17. Climate change

Climate change has been identified as a priority issue for the Forest Service to consider while making resource management decisions. Actions related to climate change are occurring within the Forest Service at the National, Regional and Forest levels. At the National level a *Forest Service Strategic Framework For Responding to Climate Change (2008)* and *National Roadmap for Responding to Climate Change (2011)* provide direction for the agency.

Key Points

- The CNF Forest Plan provides sufficient direction and flexibility in adaption and mitigation strategies in regard to climate change.
- The Forest should be strongly engaged in the Minnesota Climate Change Response Framework (MN CCRF) effort.

At the regional level, the Northwoods Project, an expansion of the Chequamegon-Nicolet National Forest Climate Change Framework, encompassing the forested landscape of Northern Wisconsin, is being expanded to include the forested portion of Michigan and Minnesota. The Chippewa National Forest (CNF) will be one of the beneficiaries of this project. Two key outcomes from this effort will be: 1) a vulnerability assessment which will highlight our ecosystem vulnerabilities, and 2) a Forest Adaption Resources document that will include a menu of adaption strategies and a workbook to incorporate climate change into existing management on the ground.

Additional information on climate change can be found in various resource sections (soils, non-native invasive species, and insects and disease) in this report.

The Forest Plan

In general, climate change is not explicitly considered in Forest Plan direction, and was not treated as a significant issue in the Forest Plan (FP) Final Environmental Impact Statement (FEIS). Climate change was touched on in the EIS and was addressed in the Response to Comments. The Response to Comments states that climate change was not considered in more detail and was not explicitly incorporated into Forest Plan direction because of the uncertainty in impacts of climate change at the Forest scale (FP FEIS, App. J. pp. J-104). However, the Plan does include components for sustainability that provides the flexibility to address climate change given the level of uncertainty. The Plan is also flexible in that it does not prohibit adaption and mitigation responses to climate change.

The Chippewa National Forest is already doing many things that complement or match recommendations of adaption and mitigation for climate change; for example, increasing or maintaining species diversity through different harvest techniques (ie. winter harvest only), selling biomass to willing purchasers, increasing plant species diversity and thus resiliency, decreasing fragmentation, and increasing carbon storage.

The Forest plan provides desired conditions and objectives that were broad and flexible enough to allow new issues like climate change to be folded in to management on the ground. For instance, mitigation techniques that increase resiliency of forests is encouraged. The Chippewa Forest Plan has desired conditions and objectives to increase species diversity through species composition and age class objectives.

Increasing resiliency of the forests, in the face of potential climate change, echo throughout the CNF Forest Plan with direction for moving towards increased diversity in amounts, conditions and patterns of vegetation. For example:

> D-VG-3: Vegetation (live and dead) is present in amounts, distributions, and characteristics that are representative of the spectrum of environmental conditions that would have resulted from natural cycles, processes, and disturbances under which current forest ecosystems and their accompanying biological diversity evolved. The ecosystem composition, structure, and process representation considers time frames, a variety of landscape scales, and current biological and physical environments. Resource conditions exist that minimize undesirable occurrences of non-native invasive species.
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> D-VG-5: Vegetation constantly changes through management activities and through naturally occurring disturbances and ecosystem recovery processes such as wind, fire, flooding, insects, disease, and vegetation succession. These fluctuations are within an ecologically and socially acceptable range of variability.
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> D-VG-6: Vegetation conditions that have been degraded or greatly diminished in quality or extent on the landscape by past land use are restored to conditions more representative of native vegetation communities. These conditions, in ecologically and socially appropriate areas, result from gradually re-establishing: a) Old forest and old-growth forest age classes and vegetative growth stages, while providing for a full array of forest age classes and vegetative growth stages. b) Uneven-aged and multi-aged forests with a variety of tree ages and different vegetation layers (heights) within the same community, while also providing for even-aged forests. c) The full range of successional stages in non-forested lands such as bogs, fens, grass, and shrublands. d) Diverse mixes of trees, shrubs, herbs, mosses, lichens, and fungi species at site and landscape levels that are more representative of native vegetation communities. This includes an increase, in appropriate areas, of: rare and sensitive plants and native plant communities; white, red, and jack pine; white cedar: upland tamarack; and in some areas, white and black spruce as components of native vegetation communities.
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> D-VG-7: The diversity of vegetation spatial landscape patterns that have been degraded or greatly diminished on the landscape by past land use are restored to conditions that more closely emulate the landscape scale patterns that would result from natural disturbances and other ecological processes. These conditions result from gradually re-establishing: a) Spatial patterns that promote: well-distributed habitats; restoration of ecosystem function or processes; connectivity between aquatic, terrestrial, and riparian ecosystems across the landscape; scenic landscapes; and economic efficiencies. b) Diversity of size, shape, and distribution of patches of forest. This includes large patches

of mature and older forest (300 to 1000s of acres) that provide interior forest habitat. c) Diversity of size, shape, and distribution of temporary forest openings on the landscape. This includes opening sizes from 1 to 1,000 acres.

D-VG-8: The ecological processes of native vegetation communities are maintained, emulated, or restored at multiple landscape scales to provide representation of their natural range of distribution and variation within context of multiple-use goals and ecosystem sustainability. These include: processes such as disturbance from fire, wind, flooding, insects and disease; biological community and species interactions; nutrient cycling; and vegetation succession.

Climate change mitigation techniques recommend decreasing fragmentation as a strategy. The Forest Plan identifies an objective of increasing or maintaining certain size patches which thus discourages fragmentation. For example:

O-VG-19: Maintain or increase the acres and number of patches of mature or older upland forest in patches 300 acres or greater (FP, p.2-23).

Sequestering more carbon on the landscape, although not stated as such, can be found as a complimentary objective in the CNF Forest Plan. For example:

O-VG-6: Decrease the acres of maintained permanent upland openings except for those needed for social reasons or if important ecological needs are not adequately met by amount, quality or distribution of temporary forest openings (FP, p.2-22).

Climate Change Research Activities

A research project proposed by the Department of Energy and the US Forest Service on the Marcell Experimental Forest (MEF) will soon be implemented to study the effects of altered atmospheric and climate conditions to obtain information on the response to elevated temperature and elevated atmospheric CO2 of a black spruce-*Sphagnum* ecosystem. Multiple levels of warming at elevated CO2 levels will be examined over the 10 year life of the research to determine implications to this ecosystem. The MEF was formally established in 1962 being reserved for long-term research and to study the ecology and hydrology of peatlands.

Recommendations

- The CNF Forest Plan provides sufficient direction and flexibility in adaption and mitigation strategies in regard to climate change. This direction and flexibility should be adequate until the next Plan revision. At that time, investigation of incorporating more aggressive response strategies into Plan direction could be contemplated.

- Regarding the Minnesota Climate Change Response Framework (MN CCRF) effort, the Forest should be strongly engaged. Currently, Forest involvement has been with the MN CCRF Coordination Team and the MN CCRF Science Team. Expanded engagement from the Forest will be needed in the Vulnerability Assessment, Internal Communication, External Communication, and Forest Adaption Resources. For the Vulnerability

Assessment and the Forest Adaption Resources, silviculture, hydrology and fish and wildlife program managers and specialists should be engaged providing input and review.