

Design and Implementation of Best Practices for Sustaining Vulnerable Wildlife Populations in Northeastern Forests

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Abstract

Northeastern forests provide essential habitat for a large suite of birds and mammals that occur in no other setting. This group includes several habitat specialists listed as Species of Greatest Conservation Need (SGCN) in multiple states. Their vulnerability to various stressors has prompted the formation of several species-level conservation and research initiatives. We set out to work with these focused partnerships and with key forest stewards to integrate current ecological and biogeographic information into on-the-ground habitat enhancement. These collaborations produced a set of decision-support tools for six Regional SGCN whose combined ranges encompass 13 northeastern states and the District of Columbia. The focal species were: American marten, Bicknell's thrush, Canada warbler, rusty blackbird, scarlet Tanager and wood thrush. With contributions from field biologists, foresters, and research scientists, we produced practical, science-based guidelines for conserving these uncommon and/or declining species and other wildlife that share their habitats. For the three most common species (Canada warbler, scarlet tanager, and wood thrush), we used relative abundance and forest ownership models to delineate areas that exhibit high management and conservation potential. For the others, we compiled other relevant information – including habitat suitability and occupancy models - to assist in matching the guidelines to the appropriate settings. To promote uptake, we uploaded the guidelines to a project web site and notified members of four regional working groups, plus eighty-five natural resource professionals who had contributed to the effort as technical reviewers, advisors, and/or participants in an end-user survey. We also communicated directly with five major land stewards throughout the region and verified their intention to integrate results of the project into conservation and management planning across hundreds of thousands of acres. To maximize the impact of these guidelines, we suggest that the Northeast Association of Fish and Wildlife Agencies reach out to state, consulting, and commercial foresters to encourage them to promote desired habitat conditions on lands that they manage. Furthermore, we suggest that the Northeast Conservation Information and Education Association be engaged in the packaging and delivery of these products to a wider group of forest and wildlife managers.

Introduction

State Wildlife Action Plans have identified several hundred species that warrant conservation attention across some or all of the thirteen states that make up the Northeast region. A small subset of forest-dwelling vertebrates have attracted special attention due to: a) high regional responsibility; b) long-term and/or pronounced declines; or c) uncertain recovery in the face of changing habitat conditions. This group includes: American marten, Bicknell's thrush, Canada warbler, rusty blackbird, scarlet tanager, and wood thrush.

Regional or international working groups have formed to study and/or conserve five of these species (Table 1). Although these collaborations are at different stages of development, each provides a valuable forum for concentrating expertise and exchanging information. In this way, single-species conservation efforts advance the understanding of conservation issues and management opportunities at large spatial scales.

However, natural resource stewards who maintain or create critical forest habitat work at smaller scales, making day-to-day and long-term decisions on management units that range from tens to hundreds of thousands of acres. The aggregation of decisions made at the stand or property level ultimately determines the regional availability and configuration of habitat. Often, these decisions are made in isolation from the research, modeling, and planning conducted by conservation scientists at the landscape scale.

Recognizing this issue, Northeast Partners In Flight organized a conference in 2012 around the theme of "Bridging the Implementation Gap". This meeting and other regional wildlife initiatives have highlighted the need to: a) assess the information needs of decision-makers; b) synthesize specialized knowledge in a useful format; and c) apply the knowledge through habitat guidelines.

We aimed to accelerate the integration of scientific knowledge into site-based decisions by producing habitat management guidelines and spatial prioritizations for six of the Northeast's most vulnerable wildlife species. Our specific objectives were to:

1. Develop technical specifications for the guidelines based on the information needs of cooperating habitat stewards.
2. Produce and disseminate recommended conservation and management practices for the six focal species, addressing habitat overlap with other Regional SGCN.
3. Delineate, rank, and release management and conservation opportunity areas for each of the focal species within the northeastern United States.
4. Cultivate and verify the intent of cooperating habitat stewards to implement focal species guidelines within the designated areas.

Methods

Objective 1. Develop technical specifications for the guidelines based on the information needs of cooperating habitat stewards.

First, we developed an online questionnaire to gather feedback on the format and general contents of the habitat guidelines. We then distributed the survey to 386 foresters, wildlife biologists, conservation planners, and environmental consultants whose names and contact information had been collected from agency and industry websites and from the rolls of key

professional societies, such as the Society of American Foresters and the Forestry Guild. We made a special effort to reach managers of large ownerships with this survey, particularly state forests, national forests, and commercial timberlands. We received 42 survey responses from 12 northeastern states, plus general comments from another 9 individuals (Table 2). Together, this group of respondents included stewards of approximately 13.25 million acres or 20,700 sq mi of private and public lands, an area roughly the size of West Virginia.

Next, we used the survey results to develop a standard format and style guide for authors of the habitat guidelines. This guide reflected end-user preferences for length, content, information sequence, ratio of text to images, and tone.

Objective 2. Produce and disseminate recommended management practices for the six focal species, addressing habitat overlap with other regional SGCN.

With research assistance from student interns at Plymouth State University, we synthesized the best available information on the status, habitat requirements, and management and conservation opportunities for each of the focal species. Sources included peer-reviewed literature, government technical reports, graduate dissertations, state wildlife action plans, and products of multi-institutional partnerships, such as the “North American Landbird Conservation Plan” (Rosenberg et al. 2016). At the same time, we collected information about co-occurring SGCN from community-level investigations of wildlife habitat.

Once initial drafts of the habitat guidelines were completed, we solicited reviews from research scientists, foresters, and wildlife biologists throughout the region. In all, we received 82 individual reviews from 40 different reviewers (Table 3), averaging close to 14 reviews per species (range = 9 to 20). Reviews originated from offices in ten states and two Canadian provinces and included feedback from five state foresters and 11 state wildlife biologists.

We carefully considered all of the comments and resolved instances of conflicting feedback through discussion with the Northeast Fish and Wildlife Diversity Technical Committee (NEFWBTC). We also sought additional input through conversation with several reviewers who had provided especially insightful comments. We then substantially revised the original drafts and circulated the updates to key public and private-sector stakeholders for a second round of review in order to ensure that the final products met high standards for accuracy, balance, and thoroughness.

Objective 3. Delineate, rank, and publicly release management and conservation opportunity areas for each of the focal species within the northeastern United States.

We had originally proposed to engage experts in a ranking of management and conservation opportunity areas for each species and to share the resulting data layers via Data Basin. However, the Northeast Fish and Wildlife Diversity Technical Committee advised us to take a simpler approach and produce or compile maps for each species and make them available through the Northeast Regional Conservation Grants web page (<http://rcngrants.org>) as references to complement the habitat guidelines.

To identify landscapes that present favorable conditions for management and conservation, we used ArcGIS 10.0 to delineate areas where high relative abundance of each of three focal species (Canada warbler, scarlet tanager, and wood thrush) align with compatible forest ownerships. This involved the ranking of grid cells into five relative abundance classes (1-5) based on the

average annual Breeding Bird Survey route count for the period 2008-2012 (Sauer et al. 2014). The relative abundance classes were categorized by natural breaks in the data. We then created a separate grid of ownership compatibility ranks using a regional model of forest ownership types (Hewes et al. 2014). For this layer, ranks were assigned subjectively based on how well each ownership type's land-use and parcel-size characteristics align with the focal species' forest age-class and area requirements. For example, large ownership types with low management intensity were considered highly compatible with wood thrush and scarlet tanager, two species associated with large tracts of predominantly mature forest. By contrast, ownership types with a high proportion of forest in young age-classes were ranked low for these species, but high for Canada warbler, which breeds at relatively high densities in regenerating harvest zones. Finally, to create a new, mapped index of management opportunity, we conducted a weighted overlay of relative abundance ranks and ownership compatibility ranks, assigning a weight of 0.67 to the relative abundance layer and a weight of 0.33 to the ownership compatibility layer. The result is a scaled map of management opportunity with indices displayed in five categories, from low opportunity (1) to high opportunity (5).

This method of spatial prioritization was not possible for the three other focal species due to lack of reliable and regionally consistent estimates of habitat suitability, relative abundance, or occupancy. Therefore, we assembled the best available spatial information for rusty blackbird, Bicknell's thrush, and American marten in order to help forest stewards assess implementation opportunities on lands that they manage. For rusty blackbird, we produced a map of suitable terrestrial habitat classes (Anderson et al. 2013) within the species' northeastern US breeding range based on location records derived from telemetry studies, eBird, and state breeding bird atlases. For Bicknell's thrush and American marten we compiled ecoregional models of habitat suitability, landscape capability, and/or occupancy to help forest stewards target their habitat management activities.

Objective 4. Cultivate and verify the intent of at least five cooperating habitat stewards to implement the habitat guidelines in areas with potential to deliver conservation benefits.

Over the course of the project, we used various methods to promote adoption and implementation of the guidelines on both public and private lands, with a special focus on large, actively managed properties where implementation could achieve the greatest added benefit. The following timeline summarizes key actions in this process through 15 February 2017. Plans for continuing outreach are described in the discussion section of this report.

Jul 2014 We organized a two-day forest and wildlife management tour of a wind energy installation and commercial timberlands located in Cöos County, NH. Participants included representatives of the Audubon Society of New Hampshire, Dartmouth College Woodlands, New Hampshire Fish and Game Department, Vermont Center for Ecostudies, and Wagner Forest Management.

Jul 2015 We conducted an online survey of prospective end-users, soliciting input on format and contents of the habitat guidelines. For details about the survey population refer to Objective 1 and Table 2.

Jul 2015 We held a teleconference with foresters and wildlife biologists from Huber Resources Group, Irving Woodlands, Plum Creek, LLC (now

Weyerhaeuser), and Wagner Forest Management.

Dec 2015 – Jan 2016

We circulated draft management guidelines for review and feedback from foresters, wildlife biologists, and conservation planners and engaged 40 individuals from ten states and two Canadian provinces in this process (Table 3).

Sep 2015

We organized a forest and wildlife management tour in Piscataquis County, ME with the Audubon Society of New Hampshire, Irving Woodlands, University of Maine Cooperative Forestry Research Unit, Wagner Forest Management, and Weyerhaeuser.

May 2016

We gave a poster presentation and conducted individual outreach at the Northeast Fish and Wildlife Conference in Annapolis, MD.

Jun 2016

We organized a field workshop for foresters in concert with University of New Hampshire Cooperative Extension. The workshop, held at the the Reitsma Family American Tree Farm and Canaan Town Forest in Canaan, NH, was attended by two cooperative extension educators and 17 state and private foresters, all of who received continuing education credit for their participation.

Dec 2016

We met with the US Fish and Wildlife Service Northeast Region Landbird Biologist, National Wildlife Refuge Forest Ecologist, Atlantic Coast Joint Venture North Atlantic Coordinator, Wildlife and Sport Fish Restoration Program Biologist, and Assistant Regional Director for Science Applications to discuss opportunities to bundle habitat guidelines with other regional decision-support products, including the North Atlantic Regional Conservation Opportunity Areas Map.

Feb 2017

We circulated final products to key stakeholders, including the Northeast Fish and Wildlife Diversity Technical Committee, all technical reviewers, survey respondents, and members of four regional or international conservation working groups organized around the focal species. We also posted the material to a publicly accessible website and made plans to initiate broader outreach to state, federal, and private-sector foresters in the spring of 2017 following additional planning with the NEFWDTC.

Results

End-user Survey

Of the 42 individuals who completed the online survey of end-users, 69% identified themselves as foresters and 31% as wildlife biologists. This group also included smaller numbers of conservation planners (12%), extension educators (7%), conserved land managers, and research scientists (both 5%) (Fig. 1). Twelve of the region's 13 states were represented, with the highest level of participation from natural resource professionals based in Pennsylvania, New Hampshire, Virginia, New York, and West Virginia (Fig. 2). State agencies were very well represented in the survey pool (38% of respondents), as was the forestry service industry (29%).

Other groups that participated in the survey at low rates (<5%) included federal agencies, universities, non-profit organizations, and timberland investment management organizations.

Eight-five percent of survey respondents reported that they directly participate in the planning or implementation of forest management. Of this group 86-97% showed interest in applying management guidelines to the more widely distributed focal species (Canada warbler, scarlet tanager, and wood thrush), while approximately one-third indicated that they would consider using the guidelines to manage habitat for the less common and more range-restricted species (American marten, Bicknell's thrush, and rusty blackbird) (Table 4).

The formatting option that garnered the highest level of support was a 12-page document with an even balance of text and photographs (Fig. 3). More than 90% of respondents considered the following contents to be "very useful" or "extremely useful".

- Desired habitat conditions (stand composition and structure)
- Recommended forestry practices
- Management guide (table of starting conditions, objectives, management options, and desired conditions)
- Summary of recommended field practices

We also found high levels of interest in sections that profile the focal species, identify co-occurring Species of Greatest Conservation Need, and describe landscape-level indicators of where to create and sustain habitat.

Guidelines for Managing Habitat for Regional Species of Greatest Conservation Need

We produced five sets of guidelines for six species, combining scarlet tanager and wood thrush material into a single document on the advice of reviewers. They are currently posted online at <http://highbranchconservation.com/rsgcnhabitat/> and have been submitted to the Wildlife Management Institute and to the NEFWDTC as addenda to this report.

On average, we devoted 11.3 pages of material per species, including references, and acknowledgments. This figure amounted to just under the 12-page length suggested by survey respondents. Maps, photographs and tables make up approximately 40% of the guidelines, short of the 50% preference expressed by prospective end-users. The shortfall resulted from the inclusion of lengthy literature cited and reference sections, which were added to the first drafts in response to reviewer feedback.

For each Regional SGCN, we identified 15 to 33 other co-occurring vertebrate Species of Greatest Conservation Need that might benefit from implementation of the guidelines. These lists were largely comprised of the region's most observable wildlife group, songbirds, however mammals, reptiles, and amphibians were also included when evidence of an association was clear. The tabulated lists note habitat requirements shared with the focal species and designates those species considered to be high or very high regional conservation priorities based on a prior assessment by the NEFWDTC (December 2013).

Maps of Management Opportunity

Spatial prioritizations have been submitted to the Wildlife Management Institute and to the NEFWDTC as addenda to this report. Good management opportunities exist for at least one of the RSGCN across most of the Northeast and Mid-Atlantic regions, except in non-forested

settings and heavily developed landscapes. Predominantly forested areas at middle to upper elevations exhibit particularly high management potential for the focal species, based on patterns of distribution, relative abundance, and forest ownership. We present simple summaries of spatial prioritizations below, but emphasize that the map products are the best resource for matching up desired conditions and recommended practices with the appropriate landscape.

American marten	Large blocks of hardwood, softwood, and mixed forest in the Adirondacks, Green Mountains, White Mountains, and northern Maine that receive high amounts of snowfall.
Bicknell's thrush	Montane and boreal balsam fir-red spruce forests in the Catskill, Adirondack, and northern Appalachian Mountains above an elevation threshold that decreases from 3,425 ft in the Catskills to 2,300 ft in northern Maine.
Canada warbler	Moderate to large blocks of moist hardwood, softwood, and mixed northern forests across a wide range of elevations; also, headwater/upper-elevation forests of Pennsylvania and West Virginia concentrated along the Allegheny/Appalachian Plateaus.
Rusty blackbird	Boreal upland forests and northern swamps drained by low-gradient streams in the Adirondacks, southern Green Mountains, the Northeast Highlands of Vermont, northern New Hampshire, and northwestern Maine.
Scarlet tanager	Hardwood and hardwood-dominated mixed forest of the Central Appalachian region, including much of Pennsylvania, West Virginia, and westernmost Virginia
Wood thrush	Hardwood and hardwood-dominated mixed forests of the Allegheny Mountains, including the Plateau and Ridge and Valley sections, especially in Pennsylvania and West Virginia; also some areas of the Adirondack, Berkshire, and southern Green Mountains.

Indicators of Intent to Apply Guidelines to Management and Conservation Activities

We found a strong interest among forest stewards throughout the region in enhancing conditions for uncommon and declining species, particularly where their requirements are compatible with other landowner objectives. Even before the guidelines were completed, approximately 50 land managers around the region had already indicated that they would consider implementing the guidelines for one or more of the focal species in forests that they manage. This number includes 36 survey respondents and another dozen or more technical reviewers and advisors. Feedback received during the review included the following sample statements:

“Very good products. Informative, helpful, comprehensive, and easy to follow.” - Forest District Manager, Pennsylvania Bureau of Forestry

“I like the format and think the photos are crucial. I am looking forward to implementing them.” - Senior Zoologist, NJ Department of Environmental Protection

“Excellent resource. I look forward to using them as we move forward with our management plans.” - USFWS Biologist, Silvio O. Conte National Fish and Wildlife Refuge

“Really informative, useful documents that will be well received by land managers, foresters, and conservation staff.” – Wildlife Outreach Specialist, UNH Cooperative Extension

“Everything a forester may need to manage for a particular species.” - Regional Forester, NY State Department of Environmental Conservation

“Excellent job!! The presentation is very professional, thorough and clear.” - Director of Conservation Science, Cornell Lab of Ornithology

Since the guidelines were completed, we have confirmed the intent of five other land managers to integrate information about desired conditions and recommended practices into their management planning and operations.

1. The lead forest ecologist for the Northeast National Wildlife Refuge System aims to work with his team of foresters to incorporate the appropriate habitat guidelines across a network of about two dozen predominantly forested, inland refuges stretching from Virginia to Maine. This work will begin in the near future with rusty blackbird habitat enhancements at up to four northern refuges.
2. The executive director and community forest manager for a Maine land trust will draw on the American marten and Canada warbler habitat guidelines in establishing age-class, basal area, and stand structure goals in a management plan for a 21,870-acre property near Grand Lake Stream, Maine. The organization will also apply information contained in the guidelines to refine management plans for American marten on its other major holding, which spans an adjacent 33,808 acres.
3. The director of forestry operations for a New Hampshire-based timberland investment management organization is interested in applying information from the Canada warbler and rusty blackbird guidelines to a collection of 21 tracts in New York’s Adirondack Park that total 276,000 acres.
4. A private landowner in west-central New Hampshire will use the Canada warbler guidelines as a primary reference in planning harvest units and methods on a property that encompasses approximately 13,000 acres of mixed and northern hardwood forest under conservation easement.
5. The private lands forester for the New Jersey Forest Service will promote adoption of the guidelines to landowners throughout the state and encourage integration of their contents into the 6,200 woodland management plans and 2,300 forest stewardship plans in the Forest Service’s portfolio. State foresters in New Jersey will also promote the material to woodland owners who do not have plans and link or refer to the guidelines in the agency’s outreach materials.

In addition, a forestry consultant in New Hampshire has added the guidelines to a set of best management practices that he administers in coordination with colleagues at UNH Cooperative Extension and the Stewardship Network as part of a program called “Dirt to Trees to Wildlife”. This program promotes wildlife management based on soil properties. We have also received strong indications of interest from a member of the Long Island Sound Watershed Regional Conservation Partnership (RCP) Technical Committee, who recognizes an opportunity to align habitat management objectives among the RCP’s member organizations. Finally, the USFWS Northeast Regional Assistant Director for Science Applications has offered to promote adoption of the guidelines in ongoing discussions of cooperative forest and wildlife management with the

National Alliance of Forest Owners. The guidelines will be made available to this group as new resources to support science-based decisions, especially within the Northeast's recently delineated Regional Conservation Opportunity Areas.

Discussion

In order to capitalize on growing interest and maximize the conservation impact of these products, we suggest that the Northeast Association of Fish and Wildlife Agencies:

- Coordinate with stewards of state forests, game lands, and wildlife management areas to deliver desired conditions in regions identified by the spatial prioritization.
- Engage the Northeast Conservation Information and Education Association in developing an appealing, web-based platform, professionally designed booklets or field cards, and programming to promote adoption of the Regional SGCN habitat guidelines.
- Recommend the guidelines as a practical resource for state-based, private land foresters and extension educators who work with owners of family forests.

In the meantime, we will continue working with our partners to ensure that the guidelines are put to good use. For example:

- Our rusty blackbird and Bicknell's thrush collaborators will participate in a panel on "Effects of Forest Practices on Wildlife" at the Annual Meeting of the New England Society of American Foresters. Hard copies of all the guidelines will be made available to all of those who attend this conference.
- We will work with the International Wood Thrush Conservation Alliance to convert the PDF guidelines for this species into navigable, online text and images posted to the alliance's website.
- We will prepare a presentation on the wood thrush guidelines for a two-day meeting of the Appalachian Mountain Joint Venture at the Cornell Lab of Ornithology in Ithaca, NY.
- We will continue to work with Environment and Climate Change Canada and the Boreal Avian Modelling Project to produce a complementary set of guidelines for managing Canada Warbler habitat in New Brunswick, Nova Scotia, Prince Edward Island, and southeastern Quebec. These will be completed by May of 2017.

The habitat guidelines have been well received by various segments of the northeastern forest management community, including land trusts, state and federal agencies, and managers of commercial timberland. In addition to providing technical support for sound decisions, they facilitate dialogue across professional and sectoral boundaries by synthesizing current information. But since northeastern forests are dynamic and threats to wildlife are complex, the guidelines will need to be updated with new knowledge gained over the next five to ten years. Therefore, we encourage natural resource agencies and ecoregional cooperatives to partner with research universities in order to assess the response of Regional SGCN to management activities that create the desired conditions. Land stewards who adjust their practices based on results of such assessments will contribute the most to sustaining regional populations of vulnerable forest wildlife.

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<http://highbranchconservation.com/rsgcnhabitat/authors-reviewers-advisors/>.



Tables

Table 1. Species conservation initiatives engaged and supported by this project.

Canada Warbler International Conservation Initiative
International Bicknell's Thrush Conservation Group
International Rusty Blackbird Working Group
International Wood Thrush Conservation Alliance
Martes Working Group

Table 2. End-user survey respondents

Haley Andreozzi	Wildlife Outreach Coordinator	UNH Cooperative Extension
Robert Arnold	Forester	Arnold Forestry & Surveying, LLC
Karen Bennett	Extension Forester	UNH Cooperative Extension
Chris Bernier	Wildlife Biologist	Vermont Fish & Wildlife Department
Dan Brauning	Wildlife Diversity Section Chief	Pennsylvania Game Commission
Gwen Brewer	Science Program Manager	Maryland Department of Natural Resources
Barry Burgason	Wildlife Biologist	Huber Resources Group
Tim Burpoe	Property Manager	Molpus Woodlands Group, LLC.
Joel Carlson	Principal Consultant and Owner	Northeast Forest and Fire Management, LLC
Richard Cary	Consulting Forester	ForestLand Consulting
John Coleman	Consulting Forester	self employed
Michael Eckley	Forester	The Nature Conservancy
David Falkenham	County Extension Forester	UNH Cooperative Extension
John Gilbert	Wildlife Biologist	Irving Woodlands
Sergio Harding	Wildlife Biologist	VA Department of Game and Inland Fisheries
Ken Hotopp	Consulting Forester	Hotopp Forest Management
Jon Howard	Owner	Endless Mountains Land Services LLC
Dan Hudnut	Vice President	Wagner Forest Management
David Irvin	EP Forester I	Connecticut DEEP, Forestry Division
Jay Jeffreys	Science Team Leader	VA Dept of Game & Inland Fisheries
Andrew Johnson	New England Cottontail Biologist	Contractor, Wildlife Management Institute
Shannon Kearney	Wildlife Technician	CT DEEP Wildlife Division
Don Keirstead	Ecologist	USDA NRCS
Jon Klischies	Supervising Forester	NJ State Forestry Services
Michael Kusko Jr.	Retired District Forester	PA Bureau of Forestry
Matt Leonard	Forester	Vermont Dept of Forests, Parks and Rec
Ross S. Morgan	Forester	Northern Forest Conservation Services
Ron Muir	Transmission Forester	FirstEnergy
Justin A. Perry	Forester	NYS DEC Division of Lands & Forests
Sharon Petzinger	Senior Zoologist	NJ Fish and Wildlife
Aaron Plaughter	Manager, Certified Fiber	WestRock
Leighlan Prout	Wildlife Program Leader	White Mountain National Forest
Mike Pruss	Private Lands Section Chief	PA Game Commission
Cliff Rexrode	Consulting Forester	
Stephen Satterfield	Wood Procurement Manager	Finch Paper LLC
Andrew Sheere	Consulting Forester	Long View Forest
Michael D. Skinner	Consulting Forester	Confluence Forestry
Peter J. Smallidge	NYS Extension Forester	Cornell University Dept. of Natural Resources
Henning Stabins	Wildlife Biologist	Weyerhaeuser
Bill Stack	Forester / Natural Resource Mgr.	Seventh Generation Forestry
Cecile Stelter	District Forester	PA DCNR Bureau of Forestry

Marc Tremblay	Consulting Forester	Land Management Services
Lisa Wahle	Contract Wildlife biologist	WMI / CT DEEP
Jeff Wiegert	Regional Forester	NYS Dept. of Environmental Conservation
Judy Wilson	Wildlife Biologist	CT DEEP Wildlife Division
Jonathan L. Wood CF	Forester	Consulting Forester
Todd Wyckoff	Supervising Forester	New Jersey State Forestry Services

Table 3. Technical reviewers for the habitat guidelines

Technical Reviewers

American Marten

Chris Bernier	Wildlife Biologist	Vermont Fish and Wildlife Department
Barry Burgason	Wildlife Biologist	Huber Resources Group
Dan Hudnut	Vice President	Wagner Forest Management
Walter Jakubas	Wildlife Biologist	ME Dept. of Inland Fisheries and Wildlife
Jillian Kilborn	Wildlife Biologist	NH Fish and Game Department
Dan Kilborn	Forester	Vermont Land Trust
Cory Mosby	Wildlife Biologist	ME Dept. of Inland Fisheries and Wildlife
Alexej Siren	Wildlife Ecologist	Northeast Climate Science Center
Will Staats	Wildlife Biologist	NH Fish and Game Department
Henning Stabins	Wildlife Biologist	Weyerhaeuser
Bill Stack	Forester/Natural Resource Manager	Seventh Generation Forestry
Steve Weber	Wildlife Biologist	Wildlife Management Institute

Bicknell's Thrush

Yves Aubry	Biologist	Environment and Climate Change Canada
Randy Dettmers	Landbird Biologist	US Fish and Wildlife Service
Brett Hillman	Wildlife Biologist	USFS – Green Mountain National Forest
Dan Hudnut	Vice President	Wagner Forest Management
Pam Hunt	Senior Biologist	Audubon Society of New Hampshire
Adrienne Leppold	Wildlife Biologist	ME Dept. of Inland Fisheries and Wildlife
John Lloyd	Director of Science	Vermont Center for Ecostudies
Leighlan Prout	Wildlife Program Leader	White Mountain National Forest
Henning Stabins	Wildlife Biologist	Weyerhaeuser

Canada Warbler

Haley Androozzi	Wildlife Outreach Coordinator	UNH Cooperative Extension
Barry Burgason	Wildlife Biologist	Huber Resources Group
Rachel Cliche	Wildlife Biologist	US Fish and Wildlife Service
Dan Hudnut	Vice President	Wagner Forest Management
Pam Hunt	Senior Biologist	Audubon Society of New Hampshire
Dan Kilborn	Forester	Vermont Land Trust
Jillian Kilborn	Wildlife Biologist	NH Fish and Game Department
John Klischies	Supervising Forester	NJ State Forestry Services
James McCann	State Zoologist	MD Department of Natural Resources
Amanda Rodewald	Director of Conservation Science	Cornell Lab of Ornithology
Bill Stack	Forester/Natural Resource Manager	Seventh Generation Forestry
Cecile Stelter	District Forester	Pennsylvania DCNR Bureau of Forestry
Matt Tarr	Wildlife Specialist / Assoc. Professor	UNH Cooperative Extension
Suzanne Treyger	Forest Program Manager	Audubon New York
Rachel Vallender	Bird Conservation Biologist	Environment and Climate Change Canada
Steve Weber	Wildlife Biologist	Wildlife Management Institute
Alana Westwood	Avian Ecologist	Boreal Avian Modelling Project
Jeff Wiegert	Regional Forester	NYS Dept. of Environmental Conservation

Rusty Blackbird

Barry Burgason	Wildlife Biologist	Huber Resources Group
Rachel Cliche	Wildlife Biologist	US Fish and Wildlife Service
Dan Hudnut	Vice President	Wagner Forest Management
Pam Hunt	Senior Biologist	Audubon Society of New Hampshire
Jillian Kilborn	Wildlife Biologist	NH Fish and Game Department
Shannon Buckley	Air Quality Specialist / Ecologist	Enviro Clean Cardinal
Luke Powell	Postdoctoral Conservation Ecologist	Smithsonian Institution
Matt Tarr	Wildlife Specialist / Assoc. Professor	UNH Cooperative Extension
Steve Weber	Wildlife Biologist	Wildlife Management Institute

Wood Thrush and Scarlet Tanager

Haley Andreozzi	Wildlife Outreach Coordinator	UNH Cooperative Extension
Gwen Brewer	Science Program Manager	MD Department of Natural Resources
Rachel Cliche	Wildlife Biologist	US Fish and Wildlife Service
Doug Gross	Wildlife Biologist	Pennsylvania Game Commission
Steve Hagenbuch	Conservation Biologist	Audubon Vermont
Dan Hudnut	Vice President	Wagner Forest Management
Pam Hunt	Senior Biologist	Audubon Society of New Hampshire
Shannon Kearney	Wildlife Technician	CT DEEP Wildlife Division
Dan Kilborn	Forester	Vermont Land Trust
Jon Klischies	Supervising Forester	NJ State Forestry Services
Sharon Petzinger	Senior Zoologist	NJ Fish and Wildlife
Amanda Rodewald	Director of Conservation Science	Cornell Lab of Ornithology
Bill Stack	Forester/Natural Resource Manager	Seventh Generation Forestry
Cecile Stelter	District Forester	Pennsylvania DCNR Bureau of Forestry
Matt Tarr	Wildlife Specialist / Assoc. Professor	UNH Cooperative Extension
Suzanne Treyger	Forest Program Manager	Audubon New York
Steve Weber	Wildlife Biologist	Wildlife Management Institute

Table 4. Summary of survey responses to “Would you consider adopting management guidelines for any of these focal species on forests that you manage or help to manage?”.

	Yes	No	Not applicable	Total
Wood Thrush eastern deciduous & mixed forests	97.30% 36	2.70% 1	0.00% 0	37
Bicknell's Thrush montane spruce-fir forest in NY & northern New England	32.35% 11	2.94% 1	64.71% 22	34
Canada Warbler moist woods & forested wetlands, riparian areas, young forest, highlands	85.71% 30	8.57% 3	5.71% 2	35
Scarlet Tanager eastern deciduous & mixed forests	97.30% 36	2.70% 1	0.00% 0	37
Rusty Blackbird boreal swamps, marshes, ponds & nearby forest in NY & northern New England	35.29% 12	2.94% 1	61.76% 21	34
American Marten conifer, mixed, and hardwood forests in Adirondacks & northern New England	35.29% 12	2.94% 1	61.76% 21	34

Table 5. Summary of survey responses to “The following elements may be included in the management guidelines. How useful would each section be to your work?”.

	Not useful (1)	Slightly useful (2)	Moderately useful (3)	Very useful (4)	Extremely useful (5)	Total	Weighted Average
Introduction Species Description	2.56% 1	5.13% 2	15.38% 6	56.41% 22	20.51% 8	39	3.87
Status & Conservation Concerns	0.00% 0	14.29% 6	26.19% 11	38.10% 16	21.43% 9	42	3.67
Managing for Multiple Benefits Associated Species	0.00% 0	9.52% 4	14.29% 6	47.62% 20	28.57% 12	42	3.95
Other Co-benefits	0.00% 0	10.00% 4	27.50% 11	40.00% 16	22.50% 9	40	3.75
Conservation Links (compatible guidelines)	0.00% 0	12.20% 5	31.71% 13	34.15% 14	21.95% 9	41	3.66
Where to Create and Sustain Habitat Landscape Characteristics	0.00% 0	0.00% 0	21.43% 9	42.86% 18	35.71% 15	42	4.14
Management and Conservation Opportunity Areas	0.00% 0	7.32% 3	26.83% 11	39.02% 16	26.83% 11	41	3.85
Desired Habitat Conditions Stand Composition and Structure	0.00% 0	2.38% 1	7.14% 3	35.71% 15	54.76% 23	42	4.43
Recommended Practices Conservation Design	0.00% 0	4.76% 2	23.81% 10	35.71% 15	35.71% 15	42	4.02
Infrastructure Siting and Mitigation	4.88% 2	19.51% 8	26.83% 11	29.27% 12	19.51% 8	41	3.39
Recreation Management	4.88% 2	26.83% 11	26.83% 11	29.27% 12	12.20% 5	41	3.17
Forestry	0.00% 0	0.00% 0	9.52% 4	33.33% 14	57.14% 24	42	4.48
Management Guide (table)	0.00% 0	0.00% 0	9.52% 4	35.71% 15	54.76% 23	42	4.45
Field Guide to Habitat Management Visual Guide to Habitat Management	0.00% 0	2.44% 1	12.20% 5	29.27% 12	56.10% 23	41	4.39
Summary of Recommended Field Practices	0.00% 0	2.38% 1	4.76% 2	35.71% 15	57.14% 24	42	4.48
Species Profile (natural history details)	0.00% 0	10.00% 4	30.00% 12	45.00% 18	15.00% 6	40	3.65

Figures

Figure 1. Summary of survey responses to “Profession: check all that apply”.

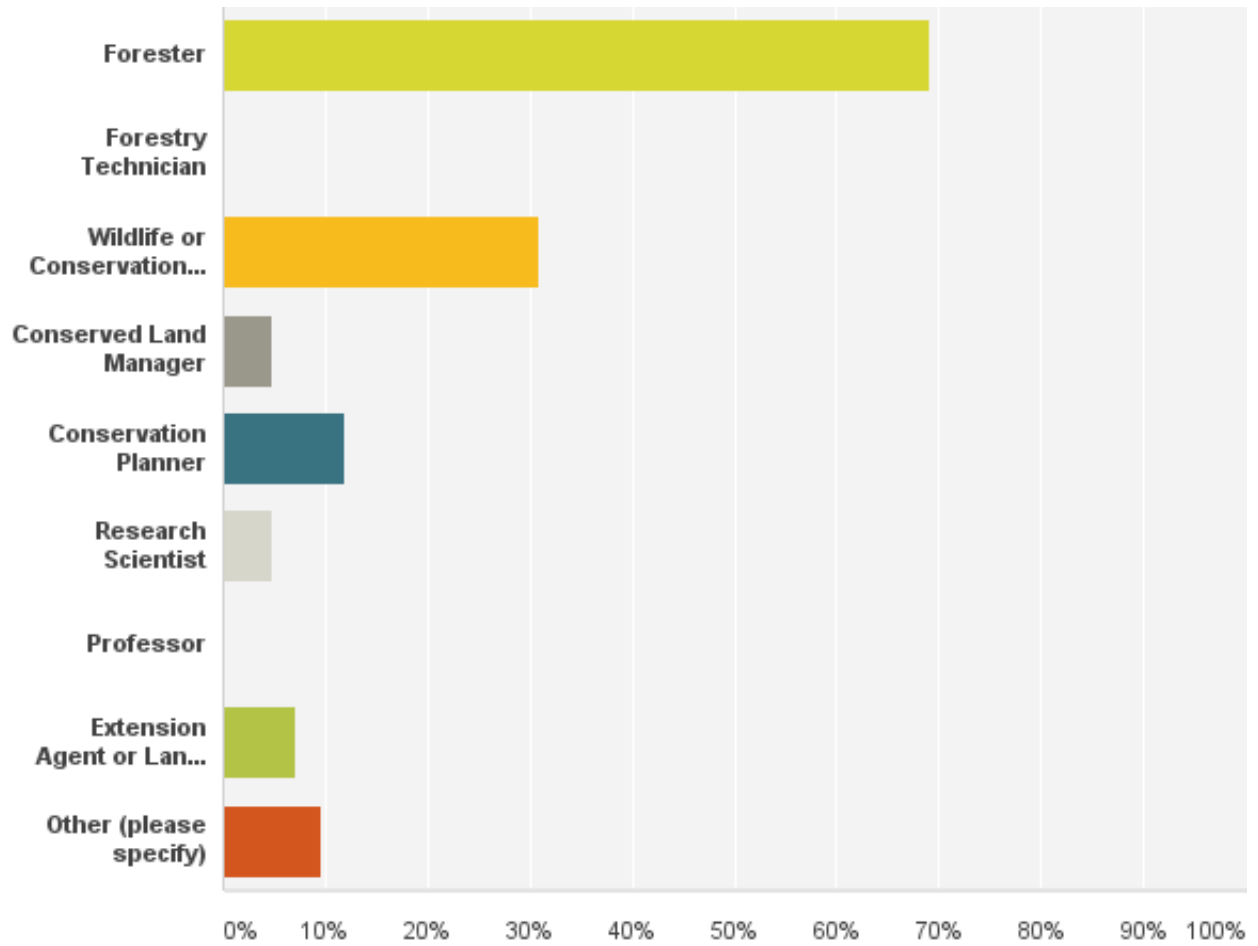


Figure 2. Summary of survey responses to “In what state do you work?”.

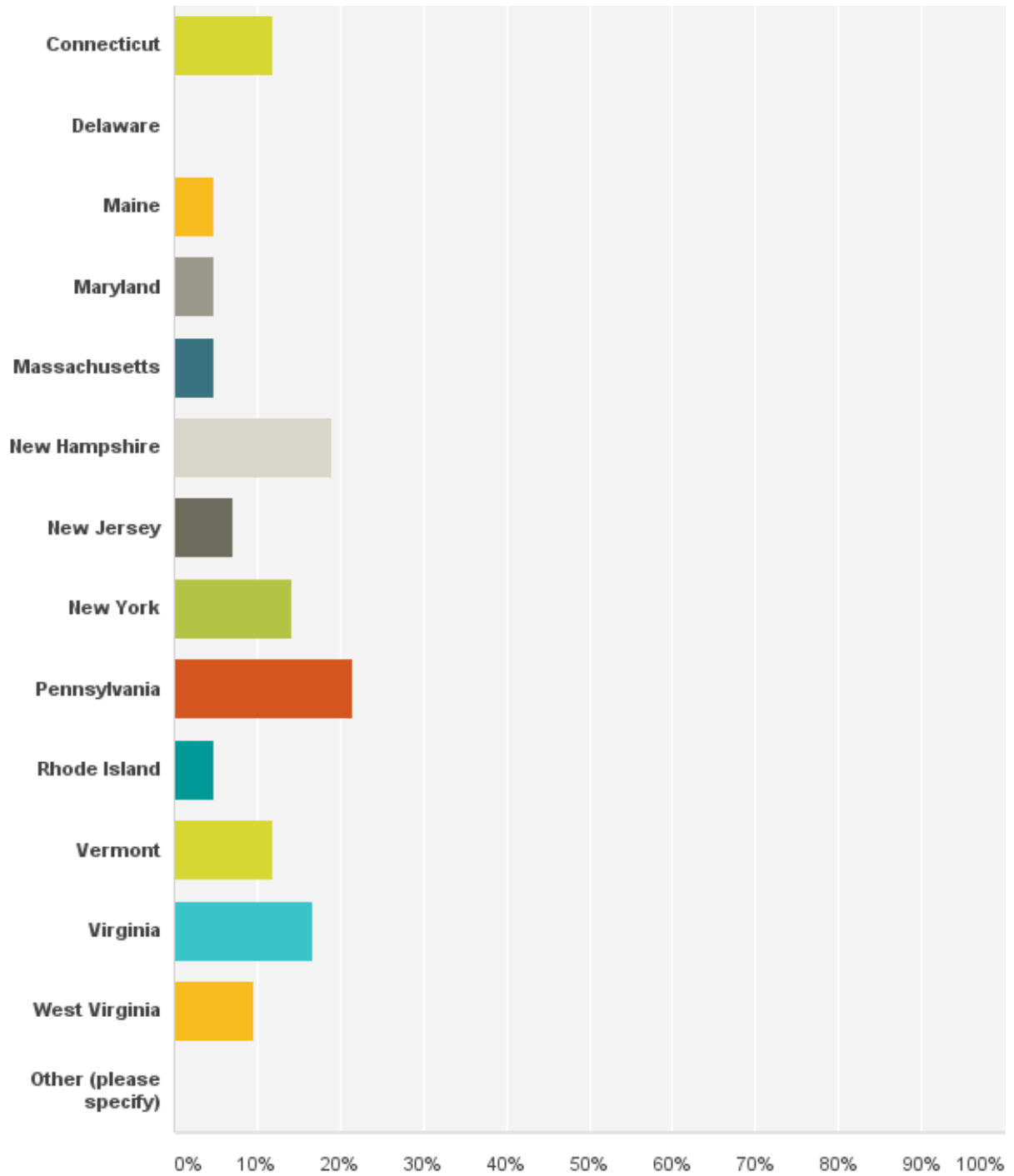


Figure 3. Summary of survey responses to “Which of the following design standards would you recommend for encouraging adoption and implementation of the guidelines by habitat managers?”.

