

Appendix F

Climate Change Considerations and Cumulative Actions

This appendix includes a synthesis of information about climate change that may be relevant to the North Shore Project and describes past present and reasonably foreseeable future management actions that may contribute to cumulative effects. Interdisciplinary team members and resource specialists used this information when determining the potential effects of the North Shore Restoration Project.

A. Climate Change Considerations

This section synthesizes the current state of knowledge regarding climate change impacts in the region, on the Superior National Forest and in the North Shore Project area. Much of the information comes from a draft Minnesota Forest Ecosystem Vulnerability Assessment and Synthesis (S. Handler, et al, 2013). This summary represents the current state of scientific knowledge used by resource specialists to determine what actions may be affected by cumulative and long-term climate change impacts in the North Shore Project. Effects analyses in the North Shore Project used the following assumptions and synthesized information.

Observed Climate Change

Northern Minnesota has experienced substantial changes in temperature and precipitation over the past 100 years, and the rate of change appears to be increasing. A great deal of observed climate information is available for the project area and for the large region.

The salient climate trends include:

- Mean, minimum and maximum temperatures have been increasing across all seasons, with winter temperatures experiencing the most rapid warming.
- The North Shore of Lake Superior has experienced more rapid warming than other areas in northeast Minnesota.
- The North Shore project area has received more precipitation over the course of the 20th century, across all seasons.
- More rain has been falling in heavy precipitation events of three inches or greater.
- Snowfall has been decreasing across northern Minnesota, although there has been an increase in large winter storms.

Climate change has also been indicated by trends in lake ice, growing season length, and wildlife range shifts.

Projected Climate Change--Regional Impacts

Climate change projections can help us get a better sense of the range of possible futures that could be expected in northern Minnesota. Projected changes in temperature and precipitation can have cascading impacts on other ecosystem processes that are important in the project area. The salient projected climate impacts for the North Shore project area include:

- Climate models agree that temperatures in northern Minnesota will continue to increase across all seasons over the next century, with dramatic warming most likely in winter (2 to 12 °F).
- Precipitation is projected to increase in winter and spring across a range of climate scenarios, but there is greater uncertainty for summer precipitation – slight increases or large decreases are possible.
- Intense precipitation events are likely to continue to become more frequent.
- Snowfall is projected to continue to decline across the assessment area, with more winter precipitation falling as rain.
- Soils are projected to be frozen for shorter periods during winter.
- The growing season is projected to extend by several weeks.
- Climate shifts may increase wildfire activity or change the timing of the wildfire season in northern Minnesota.
- Forest pests and diseases may become more active and damaging in a warmer climate.
- Less severe winters may benefit deer populations in northern Minnesota.

Projected Climate Change-- Forest Type Impacts

Climate change projections can also help us to understand the potential impacts to specific forest types in northern Minnesota. The following projected impacts are specific to the Laurentian Mixed Forest Province in Minnesota which encompasses the North Shore project area:

- Boreal species such as quaking aspen, paper birch, tamarack, and black spruce are likely to experience reduced suitable habitat and biomass across the assessment area.
- Species with ranges that extend to the south such as American basswood, black cherry, northern red oak, and eastern white pine may experience increased suitable habitat and biomass across the assessment area.
- Many species currently common in northern Minnesota may decline under the hotter, drier future climate scenario.
- Forest productivity will likely be dictated by a combination of factors such as CO₂ fertilization, water and nutrient availability, and species migration.
- Model projections do not account for many other factors that are likely to change under a changing climate, including:
 - Drought stress
 - Changes in hydrology and flood regime
 - Wildfire frequency and severity
 - Altered nutrient cycling
 - Changes invasive species, pests, and pathogens

Climate Change Considerations--Local Factors for North Shore Project Area

Because climate change projections are produced at a relatively coarse scale, it is necessary to consider local conditions in the project area that might buffer or amplify broader projections. Factors like slope and aspect, soils, past management and forest health conditions are important considerations for future climate impacts. North Shore

Project Interdisciplinary Team members identified the following local site factors for climate change consideration in the North Shore Project area:

- Terrain
 - A majority of project area is south facing which could amplify temperature increases and evaporation trends. Therefore, the project area has the potential to be more drought-prone than averaged trends alone might indicate.
 - North-facing slopes might stay cooler and wetter than other areas.
 - Frequent elevation changes along the North Shore could create greater potential for runoff, particularly along riparian areas and gorges.
- Wildfire considerations
 - Increases in available fuel under hotter, drier conditions, may increase the area's susceptibility to fire.
 - Grasses are common groundcover in the project area and could carry fires.
 - The typical spring/ fall distribution of fires may change, shifting to a summer-fall fire season.
- Invasive species
 - The project area receives high recreational use and could be more susceptible to invasive species through the many corridors for invasion.
 - Warmer winter temperatures along the North Shore might allow more invasive species to colonize this area than areas further inland.
- Lake effects
 - Most of project area falls within the lake effect zone or in transition zone.
 - Future temperatures may be less moderated because of Lake Superior's rapid warming relative to land surface temperatures.
 - Lake Superior is staying warmer later into the year, which could result in an extended growing season in the project area relative to the surrounding area.

B. Cumulative Actions

This section describes past, present, and foreseeable future management actions that may contribute to cumulative effects. This list is used by resource specialists to determine what actions may create effects in addition to the direct or indirect effects from the North Shore Project.

Council on Environmental Quality (CEQ) guidance states that the cumulative effects analysis area should be determined by resources, based on potential effects (*Considering Cumulative Effects*, Council on Environmental Quality, January 1997 pp.15-16). Each resource determined the appropriate cumulative effects analysis area and subsequently which of the actions listed are relevant.

Past actions have been completed and their effects taken into account in the existing condition. Present actions are those where the activity, such as a timber contract, is still operating or a decision has been made to implement an action. Future actions are those where an activity is being planned but not started or a decision has yet to be made.

Federal Past and On-going Actions within Project Boundary

- Completed management actions from vegetation projects have been accounted for in the existing condition of the North Shore Project Area. Currently, there are no active timber sales within the North Shore Project boundary.
- On average between 50 and 100 acres of prescribed burning in wildlife opening occurs annually. These burns have been completed for wildlife benefits in upland openings. The purpose has been to maintain those openings.
- No stands in the project area are planned to be released in 2014 or 2015.
- Ten special use permits are ongoing within the North Shore project area. One was issued in 2010 and expires in 2015. This permit allows the holder to access their private land in the project area for use as a right-of-way in Township 62 North, Range 4 East, Section 1. This is the only allowed access across Forest Service lands to all private parcels in the area. Two other permits allow the Minnesota Department of Natural Resources (DNR) to access State land in the project area for winter access to State timber sales and were issued in 2013; they expire in 2017. At the end of the permit period, the DNR will decommission the portions of the road that they created. In T62N, R4E, Section 1, this road uses a portion of the private access road described above; the other is in T62N, R4E, Section 8 and is for access to State lands off of Cook County 16. A Private Trail Special Use Permit is issued to the Minnesota Departments of Natural Resources (DNR) Trails and Waterways for a paved bike trail (Gitchi-Gami). The trail is located in Township 59 North, Range 4 West, Section 28, 29 and 31. The permit was issued in 2004 and expires in 2013. Private Road Easements are issued to the following permit holders: Steamhaul Lake Road Assn. (T60N, R3W, Sec 28), Michael Bradley (T59N, R4W, Sec 1), Maynard/Taylor Road Assn. (T59N, R4W, Sec 17), John Willard (T60N, R3W, Sec 28), and Gerald Gervais (T59N, R4W, Sec 15). A Private Road Permit are issued to the following permit holder: Sugarbush Trail Assn. (T59N, R4W, Sec 10) – exp. 2013.
- The Non-Native Invasive Plant Management Project EA (USDA 2006a) describes an integrated pest management approach for managing noxious weeds on National Forest System land and potential environmental effects. In the North Shore project area, 12.5 acres (136 sites) of invasive plants were treated in 2012; a similar amount of acreage is expected to be treated in 2013.
- The Superior National Forest has completed a Forest-wide Travel Management Project (FTMP) in November, 2009, in coordination with the Minnesota Department of Natural Resources, St. Louis, Lake and Cook Counties, 1854 Authority, and the Grand Portage Band. The project addressed Off-Highway-Vehicle (OHV) use and the use of unclassified roads.

As shown on Table F-2, there are 3.9 miles of unclassified roads within the North Shore project area. Under the Forest-wide Travel Management Project (USDA 2009b), 3.9 miles of unclassified roads will be decommissioned and allowed to return to a natural state. No miles will be converted to an OML 1 or 2 roads.

Table F-2: Change in Road Miles - North Shore Project Area

Road Type	Total Miles	FTMP Miles ¹	Change in Miles
Unclassified	3.9	0	-3.9
OML 1	11.0	11.0	+0.0
OML 2	13.9	13.9	+0.0
OML 3	9.0	9.0	+0.0
OML 4	3.0	3.0	+0.0
County Roads	97.0	97.0	+0.0
State Forest Roads	8.8	8.8	+0.0
State Hwy & Township Roads	57.6	57.6	+0.0
Total	204.2	200.3	-3.9

¹FTMP: Forest-wide Travel Management Project

Reasonably Foreseeable Future Actions on Federal Land within Project Boundary

Reasonably foreseeable future actions on Federal land within the North Shore project area are listed below. Other actions may occur in the future; however, the Superior National Forest does not have proposals for any other actions outside of our proposed actions and the following projects.

The Superior Cycling Association has proposed continued development of single track mountain bike trails at both Britton Peak and Pincushion areas.

- Pincushion - 5-7 new miles would be on National Forest System land.
- Britton Peak - 22 miles new, including a 13 mile connector to Lutsen Mountains on National Forest System land.

In November 2012, the Superior national Forest initiated scoping for the proposed Cook County Land Exchange. In the proposal, the United States would acquire approximately 1910 acres of non-federal land in the Boundary Water Canoe Area wilderness in exchange for approximately 1620 acres of National Forest system land scattered through Cook County. Approximately 365 acres of the National Forest System land proposed in the exchange are in the North Shore Project area.

There are no special use road permit applications for road access in the project area.

Past, Ongoing and Reasonably Foreseeable Future Actions on State and Private Lands within Project Boundary

State lands encompass approximately 24 percent (24,200 acres) of the project area. Based on stand information from the Minnesota Department of Natural Resources website and discussions with the State resource planners, of the 24,200 acres of State land, the State is currently proposing stand examinations and harvest needs on 98 acres within the project boundary (see Table F-3). For the cumulative effects analysis all acres were assumed to be harvested even though actual treatment acres may be less.

Table F-3: Potential MNDNR Forest Management Activities in Border Lakes Section in the North Shore Project Area.

Prescription	Acres
High-risk, low volume - needs a field visit to determine prescription	98
General Harvest	0
Commercial thinning	0
Total	98

Data Source: www.dnr.state.mn.us/maps/forestview/query.html

County and Private land encompass 37% of the ownership within the project boundary. These lands are located throughout the project area, and include concentrations near Lutsen, Grand Marais and Hovland. The Superior National Forest anticipates minimal harvesting on private lands within the project area since many of these properties are used for residential or recreational purposes such as private homes or resorts; managed forested tracts are relatively small and disbursed. Many landowners in the project area have been and are continuing to work on restoring their land through planting white pine and other conifer species as well as conducting other restoration activities.

Management Actions outside Project Area Boundary

The cumulative effects analysis for the landscape ecosystem objectives and Management Indicator Habitat objectives included any past or present decisions or actions not completed and proposals under consideration. Projects which create young age class on the Superior National Forest are listed as follows: Birch EA, Border EIS, Cascade EA, Clara EA, Devil Trout EA, Dunka EA, Echo Trail EIS, Glacier EA, Inga South EA, Junction EA, Kadunce EA, Lima Green EA, Manitou CE, Maple Hill EA, North Shore EA, Mid Temperance EA, Pelican EA, Tomahawk EA, Toohey EA, Tracks EA, Virginia EIS, Whyte EA, and Windy EA.