

### **3.14 WATER QUALITY**

#### **3.14.1 Introduction**

Aquatic resources and water quality relate to one of the significant issues outlined in Chapter 1: vegetation management and associated roads relative to ecological integrity of the Boundary Waters Canoe Area Wilderness (BWCAW). The main area of potential effects are (1) the construction of new road/stream crossings that could produce barriers to aquatic organism passage or changes on aquatic habitat related to hydrologic alteration and (2) harvest that exceeds a threshold on a watershed level to produce altered hydrologic regimes and results in negative impacts to stream habitat.

#### **3.14.2 Analysis Methods**

##### **Indicator 1: Change in the number of stream crossings**

This indicator assesses the change in the number of road/stream crossings resulting from either decommissioning and/or new temporary road construction that are proposed within the Glacier Project Area for each alternative. This indicator does a good job of highlighting differences among alternatives because it represents the potential effects to instream and riparian habitats, potential erosion and point source sediment input at stream crossing sites, as well as potential effects to stream flow, flood flow capacity, and sediment transport. Additionally, this indicator is very useful for determining potential effects to aquatic organism passage and stream connectivity.

##### **Indicator 2: Percentage of upland open and upland young forest within each watershed**

This indicator is a cumulative effects indicator that represents a threshold for Sixth Level Watersheds in the project area where the proposed level of harvest for any alternative may not cause more than sixty percent of the watershed surface area to be in upland open or upland young forest condition. This indicator does a good job of highlighting differences among alternatives because research indicates that watersheds having more than sixty percent upland open and upland young forest conditions are susceptible to peak flows that can potentially reshape channels, increase erosion and sedimentation, as well as decrease diversity within streams (Verry 2000).

#### **3.14.3 Analysis Area**

The spatial boundary for the change in the number of stream crossings is the Glacier Project boundary, specifically where roads and streams intersect with the project boundary. This is an adequate spatial scale since most stream segments are contained within the project area boundaries. The stream segment scale is adequate to assess potential organism passage or habitat impacts based on the distance of potential organism movement and the potential upstream and downstream physical changes. Temporal boundaries vary with impact from short-term erosion from road maintenance (hours or days), to yearly erosion from seasonal peak flows, and finally to passage barriers that would extend to the duration of culvert placement (years or decades).

The spatial boundary for the percentage of open upland and young upland occur at the watershed scale; our analysis includes all the Sixth Level Watersheds (USGS 12 Digit Hydrologic Unit Code) that intersect or are upstream of the project area. The temporal boundary would be the duration of the harvest along with the regeneration time and stream or lake recovery time from a potential

impact. Temporal boundaries are on the scale of long-term stream recovery from channel instability caused by hydrologic alteration (years or decades).

Both of these indicators may reach into the BWCAW by sharing connected watersheds or individual stream segments. The cumulative effects boundaries for both indicators are identical to the direct and indirect effect boundaries. Regarding the first indicator, the change in the number of stream crossings, the stream segment scale is appropriate for cumulative effects because it will likely encompass spatial requirements for aquatic species during different life history stages and during times of stress. Temporal boundaries vary with impact from short-term erosion from road maintenance (hours or days), to yearly erosion from seasonal peak flows, and finally to passage barriers that would extend to the duration of culvert placement (decades). The cumulative effects boundary for the percentage of open upland and young upland occurs at the Sixth Level Watershed Scale and is appropriate because response of the indicator is linked to large-scale watershed dynamics. The temporal cumulative effects boundaries would be the duration of the watershed-scale activity along with the regeneration time and stream or lake recovery time from a potential impact (decades).

#### **3.14.4 Affected Environment**

Stream Crossing Surveys indicate existing condition of the stream crossings within the midlevel area. Surveys were completed at forty-two road crossings within the Glacier Analysis Area. Conditions at specific sites varied from those containing both geomorphic impacts and aquatic organism passage barriers to those with good stream simulation and no adverse effects. Based on these and additional surveys, a prioritized list was recommended for rehabilitation, three of which are included in the purpose and need.

All or parts of sixteen watersheds intersect the Glacier Analysis Area. The area drains into one major drainage, the Rainy River Watershed. The Glacier Analysis Area represents an insignificant portion (less than ten percent) of the total area of six of these watersheds; as a result the assessment is focused on the remaining ten watersheds, which together comprise ninety-four percent of the Glacier Analysis Area. The watersheds in the analysis area are largely headwater lake and stream environments for the Rainy River Basin. As such, they are dominated by lakes and wetlands. The sixty percent threshold for combined upland open and upland young forest is relevant as a cumulative effects indicator only for watersheds that contain less than forty percent of the area in wetland (wetland+lowland+water landtype). Out of the remaining ten watersheds mentioned above, three have forty percent or more wetland landtype and are excluded from further analysis. Similarly, a number of watersheds are partly inside the BWCAW; of these, nine of them are excluded on the basis of the portion of watershed being greater than forty percent wilderness (i.e., since no management would take place in the designated wilderness to convert to a young and open state, the remaining portion of watershed outside the wilderness cannot exceed the sixty percent threshold). The existing condition of the five remaining watersheds (those not eliminated above) is well within acceptable limits as defined by the sixty percent threshold for combined upland open plus upland young forest. The portion of each watershed in this condition ranges from a high of twenty-one percent (Lower Bear Island River Watershed) to a low of six percent (Lower Kawishiwi River Watershed).

### **3.14.5 Environmental Consequences**

#### **3.14.5.1 Direct and Indirect Effects**

This effects analysis is based on assumptions that the project follows applicable Minnesota Forest Resource Council (MFRC) site level guidelines, Forest Plan direction (specifically listed in the Glacier Water Resource Report), as well as required design features and mitigation measures contained within the Glacier Project.

#### **Alternative 1 (No-action)**

There would be no direct, indirect, or cumulative effects caused by the no action alternative.

#### **Direct and Indirect Effects Common to All Action Alternatives (Alternatives 2, 3, and 4)**

Estimated positive direct effects to aquatic resources include the management of riparian areas for extended rotation, long-lived conifer species, and/or increased basal area. Direct and indirect effects from planting and harvesting in these areas include providing shade and cover for aquatic organisms and increasing in-stream habitat complexity with future large woody debris recruitment. Vegetation management activities in individual watersheds do not significantly contribute to reaching the sixty percent threshold for open and young forest and will not have any direct or indirect effects on watershed health, both inside and outside the BWCAW. The largest increase in open and young forest occurs in the South Kawishiwi River (Upper) watershed; from and existing seven percent to a proposed 17% open and young forest. The largest open and young percentage of any watershed analyzed is 23% (Bear Island River, Lower). Positive effects to aquatic resources are anticipated regarding the number of road crossings within the project area; this is based on the proposed improvements to three existing crossings offsetting the addition of two new road crossings. The new road crossings will follow Forest Plan direction for providing stream simulation through the crossing as well as aquatic organism passage. The three stream crossing improvements will provide benefits to aquatic organism passage and water quality by reducing the potential for passage barriers and impacts to aquatic habitat.

#### **3.14.5.2 Cumulative Effects**

Assuming that the construction and maintenance of roads on non-Forest Service lands will generally follow at the same rate as roads on Forest Service lands, cumulative effects would be minimized and insignificant when designs and strategies for maintaining stream integrity at road crossings are used. These types of practices on non-forest roads are unlikely to approach any thresholds producing negative cumulative effects on streams. The sixty percent threshold for open and young forest will not be met or exceeded if land use and forestry practices continue at the same level with other entities within the Glacier Project Area, especially considering the efforts of the current proposal to promote long-lived species and extended rotation in and near riparian areas. This combined with the fact that much of the project area watersheds contain a large proportion of wetland, water, and wilderness area, will produce no cumulative effects for any of the action alternatives whether inside or outside the BWCAW.

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