



# D Acres of New Hampshire

## Organic Farm & Educational Homestead

### Sustainable Forestry with Oxen

workshop handout October 18, 2004

#### Oxen

Oxen are a great resource for the small farmer managing a woodlot. For centuries they have been used for plowing, logging and other farm work that requires heavy moving or lifting. Oxen are slow, strong animals that can do a lot of hard work.

At D Acres, we use a pair of oxen (August and Henri) for many activities around the farm. Using a cart they haul their own manure and used bedding to the various compost piles around the farm. Using chains and a fire hose as a tongue they haul logs through the woods. Using an arched wheel with welded strands of rebar they can haul brush without causing significant damage to the ground. They also use stoneboats (flat sleds) to haul rocks from the woods to the sites where they are needed.

In exchange for the work performed, August and Henri receive excellent care. The following are concerns that we have addressed in order to make sure that the boys are in good working condition and comfortable.

#### Housing

Oxen can live outdoors for the majority of the year in this climate. We choose to bring the oxen into the ox hovel every night because the additional habitual handling makes the boys easy to work with. Oxen that are kept on pasture with little handling will be less accustomed to being with people, and therefore more difficult to manage. Housing should be kept dry. Oxen are susceptible to health problems if made to stand or lie in wet bedding. They prefer cold temperatures, fresh air and snow to hot, closed environments. Fresh air keeps the oxen healthier. We keep the doors to the ox hovel open as long as possible into the winter, and get the boys out into the fresh air as much as possible. They do not like to stand out in a cold rain, but be careful: leaving oxen indoors for several days at a time will make them excitable. Just like kids that get stir-crazy when kept indoors on a rainy day, oxen that are kept indoors for prolonged periods of time may exhibit some unpredictable behavior.

The ox hovel was built specifically for the boys. It includes a sleeping area (about 8'x8'), a hallway along the side for storage of the boys' work implements and tools for cleaning, as well as a loft above for storing hay (about 150 bales). When considering housing for a pair of oxen, remember that they get very big. The average ox is twice the size of a cow of the same breed. Consult a resource on oxen to determine how big your team will get so that you will have a good idea of how much space they will need when they grow to maturity. Concrete is an option for the floor of barn. Concrete is much harder on the animals than a wood or natural rock surface and may cause discomfort for the animals. Wood will eventually rot, but with proper bedding it provides a more comfortable surface, which is fairly easy to clean.

We clean the bedding for the boys everyday. Bedding consists of sawdust (a by-product of our woodshop), bark mulch or wood chips and wasted hay. Wood chips are a by-product of the chipper. Recently we did some cut-

ting near the ox hovel, so we were able to chip brush and tree tops directly into the storage area on the side. The chips, sawdust and bark mulch are equally effective as bedding.

Used bedding is carted off to the compost piles about once a week. Too much wood (as opposed to manure) disturbs the balance required for a healthy compost pile, so we try to utilize the bedding as much as possible before removing it entirely. In order to provide a nice dry place the boys to sleep each night, we sort through the bedding each morning, removing the manure and urine soaked or otherwise soiled bedding. The remaining bedding is piled on one side of their sleeping area or the other so that the rest of the floor space can dry adequately. This reduces rotting in the floorboards. In the evening, we spread out the pile of remaining bedding and throw fresh sawdust on the top. In winter, the boys require more bedding to make their resting spot more comfortable and to keep them warmer.

The boys must have access to water at all times. They generally consume about 40 gallons of water a day. On hot days or when they are working they drink more. This is an important consideration for housing oxen. We put a hose underground to the hovel so that there would be a constant source of fresh water close by. We also use water catchment from the roof of the hovel in order to capture rainwater and store it in a bathtub for the boys to drink when they are outside during the day.

The ox hovel has a large door for the boys to enter and exit their outdoor area. The area is rather small, and does not provide enough space for the animals to exercise adequately. The area is inadequate as pasture, so when they are outdoors they must be fed in a feeder that is attached to the wall outside the hovel. We are looking to expand this area so that the boys will have more room to move around while they are not working during the day. This area is enclosed with an electric fence. The boys are accustomed to electric fencing. We have not had any problems using it in their enclosure, nor in their pasture.

## Feeding

There is a lot of science to feeding a bovine intended for dairy or meat production. There is less need for such effort with the mature ox. Oxen do just fine on a diet of hay and fresh grass. We try to give August and Henri 4-6 hours of pasture time 5 or 6 days a week. In addition to this time, we give them about a bale of hay mixed with a very full wheelbarrow (or two) of fresh cut grass. Hay costs between \$2 and \$3 per bale depending on the source. The oxen prefer fresh grass to hay. We mix the fresh grass with the hay to make it more palatable. Obviously, this is not possible year round. As the grass begins to disappear, the boys eat more and more straight hay, so that in the winter, they are consuming about 2 bales (1 bale each) of hay. We do not supplement hay and fresh grass with grains or any other food. The mature ox used for farm work can be quite healthy on this diet. The feed for calves and oxen that are being groomed for show requires more attention. Generally speaking, oxen in the United States are overweight. An overweight ox will have more health problems and will not live as long. That said, we do sometimes give the boys a little treat. Our friend Jay sometimes brings the boys the food waste resulting from cider and beer production, which the boys enjoy immensely. Their behavior becomes a bit erratic, though.

## Training

The boys came to us already trained with verbal commands to walk (“Come Along”), turn right (“Gee”), turn left (“Haw”), back up (“Back”), move in toward each other (“Put in”), move away from each other (“Put out”), and stop (“Whoah”). These commands have served us well for working the boys. The key to training is to be consistent and to work with the team often. Training is a continuous process. August and Henri are constantly watching us, learning what we expect of them and what they can get away with. If we let them get away with incorrect behavior it is very difficult to undo it.

Along with a verbal command, we use a switch or goad (a stick) to reinforce the words with a specific touch. The switch or goad need not be used in a violent manner to get the boys to do what we want. A light tap is sufficient in most cases. I find that August and Henri are content to follow the verbal commands most of the time. They are somewhat less attentive when they see a field of grass that looks appetizing, or when they are tired and thirsty at the end of a work session. The combination of verbal command, switch and experience working with a team are very helpful in loud or distracting situations such as working beside a chainsaw or chipper. The boys are remarkably responsive to commands even when they are nearly inaudible above the sound of machinery. I attribute this to the boys' knowing what to do based on my body movements. Frequently I will say nothing and the boys will do what I want, simply because we have worked together for a while and they have come to know my body language. For training purposes, however, it is best to consistently utilize the combination of vocal commands and gestures so that a team will be similarly responsive to a new teamster.

Training is most effective at a young age. August and Henri have been responding to the same 7 commands for the last 4 years. Trying to train a 2 year old ox to follow commands can be much more difficult. The adage about old dogs and new tricks holds for oxen too. A rowdy ox can be yoked to a well-trained ox in order to train the wild ox about proper yoke etiquette. It must be considered, however, that this can be an unpleasant experience for the well-trained ox. Similarly, older oxen can be used to train a new or younger team by working them in tandem (one team behind the other). When August and Henri get to age 9 or 10 (barring any accident or illness beforehand), we will probably look for a new pair of calves to train. The mature boys will be helpful for training the young, and the boys will remain useful until the young calves are trained and large enough to be of use for woodlot management.

People working with the oxen also need training. It is helpful to work in teams hitching logs and brush. People must understand the work situation and stay clear of the oxen. For situations where loud mechanization is involved it is helpful to devise a system of hand signals to communicate. Clear hand signals increase safety and facilitate quicker communication.

The yoke is an important tool for working oxen. Yokes come in a variety of styles. There are yokes for a single ox and yokes for a pair. Yokes and pins can be purchased for around \$300. Talk to someone that has a team to find out where you can buy a yoke. Some folks have an extra yoke in the barn that their team has grown out of. After a little forestry accident last year left us yoke-less, we decided to make our own yoke in the woodshop. The pins are a bit more difficult as they require a steaming process.

## Exercise & Work

Pulling logs, stones and carts is not easy work. Despite the size of the animal, an ox is not inherently capable of pulling heavy loads, especially without sustaining injuries. Some folks like to have a pair of oxen to bring to shows, but do not put sufficient effort into maintaining the physical strength of the team for the rest of the year. I believe that this is negligent animal care.

Take for example our species: human beings are capable of running marathons. However, a person that has not conditioned their body for the endeavor could not come close, not to mention avoid shin splints, a twisted ankle or serious aching the next day. The same is true for oxen. Oxen that walk and work regularly are capable of tremendous feats. Those that do not can suffer injuries and soreness.

August and Henri work or exercise several times a week. Their work depends on the jobs that need to be done around the farm. This year they have consistently dragged their manure cart to compost piles about once a week; they dragged hundreds of stoneboats of rocks from the woods to our building site for use on the foundation; they dragged saw logs from the woods to the road; they moved smaller diameter wood to the appropriate piles (hard wood for firewood that needs chopping, hard wood for firewood that doesn't, soft wood, wood that

can be used for cordwood building and wood that can be used for posts); and they brought brush to the chipper.

In the fall, the boys patiently walk along Streeter Woods Road and wait while we pick up piles of raked leaves and put them in the manure cart. In the winter we use an old box-spring or stoneboat to groom trails through the woods. Logging is a great activity for all but mud season. Oxen can also be used for plowing in the spring and fall.

Caring for a team of oxen can be very rewarding in terms of the work that they produce and the relationship that develops between oxen and teamster, but it requires a lot of work. A responsible owner must be attentive to the needs of the oxen for regular exercise regardless of the weather outdoors. Finding exercise for a team may be quite easy in one season and rather difficult in another depending on the nature of the operation. It is important not to neglect the team when work is scarce, or their performance and health will suffer.

## Forestry

In the Northeast we have a history of forestry. All of New Hampshire has been cut. It is possible to remove wood from every square foot in the state. We currently have many technological and scientific advantages compared to our predecessors. As participants in a relationship with the forest we control how we interact with forest. We are the caretakers who must decide how to utilize this gift as a resource for today and the future.

### Flora & Fauna

The trees have two main categories. Conifers and Hardwoods are fairly easy to distinguish by appearance. There are overlaps in characteristics. For example, hemlock is a dense hard conifer and tamaracks lose their needles annually.

#### **Hardwood Deciduous**

Broadly classified as broadleaf plants that drop leaves annually. These trees are generally more dense and slower growing. They propagate from seeds and suckering from the stump. The renewable choice for indoor heat in the Northeast. Highly valued for furniture, cabinetry and carving.

Cherry- prized as indoor finish for the beautiful reddish color of the wood

Hard, excellent for indoor woodworking projects

High value as veneer

Striped Maple- large leaves, brittle wood, generally only grows to about 40 feet, diameter 2-6" and then dies, suckers heavily from the stump when cut, moose love the vertically striped green bark

Rock/Sugar Maple- leaves shaped like the Canadian flag, high percentage of maple sugar, great firewood, high value veneer wood, smooth edges to along maple leaf profile, beautiful red foliage

Red/Swamp Maple - edge of maple leaf profile has ridges, grows in clusters

Beech-smooth gray bark, susceptible to a bark scab, provides food for wildlife, large spreading canopy that competes heavily for sunlight

Ash-valued historically for baskets and baseball bats, strong and hard lightweight wood

Oak-excellent firewood and flooring material, the acorns are forage for the critters

Elm-rarely grows more than 6" diameter as epidemic of dutch elm disease...historically a valuable wood, hard and durable often used for the original wagon wheels

White Paper Birch-beautiful white bark makes this a wonder of the forest, short lived, it is a pioneer that often grows in clumps, relatively soft wood, good firewood but bark slows drying

Yellow Birch- similar bark to the white birch golden and perhaps more shaggy, this tree is currently highly valued for veneer wood

Locust Black & Yellow- Black is a thorny legume, renowned as rot resistant fence posts. They flower and form seed pods that are excellent fodder for birds.

Linden-Rare tree, beautiful large heart shaped leaf and fragrant flowers

Basswood-Rare Highly valued as carving wood

Poplar-Common fast growing pioneer, Leaf flutter in the wind is notable and unique. Known as aspen in the west, they sucker and propagate from massive spreading root systems. Component of paper production often referred to as pulp wood.

### **Softwoods Conifers**

Reproduce by cones. These woods are generally less dense and use needles to photosynthesize. Kiln dried construction 2\*4" type wood is often stamped SPF which signifies it as Spruce Pine or Fir. The wood has been chosen because it is abundant, strong, lightweight and it fastens well with nails.

Balsam Fir- bubbles of sap in the bark smell like Christmas when popped, this tree is short-lived but regenerates from seedlings well, all purpose utility wood the branches are used for seasonal wreaths

Eastern White Pine- the tallest of eastern trees, these trees are highly valued as framing and knot free finish wood, resistant to UV radiation it is excellent siding material

Spruce- All purpose wood not very rot resistant

Hemlock-grows groves in wet areas, hard strong wood often used a structural beams. Outdoors immersed in water they are resistant to rot, thus they are utilized for building up wet areas and water bar structures

Tamarack- loses its needles in the fall, beautiful yellow foliage, often grows in wet areas

Cedar-excellent bird habitat, rot resistant wood highly valued for house siding and fence posts

### **Small Trees, Shrubs and the Understory**

Serviceberry also known as june berry, White flowers in May with blueberry sized red edible fruit in June July, often grows on the edge of fields mature trees reach 40-60'

Apple-naturalized species that supplies flowers and food for insects and animals, mature they grow to 30-40'

Hawthorn- white flowers and red berries, herbal medicine for moderating blood pressure, nasty thorns matures approximately 20'

Blueberry-native species, beautiful red foliage, edible fruit, likes lots of sun but will survive with less high bush matures at 6', native lowbush grows approx 2'

Bumble Bush-popular as a landscape plant, nice white flowers, large leaves and gangly stem make this a potential hazard underfoot

## **Bulbs**

Hardy low maintenance plants that flower before the hardwoods leaf out. Nature works to fill niches. Bulbs are opportunists for light whereas the perennial trees are more reserved in the frenzy of spring activity. Daffodils are a favorite. Low maintenance spring flowers are a bonus.

## **Endangered At Risk**

Goldenseal, Black Cohosh and Ginseng are popular medicinal herbs that have been overharvested in the Northeast. The Lady Slipper is an example of a wildflower who is at risk. These species must be noted, propagated and protected to insure their continued survival. It is the responsibility of the land tenant to preserve these species into the future. As such planting and preservation areas should be considered. Make sure to buy seeds and plants from reputable nurseries which are ethically propagating the plants.

## **Management Practices**

**Soil and Erosion-** The soil is fundamental to the forest. Without the soil there is nowhere for the roots to grab the Earth and the necessary water and nutrients. Soil erosion causes problems downhill with siltation in the watershed. On the woodlot soil damage causes undesirable shifts in species, problems with regeneration, and obviously less productivity as the nutrients are washed downhill. Compaction also contributes to hydrologic problems as rain does not filter through the soil but runs off more rapidly.

Soil erosion can be minimized by operating only during dry or frozen weather conditions. Trail planning also can reduce the impact of pulling wood. A well designed system of trails considers the destructive flow of water as well as the easiest way out for the wood. Logging roads must be maintained with proper water diversions such as water bars to prevent the destruction of the road as well as the soil.

Trees-

**Thinning Clumps-** Trees that sucker grow in clumps from a single root crown. The trees compete for limited resources and suffer. Rather than let the trees fight for space, it is better to thin the clump to enable optimal growth.

**Limbing Pine-** Pine has higher value when free of knots caused by limbs. Limbs should be broken off up to 18' to promote growth and higher value timber. The limbs die naturally and can be broken off with a stout pole.

**Mast Trees-** These are large desirable trees that serve as a source of food and the seed of future trees. They should be identified and preserved to promote a healthy forest.

**Freeing Up from Neighbors-** This is a theory based on improving the growth of trees that will be harvested in the future. Trees are removed from the perimeter to reduce competition. The area of the cut can be dictated by a rule of thumb that from 5-10" diameter all trees within a foot per inch of diameter should be cut, therefore all competitors within 8' of an 8" diameter tree. For trees above 10" in diameter, thin the trees that are 2 foot per inch of diameter. Trees can also be thinned based on if they are touching in the canopy above.

There is danger to your prize from thinning the neighbors. Trees are susceptible to windthrow if neighbors that were windshields disappear. Veneer quality wood can shift their straight growth if neighbors are removed. Therefore it is recommended to remove trees slowly over time and practice this process through the years for the best results.

**Leaners-** These trees generally do not have value as saw logs and will likely fall over before they reach maturity. Leaners can really disrupt felling as trees become hung up on one another. It is often best to



remove these trees to let others grow and prevent them becoming a nuisance during harvest.

**Girdling-** This is the safest way to take down a tree but it takes time. First you kill the tree by cutting a ¼” incision around the base of the tree. This effectively stops the respiration of the tree and it dies. Then the tree comes down slowly. This is especially effective on low value wood that is difficult to fell and move. It also creates excellent animal habitat.

**Maximize Your Interest-** What trees are right for you? Do you have particular favorites or interests in species? Where on the property are species more useful?

**Remove Potential Overhead Dangers-** Broken limbs hanging in the canopy “widow makers” should be identified and removed before proceeding with cutting.

### **Site Evaluation-Soil, Slope, Species Present, Wetlands**

The idea of site evaluation is to assess what the site offers to design a system of woodlot management that is appropriate for the landowner and the land. Therefore site evaluation is about the people and the place. What is our usage? What are the equipment and people resources of the project?

There are many factors to consider. An economy of movement is definitely desirable. The more efficiently heavy objects are moved the less energy is wasted. Sawlogs and brush are utilized differently and they are both a challenge in the woods. The sawlogs must be pulled down to a location for milling, while the brush is piled to be burnt, saved as a wildlife habitat or dragged to the chipper. This illustrates how the operation must be spatially orchestrated to be effective. Otherwise the forest becomes a confusing collection of limbs and logs that is a congested mess, which adds weight and frustration to heavy, difficult work

The flow of wood from the stump to the location where it is processed and utilized is important. Often using gravity to stockpile materials downhill makes the most sense. Water drainage and erosion make accessibility a thought provoking challenge. The slope of the land is a critical component that can be dealt with positively but it must be considered and addressed.

It is important to minimize trail and access roads. The less road the more room for trees to grow and there can be less of an erosion issue. All roads should be properly maintained so that the soil is conserved and access is assured.

The species that are present should be considered in all planning. Native species are indicators of the soil type and moisture level. This provides clues to other species that would be adaptable. Possible utilization considers how trees regenerate over time. An example might be utilizing red maple stands that are difficult to remove without stumping. Trees such as this that sucker from the stump can be cut at regular intervals supplying the raw materials for a round wood furniture business. The key is to evaluate the species of a site and design a plan to make the best of the site.

The soil is fundamental. The soil in new Hampshire is acidic with a thin layer of organic material. Every effort should be made to preserve and improve the soil. Ledge areas should be avoided as the soil will rapidly wash away from the rock if disturbed. Large rocks littering the landscape can be difficult to work around.

Wetlands are identified by evidence of standing or running water and particular plant species. These zones are protected by state regulations. It is often better to access these areas during the deep freezes of the winter. Working in the frozen forest provides the ground protection and limits soil erosion.

### **Usage**

**Sawlogs-** The large diameter straight knot free wood goes to the mill. Spruce, Fir and Hemlock make excellent construction frame material. Sugar Maple, Cherry and Ash should be processed at the mill to be utilized as interior finish or furniture. Veneer Wood is wood sent to a special mill that actually shaves the log thus forming sheets of wood that is then laminated into plywood.

**Firewood-** Small diameter hardwood is used indoors while the hot and fast burn of conifers make great campfire and sugaring wood.

**Round Wood Construction-** Fence posts, outbuildings, trellises, and flagpoles are some of the utilitarian uses of the material. Round wood furniture is a popular rustic motif.

Recreation- Trails can be designed to facilitate leisure activities such as hiking, biking, horse riding, hunting, skiing and motorized recreation vehicles.

Wildlife Habitat- The use of the woodlot can be geared towards the woodland creatures. Species and habitat that provide food and shelter to the critters are encouraged. If you would like more deer look to provide food like apples and preserve areas of dense conifers for bedding zones. Wood peckers and owls use hollows and dead standing trees for habitat and their food often resides inside (insects and mice).

Tree Felling- This is an art and science too vast for a safe and reasonable explanation in this forum. The idea is to be able to fell the trees in the direction of your choosing. It is dangerous, laborious work. Please read the manuals, take safety classes and use common sense when considering saw operation. Professional Timber Falling: A Procedural Approach by Douglas Dent is an excellent source of information.

## References

Common Sense Forestry by Hans Morsbach is easy to read and thoughtful, not too technical with hands on wisdom for the woodlot owner who wishes to work in the woods

Low Impact Forestry: Forestry as if the Future Mattered edited by Mitch Lansky this is a valuable text, technical and with a wide variety of information, more of a compilation than a start to finish analysis

Restoration Forestry: An International Guide to Sustainable Forestry Practices by Michael Pilarski an author famous for his support of sustainable forestry presents a collection of resources and ideas. This book has an enormous scope of information for people interested in worldwide and local forest management..

The Good Woodcutters Guide by Dave Johnson Practical guide to cutting wood. It goes over the basics in easy to read format. Great gift for the aspiring sawyer.

Ecoforestry: The Art and Science of Sustainable Forestry edited by Drengson and Taylor  
This is a textbook style volume that includes theories and examples of commercial ventures in sustainable forestry. Not many hands on details

Oxen : A Teamsters' Guide by Drew Conroy is a great book for the beginning teamster, though little is mentioned about the details of training a new team.

### Local Resources

Jay Legg, Legg's Logs 786-2319

Rick Evans, Licensed Forester Clark Hill Canaan

Northan Parr, UNH Cooperative Extension, Grafton County, 787-6944

Steve Schmidt, NH Farm Service Agency, Grafton County 747-3751

Small Engine Technology 536-2095

Hawkenson Equipment 536-2433