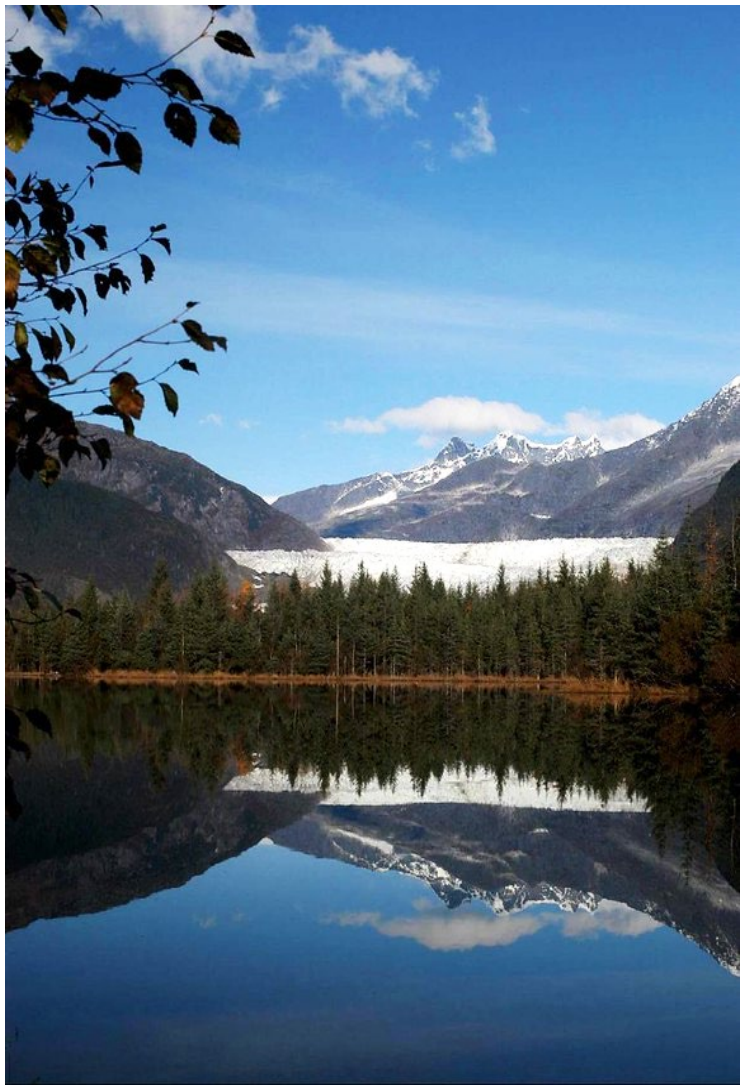
United States Department of Agriculture

Draft Watershed Condition and Water Resource Assessment

Tongass National Forest Plan Revision



Forest Service | Alaska Region | Tongass National Forest | December 2024

Draft Watershed Condition and Water Resource Assessment

Tongass National Forest Plan Revision

Forest Service, Alaska Region

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Introduction

This section identifies and evaluates existing, available, and relevant information (36 CFR 219.6(b)) on watershed conditions and water resources in the plan area. The Tongass National Forest includes a large archipelago (~1,100 islands) and mainland of southeast Alaska. The Tongass has varied topography (0 to over 16,000 feet in elevation), water resources, and stream types and sizes. The maritime climate moderates seasonal temperatures, relative to areas further inland, at this latitude. The storm track and terrain of the region creates high precipitation. On a regional scale, precipitation has historically averaged 106-170 inches, depending on subregion (Littell and Johnson 2024). However, there is wide localized variation, with some sites receiving less than 20 inches, and others receiving an average of over 350 inches of precipitation per year (Alaska Center for Climate Assessment and Policy 2023). Heavy snowfall at higher elevations supports glacier formation, primarily on the colder mainland. Precipitation occurs year-round, with the strongest storms coming in the form of atmospheric rivers, mostly occurring from August through November. About 75 percent of watersheds are dominated by rain or snow runoff, with the others being mixed, glacial melt, or wetland runoff (Flitcroft et al. 2022). The steepness and wet climate results in thousands of perennial watersheds with headwater source areas a relatively short distance to the ocean. As a result, anadromous species thrive in southeast Alaska watersheds.

Spatial variability of precipitation and temperature are expected to increase, causing more rain than snow, leading to increased winter high flow and decreased late summer low flow conditions (Johnson 2024). Where glaciers exist (less than 20 percent of the Tongass National Forest), current melting trends will likely continue, and are expected to result in increased risk of outburst flooding and eventually will lead to changes in channel morphology and streamflow regimes if all the ice has melted in a given watershed (Johnson 2024 and Bellmore et al. 2024). The retreat of glaciers along the coastline is resulting in increased miles of stream. Associated isostatic rebound, caused by the land rising with the loss of the weight of glaciers, may be influencing estuary conditions due to the land rising relative to the ocean. The Aquatic Ecosystems Section contains a more thorough assessment of status, trends, drivers and stressors for glaciers, streams, rivers, lakes and estuaries.

Resource History and Current Management Direction

The current Tongass Land Management Plan (Forest Plan) amended in 2016 includes desired conditions, goals, objectives, and standards and guidelines supporting the maintenance and improvement of watershed conditions and water resources (USDA 2016b). It contains direction that varies based on stream class and process groups. The Forest Plan generally classifies streams as follows:

> Class I: Streams and lakes with anadromous fish (fish that spawn in fresh water and spend a large portion of their life in salt water) or adfluvial fish (fish that spawn in tributary streams where the young rear from 1 to 4 years before migrating to a lake system, where they grow to maturity) or fish habitat, or high-quality resident fish waters or habitat above fish migration barriers known to provide reasonable enhancement opportunities for anadromous fish.
>
> Class II: Streams and lakes with resident fish or fish habitat — generally steep channels 6 to 25 percent or higher gradient — where no anadromous fish occur, and otherwise not meeting Class I criteria.
>
> Class III: Perennial and intermittent streams with no fish populations, but which have sufficient flow, or transport sufficient sediment and debris, to have an immediate influence on downstream water quality or fish habitat capability.

Class IV: Other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capacity to directly influence downstream water quality or fish habitat capability.

The Forest Plan requires watershed analysis before (1) making site-specific adjustments to riparian standards and guidelines, and (2) authorizing management activities in public water system source watersheds. Watershed analysis is otherwise not required but may be conducted at the discretion of the responsible official.

The Tongass Timber Reform Act (16 U.S.C. 539d) prohibits commercial harvest within one hundred feet on each side of all Class I streams, and Class II streams that flow directly into a Class I stream (see Figure 1 for an illustration).

Figure 1. Example of Tongass Timber Reform Act buffers applied to a timber sale. The greener, treed areas around the lakes and stream channels show where the trees were not harvested, in order to provide the required buffers. The lighter brown areas show where trees were harvested. Photo credit to Emil Tucker.

Existing riparian management area standards and guidelines use channel types and process groups to guide land management activities and predict the effects of those activities along streams and rivers. Fifty channel types are grouped into nine stream process groups. Over 60 percent of the mapped stream miles are within the high gradient contained process group (USDA 2016b). Figure 2 shows the typical distribution of process groups. Photos of select process groups are shown in Figure 3.

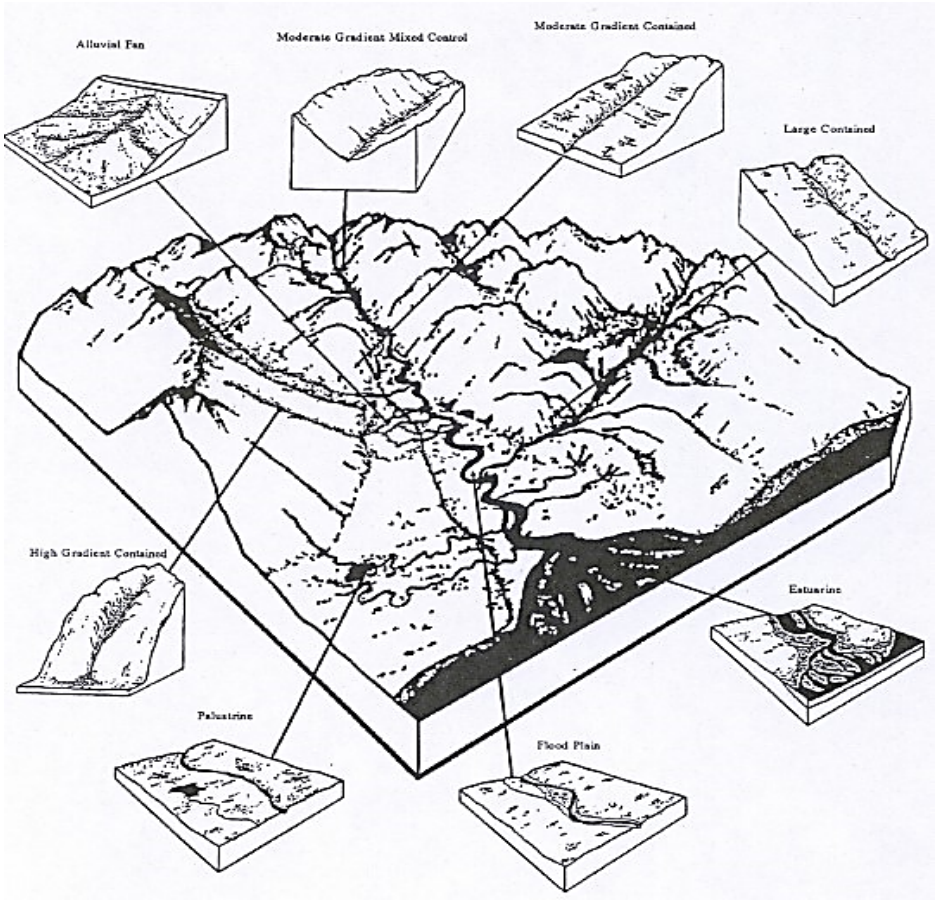

Figure 2. Typical distribution of process groups within watersheds of the Tongass National Forest. This image was copied from Appendix D of the 2016 amended Forest Plan (USDA 2016b).

Figure 3. Photo collage of a selection of process groups. Upper left - high gradient contained process group. Upper right - moderate gradient mixed control process group. Middle left - floodplain process group. Lower - estuarine process group. Photo credit to Emil Tucker.

A unique feature of watershed hydrology in the Tongass National Forest is the relatively large amount of karst landscape covering about 423,000 acres. Karst is assigned a low, moderate, or high vulnerability rating based on resource damage risk. Sinkholes, collapse features, and sinking or losing streams on moderate and high vulnerability karst are protected by standards and guidelines. High vulnerability karst

is unsuitable for commercial timber production. Management strategies for allogenic (runoff entering a karst system from non-karst areas upslope) versus autogenic (precipitation falling directly onto the karts system) recharge areas are important to protect water quality and need further research and guidance (USDA 2016b). The Aquatic Ecosystems and Geology and Geologic Hazard sections contain a more thorough assessment of karst ecosystems.

The Forest Plan includes standards and guidelines and directs that best management and soil conservation practices to projects will be applied to maintain water quality consistent with Alaska Water Quality Standards (18 AAC 70) and protect public drinking water source watersheds under the federal Safe Drinking Water Act (42 U.S.C. 300f *et seq*.) and the Alaska Drinking Water Regulations (18 AAC 80). Activities must not result in pollution or contamination of a public water system. The Forest Plan also includes a municipal watershed Land Use Designation (LUD), areas which are maintained in a near natural condition, are unsuitable for timber harvest, with activities limited to protection and maintenance of natural resources. Consultation with Alaska Department of Environmental Conservation and affected municipalities is required before authorizing activities that are likely to cause pollution.

The 2016 Forest Plan amendment identified 77 high value salmon and trout watersheds (Public Law 113-291 reduced the number to 73) needing additional conservations measures (USDA 2016b). These watersheds emerged from extensive research over 5 years from a team of scientists including Audubon Alaska and The Nature Conservancy (Albert and Schoen 2007, and Smith 2016). The 2016 amendment made these watersheds unsuitable for old growth timber harvest and provided expectations that within 5 years the Forest Service would conduct a collaborative scientific review to determine impacts to fish from young-growth harvest in these watersheds. Results of the scientific review found that young-growth commercial harvest has yet occur in these watersheds and is not projected to occur until 2030 (TNF 2021).

The forest plan monitoring program was also revised in 2016 to be compliant with the 2012 planning rule. Relevant forest plan monitoring questions for watershed condition and water resources (36 CFR 219.12 (a)(5)), include:

> (i) The status of select watershed conditions, Question 21: What are the ecological conditions and trends of key characteristics of watershed health identified in the desired condition of the plan area?
>
> (ii) The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems, Question 12: Is the natural range and frequency of aquatic habitat conditions maintained?

All biennial forest plan monitoring reports since the 2016 amendment found that watershed conditions and aquatic ecosystems are being supported under current forest plan direction (USDA 2019, USDA 2021, USDA 2022a, USDA 2024). Recent biennial monitoring reports recommended actions such as continued monitoring of new culverts, when to sample for the presence of aquatic species, providing training, and collaborating with interdisciplinary teams (USDA 2022a).

Scope and Scale of Assessment

The primary sources of available, relevant information (36 CFR 219.6(a)(1)) for this assessment include a variety of reports and datasets produced by state and federal agencies. These sources, along with peer reviewed literature, are considered best available scientific information for this topic. Relevant information sources are collected and summarized at a variety of scales: forest, subbasin, watershed, subwatershed, and stream reach. The terms subbasin, watershed, and subwatershed describe successively smaller hydrologic units. Subbasins are greater than 450,000 acres, watersheds are about 250,000 to 40,000 acres, and subwatersheds are typically 40,000 to 10,000 acres. In some cases the terms “watershed

condition" or "priority watershed" are used even though scale is at the subwatershed level. Temporal scales are dependent on the length of monitoring program or procedures used. Spatial and temporal scales are described in each section below.

Watershed Condition

The Watershed Condition Framework is a comprehensive approach for restoration of priority watersheds in national forests (USDA 2011a). The Tongass National Forest completed a watershed condition framework analysis in 2010, 2015 and 2020, and the results are used in the assessment to summarize forest-wide watershed condition.

The Watershed Condition Framework classifies all subwatershed conditions, using a comprehensive set of 12 indicators representing the underlying ecological, hydrological, and geomorphic processes. Each indicator is evaluated using a defined set of attributes and receives a condition score rated as good, fair or poor according to criteria in the watershed condition classification guide (USDA 2011b). The overall watershed condition score is a weighted average of four process category scores (thirty percent each for aquatic physical, aquatic biological, and terrestrial physical, and ten percent for terrestrial biological). Each subwatershed is then assigned these scores to result in an overall functional rating (Functioning Properly (1.0 to 1.6), Functioning at Risk (1.7 to 2.2), or Impaired Function (2.3 to 3.0)).

The Tongass National Forest modified the rating criteria for some of the Watershed Condition Framework indicators, most notably aquatic habitat, riparian and wetland vegetation, and roads. Aquatic habitat condition ratings consider relative percent of habitat disconnected by artificial blockages, and relative percent of riparian area harvest adjacent to floodplains, alluvial fans and moderate mixed control process groups. These process groups tend to be more sensitive to the impact of riparian area harvest and contain high quality fish habitat (Bryant et al. 2004, Moore et al. 2024, and Ross et al. 2019). Habitat disconnection by artificial blockage is primarily due to roads, culverts, and dams. Riparian and wetland vegetation condition ratings consider relative percent of both harvest and roads in riparian area for all process groups. Road condition ratings consider watershed-level open road density, proximity to water, mass-wasting risk, and best management practice compliance.

The Watershed Condition Framework also designates priority watersheds using an interdisciplinary team process. Watershed restoration action plans are developed to identify essential projects to maintain or move priority watersheds towards properly functioning conditions. Trends in watershed conditions also considered the number of watershed restoration action plans and essential projects completed since 2010 and those planned for completion in the immediate future. The Watershed Condition Framework map viewer is a publicly accessible website linked to source data maintained in the watershed classification and assessment tracking Tool (WCATT) and is refreshed daily. This assessment used data pulled from WCATT on October 23, 2024. The Watershed Condition Framework program expects watershed conditions be reviewed and updated every 5 years (USDA 2011b). Annual adjustments to watershed conditions may occur as watershed improvements projects are completed. Trends in watershed conditions were assessed by comparing results of each of the Tongass National Forest's 5-year periodic assessment: 2010, 2015, and 2020.

Watershed Restoration

The watershed improvement tracking (WIT) database was used to assess trends in watershed restoration projects completed at the forest level since 1999. Activity classes considered include aquatic, riparian, and roads. Aquatic activities were summarized by miles improved per year. Riparian activities were

summarized by acres improved per year. Road activities were summarized by sites (primarily stream crossings) improved per year. This assessment used data pulled from WIT on August 2, 2024.

Water Quality

Water quality status was assessed using Alaska Department of Environmental Conservation 2022 integrated report (ADEC 2022a). The Draft 2024 report was also considered and will update the 2022 integrated report when finalized (ADEC 2024). The Clean Water Act (CWA) requires states to prepare water quality assessment reports every 2 years, including status (CWA Section 305(b)) and a list of impaired waterbodies (CWA Section 303(d)). The 305(b) report includes the following status categories:

Categories 1 and 2: Waters for which there is enough information to determine that water quality standards are attained for all or some of their designated uses.

Category 3: Waters for which there is not enough information to determine their status.

Category 4: Waters that are impaired but have one of several different types of waterbody recovery plans.

Category 5: Waters that are impaired and do not yet have waterbody recovery plans. Also known as 303(d) list impaired waters.

The Alaska Department of Environmental Conservation (ADEC) depends on a variety of random and non-random data sources from a diverse group of partners to determine if beneficial uses of water are being supported (ADEC 2021). However, poor accessibility in southeast Alaska results in low numbers of monitoring sites relative to the number of waterbodies (ADEC 2017, 2018, and 2019). Unfortunately, ADEC doesn't complete a statistical trend analysis between 2-year reporting cycles. Therefore, this section assessed water quality trends by comparing 305(b) reports and 303(d) lists prepared since 2014.

Best Management Practices Monitoring

The National Core Best Management Practices (BMPs) program consists of four components: 1) National Core BMPs, 2) standardized monitoring protocols, 3) national directives, and 4) a data management structure (USDA 2012). The National Core BMPs focus on "what to do", not "how to do it". Guidance is provided for 11 resource categories, such as vegetation management, recreation, and roads. Best management practice prescriptions are developed on a project-by-project, site-specific basis. The Alaska Region has best management practices (USDA 2006) to meet agreements with the state regarding clean water act compliance, which the Tongass applies to site-specific projects. However, the national BMP monitoring program is used for official reporting.

The national BMP monitoring protocol assesses a random selection of completed projects on an annual basis to determine if BMPs were implemented and are effective. Implementation ratings are based on the degree to which BMPs are included in project planning documents, cross walked to contracts or agreements, implemented during the project, and when needed corrective actions were identified and implemented. Effectiveness ratings are based on the degree to which waterbodies were protected from actual or potential pollutant discharges, or other adverse effects to water quality. The composite rating is determined using a matrix of implementation and effectiveness ratings for each project category. The composite rating was assessed over the last 10 years to determine trends in BMP compliance. Table 1 displays the composite rating matrix.

Table 1. Best Management Practices monitoring composite rating matrix.

	Fully Implemented	Mostly Implemented	Marginally Implemented	Not Implemented	No BMPs
Effective	Excellent	Excellent	Good	Good	No Plan
Mostly Effective	Good	Good	Fair	Fair	No plan
Marginally Effective	Fair	Fair	Poor	Poor	No plan
Not Effective	Poor	Poor	Poor	Poor	No plan

Water Resources (Water Use)

The United States Geologic Survey has produced water use estimates every 5 years since 1950. The 2015 USGS water uses report (Dieter et al. 2018) and data are the most recent comprehensive estimates available to assess status and trends. Water use estimates include both ground and surface waters for a variety of uses, including public, domestic, commercial, industrial, mining, aquaculture, and hydroelectric. Some counties, cities, boroughs, or census areas in southeast Alaska do not have estimates prior to 2010 while others go back to 1985. Even though these estimates include off forest diversions, the national forest encompasses most water source areas in southeast Alaska.

Status and Trends

Watershed Condition

The Tongass National Forest encompasses 921 subwatersheds; all are considered properly functioning under the Watershed Condition Framework classification process. Even though all subwatersheds are within the properly functioning condition category, some subwatersheds are bordering on functioning at risk (Figure 4 and Figure 5). Those subwatersheds with decreased function have some of the 12 indicators rated as fair or poor. Indicators for which the most subwatersheds are rated as fair or poor, from greatest to least, are aquatic habitat condition (Figure 6), riparian and wetland vegetation condition (Figure 7), water quantity (Figure 8), and roads and trails condition (Figure 9). Two to three subwatersheds have fair ratings for the water quality, soils, and forest health indicators. Indicators for aquatic biota, fire effects/fire regime, forest cover, terrestrial invasive species, and rangeland vegetation are rated good for all subwatersheds.

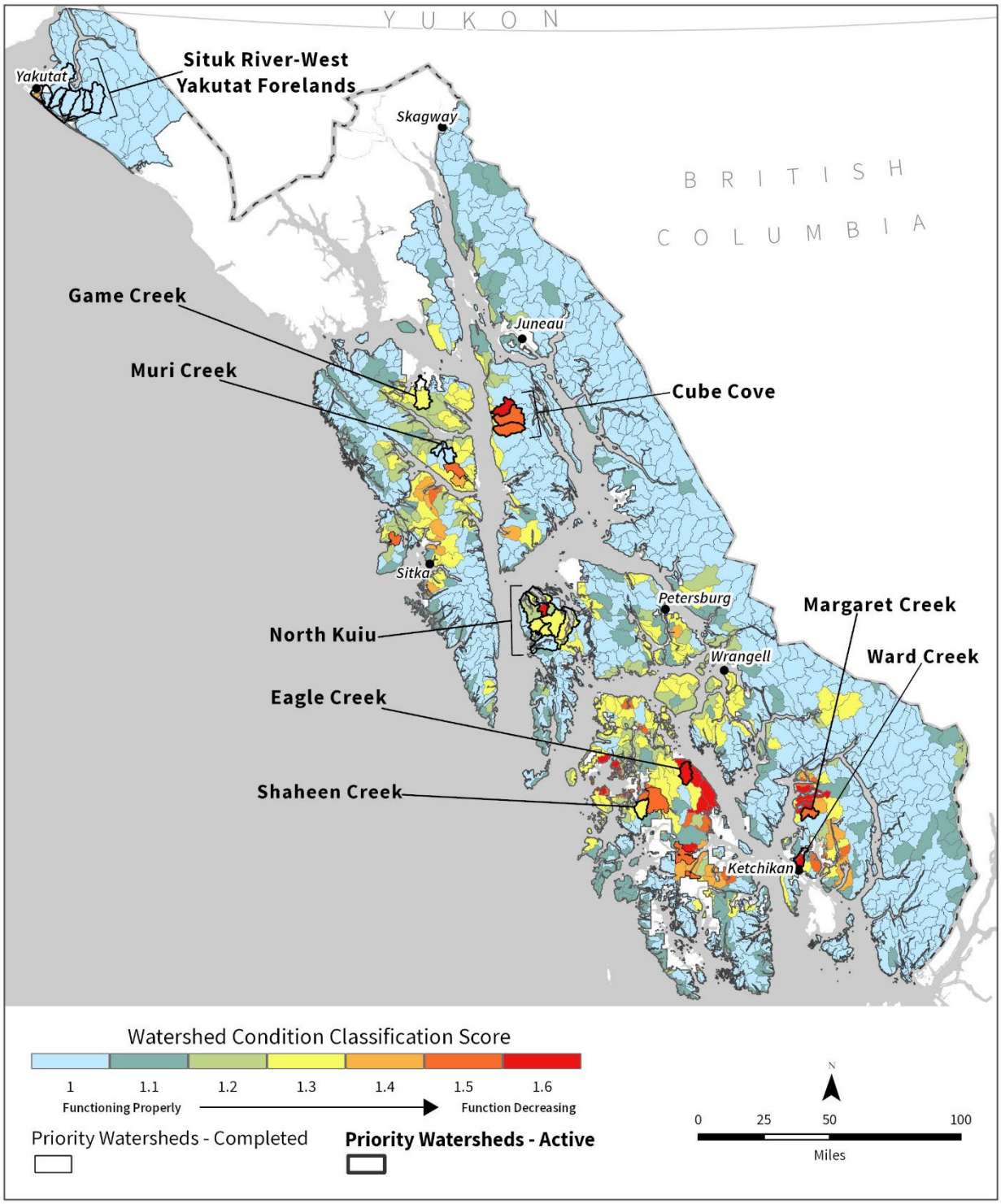

Figure 4. Map of watershed condition classification scores and priority watersheds on the Tongass National Forest. Active priority watersheds are labelled.

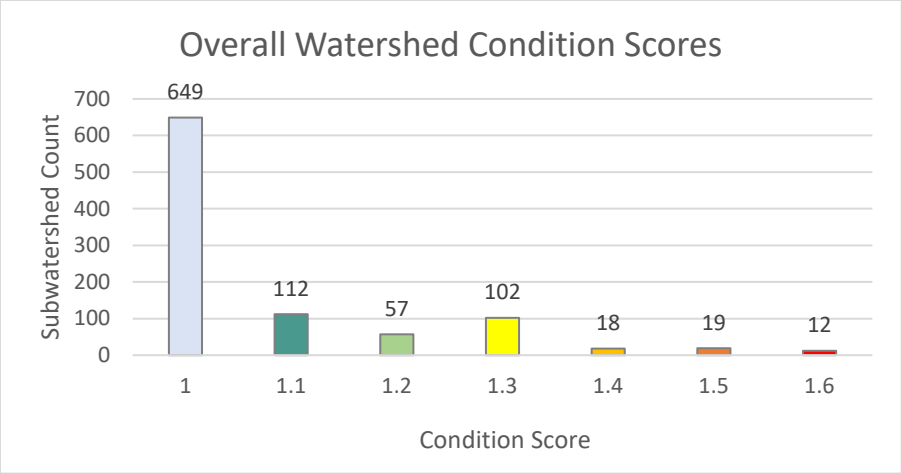

Figure 5. Bar chart showing the distribution of watershed condition scores as illustrated in Figure 4. A rating of 1.0-1.6 is considered properly functioning, a rating of 1.7-2.2 is considered functional at-risk, and watershed rated 2.3-3.0 are considered to have impaired function.

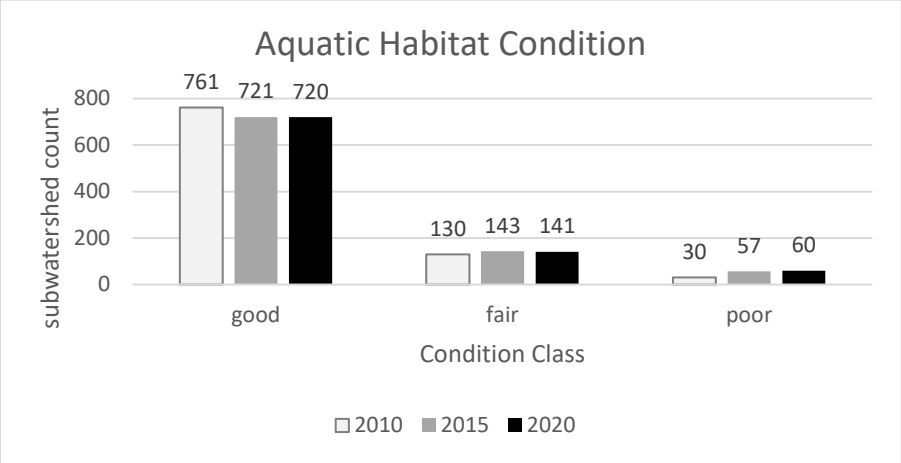

Figure 6. Aquatic habitat condition class trends from Watershed Condition Framework process across three assessment periods.

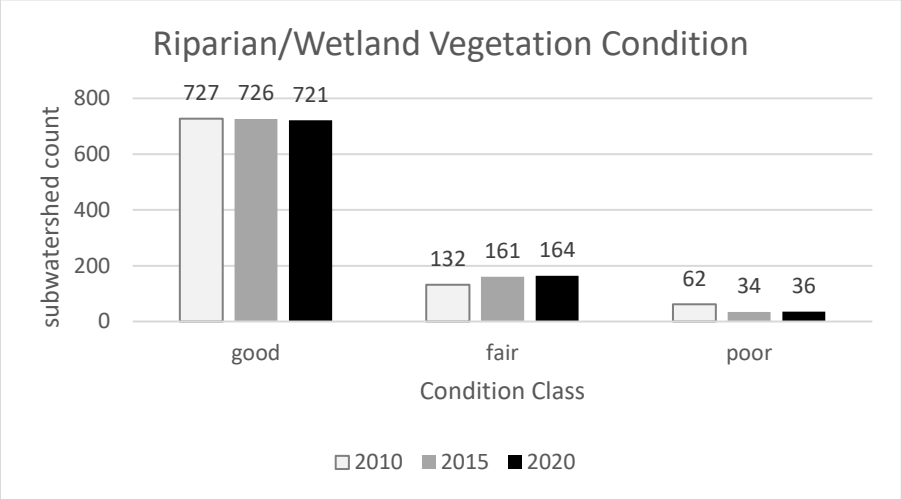

Figure 7. Riparian and wetland vegetation condition class trends from Watershed Condition Framework process across three assessment periods.

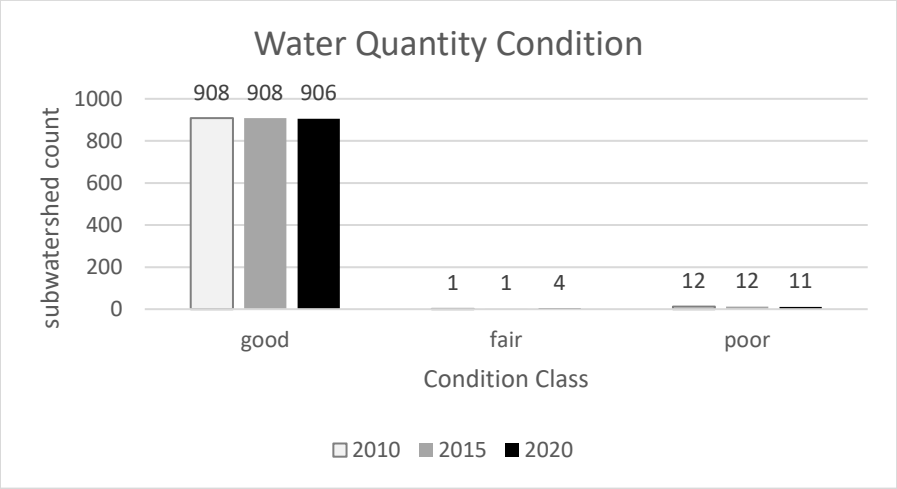

Figure 8. Water quantity condition class trends from Watershed Condition Framework process across three assessment periods.

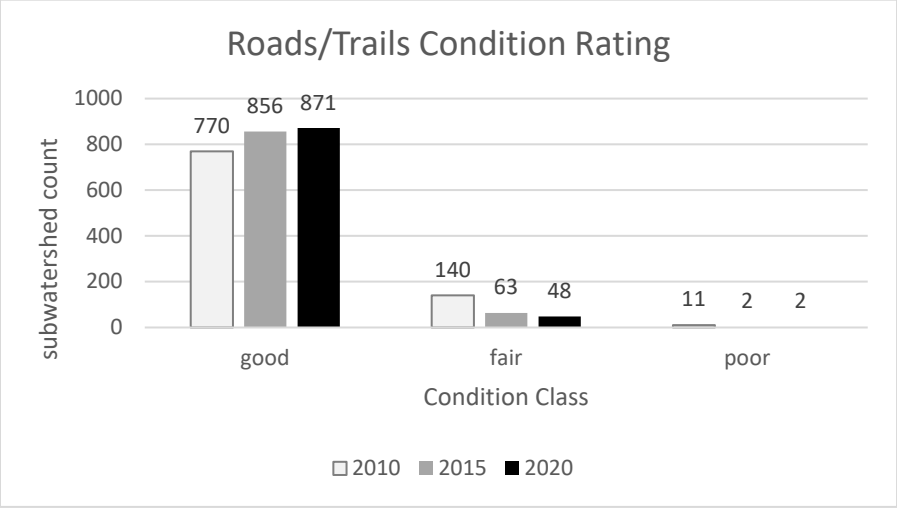

Figure 9. Roads and trails condition class trends from Watershed Condition Framework process across three assessment periods.

Since the inception of the Watershed Condition Framework in 2010, the condition of subwatersheds on the Tongass have shown some declines in function and some increases in function depending on the indicator. Aquatic habitat conditions have declined in 41 subwatersheds, mostly due to land exchanges in which the Tongass provided land with higher aquatic conditions, and received land with lower aquatic habitat conditions (Figure 6). Riparian and wetland vegetation conditions have declined in 6 subwatersheds, while 26 subwatersheds have improved from poor condition (Figure 7). Water quantity conditions have remained relatively stable with two subwatersheds declining and one improving (Figure 8). In contrast, road and trail conditions have improved in 101 subwatersheds (Figure 9). Road stream crossing improvements, fish passage restoration, and road decommissioning have improved watershed conditions in some areas; land acquisition and mining activities have resulted in declined watershed conditions in other locations (USDA 2022b). Condition ratings were also affected by improved stream network and topographic mapping, increasing or decreasing stream length and adjusting spatial location (USDA 2022b).

As of 2016 about 5 percent of all riparian forest in the Tongass National Forest had been harvested (USDA 2016a). About 40 percent of all riparian harvest occurred within the most sensitive process groups: floodplains, alluvial fans, and moderate mixed control. Most riparian harvest took place prior to the 1990 Tongass Timber Reform Act (TTRA) buffer requirements. Riparian harvest become less than 200 acres per year through 2008, and declined again after the 2008 Forest Plan Amendment, to about 34 acres per year, on average. The 2016 amendment projected timber harvest in riparian areas to be about 10 acres per year, but the actual harvest has been even less than that.

Road densities on the Tongass are very low. About 90 percent of watersheds on the Tongass have road densities less than one road mile per square mile, many of those having no roads at all. Road density on adjacent non-Forest Service land is higher than on the National Forest, averaging 2.3 miles per square mile as of 2016 (USDA 2016a). In watersheds with mixed ownership, average road density lies somewhere in between. Recent land exchanges since the 2016 amendment may have increased road density in mixed ownership watersheds where more lands were disposed versus acquired. About 20 miles of new road construction and reconstruction per year was projected to occur into the foreseeable future, with about 10 percent (2 miles per year) occurring in riparian areas (2016a). However, since 2016, actual new road construction (both temporary and permanent), ranged from 0-3.4 miles, so was less than predicted.

Both timber harvest and roads can affect streamflows relative to the proportion of a watershed harvested (Moore and Wondzell 2007 and Grant et al. 2008). The Watershed Condition Framework water quantity condition indicator is related to dams and diversions (USDA 2011b), therefore the forest cover and roads indicator is more relevant in terms of forest management affecting streamflow. All forest cover indicators are properly functioning, meaning less than 5 percent of a given watershed has been cleared of forest cover (USDA 2011b). This amount of forest harvesting is not enough to contribute a measurable change in streamflow at the watershed scale (Moore and Wondzell 2007 and Grant et al. 2008). There can be effects at a smaller spatial scale within watersheds where harvesting and roads are concentrated. Further, recent studies found that watersheds at higher latitudes, including southeast Alaska had greater increases in peakflows in response to harvesting (Naman et al. 2024). Therefore, streamflows could be altered in 50 watersheds that have the highest percent area harvested coupled with moderate to high road densities.

The Terrestrial and Aquatic Ecosystem sections include more details on status and trends of aquatic, riparian and wetland ecosystems in the Tongass National Forest.

Watershed Restoration

The Tongass National Forest has completed six priority watershed restoration action plans (WRAPs), since the inception of the Watershed Condition Framework in 2011 (Figure 10). A total of 21 essential projects were completed under these WRAPs. The Tongass has completed the second highest number of WRAPs of all National Forests, as reported in the 10-year Watershed Condition Framework progress report (Wait and Pak 2022). Two of these WRAPS, Sitkoh Creek and Sitkoh River, are within the Tongass 77 Watershed network (Smith 2016). There are two WRAPs with a total of nine essential projects pending completion in 2024. Three WRAPs with a total of 10 essential projects are planned for completion in fiscal years 2025 and 2026. New priority watersheds include Cube Cove, Game Creek, Muri Creek, North Kuiu Island, Situk River-West Yakutat Forelands, and Ward Creek. New priority watersheds overlap the Tongass 77 Watersheds, specifically North Kuiu Island and Situk River-West Yakutat Forelands.

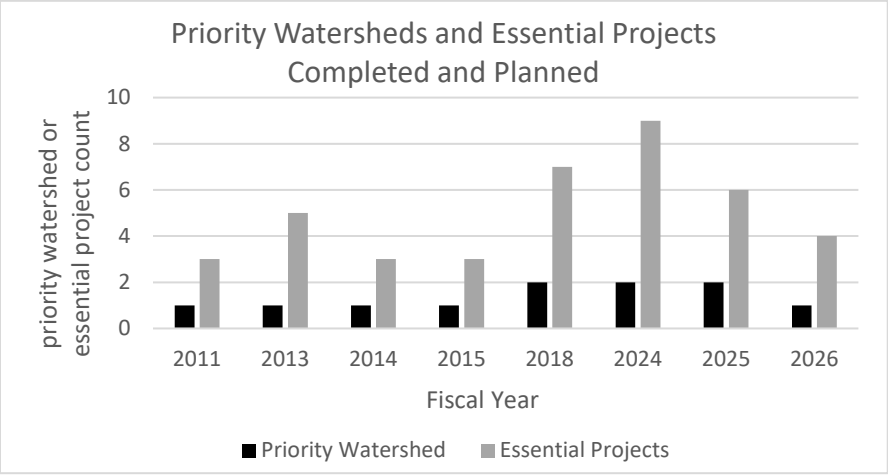

Figure 10. Priority watersheds and essential projects completed and planned since 2011.

The Watershed Improvement Tracking (WIT) database includes aquatic, riparian, and road improvement projects both within and outside of priority watersheds. Nearly 80 miles of stream restoration has occurred on the Tongass National Forest since 1999 at an average of 3 miles per year (Figure 11). Since 2017, the annual average has declined to 1.5 miles. This decline is due to completing the highest priority projects initially resulting in fewer miles completed in recent years. Most aquatic restoration projects focused on increasing large wood in the channel (73 percent), with the remainder focused on stream channel reconnection, modification, reconstruction, and stabilization projects. Figure 12 is a photo collage of aquatic habitat improvement projects.

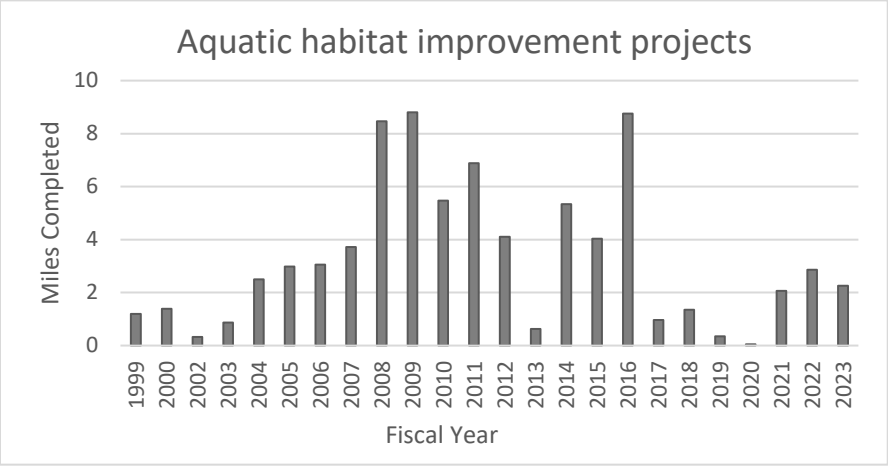

Figure 11. Miles of aquatic habitat improvement projects completed since 1999 from the Watershed Improvement Tracking database.

Figure 12. Photo collage of aquatic habitat improvement projects. Upper left: hand crew working on stream restoration in Sprout Creek of the Magaret Creek priority watershed. Upper right: completed hand crew stream restoration in Last Chance Creek. Middle right: excavator working on stream restoration in the Margaret Creek priority watershed. Bottom: completed stream restoration work in the Margaret Creek priority watershed. Photo credit Jonathan Hyde.

Almost 4,400 acres of riparian vegetation restoration treatments have occurred on the Tongass National Forest since 1999. The forest averaged 220 acres of riparian vegetation treatments per year since 1999 (Figure 13), with a decline to an average of 20 acres per year since 2017. All riparian vegetation treatments focused on thinning of young-growth stands.

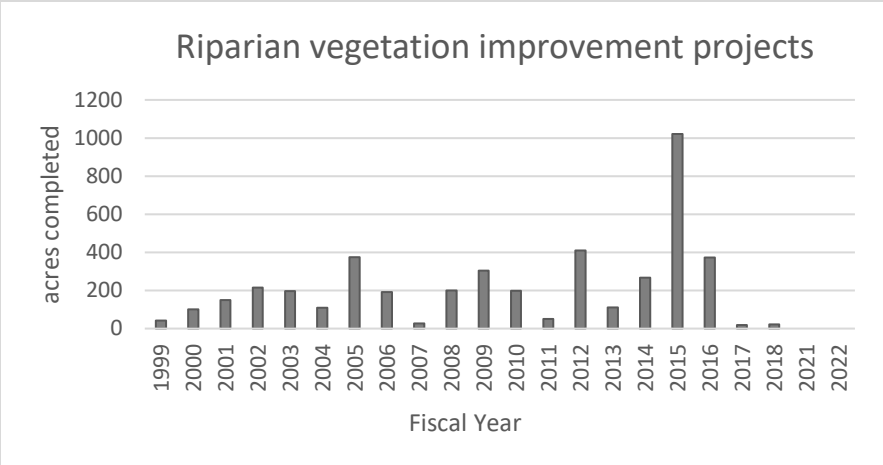

Figure 13. Acres of riparian vegetation improvement projects completed since 1999 (Source: Forest Service Watershed Improvement Tracking database).

Over 28,000 road stream crossings have been inventoried on the Tongass National Forest. About half of the stream crossings (~14,000) have fish habitat present. Twenty-seven percent of the stream crossings (~3,800) with fish habitat present have been evaluated for juvenile fish passage. About sixty percent of the stream crossings (~2,250) evaluated for fish passage were assumed to meet juvenile fish passage requirements. Stream crossing attributes affecting juvenile fish passage include debris blockage, outlet perch, culvert gradient, and stream constriction.

Almost 1,100 stream crossings on the Tongass National Forest have been treated to improve aquatic and watershed function since 1999. Most stream crossings treated were associated with aquatic fish passage (91 percent), with the remainder being non-fish related. The forest treated an average of 41 road stream crossing per year since 1999 (Figure 14). The recent decline since 2017, in treating an average of 25 stream crossings per year, follows the trend in fewer aquatic and riparian restoration projects.

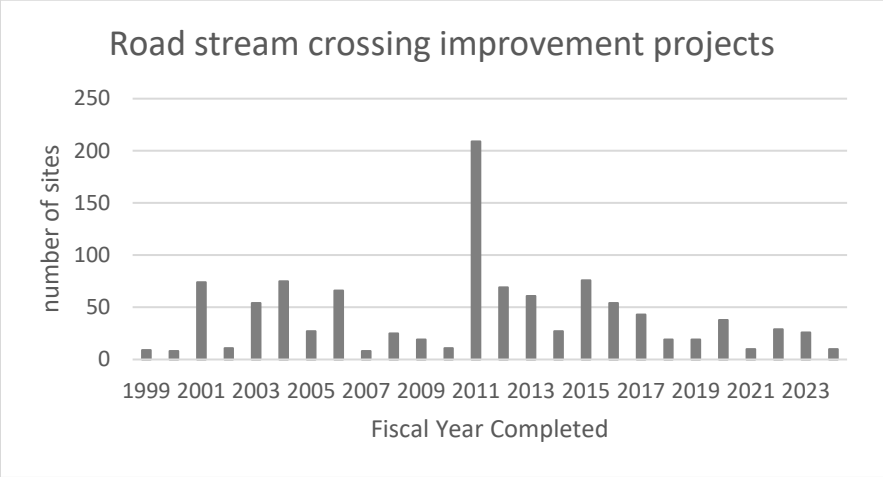

Figure 14. Number of road stream crossing (both fish and non-fish related) completed since 1999 (Source: Forest Service Watershed Improvement Tracking database).

Water Quality

Water quality on the Tongass National Forest is mostly unimpaired, with less than 10 miles of streams and very few lakes and bays considered impaired (ADEC 2022a). However, many waterbodies have not been formally assessed or lack enough data to be formally assessed. Table 2 summarizes the spatial extent of waterbodies assessed by 305(b) status category in Southeast Alaska.

Eight streams in the Southeast Alaska Region are impaired (only two are on National Forest Service (NFS) lands; Katlian River and Tributary Creek/Greens Creek), and all but one has a recovery plan in place. Mining, silviculture, and urban runoff issues (development, highways, or landfills) are the primary reasons for stream impairment. Thirteen beaches adjacent to NFS lands are impaired from enterococcus and fecal coliform, all due to septic systems. Ten marine environments (bays, coves, harbors, and inlets) are impaired with recovery plans due to heavy metal leaching from mining tailings, historic petroleum spills and current refinery operations, various industrial point sources, and pulp mill debris deposits. Thorne Bay and Salt Chuck Bay are the two impaired marine environments that intersect a total of 4 acres of NFS lands.

Comparing integrated reports back to 2014, only one stream moved from category 3 to 4 due to lead from adjacent mining operations. Air and water quality monitoring analysis suggest that the disposition of fugitive dust from the tailings disposal facility is a potential source contributing to the dissolved lead concentrations observed in that waterbody (ADEC 2022b). In 2014, five streams (tributaries to Sweetwater Lake) previously listed for heavy metals were removed from the 303(d) list. Since 2016 no waterbodies moved from an impaired category to attaining. Although two beaches recently moved from category 3 to 5 - 303(d) list, none of these are on NFS lands. The draft 2024 integrated report isn't proposing substantial changes to water quality determinations in the Tongass region, pertaining to impairment categories 4 and 5 (ADEC 2024).

Table 2. Alaska Department of Environment Conservation 2022 Integrated Water Quality Report 305(b) summary, for waterbodies that intersect the Tongass National Forest. This includes only waterbodies in the Southeast Alaska Region.

Status Category	Streams and Rivers including segments downstream of NFS lands, miles	Streams and Rivers clipped to Forest boundary, miles	Lake and Bays including open waters extending beyond NFS lands, acres	Lake and Bays clipped to Forest boundary, acres
2	124	97	35	0
3	250	125	3209	7
4	2	1	7	1
5	8	6	16	3

Best Management Practices Monitoring

At the project level, water quality impacts from non-point sources are minimized by prescribing best management practices (BMP). The National Core BMP monitoring program provides a composite rating of BMP evaluations (both effectiveness and implementation). The following chart (Figure 15) illustrates trends in BMP composite ratings since 2015. A total of 81 evaluations were completed from 2015 through 2024, averaging 16 per year. Results since 2015 are mixed with project categories scoring fair to poor including facilities, recreation, roads, vegetation management, and water use. However, fair to poor ratings account for less than 27 percent of all ratings. Not all projects in those categories were rated fair or poor. Good to excellent ratings have equaled or exceeded 75 percent with a slight dip to 54 percent during the 2019/2020 reporting cycle. However, the most recent biennial report shows improving trends in BMP effectiveness and implementation with 75 percent of evaluations receiving an excellent composite rating.

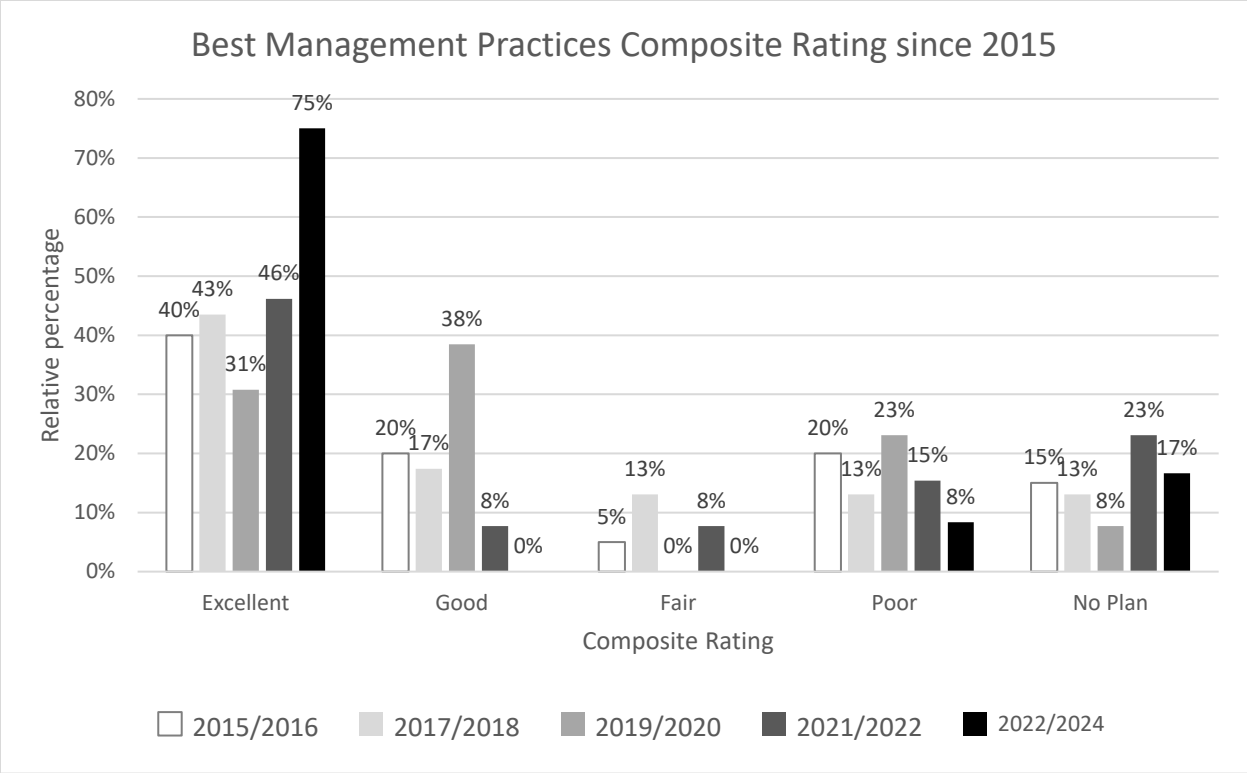

Figure 15. Best Management Practices Monitoring composite ratings from 2015 through 2024.

Water Resources (Water Use)

Alaska is the 5th largest user of water for both aquaculture and mining in the United States (Dieter et al. 2018). Saline water use in Alaska ranks second in the USA for mining operations (Dieter et al. 2018). Other major categories of water use such as irrigation, industrial, and thermoelectric power are much lower in Alaska than the rest of the United States.

Aquaculture is by far the highest use of water in southeast Alaska, for both ground and surface water (Figure 16 and Figure 18). Only aquatic plants and shellfish are grown for aquaculture in Alaska (NOAA 2024) with freshwater primarily used for operations and processing of harvested materials. The aquaculture category also includes fish hatchery operations although most of the water is diverted through raceways and returned to the source after use. Trends in total surface water use has recently declined due to aquaculture (Figure 16). Without aquaculture, trends in surface water use are increasing primarily due to mining (Figure 17). Groundwater use has recently seen a decline primarily due to aquaculture and industrial use (Figure 18 and Figure 19) which contrasts with the rest of the United States.

Public supply is the second greatest water use in southeast Alaska, for both ground and surface water. The total population served by public water services has increased from about 43,000 to 62,800, between 1985 and 2015. The percentage of the total population served by public supply has increased from about 64 to 87 percent, between 1985 and 2015.

Municipal watersheds supply water to the following incorporated cities and boroughs: Ketchikan, Petersburg, Sitka, Juneau, Wrangell, Kake, Klawock, Craig, and Hydaburg. The source watersheds for these communities are within the municipal watershed Land Use Designation (LUD) of the Forest Plan. The Petersburg Watershed is also protected by USDA Forest Service Land Uses, subpart A Miscellaneous

Land Uses (36 CFR 251.35). Ketchikan, Petersburg, and Sitka are the only congressionally designated municipal watersheds (USDA 2016a).

Forest Service source watersheds include both municipal and other subwatersheds where at least 10 percent of a population is served by public water systems identified by the Alaska Department of Environmental Conservation and the Environmental Protection Agency. The Tongass National Forest includes 79 Forest Service source watersheds totaling about 1.18 million acres, much larger than the municipal watershed LUD totaling about 45,000 acres. However, these source watersheds include all subwatersheds intersecting any source protection area resulting in much larger spatial coverage. Further refinements are needed to delineate the actual catchment area needing protection. Figure 20 displays the Forest Service source watersheds clipped to the Tongass National Forest boundary and the municipal watershed LUD.

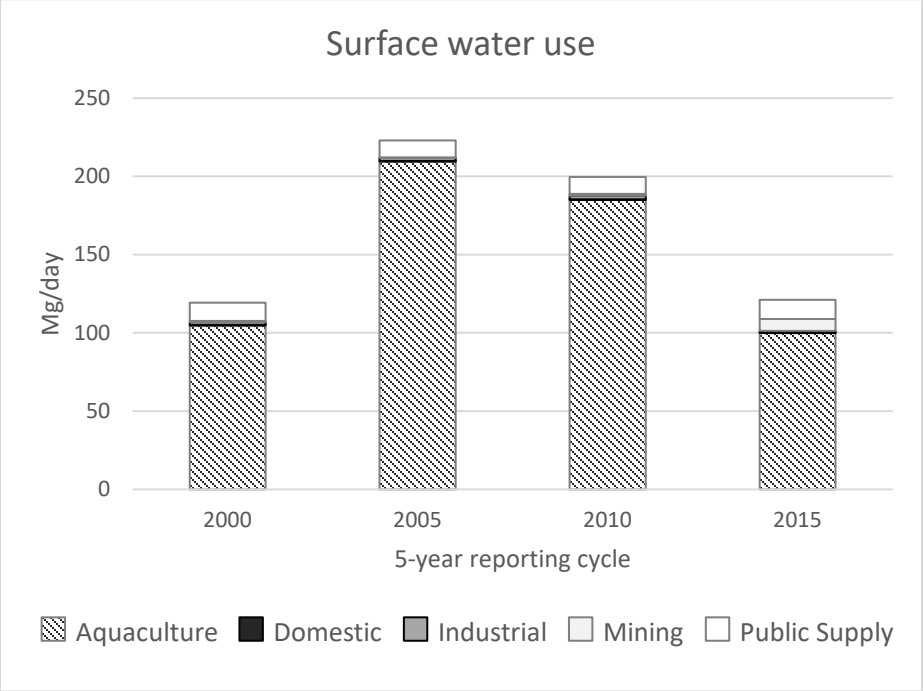

Figure 16. USGS water use estimates for major surface water uses from 2000 to 2015.

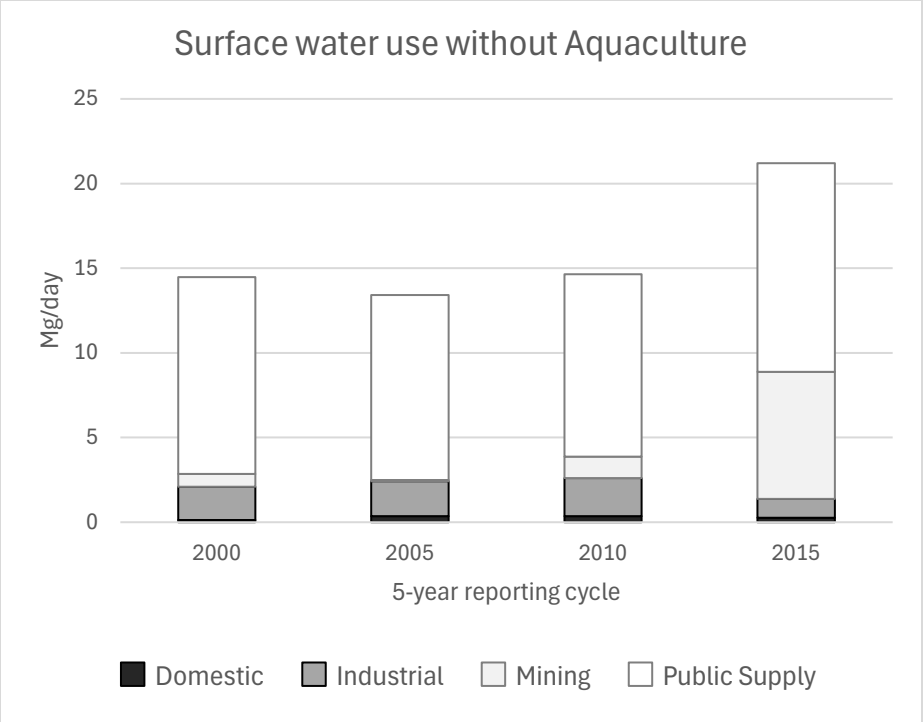

Figure 17. USGS water use estimates for major surface water uses from 2000 to 2015 without aquaculture.

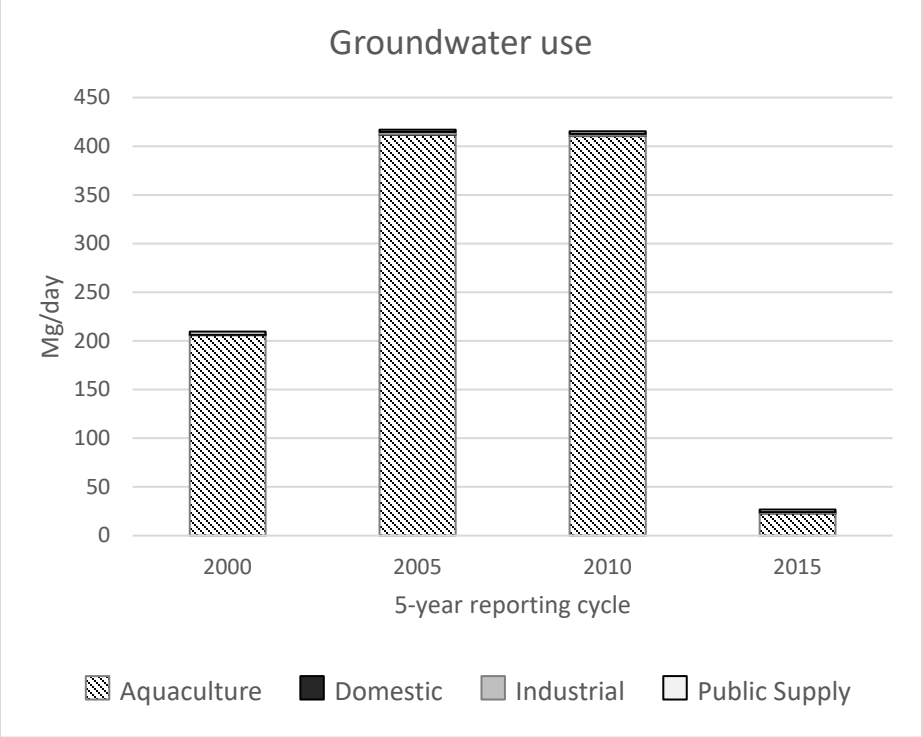

Figure 18. USGS water use estimates for major groundwater water uses from 2000 to 2015, including aquaculture.

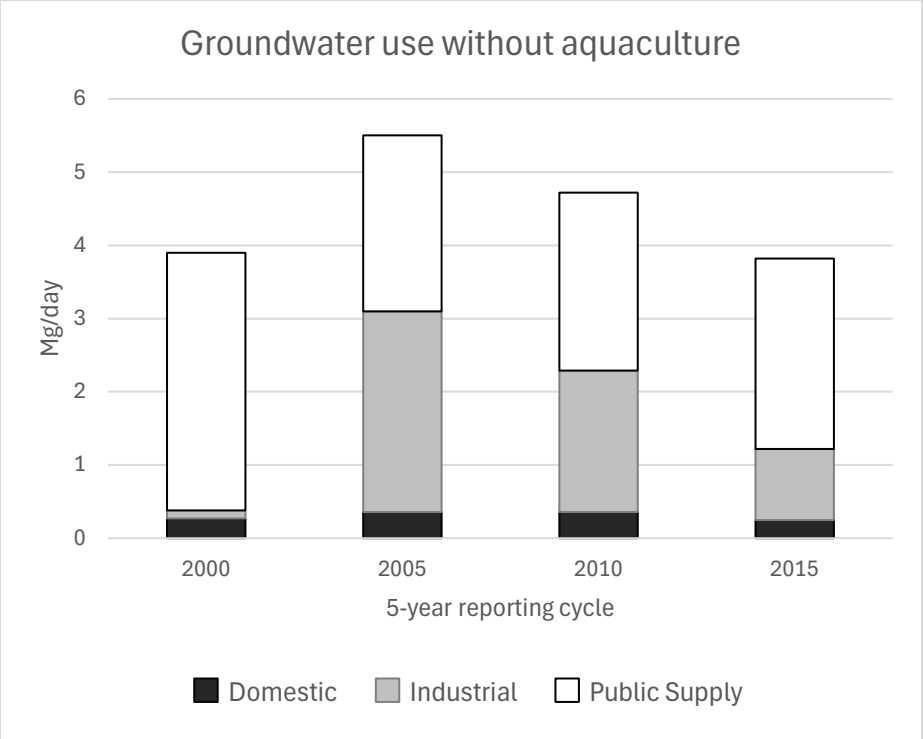

Figure 19. USGS water use estimates for major groundwater water uses from 2000 to 2015 without aquaculture.

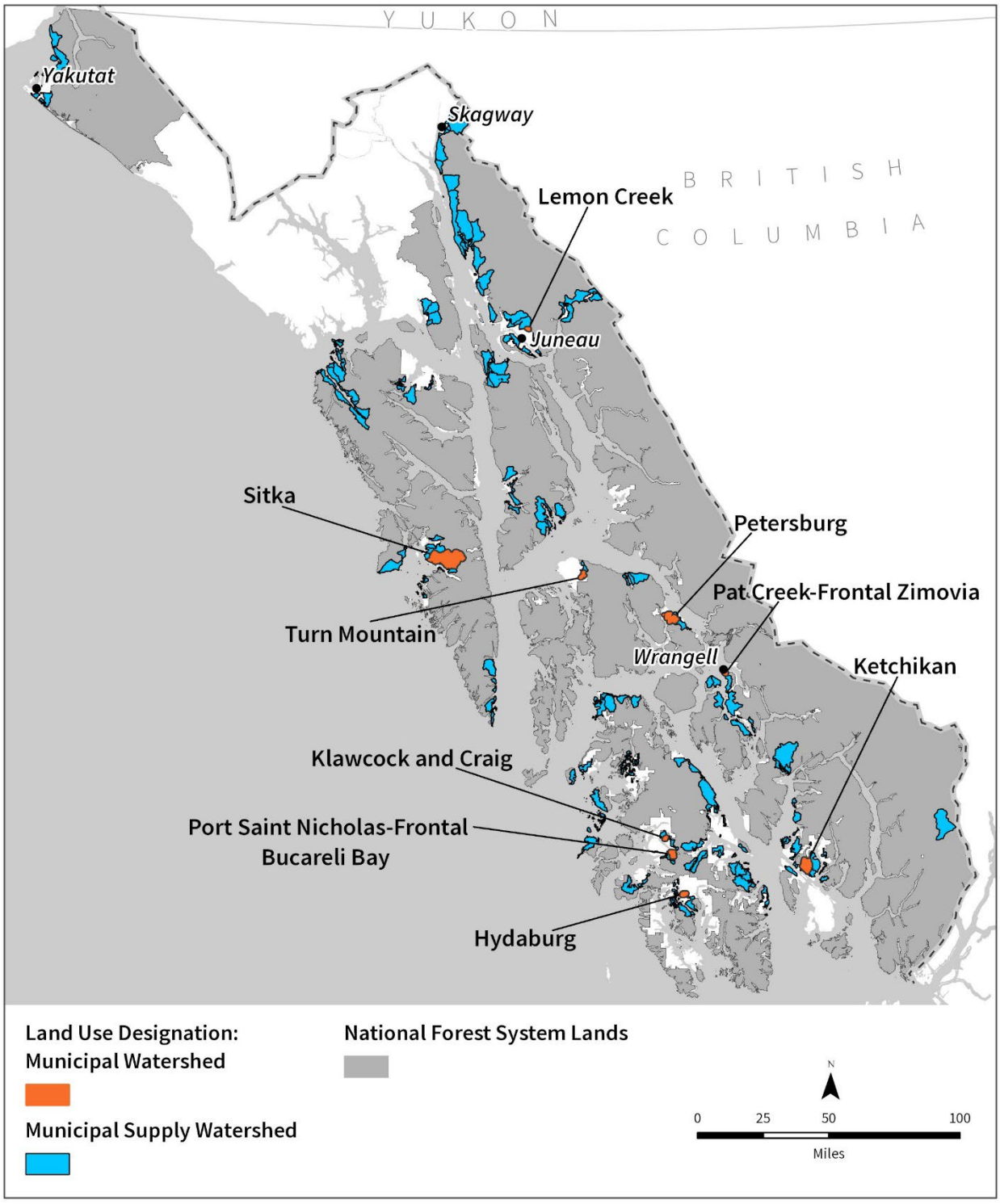

Figure 20. Forest Service source watersheds clipped to the Tongass National Forest and municipal watershed Land Use Designations. Municipal Watershed Land Use Designations are labelled.

Key Takeaways

- All Watersheds are considered properly functioning although some indicators such as aquatic habitat, riparian vegetation, and roads are rated as fair or poor for about 20 percent of watersheds. Overall trends suggest relatively stable to improved watershed conditions except the percentage of watersheds declining in aquatic habitat. Declines are primarily due to acquisition of degraded watersheds.
- Priority watershed restoration plans are being completed at a relatively rapid pace. Restoration actions include aquatic passage improvements, stream channel large wood loading, road storage and decommissioning, and riparian thinning.
- Water quality is attained with a few notable exceptions, at specific locations including mining sites, urban areas, and bays.
- Water use is greatest for aquaculture, public supply, industrial, and mining operations. Low human population densities and extremely high precipitation results in water use having a minor impact at a watershed scale.
- The Forest Service, State, and Environmental Protection Agency have a larger network of source water protection areas than currently included in the municipal watershed Land Use Designation (LUD).

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Glossary

Best management practices (BMP): Forest Service water quality maintenance and improvement measures, called Best Management Practices (BMP), were developed in compliance with §208 of the Federal Clean Water Act (CAA), PL92-500, as amended. Water quality management is administered on National Forest System (NFS) lands through the continued implementation of BMPs and through the guidance of a 1981 Management Agency Agreement with the State of California Water Resources Control Board (CARB). The appropriate BMPs necessary to protect or improve water quality and the methods and techniques of implementing the BMPs are identified at the time of this on-site, project-specific assessment.

Hydrologic unit code: A hydrologic unit is a drainage area delineated to nest in a multi-level, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters (navigate to USGS National Map (*https://viewer.nationalmap.gov/advanced-viewer/*). Every hydrologic unit is identified by a unique HUC consisting of 2 to 12 digits based on the levels of classification in the hydrologic unit system.