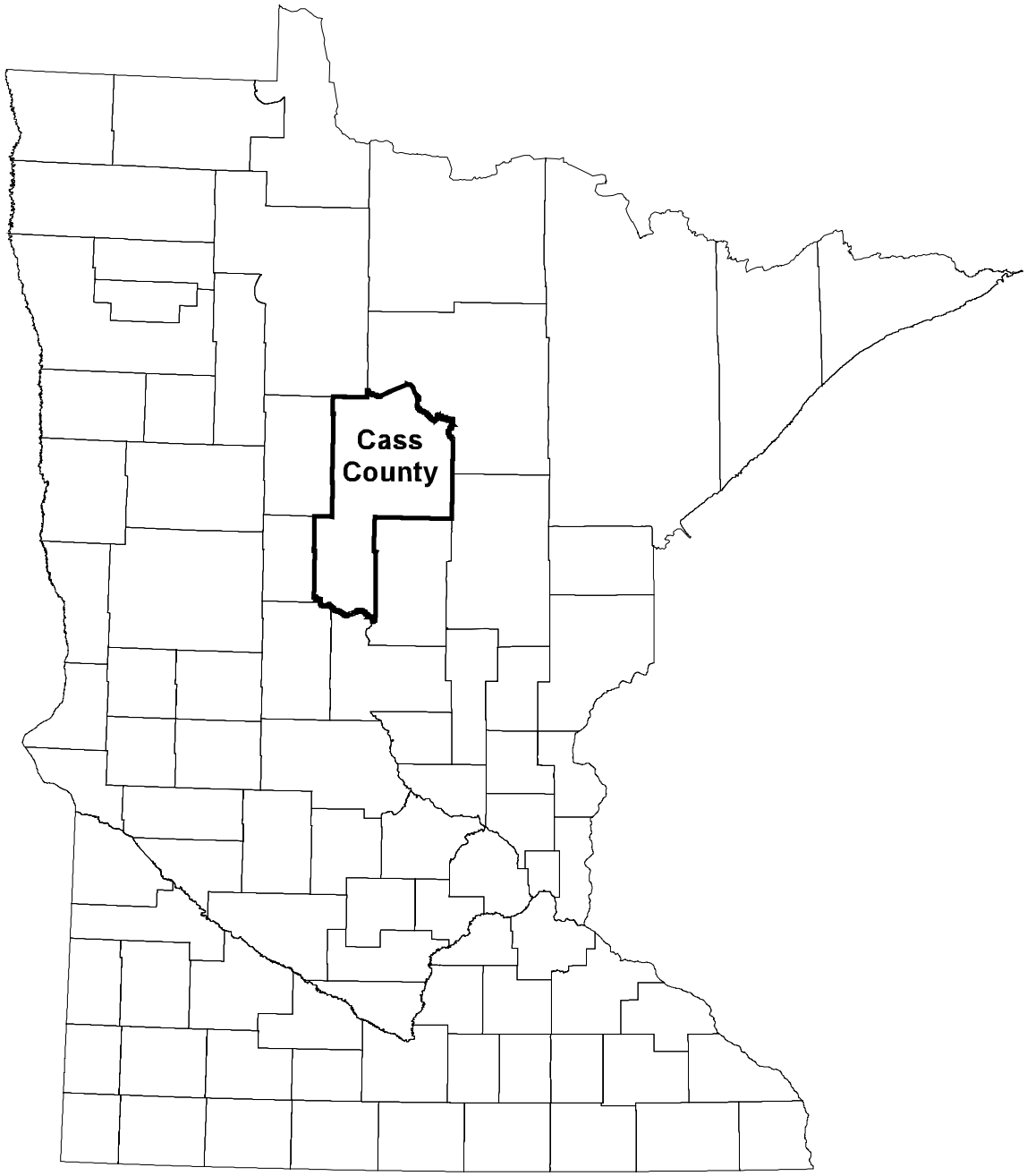


Cass County

N

Scale: 1 inch = 60 miles

Map prepared by: Pro-West & Assoc.

1.0 Mission

1.1 Mission

The mission of the Cass County Land Department is *to professionally manage the County's forest land base within the confines of Minnesota Statutes 282 and to improve the quality and value of the County's forest land resources.*

1.2 Management Approach

Cass County adopts the approach that its responsibility is to *manage the resource*. It recognizes that its challenge is to "assure the continuity of the forests and human institutions that appreciate and depend upon them."[1] It recognizes the inherent tension in seeking to balance social desires, economic needs, and ecological imperatives. Yet, the County will hold its focus on long-term, not short-term, goals and objectives.

The County understands that the landscape it inherited resulted from a century of activity little of which, at least not until the past thirty years, was intentionally directed at sustaining the resource. Within the limits of this context, the County intends to create a future forest that is "natural" in character and context.

Finally, the County recognizes the complexity of the forested landscape and the limits of human knowledge about it. Even as the County presents this strategic plan with its 100-year outlook, there is awareness "of the very tentative state of our current knowledge and the iterative nature of learning. We begin, finally, to appreciate that each management prescription is a working hypothesis whose outcome is not entirely predictable."[2] This is a plan which will be implemented stand by stand, one year at a time, with the lessons learned used to revise and improve subsequent versions of the plan.

1.3 Certification

In 2001 Cass County's forests were certified under the SmartWood© program of the Forest Stewardship Council (FSC). The County sought this certification to assure the public and consumers of products from the forest that the lands are being managed in environmentally, economically, and socially sound manner. Certification may also offer an economic advantage in the form of a financial premium for wood products. The County intends to manage its forests in a manner that will allow it to retain this certification.

[1] Behan, R.W. "Scarcity, Simplicity, Separatism, Science – and Systems", in *Creating a Forestry for the 21st Century*, edited by Kathryn A. Kohm and Jerry F. Franklin, Island Press, 1997.

[2] Introduction, *Creating a Forestry for the 21st Century*, edited by Kathryn A. Kohm and Jerry F. Franklin, Island Press, 1997.

2.0 Plan Context

2.1 Economic Context

Cass County's economy centers on tourism, forestry, and agriculture. A variation of tourism is the burgeoning development of second home property, especially around the county's many lakes. Common to all these economic activities is their dependency on natural resources.

Tourism probably is responsible for 40% of the county's total employment. Analyses done for the current comprehensive planning effort indicate that roughly 29% of State sales/use taxes generated in the county are from tourism related businesses.

Forestry supports the only major industrial activity in the county but the major wood products industrial plants are located in cities outside of Cass County (Bemidji, Brainerd, Sartell, Deerwood, Grand Rapids). Forestry services such as logging create jobs within the county.

Agricultural remains an important component of the county's economy, but its future viability is suspect as small farms lose out to large-scale corporate farming.

Long seen as a desirable location for cabins and second homes Cass County save saw even more such development over the past decade. Roughly 50% of the net property taxes paid in the county come from recreational properties. Only Crow Wing County generates more such taxes within the immediate region. Cass County's growth from 1980 into the late-1990s was nearly a a five-fold increase.

The impact of seasonal properties is seen in the fact that 34% of private parcels in Cass County are "seasonal recreation" as compared to 30% for homesteaded parcels. Approximately 40% of seasonal recreation parcels are unimproved, suggesting that a significant number of these could see cabin/second home construction within the next 20 years as more baby boomer generation people retire.

In the near absence of any substantial manufacturing, the retail sales sector dominates the local economy in terms of number of businesses, sales, and employment.

Cass County is one of a handful of non-metropolitan counties with strong growth rates in terms of population. Between 1980 and 1990 the county grew from 21,050 to 21,791. Then in the 1990s the county grew to 27,150. The Minnesota State Demographic Center projects that the county will be the sixth fastest growing county in the state increasing to 33,360 by 2010. This follows multi-state and Minnesota trends where population growth in non-metropolitan areas has centered on counties with high natural amenities such as lakes. The county's recent growth has occurred across all major age groups – children, middle adults, and older adults – although its future growth may lean heavier to older adults.

The on-going comprehensive planning process has noted that the increases in resident population and second homes has caused lakeshore property values to

continue their recent increases. In many situations resorts have been purchased and converted into lakeshore parcels. All these trends are expected to continue.

The bottom-line assessment is that natural resources are the foundation for Cass County's current and future economic activity. Appropriate management of the public resources will be vital to sustaining this activity.

2.2 Social Context

The lakes, streams and forests of Cass County create the physical landscape which helps define the essence of living in the region. Before European settlement, the Ojibwe, led lives interwoven with the natural world. The Leech Lake Band continues both traditional views of the world and uses of the natural resources.

Although the initial phase of settlement resulted in considerable clearing of forests and conversion of lands into agriculture, the intrinsic beauty of the area was highly prized by settlers and subsequent residents. This remains in evidence as residents and visitors work and recreate in the woods and on the lakes and streams.

Thus, the forested landscape is essential to defining the qualify of life in Cass County. The forests are a place to recreate, along with lakes they provide the signature picture of the area, they are key to the area's economy, and they offer a buffer or refuge from the intensity of modern living.

Nonetheless, different people possess different views on how they interact with the forested landscape. Some prefer to hunt while others come to observe wildlife. Some walk or ski quietly through the forest while others use motorized vehicles to travel woodland trails. Some feel that no harvesting of trees should be allowed while others believe that harvesting is both economically and ecologically necessary. The potential for conflict between these views will increase as more people live in the county, as private land parcels become more fragmented and increasingly posted, and as a consequence the demands placed on public lands increase.

Satisfying these and many other varying perspectives of the forested lands is probably the most difficult task for any land manager. And there are several key players involved. The County is joined by the US Forest Service and State of Minnesota as the major public land managers; together they are responsible for over half of the county. The Leech Lake Band of Ojibwe has sizeable holdings as do several private industrial owners. Coordinating management is critical toward achieving a desired landscape while addressing societal demands.

2.3 Ecological Context

The following discussion uses the National Hierarchical Framework of Ecological Units adopted by the US Forest Service[3] and the Minnesota DNR. This Ecological Classification System (ECS) provides a series of increasingly smaller and more detailed levels of description of the landscape.

Map 1: state ecological divisions/provinces

[3] McNab, W. H. and P.E. Avers, 1994, Ecological Subregions of the United States: Section Descriptions, US Forest Service publication WO-WSA-5, Washington, D.C.

Map 1: state ecological provinces

Ecological Provinces State of Minnesota [163kb]

Provinces

As shown in Map 1, Minnesota is divided into three major ecological **provinces** each representing distinctive ecological features and processes.[4]

- Laurentian Mixed Forest Province: Minnesota's true forested lands, at the time of settlement this region consisted of extensive conifer, conifer-hardwood mix, or hardwood forest. The topography is variable with landforms ranging from lake plains and outwash plains to ground and end moraines. Extensive peatlands occupy much of this area. Cass County is in this province.

- Eastern Deciduous Forest Province: This is the transition zone between the prairie to the south and west and the true forest to the north and east. It is a species-rich area with many species at the edges of their ranges. Variability in soils, moisture, and landform creates opportunities for a wide variety of forest types including maple-basswood hardwoods and fire-dependent pine/oak.

- Prairie Grassland Province: Slicing across western Minnesota is the tall grass prairie, little of which remains in its original condition today. Mainly various forms of prairie, some portions of this province which experienced lower levels of fire saw the formation of a dry oak savanna.

Sections

The ecological classification system divides provinces into **sections**. These are defined mostly by the origin of glacial deposits, regional elevation, floristic regions, and regional climate. Minnesota has ten sections (Map 2); Cass County lies in the Northern Minnesota Drift and Lake Plains Section: "The central theme for this section is that of extremely variable deposits of deep glacial drift, with numerous lakes and wetlands, and forest types that broadly include deciduous forests, coniferous forests, mixtures of these two types, and large areas of conifer swamp forests. The surface water patterns and forest types are correlated with glacial landforms including: outwash plains, lake plains, till plains, narrow outwash channels, moraine ridges, and drumlin fields."[5]

Subsections

As shown in Map 3 the 10 sections are divided into 26 **subsections** of which three cover Cass County.

- Pine Moraines and Outwash Plains: This subsection is a blend of end moraines, outwash plains, till plains, and drumlin fields. On the end moraines and till plains white and red pine forests tended to dominate. Well drained locations on outwash plains supported jack pine woodlands and forest. Lakes are common on the end moraines and less frequently on the outwash plains. Most of Cass County's land holdings are in this subsection.

[4] The descriptions for these provinces comes from the MDNR's web site [www.dnr.mn.us/ebm/ecs]; 1999.

[5] " Ecological Land Classification Handbook for the Northern Minnesota Drift & Lake Plains and the Chippewa National Forest", draft, John C. Almendinger and Dan S. Hanson, MDNR, June 1998.

Map 2: state ecological sections

Ecological Sections State of Minnesota [123kb]

Map 3: subsections

Ecological Subsections in Cass County [268kb]

Map 4: LTAs

Ecological LTA's in Cass County [232kb]

- Chippewa Plains: This subsection is characterized by level to gently rolling lake plains and till plains. Sandier sites were dominated by conifers. More productive sites supported a mix of hardwoods including aspen-birch, sugar maple, basswood, and red/bur oak.

- St. Louis Moraines: This subsection is characterized by rolling to steep slopes with end moraines being dominate landform. Northern hardwoods were common with white pine, sugar maple, basswood, and balsm fir the most common species.

LandType Associations

The final ecological class to be mapped in this narrative is the **Land Type Association (LTA**) (Map 4). This geographic level is proving to be well suited to forest management planning. The Minnesota DNR is using LTA-level analysis as the basis for its emerging forest management efforts. LTAs are generally defined by glacial landforms, bedrock types, topographic roughness, lake and stream distributions and types, wetland patterns, and soil parent material.

Chippewa Plains Subsection[6]

Na03. Guthrie Till Plain: A nearly level to gently rolling till plain with loamy till soils with a moderate amount of stones and calcium. Many small, mostly intermittent streams are present.
Na07. Bemidji Sand Plain: A nearly level to gently rolling outwash plain whose soil parent material is sand.
Na08. Bena Dunes and Peatlands: A nearly level outwash plain extensively reshaped by wind action. Soil parent material is predominantly fine sand. Extensive swamps and bogs occur, especially in the southern portions.
Na09. Rosey Lake Plain: A nearly level glacial lake basin (Aitkin) whose soil parent material is predominantly fine-textured lake sediments.
Na10. Deer River Peatlands: A level glacial lake basin on which extensive peatlands now cover the fine-textured soil parent materials.

St. Louis Moraines Subsection

Nb02. Aitkin Moraine: A rolling to steep landscape with soils being generally clayey and sandy till with some silty lake sediments in areas.
Nb03. Sugar Hills Moraine: A rolling to hummocky stagnation moraine whose soil parent material is loamy till; coarse sandy material is common in the western portions. Rocks and stones are common. Some places have windblown silt.
Nb12. Hill City Till Plain: A nearly level to gently rolling till plain whose soil parent materials consist of loamy till with a low amount of stones. A thin, wind deposited silty mantle covers much of it. Several large and many small to medium sized swamps and bogs are present.

[6] LTA descriptions prepared by Dan Hanson, ECS Specialist, Mn DNR Division of Forestry for Minnesota County Biological Survey.

Pine Moraines & Outwash Plains Subsection

Nc01. Pequot Lakes Outwash Plain: A hummocky pitted outwash plain with islands of till. Lakes occupy a quarter of the area.
Nc02. St. Croix Moraine: A hummocky stagnation moraine. Lakes occupy 12% of the area.
Nc03. Pine River Drumlin Plain: A rolling till plain with some drumlin features.
Nc04. Pillager Outwash Plain: A nearly level outwash plain intermixed with peatlands. A transition area to the Wadena drumlins to the west.
Nc06. Mosquito Creek Drumlin Plain: A rolling drumlin field whose till layer is blanketed by sand. Peatlands are common.
Nc08. Swan Creek Outwash Plain: Landscape dominated by level outwash plains which have been reworked by wind; dune features are common. Peatlands are very common.
Nc10. Beaver Creek Drumlin Plain: Landscape dominated by level outwash plains. Long, narrow ridges (drumlins) of till material are very common. Peatlands are very common.
Nc11. Park Rapids Outwash Plain: Landscape dominated by level to rolling outwash plains. Channels formed by post-glacial meltwater are common; lakes can be found in the channels.
Nc12. Mildred Outwash Plain: Landscape dominated by hummocky outwash plains. Peatlands are common.
Nc13. Spring Brook Till Plain: Landscape dominated by rolling till plain with small areas of hummocky pitted outwash, eskers, and meltwater channels.
Nc14. Outing Moraine: Landscape dominated by rolling till plains and small areas of hummocky stagnation moraines dissected by outwash channels.
Nc16. Itasca Moraine: A rolling to hummocky complex stagnation moraine. Soil parent material is complex of sandy to loamy and clay loam till. Organic soil deposits are common, often as small, closed depressions. Lakes occupy a fifth of the area.
Nc30. Itasca Moraine, Steep: A stagnation moraine characterized by steep, rugged terrain. Small kettle lakes are abundant.

The next and most detailed level of description is what is called in this plan the Forest Ecological System (MnDNR uses native plant community, the USFS uses landtype phase, others use habitat type). Section 3.3 presents this narrative.

2.4 Forest Dynamics

Relative to the human lifespan, the forest landscape seems unchanging except at the local, easily viewed scale. Yet, along a longer range time scale, the landscape has been and remains in constant change.

As the glaciers melted and retreated 10-12,000 years ago, tundra vegetation dominated the slowly warming landscape.[7] This was followed by a spruce forest which, in turn, was quickly succeeded by a red pine or jack pine forest. Then, about 7000 years ago an oak savannah replaced the pine as a period of warmer, drier climatic conditions dominated the continent. Roughly 4000 years ago, cooler, wetter conditions re-established themselves and, as a result, oak declined, white pine increased, and the region's extensive bogs began forming.

That forest landscape remained in place through historic times. It was modified

[7] This summary is based on one found in Minnesota Biological Survey. 1998. Cass County biological survey 1992-1995. Biological Report No. 59. Minnesota Department of Natural Resources.

through deliberate and unintentional human-induced disturbances, most often fire. Later, logging, conversion to agriculture, drainage, deliberate conversion to different forest types, and, in some areas, reversion from agriculture to forest have all wrought significant changes to the forested landscape.

Thus, the forest that exists today is an ever-changing landscape governed by the physical properties of the underlying soils and terrain, the dominant climatic conditions, and the critical processes of forest dynamics. And, all these have or can be altered through human intervention (e.g., drainage, pollution, introduction of exotic species, land use conversion, land management).

In section 2.1 and later in 3.2 the potential of the land as expressed in native plant communities is defined. The following discussion focuses on understanding key forest dynamics as they become important to forest management.

Forest Succession

It is deemed important to the health and vitality of the forest, and all that is supported ecologically and economically by it, that the County's forested lands possess the full range of development or growth stages. Forests change or "succeed" from one stage of development to another over time; the agent of change can be natural, such as fire, or human, such as logging and deliberate fire. The basis for a concern to pattern the current forest after the historical forest is the "assumption that native species have evolved under these natural disturbance regimes and will be better able to cope with human-induced disturbances such as logging if these are designed to imitate the key characteristics of natural disturbances."[8]

The basic pattern of forest succession involves four major phases:[9]

Establishment: or stand initiation, is the phase "characterized by establishment of new individuals, release of surviving seedlings and saplings, and vegetative reproduction of injured plants from below ground structures. It is marked by relatively rapid changes in species dominance, environment, structure, and levels of competition and high mortality among small individuals."

Thinning: is "characterized by the closing together of tree canopies" which "results in steep declines in understory establishment and growth, increases in mortality of many understory plants, and the onset of mortality in the tree layer" due to competition for light and water.

Transition: is "marked by a variety of gradual changes in population, stand structure, and vegetation processes that can last from less than 100 to over 1,000 years depending on the forest type and disturbance history. The original cohort of trees slowly breaks up, tree establishment and release of suppressed understory trees increases, and a new cohort of trees gradually grows into the canopy gaps."

Mature/Shifting Mosaic: is "characterized by a shifting pattern of relatively small patchy disturbances (death of individual canopy trees or groups of trees forming gaps of various sizes and shapes) which provide resources for new

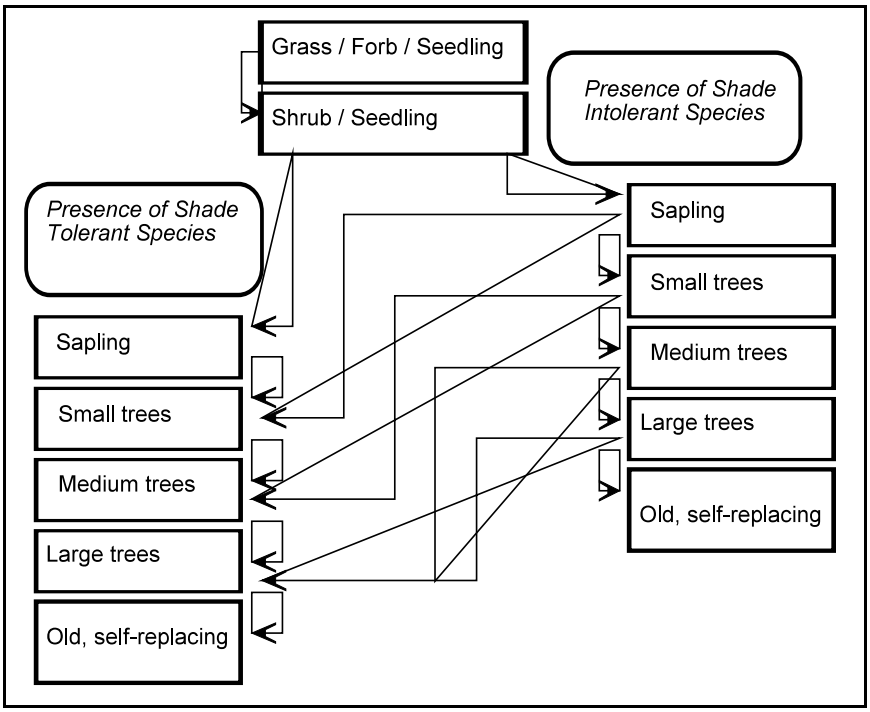
[8] Hunter, Malcolm, Jr. "Principles of Ecological Forestry", in *Maintaining Biodiversity in Forest Ecosystems*, edited by Malcolm Hunter, Jr., Cambridge University Press, 1999.

[9] Spies, Thomas, "Forest Stand Structure, Composition, and Function", in *Creating a Forestry for the 21st Century*, edited by Kathryn A. Kohm and Jerry F. Franklin, Island Press, 1997.

establishment of trees in the understory and increased height growth of individuals in lower and mid-canopy positions." It is dominated by shade tolerant plants, except on fire-dependent ecological systems which support mature even-aged forests which are partially (e.g., oak) or fully shade intolerant (e.g., pine). Fire-dependent forests had stand altering fire events that would reset the successional regime. The mature/shifting mosaic phase is uncommon in current landscapes where logging and natural disturbances have occurred more frequently than the average life span of the dominant tree species.

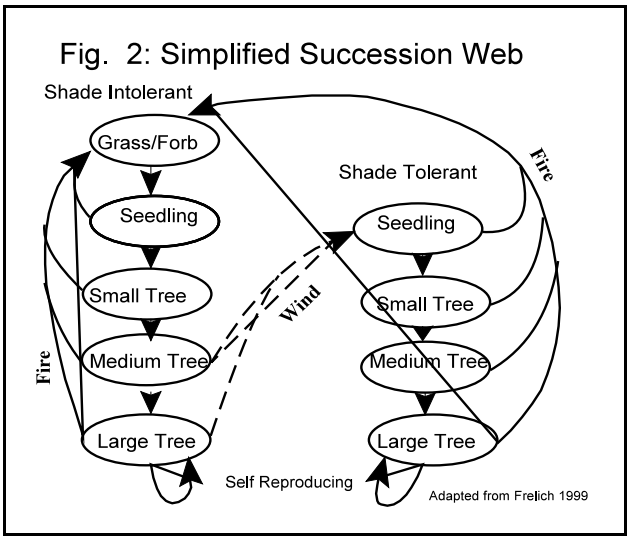
The term **Vegetation Growth Stage** (VGS) is used to describe the current condition of a forest and its potential for change through succession. It combines successional and developmental stages that occur after disturbance, where successional stage refers to changes in species composition over time and developmental stage refers to stand structure over time. The primary growth stages are: grass / forb /seedling; shrub / seedling (seedlings and shrubs now dominate the site); sapling (dense stands of trees less than 2" in diameter); small trees (trees are thinning out in number as size increases to 2-5" in diameter); medium trees (dominant trees are 5-9" in diameter while an understory is developing); large trees (dominant trees are 9-12" in diameter and understory is developed); old, self-replacing (dominant trees exceed 12" in diameter and capable of replacing themselves within the current forest structure). The stages are split between shade intolerant species (e.g., aspen, birch, tamarack) and shade tolerant ones (e.g., maple, basswood, balsam fir). Sites dominated by shade intolerant species at one stage may succeed to a shade tolerant stand as the under-story trees come to dominate the site. Figure 1 summarizes the stages and potential direction of change.

Fig. 1: Generalized Vegetation Growth Stages



The linear description of succession above does not take into account the impact of disturbance. As shown in Figure 2 in a natural state absent intervention by humans, fire and wind play the major roles in altering the forest land-scape. Any stand can be affected by fire at any time and, in effect, have its successional cycle reset. Stands at the small tree stage or beyond are susceptible to wind damage, which resets

succession back to the seedling or sapling stage and favors shade tolerant species if are present on the site.



It is important to remember that VGS refers to "time before disturbance", that is, the time that has elapsed since the stand was sufficiently disturbed through wind or fire to reset the stand's successional phase (modern era disturbances include timber harvesting and clearing for agriculture). Precisely speaking, the term refers to the age of the *forest*. However, in practical terms, for most forests, the age of the forest and the age of the dominant trees will be the same. A key exception is older hardwood forests in their multi-aged self-sustaining mature stage at which time the forest age can be considerably older than that of the dominant trees.

In the absence of human intervention, these forces of forest succession create a patchwork of forest across the landscape that reflects how each forest community has adapted over time to the particular disturbance regimes characteristic of the regional landscape. As noted above, fire and windthrow have been the dominant types of disturbance in these forests. The capacity and timing of fire and wind to alter stands range from very short (50-80) years on dry outwash-dominated landscapes to over 1000 years in northern hardwood systems.

Knowing the timing and intensity of stand altering events, statistical models can be devised to estimate the relative proportions of cover types and age classes (i.e., the vegetation growth stages) that would typically occupy the landscape under steady state conditions. These proportions are similar to the "balanced age class acres" that are the general target for regulated forests. It differs however, in that the model accounts for different successional stages, allows age classes to differ in their relative proportion, and allows for the presence of age classes beyond the timber rotation age.

By running the model at the extreme high and low estimates for the fire and wind rotations, the range of proportions in each cover type or age class can be calculated. These calculated **ranges of natural variability** (RNV) can be compared to the actual existing acreages in each ecological type and ownership category.

In general, the region's history of logging, agricultural conversion of land, and fire suppression, the comparisons between the current forest and the RNV generally show an overabundance of age classes in the 60-80 year age class, sometimes a poor representation and some times an excess in the youngest age classes, and almost always a poor representation in the older age classes. Understanding the RNV for a given forest landscape provides meaningful guidance for managing forests in a sustainable manner that emulates the forest conditions that occur under natural disturbance regimes.

Forest Patches

One critical aspect forest integrity is managing for a range of sizes and spatial arrangements of forest patches. Forest patches are defined as areas containing a contiguous forest type of similar composition and age (patches can also be comprised of non-forest elements such as fields). Associated with patch is the concept of “edge”, or the area where two patches meet.

A key quality of patches is the amount of "interior" forest area. Interior area is defined at continuous forest area beyond the range of "edge effects", which are ecological effects related to penetration of light and wind into the forest, as well as to the different habitats created between open lands and forest, or between different forest types. Knowing the amount of edge and interior area is important for understanding the value of forests as habitat for wildlife and plants of concern. It is also provides insights into the dynamics of the forest itself (e.g., susceptibility to wind, succession).

Patches, of any size, and edge are not inherently “good” or “bad” for a forest or wildlife. Simply stated, a healthy forest has a distribution of patch types, sizes and amounts of edge that taken as a whole is appropriate for the landscape. This insures there is a mix of forest and habitat critical to sustaining forest types / communities and providing essential habitat for all wildlife.

Cass County’s forest cover was analyzed regarding the size, location, and other attributes of patches. The analysis used a merged database containing resource information on County, State, Federal, Tribal, and private ownerships. The private ownership data came from photo-interpretation analyses and was amalgamated across all owners. This analysis allowed to distinguish patches based on cover type and estimated age classes. It provided an excellent landscape view of the county.

The analysis of Cass County’s patches and edge is found in the “Timber Management” section of the Strategic Management chapter.

Next... 1.0 Mission