

Overview: resilience-based forest management

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As a result of climate change, forest managers may have a new top-priority objective: maintain ecological resilience. Ecological resilience is the ability of an ecosystem to retain its overall character (e.g., shifting mosaic of age classes) and function over time, while responding to disturbance. Maintaining resilience needs to become a primary forest management objective because all valued ecosystem services (e.g., captured by objectives for timber, recreation, fish habitat, etc.) depend on it and because resilience cannot be taken for granted in a changing climate. Maintaining resilience is similar to and supported by existing objectives to maintain biodiversity (e.g., in FRPA, LRMPs, SFMs) and ecological integrity (e.g., EBM in coastal BC), but resilience theory provides an improved basis for addressing climate change.

There are no simple prescriptions for maintaining the resilience of forest ecosystems. Forests belong to the broad class of complex systems, which means they are inherently unpredictable (e.g., due to natural disturbance). Some general principles do apply, however, to managing complex forest systems, including maintaining the diversity of species and ecosystems and using natural ecosystem patterns (e.g., age class composition of landscape, structural legacies in stands) to guide management. The Biodiversity Guidebook provides a natural-pattern-based approach to forest management and thus encourages ecological resilience, however, historically forest management policy has “balanced” biodiversity objectives with timber objectives so that, currently, management-induced ecosystem patterns differ substantially from natural patterns in many parts of BC. The dual pressures of forest development (i.e., mainly timber harvesting, road construction, planting and fire control) and climate change have more potential together to shift ecosystem patterns beyond the point where the forest remains resilient than either factor alone.

In a changing climate, maintaining forest-scale resilience is particularly challenging because species distributions and disturbance regimes are shifting. Historic, natural patterns still provide useful guidance but can no longer serve as straightforward management targets. Forest managers must also consider the possible direction of the ecological shift—how are natural patterns likely to change? Managers must aim to accommodate this shift in a way that maintains resilience:

- Support existing biodiversity and related ecological function by maintaining ecologically diverse reserves at multiple scales.
- Support immigration of climatically-suited native biodiversity by creating ecologically diverse corridors and by translocating tree species.
- Limit loss of ecological memory (e.g., seed banks) by limiting compound disturbances and maintaining remnant patches.
- Limit susceptibility to natural disturbance by maintaining diverse stands and landscapes; management should promote variability that goes beyond historic patterns (e.g., different species mixes).

In general, no single management strategy should be counted on—a diversity of strategies is necessary.

Under climate change, resilience-based management strategies form part of larger adaptation approach:

- Manage for resilience to minimize risk of unexpected, abrupt, catastrophic losses of ecosystems services. Retain natural ecological potential and influence the direction and timing of ecosystem change to maintain resilience.
- Use a precautionary approach to avoid irreversible negative outcomes
- Implement adaptive management to reduce uncertainty about ecological responses to climate change and management practices and to identify negative ecological trends rapidly. Include both active (experimental) and passive (monitoring) approaches to learning about the local forest; also continuously gather and synthesize emerging exogenous knowledge that is locally relevant.
- Develop a forest management framework that is flexible and can respond rapidly to new information.