Guidelines for Managing American Marten Habitat in New York and Northern New England
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Recommended Citation
Introduction

Species profile

The American marten is a medium-sized member of the weasel family that inhabits large blocks of intermediate to old forest across northern North America. Its eastern range once extended south from Canada through the Appalachian states to West Virginia, but now reaches only into northern New York and New England. In the West, martens continue to occur down the spine of the Sierra Nevada and Rocky Mountains into California and Colorado (Fig. 1).

Martens in the northeastern United States utilize coniferous, deciduous, and mixed forests that feature an interconnected canopy reaching above 30 ft in height. This canopy structure enables tree-to-tree movement and offers protection from predators. Resting and denning sites are also important for marten survival and may be supplied by large trees and snags, downed wood, and rocks. In addition to providing cover, near-ground structure makes it possible for martens to access prey hidden beneath the snowpack.

Status and conservation concerns

Martens were extirpated from most of the Northeast by the early 20th century through a combination of forest clearing for agriculture and unregulated trapping. Contributing factors also included intensive logging, accidental fire, and conversion of most remaining woodlands to young age classes. Habitat loss and fragmentation are still principal causes of concern.

Martens currently inhabit most of the Adirondacks, where forests are largely preserved, and northern Maine, where the supply of habitat has been sharply reduced since 1970. The species is legally endangered in Vermont, occurring at low levels in the Northeastern Highlands and southern Green Mountains. In New Hampshire, where a northern population appears to be expanding, it is expected to be down-listed from threatened to a species of special concern in 2017 (J. Kilborn, pers. comm.). Throughout the Northeast, martens occupy large home ranges, averaging 0.6 - 2.2 square miles or about 400-1,400 acres.

Incidence of marten varies with local and regional forest conditions, availability of food (primarily voles, mice, red squirrels, snowshoe hare, berries, and beech nuts), and the presence of fisher, a larger member of the weasel family that preys on and competes with marten.
Therefore, factors affecting the distribution of these mammals also influence marten. For example, high volumes of down wood\textsuperscript{24} and autumn mast boost rodent populations,\textsuperscript{25,26} even as they enhance marten foraging opportunities in other ways. Deep snow also provides multiple benefits, offering martens cover for hunting subnivean prey while impairing the hunting efficiency of larger carnivores. Because martens are light and have relatively large feet, they are able to hunt on top of snow, as well as beneath it (Fig. 2).\textsuperscript{22} Reductions in snow depth or days of snow cover, which may result from changes in the Northeast’s climate,\textsuperscript{27} could curb these advantages and expose martens to greater energetic costs and predation risk.

\textit{Purpose of the guidelines}

The purpose of this document is to promote stand- and landscape-level conditions that sustain American martens, as well as other native species that depend on American marten habitat. Managers of private and public lands can use the information to plan timber harvests, delineate ecological reserves, and coordinate activities across management units. The contents could also inform siting of transportation and energy infrastructure.

\textbf{Where to Create and Sustain Habitat}

\textit{Landscape characteristics}

These guidelines apply to heavily forested regions of the US Northeast that are already occupied by marten, as well as adjacent areas that hold potential for colonizing populations. Appropriate settings for marten management and conservation span a wide range of elevations, from low basins to wooded ridgelines. Because of frequent disturbance and limited harvesting, riparian zones and mountain forests commonly contain valuable habitat elements, such as snags, stumps, downed wood, and exposed root masses (Fig. 3). In addition, topographically rugged areas often contain scattered boulders and rock piles, which provide permanent, ground-level structure for denning and subnivean access. Upper elevations (> 1,600 ft) appear to be especially important to marten along the southern edge of its range, from New York’s Central Adirondacks through the Green and White Mountains to the Mahoosuc Range in Maine. This is likely due to higher snow accumulation in these areas compared to surrounding lands.\textsuperscript{12}

![Figure 3](image)

\textbf{Figure 3.} Woody structure and dense growth near the forest floor boost prey abundance and increase opportunities for denning and subnivean access.

Martens in the Northeast typically avoid openings and regenerating forest, instead selecting pole-sized or larger stands with at least 30\% canopy closure.\textsuperscript{3,16,18,28} Individuals occupying intensively harvested landscapes may experience an elevated risk of mortality due to reduced hunting success in young
forests \(^{29}\) and increased energetic costs of long-distance movement among suitable habitat patches.\(^ {30}\) Therefore, prospects for marten conservation are greatest in landscapes that supply large blocks of intermediate to old forest and a matrix that enables movement among them. Landscapes with less than 60-70\% of the area in suitable habitat have a low likelihood of supporting martens.\(^ {31-33}\) Above this threshold, probability of occupancy increases sharply with prevalence of suitable habitat (Fig. 4).\(^ {31}\)

\textbf{Figure 4.} Landscapes with > 60-70\% of the forest in intermediate to old age classes are most likely to support American marten.

\textbf{Desired Habitat Conditions}

\textit{Forest composition}

American martens inhabit a variety of forest types, including northern hardwoods, eastern hemlock, red spruce-balsam fir, northern white cedar, and mixed coniferous-deciduous forests (Fig. 5).\(^ {3,18,19,21,34}\) Although oak forests are uncommon in currently occupied areas of the Northeast, oaks provide high-quality habitat for martens in Michigan\(^ {4}\) and appear to be shifting north in eastern forests.\(^ {35}\) In northern New Hampshire, martens preferentially select mixed-wood and coniferous landscapes during the leaf-off season, but shift toward mixed-wood and deciduous forest types in the spring.\(^ {16}\) Mast-producing trees enhance habitat quality for martens and their prey. Some types of mast, including mountain ash berries and American beechnuts make up a significant portion of the marten diet when they are available.\(^ {12,36}\)

\textit{Forest structure}

- Canopy height: > 30 ft \(^ {3,18}\)
- Canopy closure: > 30 \% in all seasons \(^ {3,18,37}\)
- Basal area of live trees and snags: > 80 ft\(^2\)/acre \(^ {3,18,28}\)
- Snag basal area: > 10 ft\(^2\)/acre
• An uneven dispersion of large trees (> 16 in dbh) and snags (> 13 in dbh), creating patches with total basal area > 100 ft²/acre

• Abundant boulders or rock piles, low branches, root masses, stumps, woody material, and/or downed logs > 9 in in diameter

Figure 5. Martens utilize a variety of forest types provided that the canopy is at least 30 ft high.

Recommended Practices

Designing landscapes that support marten populations calls for an understanding of the regulatory and socio-economic context that is unique to each state. Likewise, methods to produce desired conditions at the stand scale must draw on local knowledge of forest dynamics. Nonetheless, some measures may consistently promote the landscape- and stand-level characteristics associated with high marten use.

Conservation and management planning

Large-scale planning is key to conserving and expanding marten populations in the northern forest’s multi-functional landscape. We recommend that land stewards coordinate reserve and harvest plans across management units in order to provide a complex of mature to old forest cores, forests of mixed or intermediate age that conform to the desired conditions, and young forests that will mature into the desired conditions and replace recently harvested habitat. The following strategies may be used to realize this over-arching vision and safeguard against forest loss and fragmentation.

• Provide a continuous supply of stable or shifting marten habitat cores, each measuring > 1,250 acres. Simple shapes with large interiors are preferable to complex or narrow shapes.

• Within core areas, maintain at least 60% of the landscape in the desired condition for marten.

• Connect core areas with either permanent or shifting movement corridors that measure > 250 ft wide and conform to the desired conditions.

• When planning and connecting core areas, build on existing reserves (e.g., inoperable areas and riparian zones), as well as areas where physical conditions naturally maintain horizontal and vertical complexity (e.g., forested wetlands and mountainous terrain).

• Incorporate topographic features that channel animal movement into corridor design, such as ridgelines and mountain passes.

• When planning even-aged management, aggregate harvests to minimize habitat fragmentation.
• Minimize construction of roads and other permanent infrastructure to reduce habitat loss, fragmentation, and the risk of mortality associated with increased exposure to competing generalist species. Use temporary or seasonal roads, when necessary.

• In marten-occupied areas where development is permitted, measure baseline conditions, assess effects of new construction, and apply findings to mitigation and adaptive management.

*Forest management*

Strategies to conserve martens may incorporate a variety of forest management methods, provided that overall landscape objectives are met. The practices described here are presented in order of increasing harvest intensity. They range from small-scale and broadly applicable treatments to larger-scale techniques that should be applied with careful consideration of tradeoffs between habitat suitability and revenue from forest products.

• Utilize single-tree selection, small-group selection, irregular shelterwood systems, or variable retention harvesting in core habitat areas to maintain canopy characteristics above the thresholds required by marten (height > 30 ft, leaf-off closure > 30%, and basal area of trees and snags > 80 ft²/ac).

• Retain a small number of large-diameter trees (>16 in dbh) and snags (>13 in dbh) during harvest operations as potential resting and denning sites. Martens utilize trees with large horizontal branches, multiple tops, and large nests for resting and scanning for prey. Trees with cavities provide both concealment and protection from the elements (Fig. 6). When feasible, maintain a treed buffer up to 50 ft around these retained features.

• Where snag volume is low, retain or girdle medium to large, low-vigor trees.

• When conducting partial harvests in mixed stands, retain a sufficient number of conifers to ensure >30% canopy closure during the leaf-off season.

• In mature forest landscapes, harvest trees in groups or patches (<2.5 acres) to create or enhance pockets of cover and forage for snowshoe hare, an important winter prey species (Fig. 7).

• Leave a dispersion of mast-producing trees (e.g., mountain ash, American beech, red spruce, and balsam fir).
• In areas where even-aged management is planned, provide shifting connections among core habitat areas. The value of these connections may be enhanced through long rotations and large cutblock sizes. If appropriately configured, high-acreage clearcuts and shelterwood harvests can contribute to martens habitat targets after the regenerating forest reaches an intermediate stage of development.

Managing for Multiple Benefits

Associated species

Managing forests for martens in northern New England and New York could benefit other species of regional conservation concern that also depend on forests of intermediate to old age (Table 1, Fig. 8). This group includes area-sensitive species like scarlet tanager and black-throated blue warbler, as well as species adapted to natural disturbance, such as black-backed woodpecker, Bicknell’s thrush, and bay-breasted warbler. The southern red-backed vole and eastern red-backed salamander are among the more common vertebrate species that stand to gain from implementation of these guidelines. Both use down wood for protective cover and their combined biomass makes up a significant component of the northern forest food web. 38 Even the rare Canada lynx, which preys on snowshoe hare in young forests, benefits from retention of mature stands since they facilitate movement between hunting areas. 39

Ecosystem services

Large forest tracts are popular for recreational activities like hiking, camping, wildlife viewing, fishing, hunting, and trapping. Management and conservation practices that maintain high forest cover support these culturally important pursuits and associated economic activity. In addition, forested landscapes contribute to the resilience of natural and human communities by controlling floods, supplying clean air and water, and storing carbon. Woodlands that span wide ranges of elevation and latitude are especially valuable during this era of climate change because they enable future migration of plant and animal species as well as the stable transformation of forest communities over time.

Table 1. A partial list of Species of Greatest Conservation Need that could benefit from implementation of these guidelines. Species of high regional concern are indicated in bold. Species co-occurrence varies across the region.

<table>
<thead>
<tr>
<th>Species</th>
<th>Overlapping habitat(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barred owl</td>
<td>Mixed forest</td>
</tr>
<tr>
<td>Bay-breasted warbler</td>
<td>Boreal coniferous forest</td>
</tr>
<tr>
<td>Bicknell's thrush</td>
<td>Densely structured spruce-fir forest at upper elevations</td>
</tr>
<tr>
<td>Black-backed woodpecker</td>
<td>Boreal coniferous forest</td>
</tr>
<tr>
<td>Blackburnian warbler</td>
<td>Coniferous and mixed forests</td>
</tr>
<tr>
<td>Black-throated blue warbler</td>
<td>Deciduous forest</td>
</tr>
<tr>
<td>Black-throated green warbler</td>
<td>Coniferous and mixed forests</td>
</tr>
<tr>
<td>Blue-headed vireo</td>
<td>Coniferous and mixed forests</td>
</tr>
<tr>
<td>Brown creeper</td>
<td>Coniferous and mixed forests</td>
</tr>
<tr>
<td>Cape May warbler</td>
<td>Boreal coniferous forest</td>
</tr>
<tr>
<td>Scarlet tanager</td>
<td>Deciduous and mixed forests</td>
</tr>
<tr>
<td>Three-toed woodpecker</td>
<td>Boreal coniferous forest, especially following beetle infestation</td>
</tr>
<tr>
<td>Canada lynx</td>
<td>Coniferous forest</td>
</tr>
<tr>
<td>Southern flying squirrel</td>
<td>Deciduous and mixed forests with large trees and abundant snags</td>
</tr>
<tr>
<td>Southern red-backed vole</td>
<td>Coniferous, deciduous and mixed forests with abundant woody material</td>
</tr>
</tbody>
</table>
Comprehensive planning

Long-range, comprehensive planning that is focused on American marten could help maintain conditions for most of the northern forest’s native species through a dynamic mosaic of cover types and age classes. Wide-ranging and area-sensitive animals could benefit, in particular, from habitat stewardship that is coordinated across large ownerships. Although joint planning is not always feasible, past and ongoing collaborations in the focal region have demonstrated that dialogue among neighboring landowners can help accomplish shared conservation objectives. State biologists and foresters may be available to support coordination by providing technical knowledge or assistance in the development of easements, memoranda of understanding, and other tools for cooperative wildlife management.

Whether conducted within or across property lines, spatially explicit planning is key to conserving martens since their populations are largely shaped by coarse-scale factors such as forest maturity and overall extent. In recent decades, universities, natural resource agencies, and landowners throughout the region have worked together to quantify marten habitat needs, evaluate effects of management, and apply new knowledge to stewardship decisions. This adaptive approach is key to achieving marten conservation objectives in New York and northern New England.
Literature Cited


Other References
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Wisconsin Bureau of Natural Heritage Conservation. 2014. American marten (Martes americana) species guidance. Wisconsin Department of Natural Resources, Madison.
Acknowledgments

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The American marten is a medium-sized member of the weasel family with a range extending from Maine to California and north to the limit of tree line in arctic Canada and Alaska. Once common throughout New York and New England, it is now limited to remote, northern forests.

**Status:** Species of Greatest Conservation Need in NH, NY, and VT

**Habitat:** Large tracts of coniferous, deciduous, and mixed forests of intermediate to old age, especially where winter snowpack is deep

**Home range:** Varies with age, sex, season, habitat, and prey availability; averages 0.6-2.2 sq mi. Exclusive male home ranges overlap those of females.

**Special Requirements:** Complex forest floor with logs, down wood, and low branches providing cover for prey and subnivean access for hunting and escape from predators. Also, stumps, snags, root balls, or rocky terrain for denning.

**Diet:** Voles, mice, squirrels, snowshoe hare, ruffed grouse, berries and seeds

**Associated species:** Varies geographically and includes barred owl, bay-breasted warbler, Bicknell’s thrush, black-backed woodpecker, Blackburnian warbler, black-throated blue warbler, black-throated green warbler, blue-headed vireo, brown creeper, Cape May warbler, northern goshawk, ovenbird, pileated woodpecker, red-eyed vireo, scarlet tanager, three-toed woodpecker, northern and southern flying squirrels, red squirrel, and snowshoe hare.

**Recommended forest management practices:** When conducted in the appropriate context, some forestry practices can promote or maintain desired conditions for American marten and associated species. However, conservation benefits may be low in areas where suitable habitat occurs naturally. For more discussion of where to create and sustain habitat, consult the complete guidelines. The following table summarizes options for maintaining or creating the desired stand-level conditions.

<table>
<thead>
<tr>
<th>Starting Condition</th>
<th>Objective</th>
<th>Management options</th>
<th>Desired condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawtimber or all-aged stand (in an uneven-aged management scenario)</td>
<td>Simulate natural disturbance dynamics to maintain moderate to high canopy closure, snags, and down wood.</td>
<td>Single-tree selection Small-group selection Crop tree release Expanding-gap group shelterwood Variable retention harvesting Retention or girdling of medium to large, low-vigor trees</td>
<td>Canopy height: &gt; 30 ft Leaf-off canopy closure: &gt; 30% Basal area of live trees and snags: &gt; 80 ft²/acre Snag basal area: &gt; 10 ft²/acre</td>
</tr>
<tr>
<td>Sawtimber or all-aged stand (in an even-aged management scenario)</td>
<td>Stock future stands with large trees, snags, and woody material.</td>
<td>Retain residual trees and snags, including large stems</td>
<td>Patches of large trees (&gt;16 in dbh) and snags (&gt;13 in dbh) totaling &gt;100 ft²/acre</td>
</tr>
<tr>
<td>Pole-sized to sawtimber stand with low snag volume and/or low ground-level complexity</td>
<td>Increase the volume of snags and woody material for denning, subnivean access, and small mammal/prey cover</td>
<td>Retention or girdling of medium to large, low-vigor trees Felling and leaving small trees</td>
<td>Abundant root masses, logs, stumps, woody material, boulders, and/or low branches</td>
</tr>
</tbody>
</table>

**Additional Considerations**
- Leave a dispersion of mast-producing trees (mountain ash, American beech, red spruce, balsam fir).
- Retain softwood regeneration to enhance habitat for snowshoe hare and subnivean access to smaller prey.
- Configure clearcuts and shelterwood harvests in a way that contributes to targets for future marten habitat.
Single-tree selection in the area to the left has maintained high canopy closure. Narrow transport paths minimize disturbance, while winter harvests and the use of forwarders limit compaction of woody material.

Even-aged harvests that reserve medium to large trees and snags will enhance future resting and denning opportunities for marten.

Large group or small patch cuts in predominantly mature forests can benefit marten by creating habitat for snowshoe hare, an important winter food source. Rodent prey, such as the southern red-backed vole, concentrate in areas with high levels of down wood. Because mountain ash berries and American beech nuts support both marten and rodent populations, mast-producing trees of these species should be retained when possible.