

THE WOODLOT  
by  
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People have strange ideas about the forests of this country. For instance, "Most of our forests are in the west". In reality, a little less than half our forest land is in the Rocky Mountain and Pacific Coast regions. And much of this land is reserved for Wilderness or is so unproductive that it can't really be called commercial. If we consider only productive forest instead of simply woodland, then we find that only about a quarter of the nation's commercial forest is in the west and three quarters is in the east, about evenly divided between north and south.

If instead of land we look at our inventory of standing softwood timber, the kind we use the most, then 70 percent is in the west because that is where the high volume, old growth conifer stands predominate. So in the near future we will depend heavily on nature's bounty from our old frontier but as these stagnant, over-mature stands are harvested and we are forced to grow what we need, the focus of activity must shift eastward to where our productive land is.

"Forests represent a delicate but stable balance between the forces of nature." The truth is that forests are changing continuously by natural growth and from relentless competition between individual trees. In addition, most areas in are some stage of recovery from natural or man-made, large scale disturbances such as fire, storm, insect or disease attack, clearing for farming and cutting. In the northeast the majority of our land was once cleared for farming and then let go, allowing trees to promptly move in and begin old-field successions. These areas, and practically every other acre of forest, have been cut at least once so that we're living with our third or fourth forest which continues to be the same patchwork of even-aged stands as that originally created by precolonial fires, hurricanes and assorted natural disasters. Because of this continued buffeting by events, to simply survive, our present tree species have had to be tough and the forest system they have created as resilient and bouncy as an India rubber ball.

"Since settlement America's forests have gone steadily downhill." Well, today's woodland is different from that our ancestors saw, but less so than is generally believed. In the northeast, for instance, the same old tree species continue to grow in the same landscape niches. We can find little evidence that much has disappeared, except chestnut, and little has been added. People who study the pollen trapped in our bogs suggest that our present suite of trees hasn't changed appreciably in the last 2500 years. So we've had stability in the species mix that covers New England. On any given acre, however, it's a different story. Here detailed change in response to events has been the order of the day and the trees from the stable regional mix that dominate any piece of land at any point in time depend on the vagaries of chance seed dispersal and on the random happenings that remove the old trees. Thus, acre by acre, forest change has been active like the waves that ruffle the ocean without disturbing the sea level of species that underlie the region.

"Most private forest land is in farm woodlots." Statistics show that only about a quarter of the commercial forest lands is on farms, another third is held by "miscellaneous private", non-industrial owners. So private folks have about half the land, but in the east they control almost three-quarters and in the west less than one quarter. Thus what

happens to western forests is largely the result of government management while the future of eastern forests is mainly in private hands. Forest industries have only 14% of the commercial forest land so they can't carry the load alone; other private owners will have to supply much of our forest needs.

"Private owners generally butcher their woods and mistreat them more than any other group". It's hard to know how to judge this question, but year after year official estimates show these folks produce their fair share of the cut, fair in the sense that they own about half the land and cut about half the wood. In addition, if growth and harvest are expressed as a percent of the growing stock they keep, their production is about as high a percentage return on inventory as industry's and much better than government's performance. This may simply mean that the woodlots continue to produce in spite of neglect, or perhaps that management by accident is more effective than professionals believe. In any case, the trees are growing without much attention from most private owners.

But is this the best way to have a pleasant and profitable woodlot experience and to be a good neighbor? In most cases, no! Following a few simple rules will bring you greater ownership satisfaction from the land and, at the same time, will benefit your descendants and the public at large. In the past it was not uncommon to hold a woodlot, let nature take its course, and every couple of generations when prices were high, "lumber it off". And that still happens. But today owners have come to have a high regard for a wide array of values including the chance for outdoor recreation, seeing wildlife, hunting, enjoying environmental relief from work-a-day life, realizing gains from rising land values, aesthetics, a source of fuelwood and a host of other satisfactions which are generally not traded over the counter.

Yesterday, when land was cheap, interest and taxes low, most folks didn't worry about getting the most out of their woodland. Today, everything is dear and high carrying costs make owners more cautious and thoughtful so there is a renewed interest in land management, especially steps aimed at a balanced mix of those tangible and intangible returns.

Given that for most of us resources like time and money are scarce, how should we ration them out to a woodlot? Normal prudence suggests that one should invest first in that venture that makes the greatest return in cash or satisfaction, second, in the next best earner, and so on. The greatest satisfaction from woodland comes from the initial purchase because that entitles you to any and all present and future benefits. The next best return is from inputs to safeguard the forest -- good boundaries, access for fire control, paying taxes, and the like. For most, the third best payer is a road and trail net so you can get around and enjoy your woods. Finally, come investments in management that will improve forest production of goods and services of all kinds. Often much of the road net and management cost can be internally financed from the proceeds of some timber sales, when you have suitable timber.

People who never really cared much for management are suddenly doing something very positive as they look to their land as a means of keeping the wood basket full. In fact, a common question these days is where can I buy a woodlot and how many acres do I need to grow enough firewood for the house?

Information about land for sale is mostly gotten "word of mouth", although local papers sometimes have woodlots advertized. The county forester or a resident consulting forester both hear a good deal about

land for sale in the natural course of their business, but mostly one asks around at the local garage, store, realtor, or lawyer's office. People in the town tax office often have ideas worth following up. And, once you have found a place, it will pay to hire a consulting forester to look it over. A quick look should be enough for him to tell you whether the lay of the land and growing stock are likely to meet your needs.

I became a woodlot owner by accident because we were making a town property map. As you might expect, we had trouble locating a number of tracts and one owner who lived in Florida wanted to sell out. He'd bought the lot cheap fifteen years before "site unseen", as they say. All he knew for sure was that the northeast corner was 19' south of a big boulder and the tax bill called for 48 acres. The deed itself was coyly reticent about everything except that northeast corner and who the abutting neighbors had been about a hundred years earlier. In addition, I knew that two friends of mine hadn't been able to pin down the boundaries in their spare time over the last year.

All in all, it looked like a real gamble as to where and how much land was there, so we struck a bargain and I started hunting. Nothing made much sense on the ground until I traced the deeds back to the old Stratton farm and could follow its break up through inheritance and sale over the next hundred years. Then I knew where to look for corner and line markers of pipe or "stake and stones" and how to interpret stone walls, bits and pieces of barbed wire sprouting out of trees and old cutting boundaries. Working this out became a three-year spare time hobby that eventually required pinning down two equally vague neighboring properties.

After all that, you can bet that I have well painted bounds with iron pipes set at each corner and even at intervals on the longer straight lines. Each year I blaze, paint and brush out a bit of the boundary so that there is no confusion. As Frost said, "Good fences make good neighbors", and a well marked boundary makes it hard for a logger to "accidentally" cut over the line. Most states award triple stumpage for trees "knowingly" cut on the wrong land, so it saves grief to let people know just where your land begins.

This was the time to make a map of the place. With a pocket compass, a tape and my nephew it was easy to get the distance and direction of each boundary line and then plot it up. There is a good description of how to do this in the Boy Scout Handbook. I've found that a scale of about 400 feet to the inch is useful; it allows reasonable space to plot details and most maps aren't too big to go on a standard piece of paper which fits into normal files. Make the original in pencil and when you're satisfied, finish it with black ink. Then you will have a master that's easily reproduced with a Xerox and having cheap copies makes it possible to use the map freely for records of all kinds. In fact, a map can be the main place to note all sorts of information that will make owning your woodlot more fun.

Once I knew where the land was and had an outline map, then I wanted to know more about it. In the course of chasing boundaries I already knew where an overgrown road and a brook were located. Also, I knew that red maple swales bordered two substantial segments of the stream and that these had apparently been clear cut for fuel about twenty-five years ago. The trees are now about 4" to 8" in diameter, closely spaced and run heavily to stump sprout groups. In fact, a thinning for stove wood could now be made and the residual would grow faster.

The rest of the area had some nice red oak here and there growing in mixture with other hardwoods or above an understory of hemlock. A few of the oak were already 18" to 24" in diameter and readily saleable. But one really needs to know more precisely what is there and where it is before deciding what's best to do.

When you've finished working on the boundary it's time to look inside to see what this piece of real estate looks like. If you haven't done so already, learn to pace; it's almost a lost art that anyone can learn because it simply takes practice. But, like riding a bicycle, once you've acquired the skill, it will stay with you forever. Again, the Boy Scout Handbook is a handy reference and about the only one I know that is readily available. So, with map in hand, a compass and your natural stride, start to fill in the permanent features of your woodlot's topography.

I started with my overgrown logging road and discovered that it was well worn and needed little work to clear as far as a stone wall and then a bit beyond to the streamside swale I mentioned earlier. This part was probably a farm lane that old man Stratton laid out to get to what one of the deeds calls the "long mowing". In the early days wet swales were cleared and used to cut hay from the natural grasses that took over once the sprouts were killed off. The road continued on but gradually became more overgrown and diffuse so that it looked like a skid road used occasionally for logging. Judging from the old pines laying across it that probably blew down in the hurricane of 1938, this part has been abandoned for over forty years. Finally, even this trace disappears some distance short of the back boundary. Primitive as it is, the old road is still the easiest trail into the the lot, seems well enough laid out so that it is stable and not eroded and, with a little clearing and a load or two of gravel in wet spots, will be easy to revive.

With this landmark in, it was logical next to map in the brook that paralleled much of the road. Doing the main stream and pacing the tributaries located all the permanent and intermittent streams which flowed over the lowest land containing all the wet spots that influence growth or give trouble with roads, and it also sketched in the drainage pattern on which the higher land was hung. With the valleys done it was easy to locate the ridges and knolls and note which were steep and which were gentle.

With the rough topography filled in, I had also defined the main growing sites with moisture regimes different enough to influence forest growth. The wet swales are dominated by red maple and, at the other extreme, the dry ridge tops are given over to oak. The slopes in between have mixtures of hardwood with a pine here and there while some of the gentlest slopes with diffuse intermittent streams have a lot of hemlock under the hardwoods. So I could start to make some sense out of the forest cover and get a feel for where things will grow, and the woodlot started to take on natural form and organization.

Of course, I knew the local trees but many owners must start from scratch and learn to identify the different species. This is relatively easy: with a good field guide and a bit of practice one can quickly identify the main leaf shapes in the summer and the buds and twigs in the winter. In addition, many trees have a distinctive bark form, color or texture that is easily learned. In any case, learning the trees is the first step toward understanding what you see in the forest because the trees integrate each site and tell you something about the local micro-

climate and what's below the ground.

Although red maple, for instance, grows everywhere as scattered individuals, it will totally dominate sites too wet for other trees. Yellow birch is more plentiful on moist sites and doesn't start in the hot sun. While white birch can't stand the wet, but can dominate cut and burned over sites just as well as the pioneer short lived gray birch and trembling aspen. White pine in central New England forms pure stands in abandoned fields and pastures. But, as the first step back toward forest, it is succeeded by hardwoods on all but the driest sites, like sand and gravel plains. At the other extreme, the wettest sites are the bogs which in central New England grow sphagnum moss on the ground and black spruce, tamarack and the odd red maple overhead, with here and there a white pine on a sandy knoll. This complex of species seems able to withstand the short growing season in these valley-bottom bogs, but it grows very slowly and is probably most valuable for watershed purposes and wildlife, especially birds.

Most people don't know what to do to improve their woodland for wildlife and reasonable guides aren't easy to come by. Of course, each species of mammal, bird or fish has its own habitat preferences so you may want to look for specific guidance for the thing in which you're especially interested. The following couple of pages by Nick Burrell are about the best thing I've run across lately:

Forest Cutting Practices and Management for Wildlife.

General Recommendations:

1. No cutting within 50 feet of water (stream or pond)  
Reason: Provides protection for water in the form of erosion control and shade to prevent water from becoming too warm. Strips of uncut forests will provide an area of naturally succeeding forest land which will provide a source of mast and adequate tree cavities for cavity utilizing species of wildlife. (There are 48 species of cavity utilizing species of wildlife in Massachusetts.)
2. Timber cuts should be small and in patches  
Reason: Almost all species of wildlife utilize more than one type of vegetative cover (cover for feeding, nesting, broods, escape, resting, etc.). Wildlife populations utilize the interface between two or more types of vegetation because they can fulfill most of their daily requirements on either side of and in these edges (edge effect). More edge is created by keeping the area of cuts small. Ten 2 acre cuts will create more lineal feet of "edge" than one 20 acre cut (11,800 feet vs. 3,732 feet) and logically ten 10 acre cuts are better than one 100 acre cut.
3. Timber cutting should be geared to cutting often in small lots rather than large lots with infrequent cutting  
Reason: A great many wildlife species utilize a forest in its "early successional stage". When forests are in the process of regeneration after cutting, a great deal of ground cover is available to wildlife. This vegetation supplies excellent hiding cover, and early successional types of shrubs and berry producing plants for food. This early stage only lasts about 10 years, so cutting should be frequent enough to insure that this stage is always present in the forest. From an economical point of view, this management regime provides the forest landowner with a steady source of income rather than a boom or bust situation.
4. Provide herbaceous cover after cutting

Reason: Log landings, roads, and disturbed areas should be seeded to perennial grasses and/or legumes after cutting to prevent soil erosion and provide a source of food and cover for wildlife. Many species of birds utilize this type of vegetation for nesting and as a food source (seeds and insects for egg laying and young). Mammals such as deer and rabbits use these areas for grazing and small rodents utilize these areas.

5. Leave 3 to 7 snags standing per acre

Reason: A snag is a standing dead or partially dead tree and provides the main source of cavities for nesting and living to 48 species of wildlife in Massachusetts. They also provide a source of food (insects) for these wildlife species.

Special Management:

1. Turkey, Deer and Squirrels

These species are all dependent on mast (nuts, seeds, berries from trees) for a good deal of their food. Management for mast producing trees (oak, hickory, ash, beech, black cherry) should be included in the forest management plan.

- a. Turkey - For those forest lands that have spring seeps it is important to have mast producing trees around them as these are the first areas to become snow free in late winter and early spring. A well distributed pattern of forest openings with herbaceous cover would provide area for turkey broods.
- b. Deer - On southwest facing slopes it is important to have stands or patches of coniferous trees. Deer utilize these slopes and conifer stands in late winter.
- c. Squirrel - Supply adequate den trees. Lack of den trees is often the limiting factor in squirrel populations.

2. Grouse, Woodcock, Rabbits, Snowshoe Hare

These are species of early successional forests. It is important to make sure cutting takes place often enough to provide this type of cover. Clear cutting narrow strips of forest land adjacent to open fields in sections and at staggered intervals is recommended.

- a. Grouse - Where clones of male trembling aspen are present, regenerate periodically by clear-cutting the aspen and adjacent cover for 100 feet around the clone. Buds of male aspen are a major source of winter food for ruffed grouse and newly regenerated aspen provides excellent cover for young grouse and woodcock.
- b. Woodcock - Where alder occurs along edges of wet areas succession to forest should be discouraged by cutting the overtopping trees. Alder covers are excellent woodcock habitat.
- c. Rabbits and Snowshoe Hare - Slash should be piled after cutting. Brush piles provide excellent escape cover for these species.

If you want to accomplish all this and get some roads and trails into your property it will usually be necessary to make some kind of cutting. The time to do this is when you need the wood or when the market is brisk. Your problem may be how to find out much about the state of the market. One thing you can do is to call the Service Forester in your county and ask him about it. Part of his job is to give advice to private landowners, and because he is paid by the state you get his services free. Because he is free don't expect too much of his time as the competition for his services is understandably brisk. Alternatively, you can buy the

time of a consulting forester, but be sure to ask about his charges before you start. If it turns out that you are going to make a sale of timber then it is very important that you get a trained person to look after your interests.

The next most important thing is to have a written contract with the logger so you both know what to expect. Most people don't know what should be covered by a contract, but you can call your state extension forester at the state university and he will send you some samples. Or you can get advice from your consulting forester. Just to give some idea of the sort of considerations that should be given attention in logging the following list of suggestions for loggers was published in New York. I have slightly modified it to generalize the agencies named:

The New York Section Society of American Foresters recognizes the importance of natural resources and their use to satisfy people's needs. Foresters urge care in logging and continued use of methods that keep forests stable and productive. To help, the New York Section SAF has adopted timber harvesting guidelines for use in New York. The guidelines list ways to prevent problems from building up and for safely harvesting products from the land.

Good logging begins with good planning. First, identify potential problems. Work out solutions and then use suitable methods. Here are some things to look for and do in logging:

#### Streams and Water

Siltation comes from erosion when soil washes into streams and lakes. This reduces water quality and may harm fish spawning beds. With properly planned logging, erosion never starts. Streams can be protected from careless disturbance and water quality kept natural.

What practices will protect streams, lakes, ponds and marshes and maintain natural quality?

Recommendation: keep stream crossings to a minimum and plan them carefully.

1. Check with your state forester about special regulations that apply to logging along wild, scenic and recreation rivers and wetlands.
2. Check with your state forester for advice and approval about crossing classified streams.
3. Cross streams by the most direct route and avoid crossing at bends and through pools.
4. Find crossing sites that have low, stable banks, a firm stream bottom and gentle slopes along the approaches.
5. Cross at a few carefully chosen places rather than at any place that seems convenient.
6. Use temporary culverts, bridges or runways where stream bottoms or banks would be otherwise damaged and remove them after use.

Recommendation: protect stream banks by controlling skidding and felling close to the stream.

1. Avoid cutting trees growing within 10 feet of the stream bank (that helps keep the banks in place and maintains shade over the water).
2. Don't skid up and down the stream channel (and this is a good rule for intermittent streams too).
3. Keep skidders back at least 50 feet from the water and winch off any logs that lie closer to the bank (for slopes over 10 percent it is good to keep skidders back at least 100 feet so they don't stir up the soil and start erosion).
4. Directionally fell trees so that the tops land away from streams

(that keeps debris out of the water and keeps the skidders farther away from the banks).

5. Remove any logging debris that gets into the water so stream flow isn't affected.

6. When clearcutting, leave a 50-foot wide uncut strip along both sides of flowing streams, ponds and marshes (that keeps the water shaded and prevents heating up by direct exposure).

#### Roads and Skid Trails

Soil uncovered by skidding and truck traffic can erode if water runs over it. Good design and proper maintenance make the best prevention. Poor drainage leads to mud holes. Erosion occurs if water is not diverted off the road surface. The steeper the slope the greater the danger.

How can erosion be prevented from landings, logging roads, skid trails and off steep slopes?

Recommendation: plan carefully the protection of slopes exceeding 30 percent.

1. On steep slopes set back roads and trails at least 150 feet from streams, ponds and marshes.

2. Winch logs off steep slopes where possible and minimize the number of skid trails and the amount of skidder traffic.

3. Log steep slopes during dry weather when soils are dry or log when the ground is frozen and snow covered.

4. After logging, regrade roads and primary skid trails and install diversion devices as needed.

Recommendation: properly locate, design and build all roads and skid trails.

1. Keep roads and skid trails out of wet and poorly drained spots and off the tops and toes of banks and slopes (that should keep machines from getting stuck too and make skidding and hauling more economical).

2. Provide ways to divert running water off roads and primary skid trails when slopes exceed 10 percent (figure out where streams of water will run off during a rain or snow melt, and put diversion devices to channel surface water off the road or trail).

3. Keep roads back from streams, ponds and marshes (set them back 100 feet on slopes less than 30 percent, and 150 feet for steeper ones).

4. Don't run ditch water directly into a stream (stop roadside ditches before a stream crossing and divert the water into the woods).

Recommendation: select landing locations that avoid erosion problems.

1. Keep landings out of low spots and poorly drained places.

2. Put landings on gently sloping ground that will give good drainage.

3. Set back landings at least 200 feet from streams, ponds, lakes and marshes (that will reduce chances of siltation from erosion off the landing).

4. Grade and level landings after use and reseed if needed.

#### Roadsides Along Major Travel Corridors

Most people object to logging slash, hung-up trees, poor utilization, deeply rutted roads and landings and the like. Plan ahead to avoid build-up of these things. Be aware of the landscape. Logging just a little differently usually keeps the roadside area looking good.

What will help to make logging jobs look better along major travel corridors?

Recommendation: comply with fire laws.



1. Keep logging debris off the right-of-way of public roads and back at least the legally required distance from the right-of-way.

2. Lop all conifer tops.

3. Keep log piles back at least 20 feet from the right-of-way.

Recommendation: if logging along major travel corridors isn't screened by a hill, high bank or other topography, maintain a 100 foot wide scenic buffer strip along the roadside.

1. Directionally fell trees so that the tops land away from the road (that puts the slash further out of sight and reduces need for top lopping).

2. Use all merchantable products in each tree (people don't like to see unused logs and bolts left lying in the woods, and if you cut them out it automatically lops off many of the large branches too).

3. Pull down hung-up or partly fallen trees, fell bent over and broken off trees and use merchantable material in them.

4. Use care in skidding to protect understory vegetation (shrubs and saplings make a good natural screen).

5. Keep skidders back in the woods and off the right of way (that keeps the road banks from getting rutted and helps keep skid trails out of sight).

6. Cut lightly within 100 feet of the forest edge by keeping at least 50 square feet per acre of basal area in residual trees, including some big ones (this keeps a forest-like appearance along the road).

7. Keep in mind that trees standing directly at the edge of the woods provide the best screening.

8. Keep stumps low.

Recommendation: wherever possible, keep landings out of sight and dress up landings and access roads after use.

1. Put landings behind a hill, bank or land form that hides them from the road, or set landings back into the woods as far as practical (use a set-back of at least 200 feet whenever possible).

2. Build access roads somewhat curved (it is harder to see around a curve than up a straight road).

3. Lay out landings so the long axis lies perpendicular to the road.

4. Keep entrances from the road narrow to reduce visibility from the roadside (widen the road once back in the woods but keep the entrance narrow to restrict visibility).

5. Clear landings after use by burying debris or dragging waste material back into the forest (actually, if you skid out only usable parts of the tree, there won't be much waste at the landing).

6. Back blade landings and access roads so they are smooth and level and free of ruts and mud holes (they look better and should rapidly seed into new vegetation).

7. Put in diversion devices at places where water might run down the roads and wash off soil into roadside ditches.

8. Regrade and clean ditches along the roadside and close temporary roads.

9. Where needed, seed access roads, landings, and ditches (especially where they come close to the highway).

10. Pick up oil cans, lunch wrappers, broken cable and other junk.

Good stewardship of natural resources means wise use. Wise use provides a proper inheritance for future generations while caring for our needs today.

The New York Section SAF calls upon landowners, timber harvesting

contractors, forest managers and forest industries to harvest carefully. Everyone must work to keep our forests productive through safe and well planned logging. These guidelines list practices that prevent problems.

There are a number of places in Massachusetts where a landowner can get help in coping with a woodlot. I've already noted there is a free service forester in each county. To get in touch with yours write the Division of Forests and Parks, 100 Cambridge Street, Boston, MA 02202 or call (617) 727-3184. They will give you the proper name and number to call, or address to write. The service forester is also the person to call if you want to make investments in tree management because he can get federal cost-sharing assistance for you to do certain things in your woodlot.

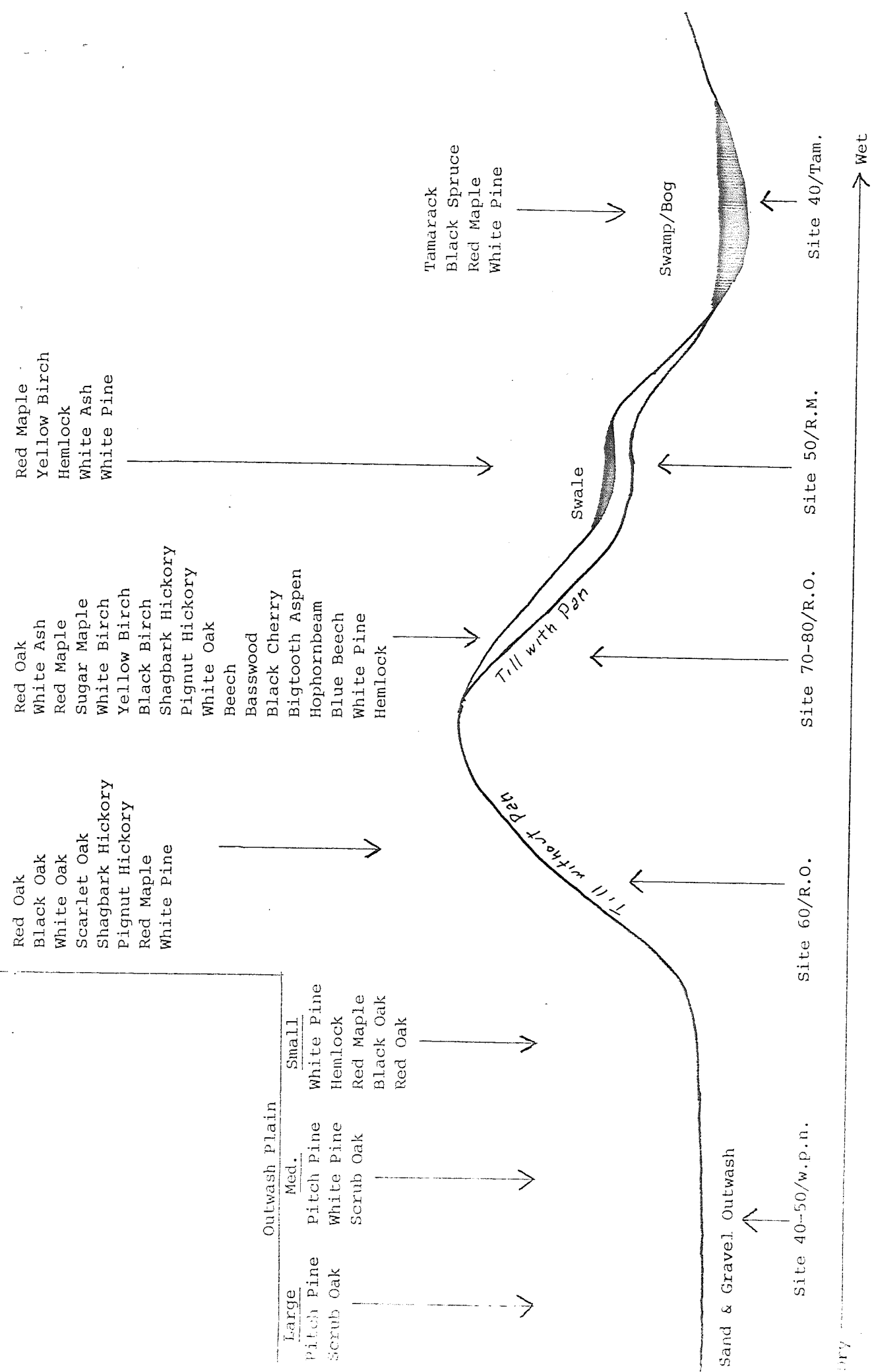
In addition, there is an extension forester at the University of Massachusetts in Amherst in the Department of Forest and Wildlife Management. He is paid to use education to help solve technical forest problems and has a number of free publications about forest that are very helpful. You can also get free advice from the Cooperative Extension Service office usually located in your county seat. The local Soil Conservation District Office for your locality is also a source of technical help with water, soil and land management problems.

You should know that Massachusetts has several laws that concern trees and forests. The oldest is the Public Shade Tree Act which began in the last century. This gives the local tree warden jurisdiction over trees that shade the public way. He must hold a public hearing at the tree before authorizing its removal, except in emergencies. If a citizen objects in writing at the hearing the decision is thrown over to the Selectmen.

There is also a Forest Cutting Practices Act that requires a landowner to file a notice of intent to cut and a cutting plan before most timber sales. All people in the business of logging must get a commercial harvester's license from the state. There is also a Slash Disposal Act which is administered by the state fire wardens. Finally, the local conservation commission administers the Wetlands Protection Act which, with the Cutting Practices Act, also covers logging in wetlands. All told, a fairly comprehensive set of safeguards for Massachusetts forests.

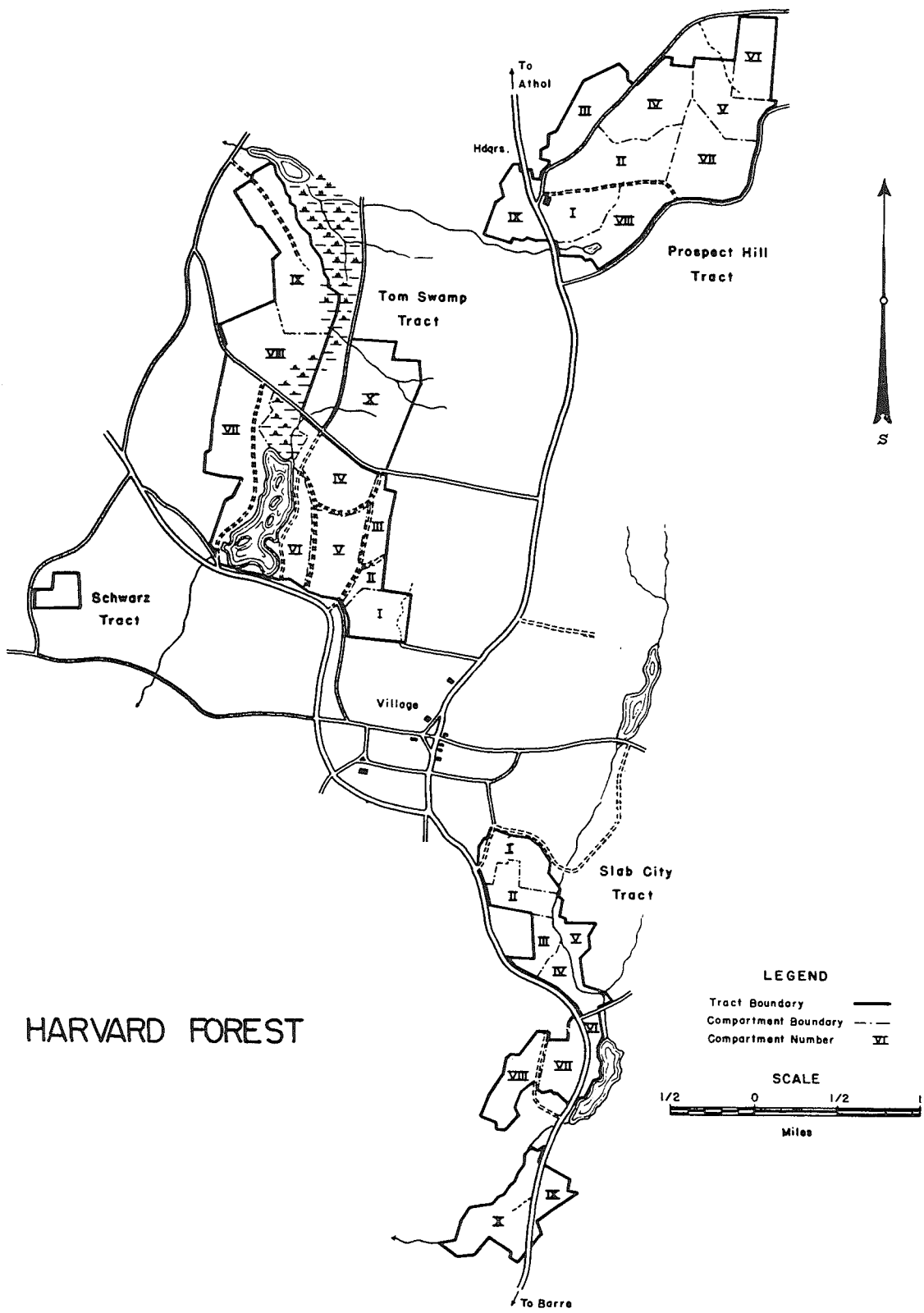
In addition, there are three special tax laws that help landowners with local property taxes. Chapter 61 reduces annual taxes on woodlands by 95% and imposes a severance tax on products cut under an approved timber management plan. Chapter 61A gives relief to farmland and associated farm woodland on bona fide active farms. Chapter 61B gives some tax reduction for open land devoted to recreation. There are also some federal income tax advantages for forest returns. It is also possible to get reduced property, income and inheritance taxes by giving a conservation easement on forest or other open land to the town or some other acceptable conservation organization.

These preliminary thoughts may give you a small start toward a more satisfying relationship with your woodlot.



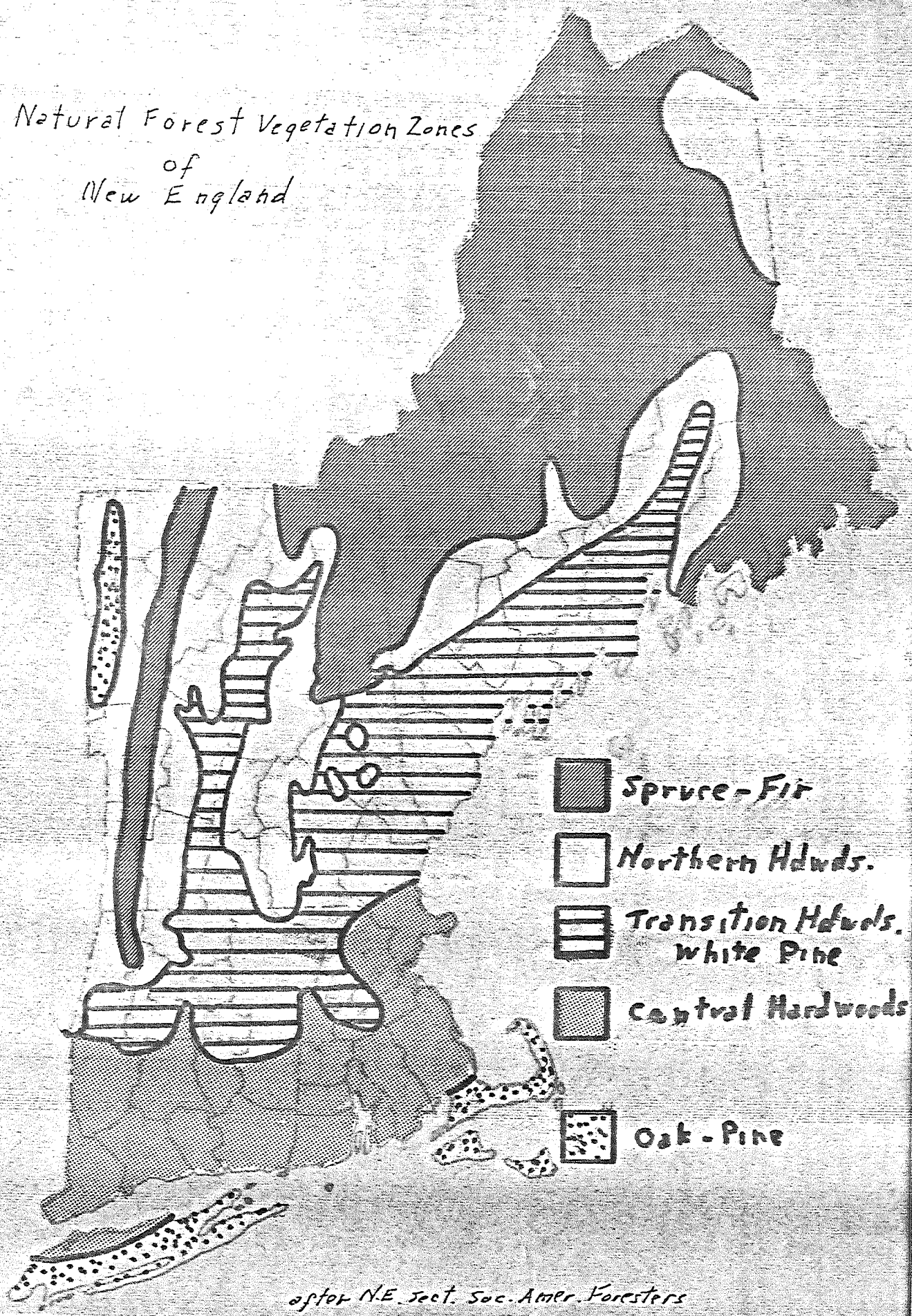
Major Suites of Tree Species and Site Productivity Ratings Found  
on Landform Units of Central Massachusetts.

# HARVARD FOREST



W. H. H. Newlands

Natural Forest Vegetation Zones  
of  
New England



after N.E. Sect. Soc. Amer. Foresters