Cornell University
Cooperative Extension
Columbia & Greene Counties

AGROFORESTRY RESOURCE CENTER

You and Your Forest: Letter 3

Agroforestry and Forest Enhancement

Agroforestry is defined as the combination of agriculture and forestry practices that result in integrated, diverse, productive, profitable, healthy and sustainable land use systems. Agroforestry can be an intensive land-management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately integrated with crops and/or livestock. Agroforestry explores ways to creatively use forested areas for economic benefit while retaining the actual forest. These alternative methods might include growing ginseng, goldenseal or gourmet mushrooms, producing maple syrup or selling firewood or wood chips and beekeeping. It can also be as simple as harvesting balsam fir boughs for Christmas wreaths. Agroforestry is not a new concept, nor is it a new technology. For centuries, agroforestry has been practiced around the world. More recently, agroforestry has been viewed as an emerging concept and technology that bridges production agriculture and natural resource conservation with environmental enhancement and human needs.

When used appropriately agroforestry technologies help attain sustainable land-use systems in many ways. Specifically, agroforestry technologies 1) provide protection for valuable topsoil, livestock, crops, and both aquatic and terrestrial wildlife; 2) increase productivity of agricultural and horticultural crops; 3) reduce inputs of energy (physical, chemical, or biological) and chemicals; 4) increase water-use efficiency of plants and animals; 5) improve water quality; 6) diversify local economies; and 7) enhance biodiversity and landscape diversity, and ultimately, the quality of life for people.

Silvopasturing in New York

Grazing domestic livestock in wooded areas is a common practice in many parts of the world and other regions of the United States, but became taboo in the Northeast in the latter-half of the 20th century when foresters and conservationists began to educate farmers on the potential harmful impacts of allowing livestock in the woods. Damages included excessive soil compaction, debarking, and excess browsing.

But in the modern world of invasive plants, high land ownership costs, and other challenges to healthy and sustainable woodlands, it is worth taking another look at livestock grazing as an acceptable and valuable tool for the management of some woodlots. The purposeful and managed grazing of livestock in the woods, known as *silvopasturing*, differs from woodlot grazing of the past in that the frequency and intensity of the grazing is controlled to achieve the desired objectives. New fencing systems, a better understanding of animal behavior and the evolution of "management intensive grazing" practices have enabled us to gain the necessary level of control over livestock to achieve positive impacts from silvopasturing.

Silvopasturing is not appropriate for every operation or every woodlot as it requires a commitment to caring for animals, and to enclosing areas with a secure fence to keep livestock in and predators out. Likewise, silvopastures on poor growing sites, rough terrain, or with difficult access would have fewer advantages than the converse. Care should also be taken to identify and protect unique ecosystems and high-value wildlife habitat, such as vernal pools and wooded wetlands when developing silvopasture areas.

In addition to starting with the right location, the most important key for success is skilled management of the system. This requires considerable knowledge of both silviculture and grazing. But limited experience shouldn't dis-

Continued on Page 2

Silvopasturing in New York *cont.*

courage others from exploring the potential of silvopasturing on their property. There are a number of ways that one can jump ahead on the learning curve:

- Look for on-line resources. There are a number of temperate agroforestry sites with good articles and information on silvopasturing, though much of the information will need to be extrapolated to your own situation. The "Guide to Silvopasturing in the Northeast" is currently available under the "publications" section of http://forestconnect.info
- Develop woodlot management and animal husbandry skills independently, and then gradually look for ways to symbiotically combine the two systems in a context appropriate for your own property
- Seek out local examples of innovative graziers to see what has worked for them
- Work with a forester who is willing to help you learn and experiment. Expect some resistance at first when you mention the word "silvopasturing", but foresters are trained to achieve landowner goals. They may be lacking in knowledge on the livestock side of the equation, but their expertise in vegetation and forest management will be invaluable.

Livestock can be used to organically manage undesirable vegetation in the woods that interferes with goals ranging from aesthetics to wildlife and everything in between. But simply turning animals into an area infested with problematic plants like buckthorn or beech brush, and then expecting good results is unrealistic. Carefully controlled grazing with the right kinds of livestock at the right time of the year is just part of a larger strategy to deal with nuisance plants. In severely over-grown areas, heavy-duty mowing may be necessary to reduce the height of the target vegetation. Animals then do the rest by browsing the coppice sprouts and other re-growth until weakened and eliminated. There are numerous other creative strategies for reducing overgrown areas to a more manageable browsing height if a local mowing contractor cannot be found. Likewise, there are a number of practical ways to grow-back desirable plants when the time is right, so creating a silvopasture does not exclude the option of natural regeneration in the future.

One economic benefits of silvopasturing is the generation of frequent, short-term revenues from the wooded portions of properties through the production of valuable goods ranging from breeding stock to quality foods and fibers. These same items can be used for personal benefit and self-sufficiency, which increase the overall enjoyment and utility of woodland. The sale of silvopasture products and the conversion of wooded areas into silvopastures may also help farmers and woodland owners qualify for important property tax abatement programs such as Ag Assessment (NYS RP 305 Program) and the 480-A Forest Tax Law.

Some other important points to consider before taking the plunge into silvopasturing are the time, investment and dedication required to succeed. Develop a written start-up plan for your project that outlines *where, when, what, why, how and how much* you can spend in terms of both time and money. If you have never raised livestock before, take time to speak with livestock specialists from Cooperative Extension and ask them to refer you to other producers who may share helpful advice. Start small because it will be better to make the inevitable mistakes on a smaller scale, but don't let the fear of initial failure prevent you from exploring the exciting opportunities of silvopasturing!

Brett Chedzoy (bjc226@cornell.edu)
Extension Educator

Riparian BufferManagement

Well-managed riparian buffers are areas of trees and shrubs located adjacent to streams, lakes, ponds, and wetlands. These buffer areas provide an extremely important and widely diverse array of benefits to the environment. Certain species established or managed in riparian forest buffers can also provide timber, wood fiber, and horticultural products.

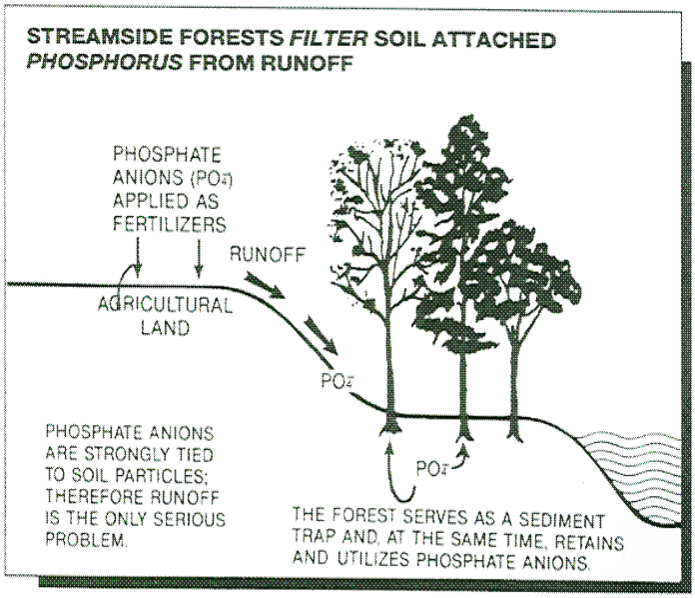
The streamside forest functions as a FILTER by removing sediment and other suspended solids from surface runoff. Sediment is probably the most common and most easily recognized of the non-point source pollutants. Sediment suspended in the water can reduce or block the penetration of sunlight adversely affecting the growth and reproduction of beneficial aquatic plants. When deposited on the stream bottom it can interfere with the feeding and reproduction of bottom dwelling fish and aquatic insects, weakening the food chain. Large deposits of sediment can overfill stream channels and floodplains, greatly increasing the potential for flooding.

Phosphorus is the nutrient which has the greatest negative impact on our waterways. Fortunately, its impacts can be significantly reduced by the filtering action of the streamside forest. The great majority of available phosphorus is bound to soil particles in the riparian zone. Vegetation in the riparian buffer removes about 80% of phosphorus from surface runoff water as it filters this sediment. The streamside forest functions as a *TRANSFORMER* when chemical and biological processes occurring within it change the chemical composition of compounds. For example, under well oxygenated soil conditions, bacteria and fungi in the streamside forest convert nitrogen in runoff and decaying organic debris into mineral forms (NO3). When soil moisture is high enough to create anaerobic conditions in the litter and surface soil layers, denitrifying bacteria convert dissolved nitrogen into various nitrogen gasses, returning it to the atmosphere**. Studies have shown that the amount of nitrogen in runoff and shallow groundwater can be reduced by as much as 80% after passing through a streamside forest.** Toxic chemicals such as pesticides are also transformed to non-toxic forms. Applied pesticides seldom move far off-site. Those picked up by runoff, are converted to non-toxic compounds by microbial decomposition, oxidation, reduction, hydrolysis, solar radiation and other biodegrading forces at work in the soil and litter of the streamside forest.

The streamside forest can function as a SINK when nutrients are taken up by plants and sequestered in plant tissue. Some estimates indicate that 25% of the nitrogen removed by the streamside forest is assimilated in tree growth which may be stored for extended periods of time in woody tissue and possibly removed as logs or other forest products.

The streamside forest functions as a SOURCE when it provides energy to streams in the form of dissolved carbon compounds and particulate organic detritus. These materials are critical to processes within the stream itself, helping to restore and maintain nature's equilibrium. In small, well shaded upland streams, as much as 75% of the organic food base may be supplied by dissolved organic compounds or detritus such as fruit, limbs, leaves and insects that fall from the forest canopy. Benthic detritivores, the stream bottom bacteria, fungi and invertebrates that feed on the detritus, form the basis of the aquatic food chain. They pass on this energy when they are consumed in turn by larger benthic fauna and eventually by fish. Thus the streamside forest functions as an important energy source for the entire aquatic food chain from headwaters to estuary.

Plant establishment is an important part of most riparian buffer restoration initiatives. Detailed standards and specifications that describe planting techniques and establishment procedures should be developed with the help of a local expert. Native species should be used where possible to achieve the restoration goals. Vegetation can be established by seeding; planting vegetative cuttings; or using nursery-grown bare-rooted, potted, and burlap-wrapped specimens.



Reference: Maryland Department of Natural Resources

Reforestation and Planting Tree

The successful establishment or re-establishment of woody plants to a natural site requires careful planning and preparation. Species and site selection are critically important to the entire process and often require the assistance of local experts. Moisture conditions, soil texture, competing species, wildlife constraints, slope and exposure are just a few of the site characteristics which need to be evaluated before deciding which plants to establish.

Site Preparation: Land preparation is essential for a successful planting. If grass or brush occupy the site, the entire area to be planted should be mowed before planting. After mowing, each row to be planted should be plowed or disked back to expose the soil and remove vegetation. Seedlings must be planted in soil, not the sod layer. At a minimum, preparation requires scalping the sod around each planting hole to expose mineral soil. Herbicides can be used to remove competing vegetation, however contact your Cornell Cooperative Extension or a professional forester for assistance, and **always** follow label instructions. Investigate pesticide use of agricultural fields before planting. Seedlings will not tolerate some herbicides which can persist in the soil for several years after application.

Tree Planting

If you have a large number of seedlings to plant (more than 5,000 or so) it may be easier to purchase, rent, or contract for a planting machine rather than to plant by hand. The machine digs planting furrows at the desired depth and automatically fills the furrow behind the seedlings. If hand-planting makes sense then follow this process:

(1) Carry seedlings in a bucket of water; take only enough seedlings with you to last the length of a row. The remaining seedlings should be left in a cool, shady location.

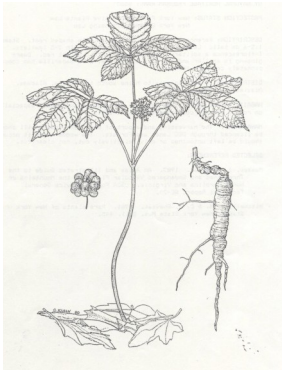
(2) Prepare a hole large enough to contain the root system using a grub hoe, shovel, flat spade, or planting bar.

(3) Place the seedling in the hole; if need be, prune the longer roots to about six (6) inches. Make sure all the roots are buried and the seedling is standing straight. Plant the seedling at the same depth as it grew at the nursery. Make sure roots are pointed downward (i.e. not "J" rooted).

(4) Firmly pack the soil around the roots using the heel of your shoe. This will eliminate any air pockets that may cause the roots to dry out and kill the seedling.

The most common cause of seedling mortality is mowing. Mark your plantings with signs and stake the rows. If appropriate, prevent damage from livestock by constructing a fence around the plantation. For information on watering, mulching, weeding, fertilization, and pruning contact Cornell Cooperative Extension or your county Soil and Water Conservation District.

American Ginseng Production



For the past 3,000 years or more the roots of a perennial plant called ginseng have been an important component of traditional Chinese medicine. The roots of wild American ginseng have been harvested, dried, and exported from the United States and Canada to China, since the mid 1700's. Today, American ginseng is also a very important part of traditional Chinese medicine. It is used as an "adaptogen" that allows the body to adjust to various types of stress. It is not used as a specific cure or remedy for any particular ailment but as a component of many medicinal herbal combinations that help people deal with the aging process and related disorders.

American ginseng, (Panax quinquefolium) is a native American herb with a range that extends from Southern Quebec to Northern Georgia and from the East Coast to the Midwest. It grows as an understory plant in the shade provided by deciduous hardwood tree species. In the Northeast it is most often found growing under sugar maple, preferring cool, moist densely shaded woodlands with well drained soils.

Field cultivated ginseng is grown in raised beds in fields under artificial shade provided by either wood lathe or polypropylene shade cloth for a period of three to four years. In 1998 there were approximately 8,000 acres of "field cultivated" ginseng in production in North America.

Ginseng cont.

Today about 5,000 acres are in production, mostly in Ontario, with less than 1,000 acres in New York and Wisconsin.

Woods cultivated ginseng is grown in a forested environment in tilled beds under natural shade for a period of six to nine years. Wild simulated ginseng is grown in untilled soil in forests for a period of nine to twelve years or even longer. The dried roots of wild simulated ginseng closely approximate the appearance of truly wild ginseng.

Wild ginseng is an internationally protected species. Its collection is either prohibited or strictly regulated in states where it occurs. In order for ginseng to be legally exported from any state it must be certified as being cultivated ginseng or, if wild plants are gathered, they must be harvested according to the rules and regulations of a state certification program approved by the U.S. Fish and Wildlife Service. Prospective growers should contact their local DEC office or Cornell Cooperative Extensive office for information regarding any local rules and regulations that might affect cultivation, including pesticide regulations.

Ginseng growing in a forested environment is certainly not a "get rich quick" scheme as it takes a minimum of five to eight years of growth before harvesting can occur. Prospective growers are encouraged to start with a very small investment, perhaps a few ounces of seed plus a hundred rootlets. Expand only if preliminary results are positive.

However, before investing any resources, be sure to have a site evaluation completed by a professional forester or other expert. Some indicator species of a good ginseng site include maiden hair fern, hard maple, white ash, basswood. A poor site would exhibit too much shade from species such as hemlock or beech. Have a full analysis soil test completed. The most important parameters of a soils test are the pH, calcium, calcium to magnesium ratio, and organic content. Ideally, a better site results in better establishment of the plant. Some additional sources of problems with establishment are slugs, turkeys, rodents. Once ginseng is established, it is a tough plant and may live 100 years or more.

Note: The Agroforestry Resource Centers and the Siuslaw Model Forest have ginseng demonstrations for viewing. Please call the office 622-9820 for further information.

MAPLE SYRUP

When the winter temperatures rise above freezing during the day, and fall below freezing at night - it's time for maple production to begin. Sugar maples may be tapped as early as the end of January, but in our area generally late February or early March. Collection usually stops in April when the buds begin to swell.

Productive trees are usually more than 30 years old and 10 inches in diameter when first tapped. Larger trees can handle up to four taps, each yielding about 10 gallons of sap per season. For optimum production, a sugarbush should be thinned and culled on a regular basis—old trees tend to have low output of sap as well as low sugar content.

According to the New York State Maple Producers Association, most maple producers have put away their metal spiles and buckets. They save time and collect more sap by connecting their maple trees—collectively known as a sugarbush—with a network of plastic tubing. The sap flows to collecting vats or, in some larger operations, is pumped directly to the sugar house. This is where the sap is transformed into syrup. When the sap first arrives in the sugarhouse it is mostly water and bears little resemblance to the beautiful amber liquid we eventually use on our pancakes. The sap to syrup conversion happens when most of the water is boiled away. During "sugaring off" season, sap is evaporated continuously until the supply of sap is converted to pure maple syrup. It takes anywhere from 30-50 gallons of sap, depending on the sugar content of the sap, to make one gallon of syrup. This evaporation process, like the collection of sap from the trees, has been modernized. New York State producers use sophisticated equipment to control the evaporation process and to make the most efficient use of the fuel used for this process. Some maple producers have started using a reverse osmosis process to remove water from the sap before being further boiled down. The use of reverse osmosis allows a significant percentage of the water to be removed from the sap prior to the evaporation process, reducing energy consumption and exposure of the syrup to high temperatures. And remember, although you may want to minimize production costs, maple syrup is a food product and should be produced only with equipment and materials that are approved for food application.

For further information on maple production refer to the **Cornell Sugar Maple Research & Extension Program** at http://maple.dnr.cornell.edu/.

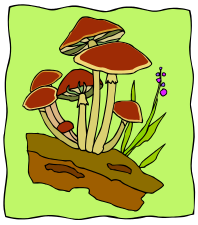
Mushrooms

Mushrooms are one of the leading nutrient recycling organisms in the world. Along with organisms such as bacteria and yeasts, fungi are responsible for the decomposition activity in the forest. Many mushrooms are well adapted to growing under forest cover, so growing them can be a good fit for someone considering ways to incorporate a stand of trees on their property into a money making venture. Fungi are cold tolerant and are easy to grow throughout the Northeast. Also, since they don't have to be replanted each year, most of the work is done in the first season. A mushroom, the part of the fungus we see, is just the fruiting body of a large, intricate network of filaments, called mycelia. Fungal mycelia live in the soil and in organic matter, especially wood. These fine filaments intertwine and connect in an intricate network that carries nutrients, water, and minerals to nourish the fungi. Picking a mushroom has been likened to plucking fruit from a tree.

Choosing which varieties to cultivate may well be the toughest aspect of growing mushrooms. Most folks are familiar with the rich and robust shiitake. Chicken-of-the-woods mushrooms are very meaty and absorb cooking flavors well, and the hen-of-the-woods, or maitake as it is known in Japan, has a pleasing mild flavor. Lion's manes grow like a white pom-pom and resemble lobster in taste and texture, and oyster mushrooms are heavy yielding, sweet tasting mushrooms that are excellent in a stir fry. Other mushrooms that can readily be grown include the amazingly vigorous King stropharia. All of these mushrooms are indigenous to the Northeastern US, except the shiitake. Visit www.fungiperfecti.com to see photographs and descriptions of these commonly grown mushrooms.

Growing Forest Fungi and other Mushroom Cultivation Options

Date: Saturday, April 28
Registration deadline: April 14mushroom
Time: 10:00 a.m. - 12:30 p.m.
Cost: $20.00 per person
Presenter: Bob Beyfuss, Retired Extension Educator



Are you interested in exploring how to grow your own mushrooms or perhaps start a small scale mushroom operation? Participants in this workshop will learn various techniques for growing different species of mushrooms using a variety of materials. You will also participate in a hands-on experience inoculating bolts of wood with shiitake spawn and bring home your own inoculated log for personal enjoyment. In addition, there will be an opportunity to examine where we harvested small pole-size trees used for inoculating the shiitake mushrooms, and understanding the rationale for harvesting those particular trees as part of forest improvement. If you are interested in learning how to grow a variety of mushrooms, you won't want to miss this program. Bob Beyfuss has been instructing those interested in mushroom cultivation throughout the state for over a decade.

Christmas Tree Production

High quality trees and profitability are important characteristics of a successful Christmas tree farm. In addition to targeting clear economic goals, a Christmas tree farmer should manage the crop in such a way that production is sustained well into the future.

Planting, managing and harvesting Christmas trees is a high labor, high risk endeavor. Before beginning this venture be in a position to answer "yes" to **every one** of the following questions:

- Are you willing to plant trees every April?
- Are you willing to shear or prune every tree, every year (mid-June to mid-July) until it is harvested?
- Are you willing to control weeds and grass? Much of this can be accomplished with chemicals and cultivation, but manual work is required.
- Are you willing to devote time and energy in late November and December in marketing your trees?
- Are you willing to invest land, equipment, and labor to a project that will take at least six years before you see any return?
- Will you devote time to educate yourself in all areas of the Christmas tree business?
- Will you take the time to control or minimize the damage caused by mice, rabbits, moles, deer, and dogs?
- Will you protect the trees from fire?
- Will you completely exclude all livestock?
- Are you willing or able to accept periodic heavy losses due to drought, hail, or other natural causes?
- Do you enjoy tending trees as they grow?

If you answered "yes" to all of the above, then you are ready to be a Christmas tree farmer/grower.

Resources & References

CCE's Agroforestry Resource Center in Acra, NY conducts numerous programs and workshops relating to Agroforestry practices. To view a listing go to

www.ccecolumbiagreene.org

www.dec.state.ny.us/website/dlf (NYS DEC Division of Lands & Forests) Bureau of Private Land Services—"Forest Protection" (native & endangered plants, ginseng, etc.); "Urban Forestry" (tree pruning, etc.)

www.nrcs.usda.gov/technical (Natural Resources Conservation Service) "Forestry & Agroforestry"; "Invasive Species"; Technical References- "Stream Corridor Restoration: Principles, Processes & Practices"

www.unl.edu/nac (USDA National Agroforestry Center) "Riparian forest buffer"; "Forest farming" (ginseng, mushrooms, etc.)

www.nal.usda.gov/afsic (Alternative Farming Information Center) Publications — "Agroforestry"; Hot Topics - "List of Alternative Crops & Enterprises"

www.plants.usda.gov (USDA Plants Database) Plant Topics - "Alternative Crops"

www.arborday.org (Arbor Day Foundation) "How to Plant Trees"

www.fs.fed.us/ (US Forest Service) Publications - "A Soil Bioengineering Guide for Streambank & Lakeshore Stabilization"; "Research & Development" - "Search for all Research Publications" - Northeastern Research Station" (see pubs. #15, #144, #271, #404, etc.); "State & Private Forestry" - "Forest Health Protection" - "Forest Health Management" or "Tech Assistance" - "How to Publications"

www.ifcae.org/ntfp (Institute for Culture and Ecology) "Non-timber Forest"

www.privateforest.org (Nature Conservancy/US Forest Service) "Forest Management 101"
http://maple.dnr.cornell.edu (Cornell Maple Program

USDA Agroforestry Notes—Beyfuss, July 1999

USDA Agroforestry Notes—Rietveld and Irwin, August 1996

USDA Natural Resources Conservation Service—Riparian Forest Buffer Job Sheet 391, January 1998

USDA Forest Service, Northeastern Area—Riparian Forest Buffers

NYS Department of Environmental Conservation—Trees & Shrub Planting in NY 2004

National Tree Trust—NTT Quick Tips: Planting Your Seedlings

Nebraska Cooperative Extension EC 76-1741—Christmas Trees: A Management Guide

North Carolina Cooperative Extension—Best Management Practices for Christmas Tree Production

NYS Department of Environmental Conservation—Protected Native Plants

Cornell University Conservation Corner Leaflet 13—Dickson & Kelly, February 1975

Cornell Cooperative Extension & Penn State University—Maple Syrup For Beginners 1998

USDA Natural Resources Conservation Service – Ag Information Bulletin 339

Growing Gourmet and Medicinal Mushrooms, by Paul Stamets. Ten Speed Press. 3rd edition, (December, 2000).

Protected Plants

New York State regulations (6NYCRR Part 193.3) provide protection for four separate lists of rare plants -endangered, threatened, exploitable, vulnerable and rare. The regulation gives landowners the right to prosecute collectors that take plants without permission. Violators of the regulation are subject to fines of $25 per plant illegally taken.

Each list of plants has its own criteria for listing. The lists were developed through the cooperative efforts of the New York State Science Service, New York Heritage Program and the New York State Department of Environmental Conservation. It is anticipated that the regulation will be changed every two or three years to reflect new information on the status of plants.

Endangered native plants are plants in danger of extinction throughout all or a significant portion of their ranges within the state and requiring remedial action to prevent such extinction. Examples include prostrate juniper, Virginia pine, willow oak, dwarf willow, and painted trillium.

Threatened native plants are plants that are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges in the state. Examples of threatened plants include golden seal, panic grass, scarlet Indian-paintbrush, and sand dune willow.

Exploitable, vulnerable native plants are plants likely to become threatened in the near future throughout all or a significant portion of their ranges within the state if causal factors continue unchecked. Examples include butterfly weed, sundew, black alder, mountain laurel, ginseng and pitcher plant.

Rare native plants are the final category of protected plants. Examples of rare plants are swamp birch, jack pine, and High-mountain blueberry.

It is a violation for any person, anywhere in the state, to pick, pluck, sever, remove, damage by the application of herbicides or defoliants, or carry away, without the consent of the owner, any protected plant. Each protected plant so picked, plucked, severed, removed, damaged or carried away shall constitute a separate violation.

Please visit the NYS DEC website listed in this issue for a complete and up-to-date listing of protected plants.

Cornell Cooperative Extension's
Agroforestry Resource Center &
the Watershed Forestry Program of
the Watershed Agricultural Council

Cornell Cooperative Extension
of Columbia and Greene Counties
Agroforestry Resource Center
6055 Route 23, Acra, NY 12405
Phone: 518-622-9820/FAX: 518-622-0115

Email: greene@cornell.edu

The Forest Stewardship Self-Study Course is a collaboration among Cornell Cooperative Extension of Greene County, New York City Department of Environmental Protection, U.S. Department of Agriculture's Forest Service and the Watershed Agricultural Council's Forestry Program.

Many thanks to Greater Adirondack R C & D Council and especially Laurel Gailor of Cornell Cooperative Extension of Warren County for their outline and assistance with the Forestry Letter Series.