



-Balance in the Forest- **A Forestry Primer**

Adapted from the on-line Teachers Guide

<http://mff.dsisd.net>

MICHIGAN STATE
UNIVERSITY
EXTENSION

FORESTRY IS A BALANCING ACT

"Balance" refers to forest management decisions that consider a large number of **biological**, **economic**, and **sociological** factors. Some of these factors, or elements of a factor, may not be as well understood as desired. However, the demand by the public for increasing amounts of wood, recreation, wildlife, clean water, and other outputs *requires* that we manage for these things as best as possible. With management, our forests will produce more outputs possible than without management. Management is also the answer to many environmental challenges (read the background essay by Dr. Patrick Moore).

Forests are *NOT* managed for the sake of the forest. They are managed for *people*. Forest don't *need* management. Forests were here long before people and they did just fine. People *need* forests. That's why forests are managed. And that's where the economic and sociological factors come into play with forestry. Sometimes factors contradict each other and controversy arises. Other times, the results of proposed practices or policy are not fully understood by science and objections are raised. Many times in the public arena, perception counts more than science.

In the table below, *some* of the forest management factors are listed. Some factors might fit in more than one category.

BIOLOGICAL FACTORS	ECONOMIC FACTORS	SOCIOLOGICAL FACTORS
Forest Type	Timber Product Mix	Proximity to High Use Area
Tree Species Mix	Access to Stand	Harvest System
Tree Species Characteristics	Size of Timber Sale	Visual Appearance
Timber Age, Size, Quality	Soil Conditions	Attitudes About Harvest
Stand Density	Local Topography	Attitudes About Forests
Soil Type & Condition	Distance to Mills	Ownership of Stand
Habitat Attributes	Type of Mills	Landowner Awareness Level
Rare Species or Features	Season of Year	Management Objectives
Proximity to Water	Mill Prices	Competing Use Interests
Landscape Characteristics	Stumpage Prices	Available Assistance
Forest Pest Situation	Type of Harvest Equipment	Local Human Demographics
	Type of Harvest System	Laws & Regulations
	Road System Quality	Logger Skill Level
	Trail Construction	Rural vs. Urban
	Water Crossings	Landowner Associations & Co-ops
	Forestry in Local Economy	
	Average Income Levels	
	Unemployment Rate	

A PRIMER ON FORESTRY

What is Forestry?

Trees and forests are the primary foci of forestry. Science, research, and experience have taught forestry a lot about trees. For the most part, we know how they grow, how to enhance tree health and growth, and we know much about their habitat requirements and life cycles.

Forestry also knows a great deal about forests, which encompass many more components than just trees. Nevertheless, forestry probably knows less about forests and forest ecology, than characteristics of individual tree species.

A managed forest is an attempt to produce a set of outputs, whatever those might be for a particular ownership at a particular time. See the **Multiple Use** section for a discussion on this. The actual set of practices prescribed for a stand of trees is called silviculture. "Silvi" refers to trees and "culture" refers to management. Note how the terms "forestry" and "silviculture" are related.

FORESTRY: *The profession embracing the science, art, and practice of creating, managing, using, and conserving forests and associated resources for human benefit and in a sustainable manner to meet desired goals, needs, and values -- note: the broad field of forestry consists of those biological, quantitative, managerial, and social sciences that are applied to forest management and conservation; it includes specialized fields such as agroforestry, non-industrial forestry, and wilderness and recreation forestry.*
-Society of American Foresters, 1998

SILVICULTURE: *The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands, to meet the diverse needs and values of landowners and society on a sustainable basis.*
-Society of American Foresters, 1998

There are seven (at least) objectives when implementing silvicultural practices.

1. Manipulate stand composition of species (usually trees).
2. Manipulate stand density (number of trees depending on their size).
3. Manipulate tree growth rates (usually means an increase).
4. Protect site quality (soils, habitat, water, etc.).
5. Provide a sustained yield of timber.
6. Protect stand from damaging agents (insects, diseases, etc.).
7. Utilize harvested trees in an efficient manner.

What are Some Examples of Forestry?

Several groups of silvicultural practices can be identified. Arguably, the most familiar practices involve **timber harvest**. Under management, timber harvest is part of a silvicultural system designed to both harvest *and* regenerate forests in a sustainable manner. Timber harvest *without* silvicultural considerations can damage both the forest stand and the site itself. However, the difference between the two may not be readily apparent. The most commonly used management systems used in Michigan are

clearcut, shelterwood, and selection systems. These are described and discussed on the **management systems** section.

The harvest or cutting of trees sometimes may not involve a regeneration component but would still be considered good forestry. **Thinning** is often done to improve the quality of trees in a stand or promote greater stand health. A good example would be in a red pine plantation where stand densities have reached levels that impede the growth of trees. A thinning would be prescribed that reduces stand density, allowing the remaining trees to maintain healthy growth rates. The impact on regeneration would be negligible. Thinning may also be employed to reduce fuel loads in order to reduce fire hazard; or it might be used to harvest short-lived species in stand where long-lived species are preferred (e.g. sugar maple and northern white cedar).

Release cutting is designed to remove larger, older overhead trees to provide more light to smaller, younger trees in the **understory**. White pine and northern red oak are species that can benefit from overhead release. **Salvage** cutting involves response to natural catastrophes created by windstorms, wildfire, or insect and disease outbreaks. It attempts to utilize as much of the wood resource as possible and promote the regeneration of the next forest. **Pruning** of pine or other species removes lower branches that would otherwise create log defects in future growth. Lower branches typically do not contribute much to a tree's photosynthetic capacity and sometimes are actually a drain on a tree's resources.

UNDERSTORY: Forest vegetation is usually arranged in "layers", from the ground to the top of the **forest canopy**. The biggest trees are called **dominants** or **codominants**. The next layers are shorter trees either pushing their way into the canopy or **suppressed** (sickly) by the shade. Sapling trees and shrubs form the **"understory"**. Below the understory are the small plants, herbs, grasses, ferns, etc.

Planting trees is another very familiar aspect of forestry and forest management that entails a great deal more than simply putting seedlings in the ground. In most situations, a planting area has aspects quite hostile to young trees. Grasses and shrubs present significant competition for light, water, and nutrients. Properly preparing a site and following through with appropriate post-planting practices are essential to a successful planting operation. Many times it takes a planting failure for people to appreciate the role of site preparation and tree tending. More information about tree planting and tree plantations can be found in the **Tree Planting** chapter.

Genetic improvement is an aspect of forestry that is not often considered. Some tree species possess a wide range of genetic variability, such as quaking aspen (genus *Populus*). Other species, such as red pine, display relatively little genetic variation across its range. Tree species can be bred, using traditional techniques, to produce strains that display desired characteristics. These trees are grown in "seed orchards" where their seed is regularly collected and distributed. Trees may be "improved" to enhance their form (timber quality), foliage appearance (Christmas and ornamental trees), growth rate (fiber production), resistance to disease (Dutch elm or white pine

blister rust), and other features. **Tree nurseries**, whether for genetic improvement or stock production require specialized knowledge and practices.

Forest and tree health concerns sometimes prompt the cutting of trees or other practices. Reducing the beech component in beech-heavy stands will minimize the impact of the newly discovered beech bark disease in Michigan. Harvesting balsam fir stands before they become overmature can depress and minimize epidemics of spruce budworm. Creating a patchwork of size classes and ages in a jack pine glacial outwash plain will lessen the chances of a catastrophic wildfire. A similar patchwork in an aspen-dominated area will maximize habitat for wildlife species such as ruffed grouse (partridge) and white-tailed deer. Harvesting may be curtailed or eliminated along watercourses and in other circumstances made special due to a rare ecological feature, landform, archeology, visual sensitivity, and for other reasons.

For a more complete review of Michigan Forestry, go to the ***Forest Management Guidelines For Michigan***, published by the Michigan Society of American Foresters.

Careers In Forestry

A forester usually carries at least a bachelor's degree from an accredited university. Foresters might also have Masters or Doctoral degrees. Forestry curricula are heavy to the sciences, math, and technology. Writing and communication are increasingly being emphasized.

Forestry has many aspects and specialties, not unlike the medical profession. Timber management and fire suppression might first come to mind for many people. But that is only part of forestry. Some of the other aspects include entomology (insects), pathology (diseases), geographic information systems, forest inventory, social aspects of forestry, agroforestry, urban forestry (arboriculture), education, landscape & watershed management, wildlife & habitat, forest management planning, tree nursery science, soils, forest genetics, forest research, economics, recreation, policy creation / advisement, tax law, and many others. The Society of American Foresters recognizes over 700 job categories among its members.

There are also many employers. The most commonly thought of employers are likely to be the Michigan DNR and the U.S. Forest Service. However, there are many public, private, and non-profit agencies that employ foresters, from a major forest products company to the IRS. Michigan has about 600-700 foresters, but that is a very rough estimate.

There are two Michigan universities with undergraduate degree programs in forestry.

Michigan State University (East Lansing)
Michigan Technological University (Houghton)

Other Midwest accredited forestry schools are:

University of Wisconsin-Stevens Point

University of Wisconsin-Madison

University of Minnesota (St. Paul)

Purdue University (West Lafayette, Indiana)

University of Illinois (Champaign-Urbana)

Southern Illinois University (Carbondale)

Iowa State University (Ames)

Ohio State University (Columbus)

A good website about careers in forestry is available from the Society of American Foresters (SAF) [www.safnet.org]. For Michigan, various forestry careers are profiles in the "Day in the Life of A Forester" part of the Michigan SAF website [<http://michigansaf.org/ForestInfo/Days/1-MainPage.htm>].

MULTIPLE USE

Forests have many uses or produce many benefits to human beings. These uses and benefits are outputs. Outputs include timber, wildlife habitat, recreation opportunities, food and medicine sources, places for endangered and threatened plants and animals, clean water, healthy soils, visual quality, a source of spirituality, oxygen, temperature and humidity modification, carbon storage, and other environmental influences. Your students could probably think of many variations on these themes.

People use more forest outputs every year. There are more people each year. Without management, our forests will not be able to sustain these increasing demands. Nature, by itself, will not supply our needs in the amounts we need and when we need them. This is where the concept of balance lies, and the need for forest management. A healthy and productive forest, in an ecologically sound condition, must be sustained. This is essential to forestry . . . and to our society.

Every forest produces a wide range of benefits or multiple uses. However, the emphasis may change with forest type, location within the state, and ownership. Forest industry emphasizes timber production, but considers all outputs. A wilderness area on a national forest emphasizes recreation, spirituality, and visual quality. How forests are managed across a large landscape will determine the overall quantity and quality of multiple uses in the big picture. Embracing this landscape concept and merging that with society's needs is a difficult task and has only become accessible

So Many Choices! Try dividing a class into small groups of 3-4 students. Assign each group a letter or number (used later). Give each group a forest management objective (wood production, trout stream, campground, snowmobiling, plantation, rare species area, jobs in a rural town, deer habitat, etc.). Have each group develop rationale to maximize their objective and present their conclusions to the class. After the student presentations, place the group letters or numbers on display board or overhead. Examine and discuss the compatibility of adjacent uses. You can make the display board more interesting having a background of cities, roads, rivers, lakes, etc. and adding these map features to the discussion of compatibility and multiple use.

In the Upper Peninsula, there is a three session forest stewardship program available that is aimed at the middle school level. This program can be provided, on a limited basis, just about anywhere in the U.P. For more information, contact the MSU Extension offices in Dickinson, Houghton, or Schoolcraft counties.

with the assistance of recent technologies.

Examples of how outputs have been balanced in Michigan can be found on the **Case Studies** section below, which are expansions on the case studies from the CD balance section (themes from four regions of Michigan).

Controversies in Multiple Uses

Obviously, there exists a lot of room for debate on what forests should be used for. Arguments are common on the macro scale and at the stand level. Some people suggest that nature "knows" best and should not be manipulated, except to restore it a set of conditions at some arbitrary point in the past. Others may believe every acre should be intensively managed to maximize timber production. The heart of such a debate comes from opposite ends of a philosophical difference of utilitarian use versus wilderness use. Most people would understand the need for a balance somewhere in between, finding the wilderness perspective attractive and romantic but understanding that we all use forests for many purposes, some we don't even really think about.

Historically, forest management was driven by timber production and protection of forests from wildfire, insects, and diseases. Over the last couple decades, timber production has remained an integral part of management but forestry has embraced a much broader set of drivers. Public land management, especially at the federal level, has been the subject of many pieces of environmental legislation and subsequent regulation.

To Illustrate the Polarity and the Need

A red pine plantation usually emphasizes timber production in the form of pulpwood and eventually (perhaps) in the form of utility poles and sawtimber. In younger plantations, the lack of understory and associated wildlife, due to shady conditions, has been termed a "biological desert". Older red pine plantations can be managed to take on the appearance of natural stands. Nevertheless, the characteristics of a dense red pine stand provide habitat attributes that may not occur elsewhere in the landscape. A red crossbill will do well. Animals may use the dense canopy as a temporary shelter from severe weather. There may not be a wealth of habitat attributes but the few that do exist may be unique to such red pine stands. The major benefit of such plantations is the much greater production of wood, in a much shorter period of time. Plantations interspersed with a variety of other forest types will add to landscape diversity, up to a certain point.

Wilderness: "Wilderness areas" have specific definitions, mostly as federally designated areas on federal land, as defined in the Wilderness Act of 1964.

"A wilderness, in contrast with those areas where man and his works dominate the landscape is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain".

The controversy is not about whether or not wilderness should exist, but more about **how much** and **where** land should be designated. Oddly enough, some wilderness areas have no more wilderness quality (at this time) than well-managed forest. Sometimes the appreciation is more in the "label" than the actual conditions.

Large wilderness areas (see inset) protect and develop characteristics that may be missing from managed and developed areas. Large trees, a higher presence of disease, and a sense of solitude are some of the attributes of a wilderness area. They may offer insight into certain ecological processes. On the other hand, early successional forest types and associated wildlife will decline. Insect and disease outbreaks may spread beyond the wilderness borders. Most forms of popular recreation are prohibited. A landscape dominated by wilderness will usually have a negative impact on local economic activities. However, anyone who has spent time in a wilderness area that actually has the characteristics prescribed by the U.S. Congress, can't help but appreciate their value. Of course, a "*sense of wildness*", as described by Henry Thoreau and others, is not restricted to wilderness areas.

MICHIGAN CASE STUDIES

In the CD Balance Section, four real life case studies were used to help explain the balance of biological, economic, and social issues in forest management. Each case study was from a different region of Michigan to help illustrate how the relative importance of issues is variable and affects forest management, but still maintain a good balance.

1. **Western Upper Peninsula** - The Western U.P. Forest Improvement District
 2. **Eastern Upper Peninsula** - Recreation & Wetland Habitats
 3. **Northern Lower Peninsula** - Christmas Trees, Maple Syrup, & Forest Parcelization
 4. **Southern Lower Peninsula** - Agriculture, Urban Areas, and Forests
-

Western Upper Peninsula - *The Western U.P. Forest Improvement District*

The Western Upper Peninsula Forest Improvement District (WUPFID) was formed in 1985 to provide forest management services to private, non-industrial forest owners. Now dissolved, it was a "cooperative", which means members paid annual fees to receive benefits derived from community participation. The kinds of benefits received from this cooperative were:

Expert forest management advice,
Forest management planning,
Skilled timber sale administration,
Better [stumpage](#) values from larger volumes
Access to multiple markets.

Selling and managing smaller parcels of forest, say 40 acres, can be challenging. Harvesting timber from such parcels is more expensive. For example, the costs of moving logging equipment are the same for a large sale or a small sale. The cost per

unit volume of timber rises when there are fewer units, which translates to lower stumpage to forest owners. With WUPFID (or other forest cooperative), coordinating and scheduling sales among adjacent owners, or nearby neighbors, can reduce overhead costs and result in more money to the forest owner.

WUPFID employed two full-time foresters to manage member lands. The foresters worked with the forest owners to make sure their interests are protected and the forest was managed with scientifically-based practices. A long-term relationship existed among the foresters and WUPFID members.

Managing large blocks of forest provided more opportunity to make decisions on a landscape or ecosystem basis. Better decisions on a larger geographical scale can be made when managers and owners are familiar with the current conditions, land capabilities of a region, and scheduled activities with the region. For instance, managing a **riparian zone** differently may contribute to desired changes further down a **watershed**. Or, maintaining a balance of age classes across a region will enhance ruffed grouse populations.

RIPARIAN ZONE: This is a band of undefined width that lies adjacent to stream courses and lake shores. Topography, soils, and vegetation affect the width of such zones.

WATERSHED: The area drained by a particular stream, river, or lake. Small streams have smaller watersheds. Large river systems have large watersheds, with many component watersheds of its tributaries. The Great Lakes watershed covers a large portion of North America.

The western U.P. is the most heavily forested region of Michigan with 87 percent of the land area under forest. There are only about 73,000 people living on the 5.5 million acres. That's about 8-9 people per square mile, compared to about 170 for all of Michigan. Funding school, roads, and local services is challenging. Forest management and timber harvesting accounts for as much as 70 percent of local economies. So, the western U.P. is one of the "woodbaskets" of the USA and the economy and local lifestyles are built around the forest.

Although the forests are quite resilient, as history teaches us (see *Michigan Forest History chapter*), shallow soils, granitic bedrock (acidic), and sensitive water systems make good forest management all the more important. Forests reduce the erosive impacts of rain and melting snow. The Lake Superior shoreline lies in a heavy snow belt. Spring melts cause huge volumes of water to move over and through the watersheds. Forest cover is critical in keeping soils in place and maintaining high water quality. Also, because of the heavily forested area, landscape opportunities for ecological processes and wildlife species influenced by large forest tracts are possible.

Eastern Upper Peninsula - Recreation & Wetland Habitats

As glaciers melted, many low and flat areas were left in the eastern U.P. One particularly large expanse of wetland lies mostly in Schoolcraft County. Within this wetland region, the 96,000 Seney Wildlife Refuge was created. Although many ditches

were built to drain the area for agriculture, most failed. In 1976, a large wildfire burned through the area. Today, the wetland and refuge areas provide varied wildlife habitat and hydrological benefits.

Much of the area soils consist of sands laid down by melting glacier water. They are poor soils that support vegetation adapted to dry periods. In terms of forests, this means jack pine. Jack pine forests are adapted to wildfire, reproducing well after the big burns. Other soils, especially those on ridges and highland areas, have developed shallow layers of richer soil that support hardwood forests and other vegetation types. This condition creates a special concern in light of the high recreation use of the region.

Concentrations of public land and consistently high snow depths make the eastern U.P. a mecca for snowmobilers. Hundreds of miles of trails criss-cross the region. Access hubs become highly congested to the point where air quality can be an issue. The waves of snowmobilers support the rural economy in many ways, from motels to fuel purchases. During the summer, these trails are often used by ATVs, other off-road vehicles, and other forest user groups. Because of the good Interstate road system, access from southern Michigan and Ohio is much easier. People purchase summer homes and camps, similar to what is happening in the northern Lower Peninsula.

The high human presence within fire-adapted vegetation types creates a potentially disastrous scenario. Human negligence in a fire-prone forest type during a particularly dry spring or fall could result in a huge wildfire. The loss of property and human life is a real possibility as more and more people utilize these landscapes.

Public agencies work to manage the forest to minimize the chances of wildfire becoming large. During hazardous conditions, fire control teams are on constant alert with many caches of fire suppression equipment and stand-by personnel. Jack pine areas are harvested and regenerated in a pattern throughout the landscape to break up the continuous forest canopy and reduce fuel loads, which reduces the chance of catastrophic spread of wildfire. Many private tracts are unmanaged causing fuel loads to build as these forest types age and begin to break-up. Timber harvest activities sometime draw public criticism, however. Clearcutting is required to regenerate jack pine and some new residents and visitors object to the practices.

Social attitudes, an economic mainstay, and forest ecology combine to create a forest management challenge.

Northern Lower Peninsula - Christmas Trees, Maple Syrup, and Forest Parcelization

Abandoned farmsteads, reverted forests, and proximity to large urban areas create both benefits and problems for a rural forested area. With the good road systems, urban markets for Christmas trees, maple syrup, and similar products have stimulated these industries. Michigan is a major producer of Christmas trees and maple syrup. Tourism

booms and businesses supported by tourist dollars grow. Many tourists like the region so much that they purchase forest property. Large time-share developments, recreation complexes, and golf courses have become common in recent years in many parts of the northern Lower Peninsula.

Forest parcelization is the subdivision of forested land into ever smaller pieces. The ability of urban populations to travel and the high amount of disposable income has resulted in Michigan having the highest number of second homes per capita in the nation. Many of these second homes are located in the northern Lower Peninsula, often on a piece of forest land.

The price of land seems low when compared to similar properties near urban areas. However, the prices paid are often beyond the means of most rural residents. Those rural residents who have land to sell, often do quite well. Children of those residents and local non-landowners often cannot afford to purchase land. This socio-economic phenomenon of displacement of rural populations has been repeated across the USA.

Large numbers of small forested properties make forest management difficult. Management activities usually need larger tracts of land to become effective. With so many owners in the landscape, consensus is difficult. The challenge of forestry is compounded by a growing urban sentiment against forest management, priorities higher than forest management, and a shortening average ownership tenure of any particular forested tract. The net result is a large portion of the forest resource removed from forest production. These are good examples of social issues interacting with economic issues.

The increased number of homes, driveways, and other developments also contributes to forest fragmentation, or the physical disruption of contiguous forest. Forest fragmentation has impacts on wildlife habitat characteristics. Numbers of people feeding deer, high deer populations, and the bovine tuberculosis issue may all be related to forest fragmentation and parcelization. These kinds of issues are a complex of social, economic, and ecological factors. Abandoning forest management, or failure to adapt forest management, can contribute to a host of forest health problems that can impact regional economies and social structures.

Southern Lower Peninsula - Agriculture, Urban Areas, and Forests

Southern Michigan lost most of its forests and wetlands decades ago. Nevertheless, there are still many woodlands and forested corridors to explore and contribute to environmental quality. Anywhere in Michigan, you're never more than a half hour from a forest or woodland. Even in the heart of our largest urban areas, there are parks and forest reserves.

Trees are good choices for temperature modification, noise reduction, and filtering air contaminants. These characteristics become more important in urban areas. Trees also provide habitat for wildlife, even in big cities. In fact, trees may be especially valuable in residential areas for wildlife. Of course, the appearance of trees enhances just about any property in our cities and towns.

Caring for individual city trees and "urban forests" takes special knowledge. "Urban foresters" are called arborists and specialize in understanding the relationship among trees, urban environments, and human beings. A large city, such as Detroit or Grand Rapids, might employ or contract with many arborists to take care of trees. Smaller towns might only have a single arborist, or may share one with another community. Some universities have degree programs specifically for urban forestry.

Beyond the city limits, southern Michigan has some of the most valuable stands of timber in Michigan. The richer soils and milder climates support central hardwood species that rarely occur farther north. Growth rates and timber quality are also higher. The timber value of a small woodlot with high quality trees may make management cost-effective. Beyond timber value, these southern forests often protect rivers and streams, connect reserves with forested "corridors", and provide habitat for many species of forest wildlife. These forests and woodlots provide valuable refuges in a landscape dominated by non-forest land use.

In highly developed landscapes, the role of forests will shift. Woodlots and even individual trees take on increased values . . . and not just monetary value. The majority of Michigan's people live in cities, and most in southern Michigan. Perspectives and attitudes towards forests and trees that have evolved in urban environments are often much different than those from evolved in rural areas. Subsequent social valuation of forests, expressed in forest ownership and creation of public policy, sometimes result in conflicts. These sociological trends can impact forest use and forest management in important ways.



*Documents prepared by Michigan State University Extension.
Michigan State University is an affirmative action equal opportunity employer. The U.S. Department of Agriculture prohibits discrimination on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital status or family status.
(Not all prohibited bases apply to all programs.)*