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Stewardship News

Forest Regeneration Handbook—A Guide for Forest Owners, Harvesting Practitioners, and Public Officials

The State of Connecticut has recently published a new forest regeneration handbook that provides an appreciation of how Connecticut forests developed and fosters an understanding of forest regeneration concepts, including the importance of disturbance. This information will help landowners and public officials, in concert with professional foresters, make informed decisions about forest regeneration options tailored to their management objectives.

The following excerpt from the handbook's introduction outlines the publication's five sections:

- The first section provides a short history of the forest from the period of European colonization and large scale land clearing through the present suburban forest. It concludes with the challenges (fragmentation, parcelization, deer, invasive species) that must be met to maintain a healthy and vibrant forest for future generations.
- The second section explains basic concepts in forest regeneration. The importance of different combinations of light, moisture, and soil in determining success or failure of regeneration is discussed. It then details the adaptations of different species to distinct combinations of light, moisture, and soil conditions. The section concludes with an examination of competitive interference among trees striving to form part of the upper canopy.
- The third section examines the role of disturbance in maintaining habitat and species diversity. The influence distinct disturbance regimes have on forest composition is also explored.
- The fourth section introduces different methods (prescriptions) of forest management. The influence of each management style on the availability of light, moisture, and growing space for new regeneration is discussed. Because the primary reason for harvesting is often either income or a non-commodity amenity such as wildlife, the economic and esthetic considerations of each management method are also presented.
- The handbook concludes with a section detailing requirements to successfully regenerate specific species. As with the other sections, this section is not intended to be an authoritative reference, but rather to provide readers with sufficient information to make informed decisions about forest management options.

The *Forest Regeneration Handbook* is available on line at http://www.caes.state.ct.us/SpecialFeatures/ForestRegeneration.pdf. A limited number of hard copies are also available. Contact Jeffrey Ward, The Connecticut Agricultural Experiment Station, PO Box 1106, 123 Huntington Street, New Haven, CT 06504; phone: (203) 974-8495; fax: (203) 974-8502; e-mail: jeffrey.ward@po.state.ct.us

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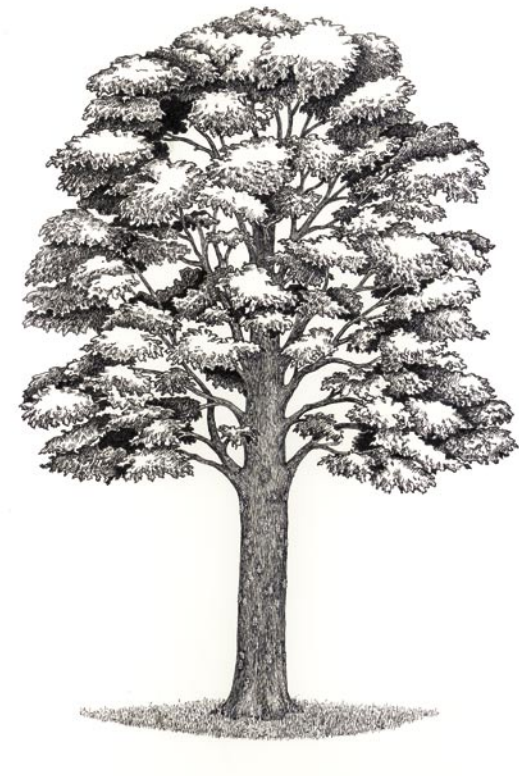
The Ecology and Silviculture of Oaks



A recent publication, *The Ecology and Silviculture of Oaks*, is an excellent reference for consulting foresters as well as landowners interested in managing oaks on their woodlots. It includes information on location and extent of oak-dominated ecosystems throughout the United States; regeneration ecology (i.e., flowering, fruiting, and reproduction characteristics, and population dynamics); site productivity; development of natural stands; self-thinning and stand density; even- and uneven-aged silvicultural methods; silviculture for multi-resource management such as management for oak savannahs, acorn reproduction to enhance wildlife habitat, old-growth oak forests, and aesthetics; and growth and yield of oak.

Regenerating oak in New England and New York hardwood stands is a silvicultural challenge. Regeneration is problematic because of the dense forest canopy usually retained after tree harvesting (i.e., the use of single tree selection cutting favors shade tolerant species such as sugar maple over intolerant and mid-tolerant species such as oak). Cutting small groups of trees in patches ranging from 0.2 to 0.5 acres (called group selection cutting) is a useful way to obtain oak reproduction. The presence of advance oak reproduction prior to cutting is extremely important in successfully regenerating oak in these small openings. Small group selection cuts make sense for landowners in the Northeast who do not want to manage their forest under even-aged management, but who at the same time want to encourage more oak reproduction.

Crop tree thinning may be applied between the group openings to enhance the growth of already existing oak trees. When feasible, diversify the selection of oak trees by species in order to provide more stable acorn crops (there is large variation in both annual and tree-to-tree acorn production) and to reduce the likelihood of suffering crop failure from gypsy moth. White oak acorns are preferred by many wildlife species, but white oak are slow growing and susceptible to epicormic branching when released from competition. Northern red oak is fast growing and desirable for wildlife because of its relatively abundant production. Regardless of species, favor crop trees with vigorous crowns in dominant and codominant positions.

For additional information, see *Crop Tree Management in Eastern Hardwoods* (NA–TP–19–93), by Arlyn Perkey and Brenda Wilkins, and *Guidelines for Applying Group Selection Harvesting* (NA–TP–02–00), by Neil Lamson and William Leak. Both publications were produced by the U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry.

Reference: Johnson, Paul S.; Shifley, Stephen R.; Rogers, Robert. 2002. The ecology and silviculture of oaks. Wallingford, Oxfordshire, UK: CABI Publishing. 528 p.

Forest Regeneration Handbook—A Guide for Forest Owners, Harvesting Practitioners, and Public Officials

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Reference: Ward, Jeffrey S.; Worthley, Thomas, E. 2003. Forest regeneration handbook: a guide for forest owners, harvesting practitioners, and public officials. New Haven: The Connecticut Agricultural Experiment Station. 44 p.

Estate Planning in Vermont

In Vermont, only a few of the over 60,000 landowners have developed estate plans that provide for long-term woodland management. Cash-poor, mostly farm families face high transfer costs when parents pass away without having given consideration to estate planning matters. In many cases, forest lands are sold to the highest bidder to pay these costs. This situation leads to parcelization of land holdings and often results in land being converted from productive woodlands to housing developments.

A project entitled "Estate Planning for Woodland Owning Families" is being coordinated by Thom McEvoy, Associate Professor and Extension Forester at the University of Vermont. The purpose is to show families how to keep forest holdings intact by teaching methods of long-term, intergenerational forest planning. Program delivery techniques include print media, radio and local network television awareness campaigns, interactive television information sessions, daylong workshops in each of Vermont's 14 counties, a network of woodland owners who can help advise families contemplating long-term planning, and a network of estate planning attorneys who can provide initial consultations to families at no charge. An association of cooperating consulting foresters is also being formed for dispensing forest management advice to clients who want to incorporate forests into their estate plans.

Over 50 people attended a recent estate planning workshop in White River Junction. Speakers, who included foresters, lawyers, forest taxation specialists, and land trust personnel who deal with estate planning on a regular basis, shared their personal war stories in dealing with estates in which provisions were not made for an orderly transfer of property (e.g., no wills were prepared). The workshop covered the three basic tools for passing forest land on to heirs: Limited Family Partnership, Limited Liability Company (LLC), and closely held S-Corporation. Each allows woodland owners to form legal entities that own the land, and gradually "vest" children into ownership and decisionmaking positions. They differ in certain respects that are important for forest landowners to understand. An excellent discussion of these various tools, their similarities, and differences appeared in an article by Thom McEvoy entitled "How to Set Up a Family Forest Limited Liability Company" (*Journal of Northeastern Agriculture* 5(8): 52–56).

For further information, contact Thom J. McEvoy, School of Natural Resources, University of Vermont, 345 Aiken Center, Burlington, VT 05405; phone: (802) 656-2913; e-mail: tmcevoy@together.net.

SWOAM Ties Conservation to Education

The Small Woodlot Owners Association of Maine (SWOAM) is a 3,000-member landowner organization dedicated to working with its members on good forest stewardship. The organization, which is also a land trust for sustainable working forests, currently has about 963 acres under fee and 928 acres under conservation easements. One of SWOAM's goals for some of these permanently protected trust properties is to provide stewardship education opportunities on forest management activities and the flora and fauna that inhabit these forests.

The USDA Forest Service's Durham Field Office is assisting SWOAM's Southern Maine Chapter with GIS mapping of the Fred and Orin Whitney Memorial Forest, a land trust property in Gray, including boundaries, existing trails, and forest stands. Once the map is completed, an old-pasture white pine stand and the mixed hemlock, pine, and maple stands will be thinned. In conjunction with the Maine Forest Service, the local consulting forester, and the USDA Forest Service, SWOAM will establish pre- and post-monitoring plots to determine the effect of this thinning on tree growth.

SWOAM is currently using volunteers, including some from the Forest Service and Maine Inland Fisheries and Wildlife, to inventory plant and animals that occur on the property. The information on tree growth, plants, and animals will be made available to local schools and residents for educational purposes. Future plans include developing a parking area, walking trails, and a brochure that explains forestry activities.

In another partnership with SWOAM, the Durham Field Office recently worked with the Maine Forest Service to educate SWOAM landowners in using GPS handheld receivers to map forest lands and trails.

Stewardship in the Public Eye

The Massachusetts Forest Stewardship Program recently published *Stewardship in the Public Eye: How and Why Six Massachusetts Towns Actively Manage Their Forests*, authored by Susan Campbell, former Forest Stewardship Program Coordinator. A guiding philosophy of the program is that close connections between people and their local landscape lead to good stewardship, and one of the best ways to build this connection is through carefully planned, positive activity in the woods. Case studies included in the publication portray the experiences of several towns that are making these connections to their woods and attempt to capture strategies for success, potential pitfalls, and some resources for getting started. Contact the MA Forest Stewardship Program for further information: 433 West Street, Amherst, MA 01002; phone: (413) 256-1201.

NED Offers a Range of Products to Resource Managers and Landowners

NED (Northeast Decision Model) is a collection of software products developed by the Forest Service to help resource managers and landowners develop goals, assess current and future conditions, and produce sustainable management plans for forest properties. The software may be downloaded without additional charge (your taxes have already paid for them) from the Forest Service's Web site at: http://www.fs.fed.us/ne/burlington/ned. The currently available programs, and two under development, are described here.

The **Forest Stewardship Planning Guide** provides the forest landowner with background information on a wide range of forestry practices used to derive a variety of benefits from forests (e.g., aesthetics, water quality, wildlife, recreation, timber). The program allows the user to define goals for forest properties, and to compare and contrast the compatibility of the various management goals. Forest consultants use this program as an introduction to the topics of forest management when they work with new clients, and it is used by schools as an introduction to forestry.

NED/SIPS was one of the initial NED products, but further developments have supplanted it. This DOS-based program is subject to some difficulties inherent to that system, but has been used by foresters for some time. The program provides a means of creating, managing, and analyzing forest inventory records at the stand level. Once data are entered, users can apply any of a set of standard treatments to the stand or design a customized cutting scheme, and use one of the four incorporated stand-growth simulators (NE TWIGS, SILVAH, OAKSIM, and FIBER). Data can only be entered for one stand at a time.

NEWILD provides access to and evaluation of information on species-habitat relationships for 338 terrestrial vertebrate species in New England. The program is based on previous publications that describe the habitat conditions used or preferred by these species.

NED-Health provides information on stress agents that affect the health of the trees in a forest, including insects, fungi, weather, or people. The program analyzes composition of a particular forest and identifies potential causes of damage, methods to recognize particular agents, and actions that may be taken to avoid or mitigate damage.

NED-1 emphasizes the analysis of forest-inventory data from the perspectives of various forest resources, including visual quality, ecology, forest health, timber, water, and wildlife. NED-1's primary function is to evaluate to what degree individual stands, or the management unit as a whole, provide the conditions required to accomplish specific goals. In contrast to NED/SIPS, NED-1 adds the complexity of managing for multiple benefits for a multiple-stand management unit. It also provides analysis for the management unit as a whole as well as the individual stands separately, so the user can evaluate conditions across the entire property.

NED-2 expands on previous versions of NED software by integrating treatment prescriptions, growth simulation, and alternative comparisons of management scenarios across a management unit. It implements a goal-driven decision process to ensure that all relevant goals are considered, the character and current condition of forest land are known, alternatives to manage the land are designed and tested, the future forest under each alternative is simulated, and the alternative selected will achieve the owner's goals. Designed for field data collection on a handheld personal digital assistant (PDA) computer, NED-2 offers an easy to link to other third-party programs using Microsoft Access. NED-2, which will likely be available in 2004, is undergoing final phases of development, and some portions are undergoing testing.

NedLite is an inventory data collection program that runs on PDA computers. Designed specifically for NED, the program includes overstory, understory, groundcover, and transect data. NedLite inventory settings can be modified for collection of NED-1 or NED-2 data. Using Palm HotSync® technology, NedLite data can be uploaded into NED for subsequent analysis. The first version of NedLite is undergoing field testing and should be available for distribution in late 2003.

The NED project, which involves a number of Forest Service units, State agencies, and educational institutions, is coordinated by the research work unit at the USDA Forest Service's Northeastern Research Station in Burlington, Vermont. For further questions or technical assistance, call (802) 951-6771 or e-mail nedsoftware@fs.fed.us.

Ecological Classification Presentation Available

Bill Leak, Research Silviculturist with the Forest Service's Northeastern Research Station, has presented a slide program over the years on ecological classification in the Northeast. The talk, entitled "Applications of the Ecological Classification System at the Landtype Phase," focuses on why trees grow where they do as a result of site factors such as soil moisture, soil texture, and bedrock type. This presentation is now available on the Forest Stewardship Web site as a Power Point file, which can be viewed, printed, or downloaded (visit http://www.fs.fed.us/na/durham/coopforest/stewardship/text/publications.shtml).

Goats in the Woods

Goats in the woods? It may sound like an anomaly, but Dr. Peter Smallidge, Extension Forester at Cornell University, and Drs. Jim Finley and Mike Jacobson of Penn State University are hoping their research will lead to some new symbiotic relationships. The "Goats in the Woods" research project is designed to benefit goat producers who seek additional browsing sites for goat meat production, as well as forest landowners who want to control understory woody brush without damaging mature trees. The specific goals of this integrated research and extension project are to assess and demonstrate the following: operational protocols to optimize goat weight gain (and profitability) in woodland settings, how goat browsing affects desired and undesired forest vegetation, and the possible working relationship between woodlot owners and goat producers.

Groups of 20 goats are enclosed in ¼-acre paddocks using well-maintained electric net fencing to prevent them from wandering off and to keep predators at bay. The frequency at which goats are moved to a new paddock depends on several factors, including the purpose of the treatment in the woodlot, the quality of underbrush available in the paddock, and the type and amount of supplemental feed offered to the goats.

The goal of goat owners is to increase incomes and reduce costs while having more land available for forage, since many lack the land base to maintain a large herd through the summer. The goal of forest landowners is to control undesirable species such as striped maple and American beech in order to favor more economically valuable species (e.g., sugar maple, black cherry, white ash). Landowners may also want to reduce the overall costs of controlling competing vegetation and reduce their reliance on herbicides.

Trials to date have shown that goats typically girdle 100 percent of striped maple stems larger than 0.5 inches d.b.h., but only 30 to 60 percent American beech stems. Goats will readily girdle other species such as red maple, yellow birch, black birch, hemlock, pine, larch, witch-hazel, hornbeam, hophornbeam, white ash, and black cherry. The goats do not normally eat the rougher bark of mature trees; however, trees must be monitored daily to assess damage.

The target audience for this research includes goat producers, woodlot owners, foresters, cooperative extension educators, and other natural resource agency personnel. For further information, contact Peter Smallidge, 116 Fernow Hall, Cornell University, Ithaca, NY 14853; phone: (607) 255-4696; e-mail: pjs23@cornell.edu; Web-site: http://www.dnr.cornell.edu/ext/goatsinthewoods/.

New Statewide Land Use Educational and Advocacy Organization in Maine

Land use planning in New England and New York is largely controlled by town governments. Effective, meaningful land use planning at the State level seems almost unreachable when towns plan in a vacuum, ignoring issues in adjacent towns. Statewide land use organizations like the 1000 Friends of Oregon can be instrumental in helping achieve regional land use goals such as the protection of nonindustrial private forest lands. A group of interested citizens in Maine recently banded together to form GrowSmart Maine, an organization committed to tackling sprawl statewide, an issue previously not addressed at the State level. The organization has established an office at Yarmouth and has received start-up funding from founding members and the organizations they represent. GrowSmart Maine hopes to offer assistance to towns through model growth ordinances and other smart growth plans.

Biodiversity

Ecology and Uses of Club Moss

Club moss (*Lycopodium* sp.) is a nontimber forest product collected and sold for floral greenery and for seasonal and traditional decorations in some areas, such as northern Wisconsin, the Upper Peninsula of Michigan, and Ontario. According to Elizabeth Nauertz, an ecologist with the USDA Forest Service, the most heavily harvested club mosses are princess-pine (*L. obscurum*) and tree ground pine (*L. dendroidium*). Other *Lycopodium* species include groundcedar (*L. complanatum*), running clubmoss (*L. clavatum*), stiff clubmoss (*L. annotinum*), and shining clubmoss (*L. lucidulum*). Much of the information presented here is taken from an article by Elizabeth Nauertz and John Zasada.

Lycopodium species vary in growth form and morphology. The aerial stems begin to photosynthesize when they reach maturity after 4 to 6 years (when they begin to produce spores). *Lycopodium* species have either aboveground or belowground running rhizomes—horizontal stems that often send out roots and shoots from their nodes. Rhizomes are important in adding to the photosynthetic capability of the plant and affect the plant's ability to expand vegetatively. The roots forming from rhizomes are used for photosynthate, water, and nutrient transport. The evergreen nature of *Lycopodium* species allows them to take advantage of low light intensities found near the forest floor in northern forests. The spring and fall "windows of opportunity" for light on the forest floor may be important times for photosynthate production and storage for the *Lycopodium* species.

The aerial stems of princess-pine and tree ground pine are frequently harvested for decorative greens. The spores of these two species are flammable and have been used for theatrical and pyrotechnical purposes. The most efficient and least destructive way to harvest these species, which have belowground rhizomes, is by clipping a mature aerial stem near its base at ground level. This procedure is less damaging to the rhizomes than ripping or tearing them away. Some evidence indicates that cutting the aerial stems enhances the survival of the plant by increasing belowground rhizome branching. The mature aerial stems should be harvested in early spring or late fall to avoid disturbing the plants during the summer, when they are sexually reproducing and releasing spores. Some guidelines recommend that no more than 25 percent of a plant's "greens" be collected from each harvest area and that subsequent harvesting should be postponed for a few years to allow for adequate regeneration.

Club moss specimen showing the terminal cones where spores are produced.

Groundcedar, commonly found in pine communities, and running clubmoss are also harvested for decorative greens and wreaths. In addition, the dried plant parts have some homeopathic and Aboriginal medicinal uses. Harvesting of these species is not permitted on public lands (all harvesting occurs on private lands). Since these species have aboveground rhizomes, they are much more vulnerable to overharvesting. The species are typically harvested by grabbing the end of a rhizome and yanking it, pulling the aerial stems, rhizome, and roots from the forest floor. This technique is obviously destructive and can eliminate future harvest opportunities. Selective harvesting from a dense patch is recommended, leaving plants to branch and expand.

Stiff clubmoss is not traditionally harvested. Shining clubmoss was gathered by Native Americans for use as padding for cradleboards.

Elizabeth Nauertz explored the effects of forest management on *Lycopodium* in a study of five forest management regimes in northern hardwood forests: managed even-age, managed uneven-age, managed old growth, unmanaged second growth, and unmanaged old growth. Two-thirds of the *Lycopodium* present were found in the managed even-age and unmanaged old growth stands. The highest *Lycopodium* frequency and cover values occurred in the unmanaged old growth, managed even-age, and unmanaged second growth. Among the management regimes used in this study, the degree of canopy removal may not be much of a concern to the relative abundance or cover of *Lycopodium* species. Individual growth form and reproduction method, both sexual and asexual, help explain the patterns of individual *Lycopodium* species' frequency and cover found in this study. Species with aboveground rhizomes would have the advantage in wet, rocky areas with compact soil, whereas species with belowground rhizomes would have the advantage in areas where the soil is well aerated and of low bulk density.

According to a purchaser in Wisconsin, the current price paid for harvested *Lycopodium* is about $0.40 per pound. Purchasers clean the product in revolving wire-grid drums, preserve and dye it, and then package it in 25-pound cartons for shipping. USDA Forest Service researchers Marla Emery found that total processing costs averaged $0.65 per pound in 1995. The product is sold to floral supply houses throughout the United States and to

importers in Europe and Mexico. Current wholesale prices range from $1.12 to $2.00 per pound based on water content (higher prices for dried product).

Commercial harvesting in New England and New York does not appear to be as extensive as in the Upper Great Lake States and Canada. This may be simply a matter of the absence of or poor development of marketing chains or pathways in the region. The industry would benefit from an organized effort to develop both a network of purchasers, and cooperatives to help with the gathering process. Increased education on the market possibilities and the necessity for long-term, sustainable harvests would also be valuable.

References

Nauertz, Elizabeth. 1999. Impact of various silvicultural practices on the abundance and frequency of *Lycopodium* species in northern hardwood forests. Houghton, MI: Michigan Technological University. 164 p. M.S. thesis.

Nauertz, Elizabeth; Zasada, John. 2000. *Lycopodium*: growth form, morphology, and sustainability of a non-timber forest product. In: Forest communities in the third millennium: linking research, business, and policy toward a sustainable non-timber forest product sector: Proceedings of a meeting; 1999 October 1–4; Kenora, ON. Gen. Tech. Rep. NC–217. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 110–115.

Ongoing Research at the Durham Lab

Results of a study by USDA Forest Service scientists Richard M. DeGraaf and Mariko Yamasaki, entitled "Effects of Edge Contrast on Redback Salamander Distribution in Even-Aged Northern Hardwoods," was recently published. (*Forest Science* 48(2): 351–361). The authors examined the distribution of redback salamanders by stand type and distance from mature forest edges created by even-aged timber harvesting in northern hardwood forests in New Hampshire.

Study objectives are as follows:

1. Delineate edge effects by determining to what extent the effects of clearcutting extend into younger and mature forest
2. Determine how edge effects change as clearcut stands mature
3. Examine the relationships between salamander abundance and habitat structure across a gradient of stand ages (regeneration/mature, sapling/mature, pole timber/mature) in northern hardwoods
4. Evaluate seasonal and yearly differences in salamander detectability

The authors found that even-aged management with clearcut regeneration lowers the abundance of redback salamanders in northern hardwoods. At silvicultural edges, redback salamander abundance increased on the younger sides of edges as stands developed from regeneration to sapling to pole timber. The pattern of salamander abundance in each of the three degrees of edge contrast was similar: low abundance 40 m out in the younger stand; increased abundance near or at the edge, or decrease just inside the edge; peak abundance in the mature stand 20 m inside the edge; and a decline at 40 m in the mature stand. Recovery of redback salamander populations to preharvest levels may take more than 30 years even at stand edges.

Seasonal and annual variations in redback salamander detections were dramatic. Across all edge contrast types, detections were highest in spring and late summer, and lowest in early summer and early fall. Yearly abundances correspond with annual precipitation levels, with lowest abundances in drier years and highest abundances in wetter years across all edge contrast types. Although redback salamander abundances are higher with advancing stand development, yearly patterns of abundance are related to overall precipitation and are not mitigated by stand development. Monitoring efforts should focus on periods of peak abundance and span the range of yearly precipitation to index treatment effects adequately.

Regarding habitat relationships, the depth of the decomposing soil organic layer was the only positive and the most strongly correlated variable with redback salamander counts. In the regression model, the percent of herbaceous ground cover, the number of hardwood stems > 2 m tall and < 10 cm d.b.h., and the organic layer depth were the significant variables. Downed woody debris was not related to redback salamander distribution.

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Naturalist's Corner

Ghost Antler Lichen

The ghost antler lichen (*Pseudoevernia cladonia*). (Photo by Ken Dudzik, USDA Forest Service)

The ghost antler lichen (*Pseudoevernia cladonia*) might be a good lichen to know if you are haunted by your failure to bag that big buck last year. Lichens are usually identified as foliose (with flattened branches) and fruticose (growing from a single point). The ghost antler lichen is unusual in that it appears fruticose in growth habit but foliose because it has flattened branches with distinguishable upper and lower surfaces. The "ghost" effect comes from the very pale upper surface and a mousy gray to black lower surface. The "antler" effect comes from the forked, antler-like branches that form compact cushions. The lobes branch in very regular dichotomies (i.e., branching is characterized by successive forking into two approximately equal divisions). This lichen lacks both isidia and soredia (cylindrical and sugary vegetative propagules, respectively).

One way to help identify lichens is to use a variety of chemical tests. For example, the K test (for potassium hydrochloride) is used to detect color changes on the surface of the lichen (cortex) or in its interior (medulla). The cortex of the ghost antler lichen becomes yellow when the K test is applied. Another test is the C test, in which chlorox or household bleach is applied to the cortex or medulla. In this case, the cortex does not change color, but the medulla changes to pink or red.

The ghost antler lichen grows on the branches and bark of conifers. The pictured specimen was found along the Maine coast, south of Bath.