

Limitations of the Natural Disturbance Model of Forest Harvesting

Natural Disturbance Model (NDM):

- Fundamental assumption is that biodiversity can be maintained in the presence of industrial use if industrial practices are made to approximate natural disturbances.
- Operational goal: to maintain forest structure and pattern, along with ecological processes, within the typical range of natural variation.

Limitations in defining NDM targets:

- The ability to approximate natural disturbances is determined by how well natural forest structure, pattern, and process can be defined. Targets that cannot be defined cannot be achieved.
- Natural disturbance regimes are extremely variable, across the landscape and over time, making the assessment of long-term trends very difficult. Even for fire, the dominant disturbance, we do not have reliable estimates of the long-term rate of burning. It is also unclear how much the rates of burning and regeneration differ among different types of forest stands. Consequently, NDM targets based on the simulation of fire regimes are based more on supposition than on fact.
- Defining NDM targets on the basis of existing forest structure and pattern, from areas that have not yet been harvested, is an alternative approach. However, forest inventories systematically underestimate the amount of old-growth forest, they are unduly influenced by large past fires, and it is difficult to account for the impact of fire suppression. Inventories also do not address natural variability over time, given that they represent just a "snapshot" in time.
- As a consequence of the aforementioned problems, the targets we define for the implementation of the NDM are necessarily coarse and of unknown reliability. Furthermore, because the targets are based on a very limited number of attributes (i.e., those that can be easily measured), they provide only a partial characterization of forest structure and pattern. Ecological processes are for the most part only represented indirectly, and disturbances other than fire are generally ignored.

Fundamental differences between the NDM and fire:

- Forest harvesting is, by necessity, accompanied by an extensive road infrastructure. Other linear disturbances, such as seismic lines, pipeline corridors, and power transmission lines, add to the fragmentation and access problems resulting from roads. None of these linear disturbances has a natural analog in fire or any other natural disturbance.
- Most burning occurs in infrequent large fires associated with so-called "fire years", whereas sustainable mill operation requires a relatively constant flow of timber from year to year.
- Harvesting operations target only merchantable stands, whereas fire affects all forest types. Consequently, the landscape patterns produced by fire and harvesting are fundamentally different.

- Forest harvesting, by definition, involves the removal of most trees from a harvest site, whereas fire generally kills trees but leaves them in place. Even when attempts are made during harvest to leave residual trees on the site, the amount of structure left is only a fraction of what generally remains after fire. Furthermore, residual live trees do not have the same ecological function as charred dead trees. The removal of trees from a site can also result in cumulative nutrient depletion.
- Erosion, soil compaction, and site preparation (e.g., ploughing) are additional byproducts of forestry operations that differ from fire.

Problems with implementation:

- Several key elements of the NDM, such as the retention of merchantable old-growth stands and the retention of residual trees on harvest sites, decrease the volume of timber available for harvest. Most forestry companies in Alberta are already facing shortages in timber supply and, therefore, cannot be expected to completely implement the NDM voluntarily.
- Computer harvest models were designed to optimize the volume of timber available for harvest and cannot incorporate ecological variables into the optimization process. Consequently, planning for the achievement of NDM targets must be accomplished through ad hoc measures, and given the complexity of the planning process, these are unlikely to be effective. Current models also fail to incorporate the potential impacts of wildfire and they utilize simplistic assumptions concerning forest regeneration and succession.
- The oil and gas industry disturbs an area of forest similar to that of the forestry industry, therefore, it will be impossible to achieve NDM landscape targets unless the oil and gas industry (and other industrial users) are integrated into the NDM planning process. However, oil and gas companies plan on very short time scales (years), and there are no legislated requirements for maintaining natural landscape patterns or limits on the cumulative impact of their activities.
- As of 1996 approximately 94% of merchantable coniferous forest in Alberta and 73% of the merchantable deciduous forest have been allocated on the basis of the traditional sustained-yield approach. This high level of allocation, particularly on the coniferous land base, will make it difficult to reduce harvest levels in the future under the NDM. The failure to account for the impact of wildfires when setting allocations will further constrain future wood supplies. Most significantly, timber allocations continue to be made on the basis of sustained-yield management, as ecological forest management and the NDM have not been adopted in either law or policy.