**Hemlock Prioritization for Landowners**





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Introduction

Conservation of hemlocks is critical to the long-term health of New York’s forests. New York has more hemlock trees than any other state in the US; it will be impossible to conserve all of our hemlocks. As hemlock woolly adelgid (HWA) moves through the state, landowners, managers, and regional planners need to prioritize which hemlocks to focus on for survey, conservation and management. This tool is a decision tree and weighting tool to help landowners and land managers decide which stands are the most important to their property.

Depending on the land you manage, different qualities of hemlock stands become more of a priority than others. Properties that have heavy public use or educational missions may have a higher concern for hazard trees around trail systems, compared to landowners on private property with large portions of infrequently visited forest. Properties outside the known HWA infestation area will have a very different management response than those in long-infested regions. Extremely valuable habitat such as old growth remnants also deserve a separate consideration apart other stands. Some very important stand qualities are described early in the decision tree; after that, stands can be put through the weighting tool to help landowners and land managers decide where to focus their attention and funds.

This tool is tailored for use by landowners or managers of single properties. If you own or manage multiple properties, you may get better results from our regional prioritization tool. That tool has extra metrics to help balance priorities across watersheds and regions.

To use this decision tool, you will first answer the yes/no special case questions; if any of your hemlock stands meets one of these criteria, we recommend that you follow the recommendations within the special cases section and not put that stand through the rest of the tool. Remaining stands are scored with as many of the various metrics that you have data for and believe to be relevant to your property.

Within the scoring tool, each stand received a score of 0-3 for a wide range of stand traits. Some are easy to determine by visiting the stands (how big is the stand, how dense, how healthy); others might require some repeat visits or extra help (are there rare species on or near the stands, for example). We recommend that you do the best you can with the information you can gather by walking your property, and fill in the blanks later if you wish to or decide the answers will help you manage your property better.

Different properties have different uses, and as a result will weight stand qualities differently. This is done in the row just below the stand trait names; the score you gave each stand is multiplied by the number in this cell and added to the total score at the end of the weighting table. The higher the number (from one to four), the more impact the stand trait (stand health, hazard trees, supporting trout fisheries, etc.) will be have on the stand’s final score. This number can be edited by the user to anything from 1 to 4, in order to better fit the uses/needs of their property. If you don’t have data for or choose not to use a trait, just leave it blank in for all of your stands. The Excel file that accompanies this tool has weighted each stand trait to conserve the ecological benefits of hemlock on your property; as you work through the tool, you can adjust the weights according to your priorities for your property. For example, if you manage a property with frequent public access and extensive trails, you may wish to weight hazard trees more heavily in your metric.

When you are done, each stand will have final score, the sum of all the weighted traits you recorded for that stand. The most important stands will have the highest values, while the least important will be lowest. (The number values don’t have a specific meaning; they are just a way to compare stands to each other. This is particularly true if your organization changes the weights, and the results will not be comparable to another user’s values.) We encourage you to think about what traits led to the higher and lower scores, and compare that with your goals on the property. If the scores agree with your goals, focus conservation on the highest scoring stands first. Everyone has limited time and resources; we hope this tool will help you better understand your property and hemlocks so you can make informed decisions about managing your forests’ hemlocks.

Higher priority stands should be monitored for HWA arrival at least every couple of years – ideally twice a year, in spring and fall. Lower priority stands can be monitored less frequently. Once HWA arrives, higher priority stands should be the ones targeted for management. How far down your priority list you choose to actively manage for HWA is up to you, and will probably depend on your finances, interest, and the risks the stands pose to people and property. Stands you don’t intend to manage can be targeted for replanting of beneficial species as the hemlocks decline, or just monitored to make sure the succession of species is one that benefits your property. It’s a good idea to monitor for invasive species invading declining hemlock stands, since disturbance sets the stage for such problems.

Included in this packet is some information on hemlock woolly adelgid (HWA) identification and reporting, a map of the winter 2020 extent of HWA in New York, and suggestions on management of HWA on your property. If you are outside the current range of HWA, especially in the Adirondacks, Tug Hill, or western New York, we hope you will report any HWA sightings to DEC, either directly or through iMap Invasives. If you have any questions, please feel free to reach out to the NYS Hemlock Initiative at [nyshemlockinitiative@cornell.edu](mailto:nyshemlockinitiative@cornell.edu).

This work was funded by the NYS Department of Conservation, the US Forest Service, and the Great Lakes Restoration Initiative. Special thanks to [CC Environment & Planning](https://www.ccenvironment.com/) of Rochester who built the original metric from which this tool was built, and to the [Ecological Research Institute](http://www.monitoringash.org/author/rwjr/) who provided substantial editing and revisioning for this tool. The final version was built in cooperation with the NYS Department of Conservation and the NYS Office of Parks, Recreation, and Historic Places.

Special Cases

1. Is the stand at the leading edge of HWA infestation, or isolated from other infested areas? In 2019, the northern edge of HWA infestation is of particular importance, as only one infestation has been found in the Adirondacks so far and the most dense populations of hemlocks in New York are in the Adirondacks and the Tug Hill region. Any infestation in these areas, or in other regions where HWA is considered and early detection/rapid response species, should be treated aggressively regardless of other considerations in order to slow the spread of HWA into new regions.

Resource: the [iMap Invasives map of HWA](https://imapinvasives.natureserve.org/imap/services/page/map.html?x=-75.6401&y=42.4049&z=9&dpnl=legend&lgrp=ALL&bm=topo&toc=mainDataTOC;0;0=1;40|aoiTOC;0;0=0;40|statesTOC;0;0=0;0|countiesTOC;0;0=0;0|waterbodiesTOC;0;0=0;40|conservationLandsTOC;0;0=0;40|usgsTopoTOC;0;0=0;0|ismaTOC;0;0=0;0|hydrobasinTOC;0;0=0;0|countryTOC;0;0=0;0|tncIPMMS;0;0=0;40&fobs=&fhbtt=&fspec=374&fstyp=n&fkdom=&fgens=&fbdte=&fadte=&fproj=&forg=&fjur=&felim=). This link should lead to a map focused on New York, where the “Filter Records” option has been selected for hemlock woolly adelgid. The little yellow hexagons are positive records of HWA; zoom in further to see specific points. This will help you understand whether your property is within the known infestation area, or whether an HWA find on your property would be an early detection/rapid response scenario.

1. Is the hemlock stand in an old growth remnant? If so, treatment and conservation should be considered, as these are exceedingly rare ecosystems. Old-growth hemlock stands support up to four times more understory species than second growth stands (D’Amato 2009).

Data resource: Site survey. See this article on identifying [northwoods old growth](https://northernwoodlands.org/articles/article/how-can-i-tell-if-my-woods-are-old-growth) remnants.

1. Stand protection: Stands that will be removed in the near future should not be treated, since their survival is not an option.

If the stands on your property do not meet any of these special cases, the following are the items that the NYS Hemlock Initiative and our partners suggest you consider when prioritizing hemlocks for HWA management. Their suggested weight is listed below the description; these weights were determined in a collaborative process including the New York State Hemlock Initiative (NYSHI), NYS Department of Conservation (DEC), and NYS Office of Parks Recreation and Historic Places (OPRHP). Resources to help you determine your stands’ ranking are offered when they are available.

Stand Traits

* **Current stand health:** Do the trees currently have healthy canopy all the way down the tree, or dense, green, fairly long canopies in pure hemlock stands? Are the trees producing new growth (lime green) in the early summer? Do you see any other hemlock pests (elongate hemlock scale, hemlock borer, hemlock rust)?

**Suggested Weight: High (3)**

Resource:[NYSHI stand survey](https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/7151/files/2018/11/Volunteer_Tree-Health-Survey_Protocol-1ntzurc.pdf)  
(<https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/7151/files/2018/11/Volunteer_Tree-Health-Survey_Protocol-1ntzurc.pdf>)

* **Environmental stressors**: Is the stand in an area where it gets ample water? Is there construction or development close enough to impact roots? Is it in on an exposed slope rather than partially shaded by topography? Is the stand on a steep slope? Trees in stressful growing conditions like these tend to decline more rapidly once HWA arrives. While in some cases this might make the stand less favorable for conservation, in cases where a stand is important for other reasons it may suggest higher prioritization, as the trees are likely to need earlier intervention than those in a less stressed stand.

Suggested Weight: Medium (2)

* **Stand size:** How large is the hemlock population? The larger and denser the stand, the more impact it has on your local environment, and the more disruption its loss will cause.

Suggested Weight**:** Medium (2)

Resource: <https://orthos.dhses.ny.gov/> for downloadable GIS leaf-off aerial imagery, or a walking survey of your property. Unfortunately, both Google maps and Bing maps now use leaf-on imagery, so without GIS capabilities your options for are limited. If you download Google Earth Pro, the 2013 imagery is from spring and may help you pick our conifers.

**Stand density: % basal area** (>50%)\* - How dense is the stand? The denser the stand, the more impact it has on your local environment, and the more disruption its loss will cause. % basal area is the percent of the total tree diameter in a given area that is hemlock. 50% is sometimes used as a cutoff to call a population dense enough to be considered a hemlock ‘stand’, or dense enough to focus on for conservation.- It’s worth noting that HWA spreads faster in dense hemlock, which can lead to hemlocks declining more quickly. (Morin et al. 2009).

Suggested Weight: Medium (2)

Resource: On the ground survey. This can be a very rough estimate – rather than a technical basal area, it’s fine to walk through a hemlock area and make a guess about whether less than a quarter of the tree canopy is hemlock, or less than half, or more than half.

* **Proximity to water body** (for early detection work only): HWA often (not always!) arrives near water when entering a new area. It’s good to check all areas, but monitoring hemlocks near water more closely may be a good idea.

Suggested Weight: low (1)  
  
Resource: The Eastern Brook Trout Joint Venture has a great interactive map that has a lot of information that is useful to this prioritization process. The map is here: <http://bit.ly/1FLvq5m>, and the useful piece for this metric is the streams and waterbodies layers. To view these, click on the link above. This opens a map; zoom in to about the county level and click on “streams” and “waterbodies” in the legend to bring up streams and waterbodies.

* **Stand isolation:** How close is the nearest hemlock population to the one you’re looking at? Isolation could mean that your hemlocks are vital for local animal populations. It also could mean that they have a lower chance of becoming infested as HWA moves across the landscape, although it’s likely to arrive eventually.

Suggested Weight**:** low (1)

Resource: <https://orthos.dhses.ny.gov/> and the aerial imagery there is probably the best bet for this, combined with some ground truthing to pinpoint the nearest hemlock rather than pine, spruce or fir.

Aquatic Ecosystem Services

* **Cool-water fish habitat:** Cold-water fish assemblages rely on consistently cold water to survive. Hemlocks help cool streams and stabilize stream flows. In the Delaware Water Gap, brook trout are 3x more common in watersheds with hemlocks than in ones with predominantly hardwood forest. Prioritizing hemlocks that directly shade or are in the watershed of streams with cold-water fish like trout will help conserve those fish habitats. (Ross et al. 2003) Moreover, with warming climate, shading can become more important (optimal temp. for brook trout 11°-16° C). Stands most important for this service would occur in riparian locations that are not shaded by surrounding slopes, and in streams where groundwater isn’t providing temperature stabilization. These shading services would be most important in streams that host brook trout (Siderhurst et al. 2010).

Potential additional effects of hemlock loss near a stream on aquatic habitat quality, either cool or warm water:

* More light reaching stream bed increases stream bed algae and other aquatic vegetation
* Hardwood litter is more easily digestible, higher quality for detritivores, alters aquatic food chains, including fish species composition
* Increased debris from dying/dead hemlock causes structural habitat changes, likely effecting aquatic communities.

**If your stand/property is in a watershed with cold-** water fish habitat, please use the “direct shade” and “upland snow” items in the tool. If not, please use the “direct shade” item, and skip the “upland snow” item.

**Suggested weight:** if in a cool-water fish watershed, the weight for both items is medium (2). If the watershed is of another stream type, direct shade can be low or medium, depending on the priority of the landowner.

Resource: To determine if your stand is in a cool-water fish watershed, please use the Eastern Brook Trout Joint Venture [website](https://easternbrooktrout.org/resources/state-maps-of-wild-brook-trout-patch-distribution/map-of-new-york-wild-brook-trout-wild-brook-trout-patches/view) and [data](https://easternbrooktrout.org/assessment-data/brook-trout-assessment-data).

* + **Direct shade of cold water stream:** see explanation of fish habitat quality. Site Assessment**:** does the hemlock stand directly shade a stream? Temperature of streams can be found from the [NE Aquatic Habitat Classification program](https://rcngrants.org/content/northeastern-aquatic-habitat-classification-project), but the data are all in GIS format.
  + **Upland snow persistence in high priority watershed:** see explanation of fish habitat quality

Resources: Eastern Brook Trout Joint Venture [website](https://easternbrooktrout.org/resources/state-maps-of-wild-brook-trout-patch-distribution/map-of-new-york-wild-brook-trout-wild-brook-trout-patches/view) and [data](https://easternbrooktrout.org/assessment-data/brook-trout-assessment-data)

* **Stream flashiness:** Hemlocks pull water from the ecosystem mainly in the spring and fall, when water is abundant, and minimally during the summer when hardwoods are active. Their loss can increase drying of streams in the summer, and increase spring flooding risk (Catovsky et al. 2002; Hadley et al. 2008, Brantley et al. 2013). Maintaining hemlock on the landscape may help buffer expected hydrologic changes in the future, and HWA infested areas already are experiencing more flashy hydrologic behaviors, (Singh et al 2020). If your property’s streams are prone to problematic fluctuations in streamflow, hemlock loss may exacerbate that issue.

Suggested Weight: Medium (2)

**Resource: none at present**

* **Steep slopes:** While there is little research on the subject of hemlock loss on steep slopes, we are concerned that despite the slow decline of hemlocks in New York, slow decomposition of dead hemlocks and their roots, and regrowth of other species, very steep slopes may be an issue. It may be worth watching to make sure that as the hemlocks decline, sufficient strong-rooted vegetation is developing on these sites to maintain the slope. Treatment can be a concern in these situation because accessing trees on steep slopes can be difficult and expensive. Restoration planting may be a good idea in these situations if the stands are not treated.

Suggested Weight: Low (1)

Resource: Property survey or GIS slope layer. This is another easily estimated value you can rate while walking your property; when you visit a stand, decide whether the stand is mainly on flat, sloped, very sloped-but-still-walkable, or too steep to walk. If the terrain is very sloped or too steep to walk on, especially if it’s near water, it might be worth managing that stand – either to maintain hemlock, or to replant so that you know what will come in after hemlock. That way you can make sure something with a strong root system is established once the dead hemlock finally fall.

Terrestrial Ecological Value

* **Primary growth stands:** Primary growth stands have been in continuous forest cover through European settlement, and have never been plowed. These often have pit-and-mound topography and are fairly rare; if your property has one of these stands, this would be a strong argument for protection/management.

**Suggested Weight: Very high (4)**

Data resource: Site survey; look for [pit-and-mound topography](https://en.wikipedia.org/wiki/Pit-and-mound_topography#:~:text=Pit%20and%20mounds%20are%20small,soil%20matrix%20used%20to%20be.) and/or trees older than the normal secondary forests in our region.

* **Rarity of ecosystem:** There are a few hemlock ecosystems that are quite rare: hemlock swamps and especially a specific subset of these swamps called rich hemlock hardwood peat swamps. If your property/stand contains one of these ecosystems, it is a priority for management and conservation.

**Suggested Weight: High (3)**

Data resource: Site survey

* **Proximity to related rare species:** This can be restricted to species that would be negatively impacted by hemlock loss; if you have a listed grassland bird nearby, the transition from hemlock to some other forest cover is unlikely to impact it (unless you have site-specific reasons for impact).

**Suggested Weight: High (3)**

Data resource: The rare plants associated with hemlock communities are found in the Appendix of this document, with suggestions on how to pick which ones to consider on your property. The best way to make see if you have rare species is to check if your habitat is appropriate for these species, and to look for them at the appropriate time of year. If this is overwhelming or you don’t know yet if rare species are on your property, it’s OK to leave this blank; the tool will still work without this information.

Another useful tool is the NY Natural Heritage Program’s Environmental Resource Mapper, <https://gisservices.dec.ny.gov/gis/erm/>. This provides, among other resources, the general locations of rare plants and animals. To see the rare species information, open the, zoom in until the layer text in the legend turns black, and then check the box next to the text; orange blobs should pop up on the map. If your property is in an orange zone, reach out to the Natural Heritage Program to see if the species near you might be using hemlock habitat. Technical tips: popups need to be enabled for this tool to work well, according to the main website. When you arrive, the layers are all greyed out – you need to zoom in pretty far before they turn black and can be visualized. Just click on the layers you want once you get in that far. When you click on the map, it’ll give you a popup window with basic information; if there’s more than one object near your click, it will say “1 of [however many]” with arrows to tab through them in the upper right-hand corner.

* **High-quality habitat:** Hemlocks in a high functioning ecosystem with strong biodiversity will be more important from an ecological perspective than hemlocks in a suburban matrix, for example.

Suggested Weight**:** Medium (2)

Data resource: Site survey

* **Presence of hemlock-**dependent species: Blackburnian warbler, blue-headed vireo, black-throated green warbler, and Acadian flycatcher all make heavy use of hemlock stands. Porcupine rely on hemlock as a staple winter food source. If a stand is known to be in use by these species, it may be worth ranking higher for preservation. Populations of the salamanders listed below, or of four-toed or longtail salamanders, would also suggest conservation. Other species that often use hemlock habitat are northern goshawk, white-tailed deer, hermit thrush, red-breasted nuthatch, and Magnolia warblers. Hemlocks near high-quality streams may provide important habitat for red-backed salamanders, Allegheny mountain dusky salamanders, and red efts.

Suggested Weight**:** Medium (2)

Data resource: Site survey or Lab of Ornithology data – better links to those data will be available in the final tool. As with other more difficult traits, if you aren’t sure what you have on your property, it’s okay to skip it and fill it in later if you can.

Cultural Value

* **Hazard Trees:** Trees near roads, power lines and structures should be considered for treatment or removal once an infestation is noted. Planning for this will help minimize costs down the road.

**Suggested Weight: High (3)**

* **Natural/Cultural resources:** Is there a historic event associated with the site? Do the hemlocks form part of a highly visited public location? This can mean whatever is relevant to the people doing the prioritization, including protection of viewsheds from iconic scenic overlooks.

Suggested Weight: Medium (2)

* **Use:** Is the stand one that is used often (picnicking, hunting, etc.)? Deciding whether or not to preserve the hemlocks should include consideration of how to replace their function for the land users. A highly visited site will also provide opportunity for education and outreach on hemlocks, invasive species, and management.

Suggested Weight: Medium (1)

Sustainability

* **Feasibility of treatment/type of treatment:** Can the trees be treated? If all other things are equal and two stands have vastly different costs or difficulties associated with treatment, the easier/less expensive one will allow more hemlocks to be treated. Some things that impact treatment potential and cost are road access, (less expensive), access to a water source if the site is not near a road (less expensive), and extreme slopes (more expensive).

**Suggested Weight: High**

**Data resources:** site map, slope layer, site visit

* **Climate resilience:** Trees that are situated where their needs will continue to be met into the future will be higher priority than those that may be lost as the climate changes. This is of high importance, but we don’t have a specific set of recommendations for hemlock; as a result, we are cautious about dismissing otherwise high priority stands based on an assumption of climate change response. New York is in the middle of eastern hemlock’s geographic range (from Georgia into Nova Scotia), but hemlocks tend to grow at higher elevations in the more southern portions of its range. Generally, we would suggest that stands that are already suffering from summer drought or flooding risk will become even more stressed, as New York is predicted to have about the same amount of rainfall but in more intense rain events, leaving longer stretches of dry weather between rains. Beyond that, we just don’t have the information yet to provide more detailed suggestions.

Suggested Weight: Despite its importance, given the currently lack of strong information for hemlocks we currently rank this low (1). As more information is developed in this area, we will update the tool as appropriate. If you’re not sure, feel free to not score this – the tool will still work just fine.

Data resources: If your property is very large or you have more than one property, The Nature Conservancy has a climate resilience map you can look at to see how parts of your property score for climate resilience: <http://maps.tnc.org/resilientland/>.

* **Deer pressure:** Stands in areas with high deer pressure are more likely to have invasive species problems after hemlock loss. if you have otherwise equal stands with varying deer pressure, it may make sense to treat the stands in higher pressure areas, or put substantial effort into managing post-HWA forest composition.

Suggested Weight: Low (1)

**Data Resource:** your observations of your property and deer pressure.

References & Further Reading

New York State Hemlock Initiative website: [www.nyshemlockinitiative.info](https://blogs.cornell.edu/nyshemlockinitiative/). Provides information on HWA identification, reporting, and management in New York State.

iMap Invasives: New York (<https://www.nyimapinvasives.org/>). Real-time information on the spread of HWA and other invasives through New York State. Report your invasive species finds here, so that researchers and landowners all over the state can make better informed decisions on invasive species management.

New York State Department of Conservation’s Hemlock Woolly Adelgid website (<https://www.dec.ny.gov/animals/7250.html>). The latest information on HWA in New York, including the [current infestation map](https://www.dec.ny.gov/docs/lands_forests_pdf/hwadistribution1.10.20.pdf).

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Appendix: Rare Species Found in Hemlock Habitats

Rare species in your hemlock stand is a good reason to prioritize that stand for conservation. There are a lot of these species, but most have a very restricted distribution or specific habitats. The easiest way to look at this list is to click on the links and check the “Range” section of the plant’s profile; this will tell you if you have to consider this plant or not. There’s probably just a few, if any, that may be on your property. Another way to narrow your list is to go to New York State’s Environmental Resource Mapper (<https://gisservices.dec.ny.gov/gis/erm/>), zoom in on your county/area, and turn on the orange “Rare Plants or Animals” layer. If there are any orange splotches in your area, click to see if what they are.

**First-tier plant species**: These 38 species are either known to be associated with eastern hemlock or may be associated with eastern hemlock. There are two additional species (Jacob’s Ladder and Spreading Globeflower) which are found in hemlock habitats but not specifically associated with hemlock; their names are in bold font, and they included because they are globally at risk (ranking G3).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Common name | Scientific name | New York status | Subnational rank | Hemlock-northern hardwood forest | Hemlock-hardwood swamp | Rich hemlock-hardwood peat swamp | Associated with hemlock | Type |
| [**Northern Monkshood**](https://guides.nynhp.org/northern-monkshood/) | **Aconitum noveboracense** | Endangered | S1 | yes |  |  | yes | Riparian |
| [**Hart's-tongue Fern**](https://guides.nynhp.org/harts-tongue-fern/) | **Asplenium scolopendrium var. americanum** | Threatened | S1 | yes |  |  | yes | Terrestrial Fern |
| [Green Rock Cress](https://guides.nynhp.org/green-rock-cress/) | Borodinia missouriensis | Threatened | S2 | yes |  |  | yes | Terrestrial |
| [Calypso](https://guides.nynhp.org/calypso/) | Calypso bulbosa var. americana | Endangered | SH |  | possible |  | yes | Terrestrial |
| [Mountain Watercress](https://guides.nynhp.org/mountain-watercress/) | Cardamine rotundifolia | Endangered | S1 | yes |  |  | yes | Riparian |
| [Striped Coralroot](https://guides.nynhp.org/striped-coralroot/) | Corallorhiza striata var. striata | Endangered | S1 |  |  | probable | yes | Terrestrial Orchid |
| [**Ram's-head Lady's Slipper**](https://guides.nynhp.org/rams-head-ladys-slipper/) | **Cypripedium arietinum** | Threatened | S2 | probable | probable |  | no | Terrestrial Orchid |
| [Small White Lady's Slipper](http://newyork.plantatlas.usf.edu/Plant.aspx?id=2022) | Cypripedium candidum | Endangered | S1 |  |  | probable | ? | Fen Orchid |
| [Northern Running-pine](https://guides.nynhp.org/northern-running-pine/) | Diphasiastrum complanatum | Endangered | S1S2 | yes |  |  | yes | Terrestrial |
| [Shining Bedstraw](https://guides.nynhp.org/shining-bedstraw/) | Galium concinnum | Endangered | S1 | yes |  |  | ? | Terrestrial |
| [Bigleaf Yellow Avens](https://guides.nynhp.org/bigleaf-yellow-avens/) | Geum macrophyllum var. macrophyllum | Endangered | S1 | probable |  |  | ? | Terrestrial |
| [Wild Hydrangea](https://guides.nynhp.org/wild-hydrangea/) | Hydrangea arborescens | Threatened | S2 | yes |  |  | yes | Terrestrial |
| [Climbing Fern](https://guides.nynhp.org/climbing-fern/) | Lygodium palmatum | Endangered | S1 |  | probable |  | yes | Terrestrial Fern |
| [Sweet Coltsfoot](https://guides.nynhp.org/sweet-coltsfoot/) | Petasites frigidus var. palmatus | Endangered | S1 | yes | yes |  | yes | Riparian |
| [Hooker's Orchid](https://guides.nynhp.org/hookers-orchid/) | Platanthera hookeri | Endangered | S1 | yes |  |  | yes | Terrestrial Orchid |
| [**Slender Marsh Blue Grass**](https://guides.nynhp.org/slender-marsh-blue-grass/) | **Poa paludigena** | Endangered | S1 |  | yes | probable | yes | Riparian |
| [**Jacob's Ladder**](https://guides.nynhp.org/jacobs-ladder/) | **Polemonium vanbruntiae** | Rare | S3 |  | yes |  | no | Riparian |
| [Pinedrops](https://guides.nynhp.org/pinedrops/) | Pterospora andromedea | Endangered | S1 | yes |  |  | yes | Terrestrial |
| [Nodding Pogonia](https://guides.nynhp.org/nodding-pogonia/) | Triphora trianthophoros ssp. trianthophoros | Threatened | S2 | probable | yes |  | yes | Terrestrial Orchid |
| [**Spreading Globeflower**](https://guides.nynhp.org/spreading-globeflower/) | **Trollius laxus** | Rare | S3 |  | yes | yes | yes | Riparian |

**Second-tier plant species**: These species grow in hemlock habitats, but are not known to be dependent on eastern hemlock. While these species don’t need hemlock to survive, the loss of hemlock from their habitat will alter it dramatically, which may have a negative impact on them.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| common name | Scientific name | New York status | Subnational rank | Hemlock-northern hardwood forest | Hemlock-hardwood swamp | Rich hemlock-hardwood peat swamp | Associated with hemlock | Type |
| [Hair-pointed Moss](https://bryophyteportal.org/portal/taxa/index.php?taxauthid=1&taxon=158559&clid=107) | Cirriphyllum piliferum | Unlisted | S2 |  |  | yes | ? | Moss |
| [Musk Root](https://guides.nynhp.org/musk-root/) | Adoxa moschatellina | Endangered | S1 | yes |  |  | no | Terrestrial |
| [Woodland Agrimony](https://guides.nynhp.org/woodland-agrimony/) | Agrimonia rostellata | Threatened | S2 | yes |  |  | no | Terrestrial |
| [Cooper's Milkvetch](https://guides.nynhp.org/coopers-milkvetch/) | Astragalus neglectus | Endangered | S1 | yes |  |  | no | Terrestrial |
| [Terrestrial Starwort](https://guides.nynhp.org/terrestrial-starwort/) | Callitriche terrestris | Threatened | S2S3 | yes |  |  | no | Riparian |
| [Northern Clustered Sedge](https://guides.nynhp.org/northern-clustered-sedge/) | Carex arcta | Endangered | S1 | possible | possible |  | no | Sedge |
| [Brown Bog Sedge](https://guides.nynhp.org/brown-bog-sedge/) | Carex buxbaumii | Threatened | S2 |  |  | possible | no | Sedge |
| [Handsome Sedge](https://guides.nynhp.org/handsome-sedge/) | Carex formosa | Threatened | S2 | yes |  |  | no | Sedge |
| [James' Sedge](https://guides.nynhp.org/james-sedge/) | Carex jamesii | Threatened | S2S3 | yes |  |  | no | Sedge |
| [Schweinitz's Sedge](https://guides.nynhp.org/schweinitzs-sedge/) | Carex schweinitzii | Threatened | S2S3 |  |  | yes | no | Sedge |
| [Sheathed Sedge](https://guides.nynhp.org/sheathed-sedge/) | Carex vaginata | Endangered | S1 |  |  | probable | no | Sedge |
| [Lowland Fragile Fern](https://guides.nynhp.org/lowland-fragile-fern/) | Cystopteris protrusa | Endangered | S1 | yes |  |  | no | Fern |
| [Rough Avens](https://guides.nynhp.org/rough-avens/) | Geum virginianum | Threatened | S2 | yes |  |  | no | Terrestrial |
| Papillose Fine-branch Moss | Lindbergia brachyptera | Unlisted | S2 | yes |  |  | ? | Moss |
| [Broad-lipped Twayblade](https://guides.nynhp.org/broad-lipped-twayblade/) | Neottia convallarioides | Endangered | S1 |  | probable | yes | no | Orchid |
| [Pink Wintergreen](https://guides.nynhp.org/pink-wintergreen/) | Pyrola asarifolia ssp. asarifolia | Threatened | S2 | probable |  | probable | no | Terrestrial |
| [Small Bur-reed](https://guides.nynhp.org/small-bur-reed/) | Sparganium natans | Threatened | S2 |  | probable |  | no | Aquatic |
| [Northern Bog Aster](https://guides.nynhp.org/northern-bog-aster/) | Symphyotrichum boreale | Threatened | S2 |  |  | probable | no | Riparian |