e.g., due to stressed survival, reproduction, foraging, etc.)
- Timing: Time until exposed population begins to lose function
- Likelihood: Probability that the scope, severity, and timing of the risk factor will be realized
- Information: Quality or reliability of the evidence, experience, or factual knowledge supporting the scores provided

An overall rank was computed for each risk factor, using a formula that gave equal weight to magnitude and urgency and scaled the result to 4. Scores could range from 0.25 (if all factors were ranked as 1.0) to 4.0 (if all factors ranked as 4.0). Scores were then categorized from 1-4, with 4 indicating highest possible risk.

Step 3: Summarizing Risk to Species and Habitats

Qualitative scores and ranks were compiled in a database, collated by broad categories ("challenging issues"), submitted to wildlife biologists for final review, and edited for internal consistency. The frequency of ranked exposure pathway scores that fell into the four risk categories were tabulated by categories, following the 'maximum effects' rule as described below. Next, the average 'maximum effect' was calculated within categories. Only maximum values for affected species and habitats were included in this average, so it provides a reasonable index of the 'Intensity' of a given risk factor. Finally, the cumulative effect of all the exposure pathways scored was summed within each category, and divided by the total number of all the species/habitats that were assessed to provide an index of the 'Cumulative' effect of the category. Results are shown in table 4-1 and table 4-2. To avoid misinterpretation, ranks are not shown. Summaries of the major exposure pathways were written up in detail and grouped under broad categories for analysis.

Step 4: Summarizing Challenging Issues

Ranks and score were summarized to provide an index of relative risk to species and habitats. First, the frequency of ranked exposure pathway scores that fell into the four risk categories were tabulated by species and habitat. For any issue, only the 'maximum effects' to species and habitats were tallied. Next, the average value of the top scoring exposure pathways was recorded for each species (top 3 exposure pathways) and habitat (top 6). Only the top values were used because the number of exposure pathways varied across species and habitats. Finally, the cumulative effect of all the exposure pathways was summed for each species and habitat. Results are shown in table 4-3.

TABLE 4-1. Preliminary habitat risk groups. Habitats were placed into risk groups based on information provided on risk assessment forms.

4	3	2
Grasslands	Alpine	Montane Watersheds
Appalachian Oak Pine Forest	Shrublands	Northern Upland Watersheds
Coastal Islands	Caves and Mines	Peatlands
Dunes	Cliffs	Southern Upland Watersheds
Hemlock-Hardwood-Pine Forest	Coastal Transitional Watersheds	
Lowland Spruce-Fir Forest	Connecticut River Mainstem Watersheds	
Non-Tidal Coastal Watersheds	Floodplain Forests	
Pine Barrens	High Elevation Spruce-Fir Forest	
Salt Marshes	Marsh and Shrub Wetlands	
Tidal Coastal Watersheds	Non-breeding Bird Habitat	
Vernal Pools	Northern Hardwood-Conifer Forest	
	Talus Slopes and Rocky Ridges	

*Appalachian oak-pine forest (424,943 ac), hemlock-hardwood-pine forest (2,688,744 ac), and lowland spruce-fir forest (770,048 ac), comprise 72% of New Hampshire's land area. Risk intensity varies within this extensive area; some lands are protected and others are developed. It is most accurate to state that among New Hampshire's large-scale habitats these 3 are in the highest risk category, rather than the total area of these habitats is in the highest risk category.

TABLE 4-2. Preliminary species risk groups. Data and taxonomic expertise were limiting factors for many fish and wildlife species. Obtaining peer review to validate the risk groups and completing assessments for poorly studied fish and wildlife are high priority tasks for WAP implementation.

LEVEL 4	LEVEL 3	LEVEL 2	LEVEL 1
American Brook Lamprey	American Eel	Alewife	Bats
Atlantic Salmon	American Marten	American Bittern	Burbot
Atlantic Sturgeon	American Shad	Banded Sunfish	Cooper's Hawk
Cobblestone Tiger Beetle	American Woodcock	Bicknell's Thrush	Eastern Racer
Common Loon	Bald Eagle	Blueback Herring	Eastern Red Bat
Common Tern	Blandings Turtle	Bobcat	Finescale Dace
Dwarf Wedgemussel	Brook Floater	Bridle Shiner	Hoary Bat
Eastern Pondmussel	Eastern Brook Trout	Common Nighthawk	Lake Trout
Jefferson Salamander	Eastern Pipistrelle	Grasshopper Sparrow	Northern Bog Lemming
Karner Blue Butterfly	Fowlers Toad	Lake Whitefish	Northern Harrier
Nelson's Sharp-tailed Sparrow	Hognose Snake	Marbled Salamander	Redbelly Dace
New England Cottontail	Indiana Bat	Northern Goshawk	Silver Haired Bat
Northern Leopard Frog	Lynx	Pied-billed Grebe	Slimy Sculpin
Piping Plover	Northern Myotis	Rainbow Smelt	Smooth Green Snake
Roseate Tern	Osprey	Redfin Pickerel	Tesselated Darter
Saltmarsh Sharp-tailed Sparrow	Peregrine Falcon	Red-shouldered Hawk	
Seaside Sparrow	Purple Martin	Ringed Boghaunter	
Shortnose Sturgeon	Racer	Round Whitefish	
Timber Rattlesnake	Ruffed Grouse	Rusty Blackbird	
Willet	Small Footed Bat	Sea Lamprey	
	Spotted Turtle	Sedge Wren	
	Spruce Grouse	Swamp Darter	
	Whip-poor-Will	Three-toed Woodpecker	
	White Mountain Arctic	Upland Sandpiper	
	White Mountain Fritillary		
	Wood Turtle		

TABLE 4-3. Top 10 risk factors for New Hampshire's wildlife and habitats. Average scores should be interpreted only as a relative measure within each group below. Scores from fish risk assessments were not available for this analysis. Risk assessment scores for fish are being reviewed as data and expertise become available.

(A) Cumulative risk to habitats

ISSUE	AVERAGE SCORE*
1 Development	2.6
2 Recreation	1.8
3 Transportation Infrastructure	1.4
4 Introduced Species	1.4
5 Acid Deposition	1.3
6 Unsustainable Harvest	1.1
7 Non-point Source Pollution	1.1
8 Altered Hydrology	1.0
9 Climate Change	0.9
10 Mercury	0.9

* Average across all ranked habitats, N = 26

(B) Cumulative risk to wildlife

ISSUE	AVERAGE SCORE*
1 Development	2.1
2 Recreation	1.1
3 Scarcity	0.8
4 Transportation Infrastructure	0.8
5 Introduced Species	0.7
6 Non-point Source Pollution	0.6
7 Predation and Herbivory	0.6
8 Mercury	0.6
9 Unsustainable Harvest	0.5
10 Altered Hydrology	0.5

* Average across all species, N = 62

(C) High-intensity risks to habitats

ISSUE	AVERAGE SCORE*
1 Development	2.7 (25)
2 Altered Natural Disturbance	2.3 (9)
3 Predation and Herbivory	2.3 (6)
4 Climate Change	2.0 (12)
5 Transportation Infrastructure	2.0 (18)
6 Non-point Source Pollution	1.9 (15)
7 Mercury	1.9 (12)
8 Altered Hydrology	1.8 (15)
9 Recreation	1.8 (26)
10 Acid Deposition	1.8 (19)

* Average across affected habitats, affected habitats (n) in parentheses

(D) High-intensity risks to wildlife

ISSUE	AVERAGE SCORE*
1 Scarcity	2.6 (19)
2 Development	2.5 (51)
3 Altered Hydrology	2.1 (14)
4 Predation and Herbivory	2.0 (19)
5 Transportation Infrastructure	2.0 (24)
6 Mercury	1.9 (18)
7 Oil Spills	1.9 (9)
8 Climate Change	1.9 (14)
9 Introduced Species	1.8 (22)
10 Recreation	1.8 (38)

* Average across affected species, affected species (n) in parentheses

