

VERMONT

F^{RESTRY} LETTER SERIES

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Forest Ecology

We have learned from earlier mailings, “Forest ecology is the study of life in areas where the predominant vegetation is trees.” This study of life is very broad and includes life forms from microscopic organisms right through to the largest towering tree in your forest. The relationships among these living organisms can be very complex and seemingly endless when looked at in detail. As foresters and landowners, it is important to understand that actions taken in the forest will result in reactions that may ripple throughout the forest resulting in desired or sometimes undesired outcomes. The history of forest management has been helpful in providing us with general trends in forestry and a forest’s reaction to various forms of management. It is important to use this historic information to help guide us through management of our forests. We must also keep in mind the underlying magnitude of interconnected life in our forests and realize there are no certainties when dealing with forest ecology, rather a never ending education.

What is Silviculture?

Silviculture is perhaps the most important aspect of forestry. Silviculture is defined as the art and science of growing and tending forest crops. Crops? You might ask. Certainly! Managing trees and forests can be considered a form of agriculture just like a farmer’s corn field, with a few differences, such as the time required to reach maturity, and the obvious height and appearance differences. The science aspect of silviculture draws upon the requirements that trees have for growth, regeneration, and their response to changes in their environment. Components of many sciences are drawn together to help the silviculturist better understand this scientific approach to tree growth. The art aspect of silviculture involves thinking of creative ways to manipulate the forest to reach desired goals. Communication between the landowner and the forester will inform the forester of the landowner’s goals and will inform the landowner of limitations and expectations associated with various forms of management. An understanding of goals and limitations will set the general parameters for the silvicultural treatment. A silvicultural treatment can consist of three components. These components are regeneration (establishment of the next crop), tending (improvement cuttings and other practices performed on the growing crop) and harvesting (removal of the mature crop). The two most common forest conditions are even-aged and uneven-aged forest stands. As the names suggest, an even-aged stand is comprised of a community of trees all having comparable ages and the uneven-aged stand is made up of trees of varying ages. The condition and successional stage of the forest will help determine what combination of these components is appropriate to use in an individual stand.

Foresters should bring with them knowledge of silviculture through education and, most likely, experience. Using forest measurements taken in the field, the forester can determine which silvicultural treatment should be applied to reach the desired outcome. The silvicultural treatments prescribed by the forester are actions that often times alter the forest stand to encourage an accelerated realization of desired goals. Silviculture is an ever-evolving and continually tuned management tool that will guide sound forestry into the future.

Dendrology clue #1: This long-lived shade tolerant tree has a nodding form defined by its limbs and leaders and can be recognized at great distances.

Your fourth quiz: ↓☺

Dendrology Challenge #4: Dendrology is the botanical study of trees. Each forestry letter will highlight an important Vermont tree by displaying its leaves, seeds, nuts or silhouette within the issue. Can you guess what tree it is? Why is it important? What benefits does it provide to people, wildlife or the environment? See the clues throughout this letter and the answer on page 8 (no peeking!).

Let's take a look at some common silvicultural treatments:

The **selection method** of treatment is most often used in an uneven-aged stand and concentrates on removing mature trees, tending the immature trees, and creating new regeneration. This treatment focuses on maintaining a specific spacing and density of remaining trees in the stand and will result in sustainable harvests over relatively short time intervals. The selection system can be employed by the removal of individual trees or groups of trees.

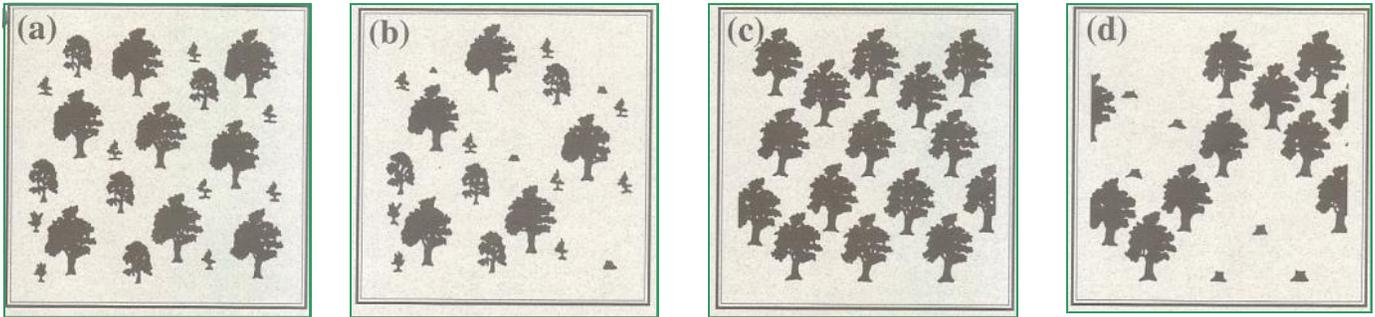


Diagram of the single-tree selection method of regeneration (a) prior to harvest, and (b) following harvest. Diagram of the group selection method of regeneration (c) prior to harvest, and (d) following harvest.

Thinnings are conducted in even aged stands. As trees grow they occupy more space in the forest, and therefore compete more intensively for resources such as sunlight, nutrients, and water. By periodically removing trees from the stand, typically poorly formed and undesirable trees, resources and growth are focused on the highest quality stems. This practice of thinning will speed up the growth of the best trees in the stand and reduce time to maturity.

The **shelterwood method** is used in an even-aged stand that is approaching maturity. The mature trees are removed in two or more successive cuttings. Remaining trees are left to provide a seed source and protection for the next generation of trees. Once the new generation of trees is established and no longer needs protection, the remaining overstory is removed.

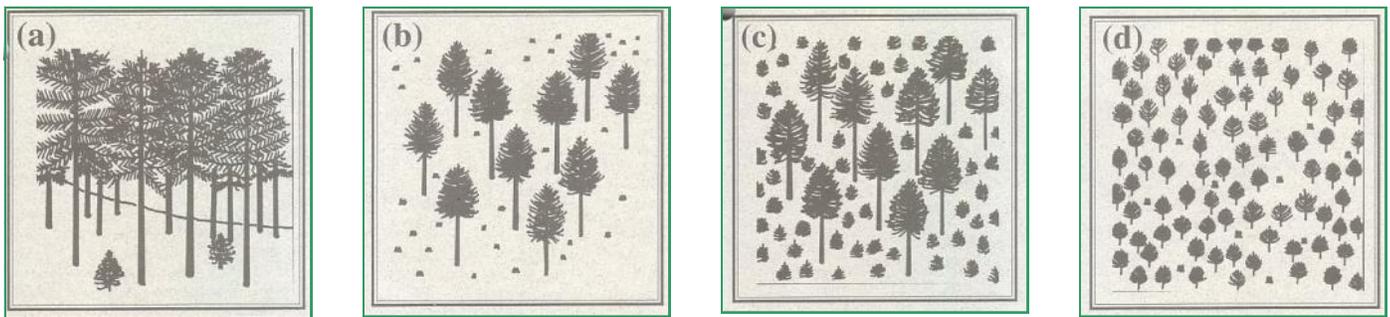


Diagram of a forest stand regenerating under a two-cut shelterwood. (a) Prior to harvest, (b) immediately following a combined preparatory and seed cut (c) regeneration becomes established after the first cut, and (d) established regeneration following the second cut, or removal cut.

The **seed-tree method** is very similar to the shelterwood method and is also used in even-aged stands. The seed-tree method removes all but a few, widely spaced residual trees in the stand. This method is often times used with tree species that have large amounts of easily dispersed seed. As with the shelterwood method, the remaining mature trees are removed once an adequate amount of regeneration is reached.

2



Dendrology clue #2: Even-aged or uneven-aged (selection) management systems can be successfully used to manage this tree. The even-aged system is preferred and most frequently used. A 2- or 3-cut shelterwood system is the best even-aged method for regenerating this tree. It is effective because it promotes seed germination and early seedling development by reducing moisture stress. However, the site must be properly scarified and all competing understory hardwoods removed to develop satisfactory seedbed conditions before or immediately after the first and sometimes the second cut.

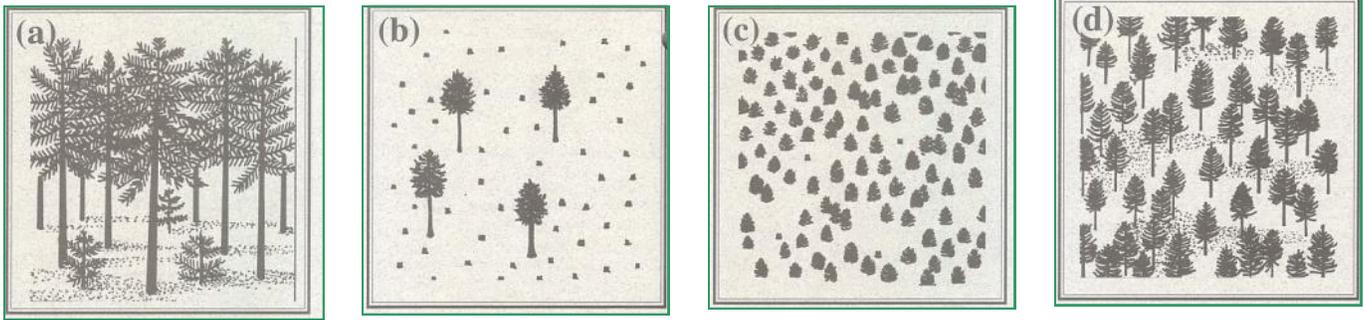


Diagram of a forest stand regenerating under the seed tree method. (a) Prior to harvest, (b) immediately following the seed tree cut, (c) young regeneration following the removal of the seed trees, and (d) established seedlings and saplings growing under open conditions.

The often misunderstood **clearcut** is the final method we will examine. Unfortunately the clearcut method has received a bit of a bad reputation, however, it is another important tool in silvicultural management. The visual impacts of a clearcut are most likely the reason for its negative perception. The clearcut is defined as the complete cutting of an area in one operation. Removal of all trees in a stand will open a stand up to several regeneration possibilities. Planting is one option of regenerating an area after a clearcut and will allow the manager more control over the next generation of trees; however, it is also quite costly and labor intensive. Seed that is lying dormant in the soil is another possibility for the type of regeneration that will take over. (Some seeds can remain dormant and viable in the soil for up to 50 years before the correct growing conditions occur.) Seeding from surrounding trees is another source of regeneration for clearcuts. Clearcuts can vary in size and shape, can be very obvious or quite inconspicuous, and after a few years will most likely be a thick jungle of vegetation and regeneration that is sought after by many forms of wildlife.

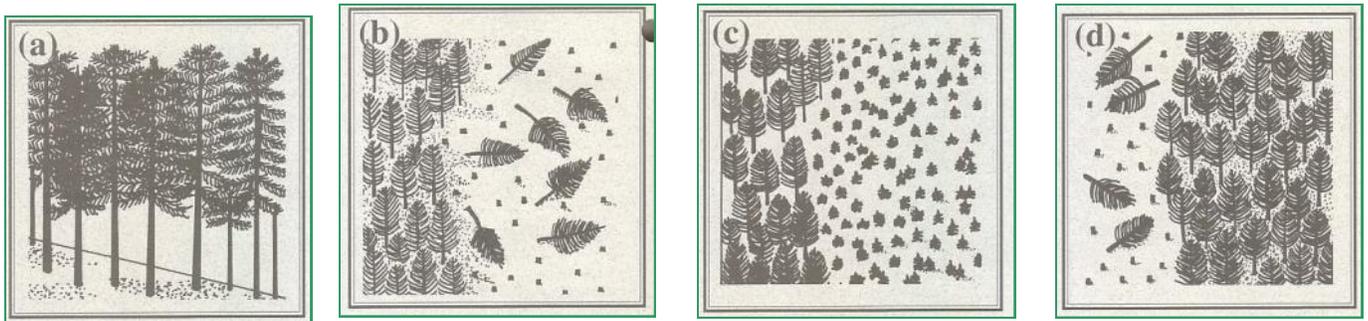


Diagram of a forest stand regenerating under the clearcutting method. (a) Mature, even-aged stand prior to harvest; (b) immediately following cutting; (c) young seedlings growing in the harvested area; (d) adjacent, mature timber being removed once the new stand is well established.

(Silviculture Concepts and Applications, Ralph D. Nyland, 1996.)

(Graphics courtesy of Virginia Cooperative Extension Publication 420-405 Principles of Regeneration Silviculture in Virginia)

It may be noted that the above description of silvicultural methods is a classic textbook description. Your professional forester may manipulate the silviculture to accomplish other goals such as those described in the Legacy Retention and wildlife habitat management sections reviewed in Forest Letter Series #4.

Taking shade tolerance into account can help the forester manage a forest for the desired outcome.

Dendrology clue 3: Once the primary source for tannin in the prosperous leather industry it had been replaced by synthetic and imported products today.



Forest Regeneration

Typically in Vermont, the vegetation that will naturally occupy any given site is trees. By mowing your lawn you are essentially keeping away a forest. Seeds from trees are widely dispersed by wind, water, and wildlife. Some trees are also born out of roots of existing trees. There are general trends that help determine what, where, when, and why various types of trees will grow in a Northern hardwood forest. One major trend that helps determine what trees will occupy a site is shade tolerance. Some trees are shade intolerant and generally will not grow unless they have plenty of sunlight. These trees are usually the first types that occupy a site when a lot of sunlight is available, such as a recent clearcut, an area after a forest fire, or an abandoned farm field. Some northeastern tree species that are in this “pioneer” category include aspen, white birch, pin cherry, and pine. Once these trees are established and start growing, the shade created by them will allow more shade tolerant species like maple, beech, hemlock, spruce, and oak to begin growing.

While it seems like trees are sprouting up everywhere, it can be difficult trying to make specific types of trees grow in specific places. There are many factors which limit the success of natural regeneration on a site. Some factors that affect success of regeneration are: soil type, aspect, temperature, moisture and wildlife. While many trees will grow on a variety of soil types, choosing to grow the right species on the right site is very important. Species like sugar maple and white ash may grow best on moderately well drained enriched soils, while a species such as white pine would prefer well drained sandy soils.

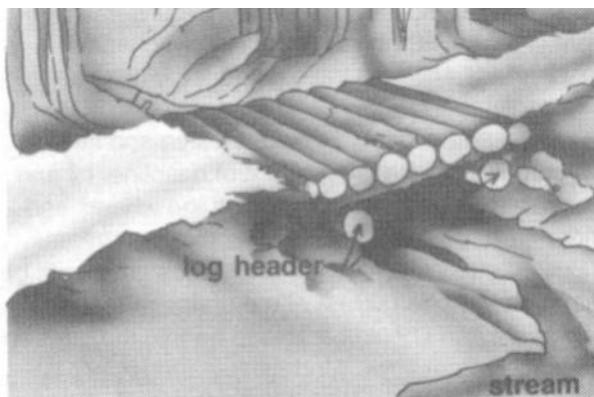
Another regeneration problem encountered in some parts of Vermont is browse by moose and deer. These animals seem to love munching on commercially desirable tree species. Small, delicious, hardwood regeneration is usually right at the perfect height for these hungry herbivores to browse.

This continual browsing in high density moose and deer areas can cause some serious forest management problems. Fran Sladyk, a local consulting forester, has witnessed a dramatic increase in Balsam Fir browse damage in Eden, Johnson, and Hyde Park. Leading the land manager to contemplate serious questions: Will moose browse damage limit landowner options in the future? Will balsam will almost disappear in the next twenty years due to this damage? Balsam grows so much quicker than spruce. Will landowners need a longer rotation when growing timber? Will a lack of sufficient regeneration extend the time frame for some logging activity (shelterwood cuts)? Will moose eat themselves out of habitat? What effects does this have on birds (bicknell’s thrush) and other animals? Issuing more hunting permits for moose may be the only effective tool remaining in these areas.

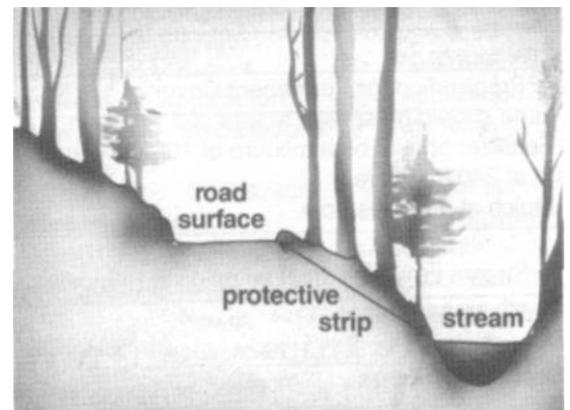
Do nothing...

Not doing anything is always an option when dealing with forest management. Even with no management, a forest will continue to grow. If no active management will create the type of forest that best meets the landowner’s goals, then that would be the appropriate choice. The owner’s objectives are always key. Many types of management require a waiting period. Young and underdeveloped stands may need time before a first thinning can be implemented. Understanding the goals of management will allow the manager to plan accordingly to best reach the desired outcome. Proper management can keep a forest healthy, benefit wildlife, and allow for a shorter and more profitable harvest rotation.

4



Design of Simple Header Bridge



Protective Strip. A protective strip prevents sediment from reaching streams and maintains shade and stream bank stability.

The improper use of equipment can cause damage to the forest through erosion, soil compaction, and wounds to remaining trees. Skid trail layout and time of year play an important role in forest management. A properly designed and maintained forest road system is a wise investment. It is important to remember that existing skid roads may not always be located in the best possible location. New landowners may inherit poorly designed trail systems that are prone to erosion. In this circumstance it may be best to relocate the trails and roads to suitable locations and stabilize the old trails with proper close out procedures. Trail systems should be designed to minimize erosion through the use of recommendations found in the booklet *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont*. It is recommended that you work with your forester while designing a trail system. After taking conditions into account, a forester will lay out an efficient system of skid trails to be used when accessing the property during a timber harvesting operation. This may be done with the aid of the logger who will be performing the work. Working together, the forester and logger can establish trails that are functional and accommodate the limitations of various types of harvesting equipment.

Over time, the continued use of an established skid trail system from operation to operation will limit disturbance to a smaller confined area. Soil compaction is a problem encountered in many forests. Fine soils have a greater tendency to compact. Tree roots spread out to fine hair-like tips and are generally found in the upper six inches of soil. These roots are called the feeder roots. Feeder roots can make up to 80 percent of the tree's root system and supply the tree with its life sustaining nutrients and water. Compaction of the soil around these roots can essentially cut off the tree's supply of nutrients. Limiting the use of equipment to specific areas can reduce the overall impacts of soil compaction.

Seasons and weather play an important role in skid trail use. The springtime or "mud season" can be one of the worst times to harvest timber. Wet soils at this time of year can cause rutting, erosion and damage to tree roots. Increased sap flow during this season will also allow bark to be knocked off residual trees much more easily. Missing patches of bark are open wounds for a tree and will most likely cause problems for the tree in the future. Winter "freeze up" is probably the best time in which to harvest. Frozen soil will often show very little evidence the forest has been accessed at all.

"Bumper" trees are a management tool used by foresters when laying out skid trails. Bumper trees are usually of low-value and are intentionally left in strategic places along skid trails. Bumper trees are used to help pivot and aid in navigation of skidded logs along skid trails. This practice reduces damage to residual trees in the stand. Bumper trees may be left after a harvest, however, they may be removed if they could lose their harvest value or are too damaged to be retained for future use as bumper trees.

Poor harvest decisions can also be a harmful practice. Removal of just high-value timber or "high-grading" during a harvest can produce poor, long lasting effects in a forest. High-grading removes the best timber, including the best seed source for future regeneration. Successive high-grading operations will deplete a forest of high quality timber, leaving mostly undesirable trees and timber species. Recovery from this improper practice can require a long period of time.

(*Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont*, Vermont Department of Forests, Parks, & Recreation, 2009.) www.fpr.org/resource/for_forres_acceptman.cfm

Dendrology clue #4: Wildlife love this tree, especially white-tailed deer. When mature the tree makes a great place for a winter bed and deer love to nibble and munch on it when deep snow makes other food sources scarce.

Dendrology clue #5: This tree is currently under attack by an exotic sap sucking insect that originated from Asia. This serious pest threatens to eliminate all stands of these trees up and down the eastern seaboard. Imagine what this would do to hurt our trout streams and cool damp woods!



Forest Health

As part of a natural life cycle, trees eventually succumb to some sort of disruptive force. Once a tree dies and sometimes even before, it will begin to decay and eventually return to the forest floor. “Tree decay releases stored energy and essential elements by the breakdown of wood. Fungi decay the wood in living and dead trees as part of a vital web of microorganisms, insects, and wildlife. Decay organisms enter trees through wounds, large and small.” (Smith, Shortle) Trees, like people, are affected by many health issues. Disease, pests, and pathogens exist in the forest community. Generally speaking, healthy trees are less susceptible to disease, pests and pathogens. When a tree is in a weakened state, through injury, extreme weather conditions, or exposure to toxic substances, it is more prone to develop further health issues. Tree injuries usually provide a direct avenue for awaiting pests and diseases. The best way to maintain a healthy forest is to follow proper management and monitor trees for symptoms of new health problems, so that they might be remedied quickly.

([A First Look at Tree Decay](#) by Kevin Smith and Walter Shortle, USDA Forest Service)

Forest Management Plans

A forest management plan is a valuable document for the forest owner. A professionally prepared plan will outline the owner’s objectives and give the landowner a comprehensive description of many aspects of the forest property. The plan will break the forest down into manageable units based on forest type, accessibility, topography or any condition that would prove beneficial to manage as a separate unit. The plan will predict the growth trends of the forest, and will outline the necessary steps required to reach the landowner’s forest goals. While providing a guide to managing the property, a forest management plan can also qualify the landowner for cost-share and tax incentive programs such as the Environmental Quality Incentives Program (EQIP) and the Vermont Current Use program. EQIP and the Wildlife Habitat Incentive Program (WHIP) are administered by the Natural Resources Conservation Service (NRCS) while the Current Use or Use Value Appraisal (UVA) program is administered through the County Foresters of the Vermont Department of Forests, Parks and Recreation. In addition to ‘on the ground’ conservation practices, NRCS also offers financial assistance to landowners for development of Forest Management Plans. The forest management plan will help the landowner achieve a sustainable and properly managed forest.

List of general components of a Forest Management Plan:

- 1) Identification of owner and the tract
- 2) Plan preparer information
- 3) Date of plan preparation
- 4) Landowner objectives
- 5) General property description
- 6) Plant and wildlife considerations
- 7) Aesthetic and recreational considerations
- 8) Historic and cultural resource considerations
- 9) Forest stand, or treatment unit, descriptions
 - forest or cover type
 - topography
 - soils information
 - stand history
 - site class
 - insect and disease occurrence
 - stocking level, stand quality, and age class distribution before harvest
 - prescribed silvicultural treatments
 - stocking level after harvest
- 10) Schedule of management activities (usually for a 10-15 year period)
- 11) Forest stand map
 - property boundaries
 - stand boundaries
 - stand identification
 - water bodies, roads, structures, other physical features
 - scale, north arrow.
 - name and address of landowner
 - name, address, and title of preparer and date prepared

Go forth and enjoy your forests! A healthy and well managed forest can be profitable, benefit wildlife and the environment and provide many forms of enjoyment. Take the time to learn about and from your forest. Your trees will thank you!



Dendrology clue #6: Ruffed grouse, wild turkey and songbirds find food (seeds) and shelter in this tree.

**ATTENTION ALL PARTICIPANTS WHO PAID \$30 FOR THE SERIES
YOU ARE INVITED TO THE**

Forestry Letter Series Field Day—Saturday, May 21, 2011

9:00 am – 4:00 pm

Trevor Evans' Place – Pine Hill Farm

600 Schuler Rd. Derby, VT

PLEASE BRING YOUR OWN LAWN CHAIR

Format: We will begin inside a tent erected on the Evans property. The day will include walking 3 different loops within the property.

Points of interest and learning will include: Pine Hill Farm's forest management plan for hardwood and softwood management and Current Use mapping; trail design & bridge building; Timber Stand Improvement; early successional forest development; invasive species identification and control (Honeysuckle); boreal forest management of wet areas including swamps, beavers dams and vernal pools; thinning, pruning and release of target species: Apple, Beech, Sugar Maple and White Pine & Red Pine plantations; using patch cutting as a tool; Lessons Learned: attempts at Christmas tree production and Red Oak establishment; local geology and soils; Beech bark disease and bear indicators; USDA-NRCS Wildlife Habitat Incentive Program (WHIP) practices – Redosier Dogwood maintenance, Apple tree pruning and release, and beech tree release; white pine transplants and red oak acorn planting techniques; and a short timber felling safety demonstration using Game Of Logging techniques. Should be a full day of worthwhile activity – please join us!

If you wish a specific topic to be covered, please let us know - and we will do our best to accommodate. Thanks!

Please come prepared to walk in any weather condition. Lunch will be provided. You may bring additional participants related to the management activities of your woodland for \$10 each. *****RSVP's required.*****

Please RSVP by Monday May 16, 2011 to: Beth Ann Finlay at 802-828-4595 or E: beth_ann.finlay@vt.usda.gov



Dendrology clue #7: The current main timber use for this tree is to supply the pulp and paper industry; a use in Vermont is to build portable skidder bridges which span streams for water quality friendly timber harvesting.



SUGGESTED READING and RESOURCE LIST

-Forest Health Issues (a very comprehensive list in excel format):

http://files.dnr.state.mn.us/assistance/backyard/treecare/forest_health/links.xls

-Eastern Forest Insect and Disease Leaflets:

<http://www.fs.fed.us/r6/nr/fid/wo-fidls/fidls-east.shtml>

-Strategies For Forest Landowners:

<http://pubs.ext.vt.edu/420/420-144/420-144.pdf>

www.privateforest.org (Nature Conservancy/US Forest Service). "Forest Management 101"

www.nrcs.usda.gov/programs/index_alph.html (Natural Resources Conservation Service)

Information about conservation cost-share programs and resources for landowners

-Forest Service Tree Index:

<http://www.fs.fed.us/database/feis/plants/tree/>

-Vermont Department of Forests, Parks & Recreation Publications

-Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in VT

-Forest Insect and Disease Conditions in VT 2008

-Timber Harvesting in VT: Summary of Laws & Regulations

-VT Portable Sawmill Directory

http://www.vtfpr.org/hfm/gen_publications.cfm

Landowners Guide to Wildlife Habitat; Forest Management For the New England Region. By R.M. DeGraaf, M. Yamasaku, W. B. Leak, and A.M. Lester. University press of New England. 2005

Positive Impact Forestry, by Thom McEvoy. Island Press. 2004

Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont, by Elizabeth Thompson and Eric Sorensen. University Press of New England. 2000

Introduction to Forest Ecology and Silviculture, by Thom McEvoy. Cornell University. 2000. UVM Extension

Management Practices for Enhancing Wildlife. Penn State Fact Sheet. 1998

<http://pubs.cas.psu.edu/freepubs/pdfs/uh107.pdf>

The Trees in My Forest by Berndt Heinrich. Harper Collins, 1997

Working With Your Woodland: A landowner's Guide, Revised Edition by Mollie Beattie, Lynn Levine, and Charles Thompson. University Press of New England. 1993

Working Trees for Wildlife. The USDA National Agroforestry Center 1990. www.unl.edu/nac/alleycropping.htm

The Northern Vermont RC&D Resource Conservation & Development Council would like to thank the reviewers of this issue: field day host Trevor Evans, consulting forester Fran Sladyk and NRCS biologist Toby Alexander.

To contact RC&D about this letter or the Forestry Letter Series call 802-828-4595 or beth_ann.finlay@vt.usda.gov

Coming up next.... Our issue #5, Crop Tree & Saw Timber Management

Dendrology Challenge Answer #5:
Eastern Hemlock, Tsuga Canadensis
Sources: US Forest Service, Wikipedia, About.com
Forestry and www.sarahjanerhee.com/deliberatelyrandom

The USDA is an equal opportunity provider and employer.