

Age Class Structure and Old Growth Retention Strategies

Age Class Distribution

- The determination of a paradigm, model, vision, concept, of age class distribution is fundamental to managing the forest
- the age class structure has a drastic impact on:
 - Wildlife habitat
 - Aesthetics
 - Timber flow
 - Nutrient cycling; carbon retention and release

Age Class Distribution

- Sustained Yield Forest Management carried with it the concept of the Normal Forest which was (while in many respects flawed) simple to articulate and to internalize as the paradigm of management
- Since moving to forest regulation through optimization models, we as forestry professionals have lost that cohesive vision of what our long term goal looks like

Age Class Distribution

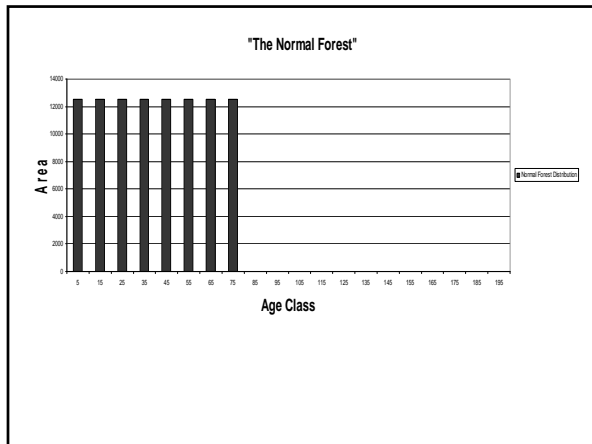
- Forest regulation through modeling is often a “black box” scenario where we diligently work on objective functions on the front end and scrutinize outputs on the back end
- Rarely is the distribution of forest unit by area by age class a fundamental driver in our modeling nor can we describe a clear vision of where we are heading

Age Class Distribution

- It could be argued that lacking this clear vision of targeted age class distribution which is sustainable then we have lost as much as we have gained through our use of complex optimization models
- It is also extremely difficult to explain to those outside the forest community what our overall goals are

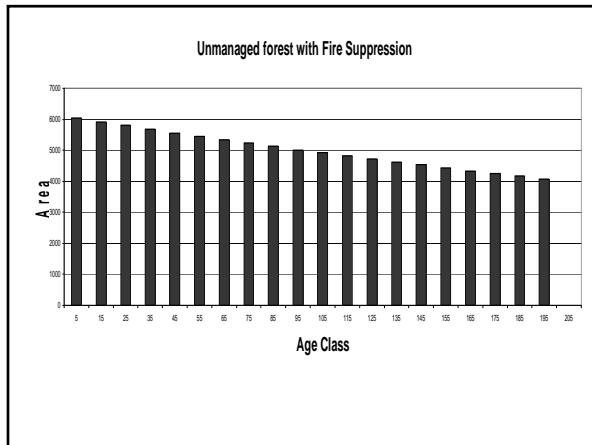
Age Class Distribution

- Lets consider some of the characteristics of various styles of age class distribution



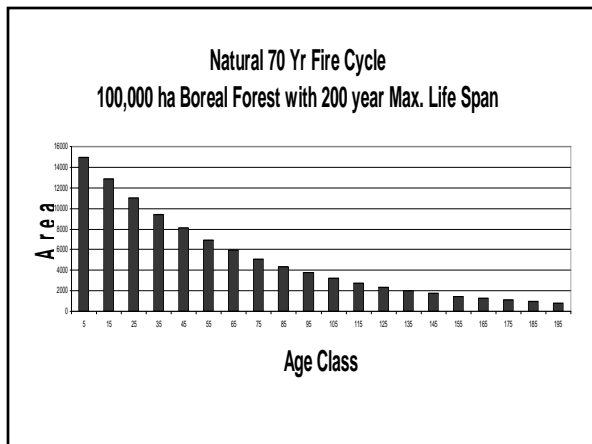
What does the "Normal" forest look like?

- Median age of about 40 years
- Patch size generally will be smaller; based on distribution of site conditions (40-200) ha
- Boundaries between patches are distinct
- 0% of the forest will be over 80 years of age; 0% old growth
- 0 % of the forest will succeed (die of overmaturity)
- Maximum growth, maximum health, minimum insect and disease
- Where forest management has come close to this pattern, the forest is distinctly "managed" in appearance; lots of plantation silviculture, fully accessed
- This pattern is most viable on small to medium sized properties with full forestry tenure and managed for timber production only



What does the Unmanaged Forest with Fire Suppression look like?

- Median age of about 85 years
- Patch size generally will be small and extremely large based on suppressed fires and occasional large "project" fires
- Boundaries between patches are rarely discernable
- 55% of the forest will be over 80 years of age; 27% old growth
- 0.4 % of the forest will succeed (die of overmaturity) annually
- Maximum disease, insect problems
- This is the "park" age class distribution pattern; this is what people think the natural forest looks like



What does the natural fire cycle forest look like?

- Median age of about 37 years
- Patch size generally will be larger (than in a managed landscape)
- Boundaries between patches are more diffuse
- 25% of the forest will be over 80 years of age; 11.6% old growth
- .08% of the forest will succeed (die of overmaturity) annually; disease and decadence are at natural ecosystem levels
- We will never "again" get to this condition in the parts of the country where fire suppression activities are the norm
- Even in the absence of fire suppression this pattern would only be represented across very large areas
- It is difficult if not impossible to maintain this pattern in the context of a managed forest

Challenges and Objectives in Managing Age Class Distribution

- The normal forest has fallen from favor in part because of its inability to provide the spectrum of habitats which exist in the natural “fire driven” ecosystem
- Fire suppression on the other hand has had a more drastic change in the ecosystem than logging ever did

Challenges and Objectives in Managing Age Class Distribution

- We want to be able to provide for predictable flows of timber (i.e. like the normal forest); while at the same time providing the range of age classes necessary to ensure full habitat representation
- It is an uphill battle to convince the public that the provincial park model is not the natural ecosystem

Challenges and Objectives in Managing Age Class Distribution

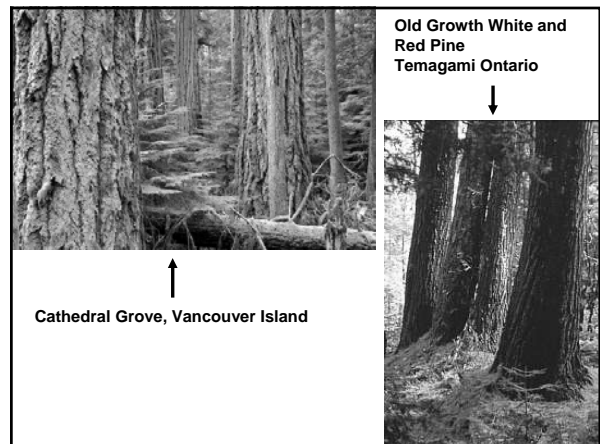
- Lets consider Old Growth ...
 - The word probably has its origins in the late 1970's
 - old growth is primarily a social rather than an ecological term
 - It was coined within the scientific community to describe the extremely old temperate rainforests of the west coast and then adopted by the environmental fraternity and has become the common and misunderstood description for all types of old, over-mature, senescent, forest

Challenges and Objectives in Managing Age Class Distribution

- Definitions of “old growth” are variable and fraught with a myriad of social nuances
- From an ecological perspective, old growth forests have some or all of the following characteristics:

Challenges and Objectives in Managing Age Class Distribution

- large old trees for species and site;
- complex stand structure characterized by wide variation in tree size and spacing, with multiple canopy layers and canopy gaps;
- large dead standing trees and accumulations of downed woody materials, tip-ups and mounds;
- specific composition of the forest community described through the occurrence or changing abundance of certain associated species (e.g., herbaceous plants, lichens and other bryophytes or wildlife species);
- few or no signs of human disturbance;
- net growth equal to or less than zero;
- age of dominant species exceeding average natural disturbance interval for ecosystem; and
- forest system near or in late succession or “climax” stage.





Challenges and Objectives in Managing Age Class Distribution

- The interest in old forests as a conservation model peaked in the 80's
- West coast protests and campaigns led the way, but the spill over ignited concerns regarding old red and white pine forests in Ontario and particularly in the Temagami area
- Enhanced protection of old red and white pine forests effectively shut down many forest products businesses

Challenges and Objectives in Managing Age Class Distribution

- In Ontario, the MNR has stated that all forests types have an old growth seral (life) stage
- In order to simplify forest modeling, and assessment and protection of old growth, the MNR has established policy defining old growth based on ecosite and age class
- Old growth is a value to be considered in forest management planning

Challenges and Objectives in Managing Age Class Distribution

- While all seral stages (life stages) of a forest, contribute to habitat for some species to some extent, the very old and the very young forest types are of particular value for habitat e.g.:
- The pre-sapling forest stage is particularly valuable hunting habitat for birds of prey (particularly when perching structures are maintained); this is also a valuable stage for herbaceous foraging species such as white tailed deer and bears

Challenges and Objectives in Managing Age Class Distribution

- The sapling stage is valuable for browsing species such as moose and also rabbits; the latter being the primary prey species of a number of medium sized predators
- Immature forests tend to offer less habitat value than other seral stages once they are beyond browsing height and until there is some understory development; they can still however contribute to thermal and security cover; they are often favored for song bird nesting as well

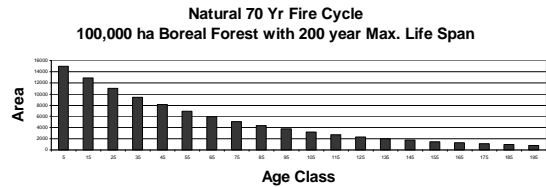
Challenges and Objectives in Managing Age Class Distribution

- Mature forest stages are more diverse than immature ones. As the understory layer develops, some forage species, security and thermal cover and nesting habitat also develop; ease of movement for large ungulates is improved
- Overmature "old growth" forests are exceedingly more diverse than other stages. New browsing opportunities are created in the understory while at the same time herbaceous forage is abundant. New species of plants and wildlife are present. Smaller predators thrive due to the abundance of downed logs. Rotting fallen wood and dead standing trees provide habitat for insect scavengers and cavity nesters

Proposed Age Class Distribution Models for Sustainable Ecosystem Based Forest Management

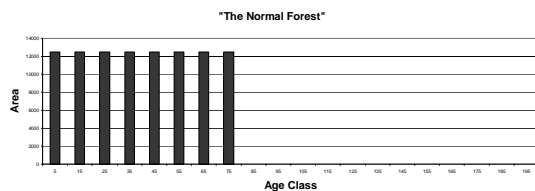
- Going back to our original discussion; our new ecosystem management paradigm needs to provide:
 - Representation of all seral stages in proportions similar to natural ecosystems
 - Special provision for old growth representation
 - Predictable timber flows

Proposed Age Class Distribution Models for Sustainable Ecosystem Based Forest Management



J shaped, Van Wagner distribution will not provide for consistent timber flows and can not be economically perpetuated especially in the early age classes (i.e. we have no satisfactory way of managing age class structure below minimum product/harvest age

Proposed Age Class Distribution Models for Sustainable Ecosystem Based Forest Management



Normal forest will not provide for old growth habitat or even much mature forest habitat; preponderance of immature age classes are the least valuable for wildlife

Proposed Age Class Distribution Models for Sustainable Ecosystem Based Forest Management

- Clearly, the new paradigm needs to have a front end similar to the normal forest with relatively uniform areas by age class, and it must have an old growth tail representing mature and over mature conditions. The extent of the old growth tail will need to be based on either a management valuation or some indication of natural disturbance patterns

Proposed Age Class Distribution Models for Sustainable Ecosystem Based Forest Management

- Four age classes ranges are important in the development of an age class distribution model:
 - prior to first age of harvest eligibility
 - harvest eligibility age range
 - old growth age range
 - post old growth age range

Prior to First Age of Harvest Eligibility

- We do not have the ability to effectively or economically modify the extent of age class ranges in this part of the curve
- We must maintain a normalized distribution of age classes prior to first age of harvest eligibility

Harvest Eligibility Age Range

- This range of age classes exists between the point where the timber is first/ideally ready to harvest and the point where natural quality decline renders harvest uneconomical
- We will get the best return by harvesting the most timber as early in this range as possible

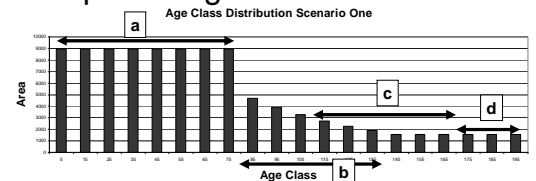
Old Growth Condition Age Range

- In Ontario at least, MNR has defined a range of age class in which old growth conditions exist; arguably there shouldn't be a hard ending to such a range, however this is convenient for modeling purposes
- This old growth age range overlaps the harvest eligibility age range; harvest eligibility starts prior to the old growth age range and ends within it

Post Old Growth Age Range

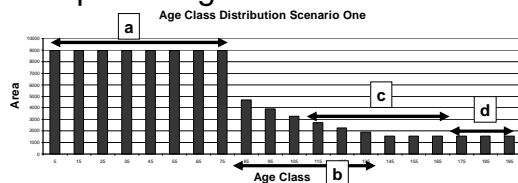
- Since, (in Ontario) there is a defined end to the old growth state, there will normally be a post old growth period prior to the eventual maximum age of particular species
- This is the period of maximum transition as stands succeed to a younger age class and often to a different forest unit
- This period is also the period of minimal growth, and maximum presence of insect and disease problems; from a forestry (rather than ecological) perspective, minimizing this period is a reasonable objective

Proposed Age Class Distribution



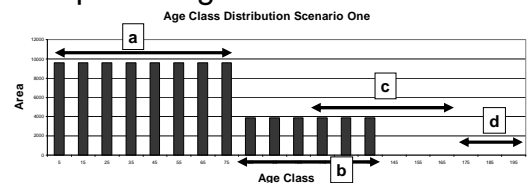
- a** Normalized distribution of age classes prior to harvest eligibility
- b** Wood harvest begins and is maximized at first age of harvest eligibility and then is stepped down through the entire range of age classes indicating some selectivity of harvest areas
- c** Old growth period as defined by policy; extent of area retained in this period is based on natural benchmark values
- d** Post old growth period; areas transition to younger forest or new age class

Proposed Age Class Distribution



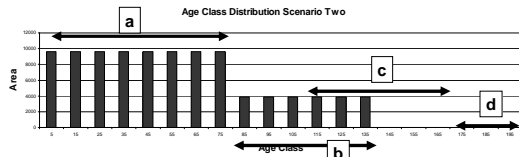
In this scenario, most harvest occurs immediately following the first age of eligibility; then stands can be selected throughout the range of harvest eligibility to favor quality of timber harvested and/or characteristics and longevity of old growth retained. The extent of old growth retention is based on the natural fire cycle benchmark and some area is retained to maximum age. Old growth characteristics are thereby maximized. This graph does not illustrate the fact that areas succeeding may go to a different forest unit and will generally not come back at 0 age (typically 30-50 and with an multiple aged structure and poorer stand quality)

Proposed Age Class Distribution



- a** Normalized distribution of age classes prior to harvest eligibility
- b** Wood harvest is maximized immediately after first age of eligibility wood is retained so that an even set of age class areas can be retained forward into the old growth period
- c** Old growth period as defined by policy; extent of area retained in this period is based on natural benchmark values. Final harvest of wood occurs at last age of harvest eligibility; prior to the end of the old growth period
- d** No timber is retained to succeed at maximum age

Proposed Age Class Distribution



In this scenario, harvest is maximized immediately following the first age of eligibility. Sufficient area is then retained into the old growth period to meet a retention target based on the natural fire cycle benchmark. Remainder of timber is cut during the old growth period at its maximum age of harvest eligibility. No timber is retained to succeed at its maximum life span. Timber harvest is higher and this less disease and insect issues associated with stand decadence but there is no representation of transitional or maximum aged trees

Impact of Old Growth Retention

- If all of the old growth is retained from the “available” productive forest land base then the impact on timber harvest is great
- In Scenario 1 timber harvest is theorized to be reduced to 55% of the “normal” harvest; Scenario 2 timber harvest is somewhat higher at 62%

Impact of Old Growth Retention

- These are significant timber harvest losses but they can be mitigated by retaining old growth from the “unavailable” land base
- If the impact of parks, and accumulating wildlife reserves is considered then the impact on the production forest can be minimized