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Nellie Juan-College Fiord Wilderness Study Area

Existing Character Baseline Report

Cover photo: Nellie Juan Glacier, Nellie Juan-College Fiord Wilderness Study Area, Alaska.

Photo credit: Randy Traynor, 2018 Voices of the Wilderness Artist in Residence.

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Existing Character Baseline Report

U.S. Department of Agriculture, Forest Service
Chugach National Forest
April 2021

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Chugach National Forest

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Introduction

The purpose of this document is to provide a baseline description of the presently existing character of the Nellie Juan-College Fiord Wilderness Study Area. This report supports implementation of the Chugach National Forest Land Management Plan (hereafter the 2020 land management plan; USDA FS 2020a), and is responsive to direction provided in the Chugach National Forest Land Management Plan Reviewing Officer Response to Eligible Objections (USDA FS 2020b). This information tiers to the monitoring plan (presented in appendix A of the 2020 land management plan), which was developed in compliance with the requirements of the 2012 Planning Rule (USDA FS 2012a) under the National Forest Management Act of 1976.

The Nellie Juan-College Fiord Wilderness Study Area was established by Section 704 of the Alaska National Interest Lands Conservation Act (ANILCA; Public Law 96-487) and the area is not designated wilderness. Managing the wilderness study area requires consideration of unique circumstances. Alaska Region policy states that until Congress acts on any recommendations from the land managers, "the wilderness study area will be managed so as to maintain its presently existing character" (USDA FS 2008). Thus, when deliberating proposed management actions, land managers must consider effects to the key qualities for which the wilderness study area was established, as well as other planning goals and objectives, and existing law, policy, and regulation.

The Nellie Juan-College Fiord Wilderness Study Area covers most of western Prince William Sound, encompassing approximately 1.9 million acres. Since there is currently no definition for "presently existing character," the 2020 land management plan contains the following objective (MA1-OBJ-3): "Within one year of land management plan approval, define the presently existing character of the Nellie Juan-College Fiord Wilderness Study Area." To address this need, the Forest Service prepared this report describing the existing conditions of the wilderness study area.

Approach

The presently existing character of the wilderness study area, which the Forest Service must maintain, is not specifically defined in ANILCA, the 2020 land management plan, or related land management law, regulation, and policy including the National Forest Management Act. To determine the best approach for describing presently existing character, the Forest Service reviewed available guidance for wilderness character monitoring published in Keeping it Wild 2 (Landres et al. 2015), along with the Chugach National Forest assessment of ecological and socioeconomic conditions and trends (USDA FS 2014) and the 2020 land management plan monitoring plan (USDA FS 2020a). The resulting approach is this two-part document: a Baseline Existing Character Report that describes the focused, quantifiable information and monitoring measures; and a Narrative (Appendix A) that describes the broader human experience of the wilderness study area. The baseline report describes the current conditions of four indicators based on current information for selected measures for each indicator. The narrative in appendix A serves to describe the area's "intangible experiences" and is intended to reflect the social and ecological characteristics experienced in the wilderness study area, presenting a broad overview that is the foundation for the focused baseline report. Together the baseline report and narrative define the

full extent of the area's presently existing character. With this approach, we are able to address the unspecific language of ANILCA while following the direction outlined in the 2020 land management plan components and to answer the monitoring question regarding whether "existing character of the wilderness study area, including areas recommended for wilderness, is being maintained" (USDA FS 2020a).

In conjunction with this report, Forest Service staff prepared a monitoring framework of measures and corresponding protocols to evaluate trends in four qualities of presently existing character outlined as indicators in the 2020 land management plan monitoring plan(USDA FS 2020a). The plan described seven measures to address trends in wildness, natural conditions, undeveloped, and opportunities for solitude or primitive and unconfined recreation opportunities. The complete monitoring protocols will be provided as a chapter in the forest monitoring guide that is to be completed in May 2022 as specified in the commitments of the 2020 land management plan.

Baseline Existing Character Report

This existing character baseline report describes the current conditions and existing character monitoring strategy for the Nellie Juan-College Fiord Wilderness Study Area. It discusses the measures and draft protocols selected for monitoring the wilderness study area and provides baseline information for each measure. The report includes information necessary to ensure monitoring is conducted in a consistent and repeatable manner and helps future managers understand how the baseline was established.

Development of Monitoring Framework

Forest Service staff developed a framework for monitoring conditions within the Nellie Juan-College Fiord Wilderness Study Area as part of the 2020 land management plan. The monitoring framework includes four indicators of the desired conditions for the wilderness study area that best represent conditions that can change over time and can be affected by forest management actions. The Forest Service then selected seven measures that can be quantitatively collected over the life of the land management plan and assessed to evaluate management changes and needs that will allow forest managers to achieve the desired conditions outlined in the plan. The process used to select these measures tiers to the 2020 land management plan and the monitoring plan rationale for the wilderness study area (Marchowsky 2019), and addresses concerns expressed by comments received on the plan components and language.

To help identify important resource issues within the wilderness study area, key documents were reviewed including the 2020 land management plan (USDA FS 2020a), the Chugach National Forest Land Management Plan Reviewing Officer Response to Eligible Objections (USDA FS 2020b), and rationale documents for the land management plan monitoring plan specific to the wilderness study area.

Overview of Wilderness Study Area Character Monitoring Measures

In the 2020 land management plan, the Forest Service identified one monitoring question to help determine if forest management actions were achieving desired conditions: "Is the presently existing character of the wilderness study area, including areas recommended for wilderness, being maintained?" (USDA FS 2020a). Four indicators were selected to document specific conditions and trends to address the question. Table 1 provides a basic overview of the Nellie Juan-College Fiord existing character monitoring indicators and proposed measures that were identified for monitoring conditions within the wilderness study area. Each indicator, the corresponding measures, and presently existing condition is described in more detail in this report.

Table 1. Indicators, proposed measures, and sources of information for describing existing conditions within the Nellie Juan-College Fiords Wilderness Study Area

Indicator	Measure(s)	Sources of Information
Wildness Actions authorized by the federal land manager that intentionally manipulate the biophysical environment	Number of authorized actions and persistent structures designed to manipulate plants, animals, pathogens, soil, water, or fire	Trends in number of permits issued (visitor use); Deferred maintenance (visitor use) or forest orders
Natural Conditions Ecological processes	Water quality attributes Watershed condition class rating	Watershed assessments; Watershed condition class ratings (watershed conditions)
Undeveloped Presence of non-recreational structures, installations, and developments	Index of authorized non-recreational physical development Index of motorized vehicle use authorizations	Deferred maintenance information, existing facility documentation Special use permits, forest decision notices
Opportunities for Solitude or Primitive and Unconfined Recreation Remoteness from sights and sounds of human activity inside the wilderness study area	Index of encounters Index of recreation sites within primary use areas	Wilderness study area encounter monitoring program, monitored sites Recreation facility occupancy rate (visitor use, multiple use)

For each indicator and associated measure(s) listed in table 1, the following information is provided in the next section:

Description of Measure—A brief description of what is being measured and how.

Background and Context—Describes the history and rationale for selection of the measure as part of the monitoring protocols.

Measure Baseline Value—The first value reported for a measure. The first year that data are compiled for a measure forms the measure baseline and is the reference point for evaluating the trend in a measure over time. The measure baseline (the first year that data are compiled for an individual measure) is distinct from the existing character monitoring baseline (the first year that

data are compiled for all measures). While the measure baseline year will often be the same as the existing character monitoring baseline year, it may predate it if legacy data are used, or it may post-date it if the data source or data protocol change. The first value reported for a measure from this measure baseline year is called the measure baseline value.

Year(s) of Data Collection—The year(s) the data were collected or compiled. Measures using rolling averages will report three years of data collection, for example, 2016–2018.

Frequency—How often data for this measure are compiled, analyzed, and entered into the appropriate data management system.

Data Source—The source(s) for baseline information and any historical data for the measure. The intent of this section is to provide a record of existing character data and data sources so that information is accessible into the future.

The Baseline Existing Conditions section provides a comprehensive overview of each measure, provides transparency into the measures selected, and forms the basis of the existing character monitoring strategy.

Baseline Existing Conditions

Indicator: Wildness

Wildness indicates the degree that an ecosystem's processes are natural and primarily free from managerial intervention. Measurement of wildness can be done by monitoring the administrative actions in the wilderness study area that intentionally manipulate the biophysical environment. Activities that intentionally change or control ecological systems inside the wilderness study area may affect wildness, regardless of what instigated the action or if the action benefits other conditions of the area's character. The Forest Service proposes to measure wildness by tracking the actions and persistent structures authorized by the federal land manager that intentionally manipulate plants, animals, pathogens, soil, water, or fire.

Description of Measure: This measure is summary value of authorized manipulations of the area, based on an annual count of authorized actions and persistent structures intended to manipulate any component of the biophysical environment within the wilderness study area (including vegetation, fish, wildlife, insects, pathogens, soil, water, or fire). Data are compiled and entered in a database developed by the Forest Service for reporting and archival.

Measure: Number of Authorized Actions and Persistent Structures

Background and Context

Any action that intentionally manipulates the biophysical environment affects the wildness quality and should be authorized only when justifiable through a review process. Most authorized manipulations are limited to scenarios in which an action is deemed necessary to: improve another quality of the wilderness study area, comply with federal regulations, or protect human health and safety. The measure includes actions under a special use permit that are taken by others on National Forest System land within the wilderness study area.

The Nellie Juan-College Fiord Wilderness Study Area saw a major influx of approved manipulations in the years immediately following the *Exxon Valdez* oil spill due to activities associated with spill cleanup and recovery. The current number of authorized intentional manipulations within the wilderness study area has declined from that historical figure, however, serving as an indicator of *Exxon Valdez* oil spill recovery. This is evidenced by the absence of cleanup efforts and the decrease in research and activities directly tied to species recovery. Another historical event that led to an increased number of biophysical environmental manipulations was the 1964 earthquake. In response to landscape changes caused by the earthquake, the Forest Service authorized the development of fish ladders and weirs and channelization of streams for habitat and species recovery. Most authorized manipulations from that time were long-lasting structures and actions, allowing for streamlined tracking. One method to track this measure is through the documentation associated with the decision for each action. Since these historical events, there has been a decrease in the number of authorized manipulations. The counts of authorized actions are provided in this report from 2012; a detailed list with descriptions of each action is available from the Girdwood Ranger District.

Measure Baseline Value

14 authorized actions

Years of Data Used for Baseline Value Calculation, Frequency Collected

2012–2014, annually

Data Source

Personal communication with Chugach National Forest resource specialists, as well as various reporting documents available in Forest Service databases. Data quantity is complete for years 2012–2020, and quality is high based on information gathered in national records or through internal permitting for compliance with the National Environmental Policy Act of 1970. The nature of authorizing actions results in a formal written record that allows for comprehensive data collection. Data adequacy has improved over time. Historical records may be less complete due to loss of documentation over the years. Data collected previously for this measure are summarized in table 2.

Table 2. Number of authorized actions from 2012–2020

Fiscal Year	Total Number of Actions	3 year rolling average
2012	13	—
2013	13	—
2014	16	14
2015	15	15
2016	16	16
2017	14	15
2018	14	15
2019	13	14
2020	14	14

Indicator: Natural Conditions

Natural conditions indicates the integrity of local ecosystems and their freedom to change and develop without human manipulation. Measurement of natural quality tracks the effects of human actions and modern civilization on natural ecosystems (in contrast to the wildness quality, which tracks the actions themselves). While some aspects of the natural quality may be under the control of land managers, other aspects (such as air quality) may not be. Monitoring ecosystem changes inside the wilderness study area is critical to understanding the unique character and how it is impacted by human actions.

The Forest Service proposes to continue to monitor attributes of the National Watershed Condition Class Rating, following the national protocol outlined in the Watershed Condition Classification Technical Guide (USDA FS 2011), to assess trends in the condition of this quality.

Description of Measures: Two measures are proposed for this indicator: 1) water quality attributes; miles of impaired streams determined by State of Alaska and Forest Service protocols; and 2) the watershed condition class rating to evaluate the natural quality.

Measure: Water Quality Attributes

This measure uses the extent of waterbodies with impaired water quality and miles of impaired streams to measure natural conditions. This measure assesses the miles of streams inside the wilderness study area boundary with impaired water quality, based on national or state 303(d) list of impaired water bodies or local monitoring data. Data are compiled from national or state 303(d) databases, or other local, state, regional, or national data sources. Local staff calculate the measure value.

Background and Context

Water quality is influenced by a wide range of biological and physical variables from both inside and outside the wilderness study area. This measure focuses on human caused threats to the area's water quality, and not on natural variation in water quality. The early development of mines throughout western Prince William Sound led to soil and water contamination both within and around these sites. Amongst the most predominant of these sites is Granite Mine, which contains leached contaminants.

The Granite Mine site is located within the Chugach National Forest approximately 22 miles northeast of Whittier, Alaska. It is situated between Hobo Bay and Harrison Lagoon on the west side of Port Wells. The site consists of waste rock and tailing deposits from the former Granite Mine and mill site that operated from 1913 until 1964. Gold and silver ore processed by the mill contained abundant arsenic bearing minerals.

Two waste rock piles located below the upper and lower adits are immediately adjacent to a Forest Service maintained trail that follows an old corduroy road from Port Wells to the upper adit. Two areas of tailings were deposited because of ore processing. One is located at the toe of the lower waste rock pile, adjacent to the trail, and another is located at the mouth of Bridge Creek (Wanigan Creek), within a tidal lagoon that drains to Port Wells. From the upper adit and waste rock pile, Bridge Creek flows for approximately one-half mile, terminating at the tidal lagoon that drains to Port Wells.

In 2017, as part of the updated environmental engineering and cost assessment report, Hart Crowser Inc. sampled and analyzed water and sediment from Bridge Creek and the tidal lagoon; surveyed benthic and soil macroinvertebrates; and surveyed terrestrial plants on tailings, waste rock, and adjacent undisturbed areas. These preliminary investigations found concentrations of arsenic, cadmium, mercury, nickel, and zinc exceeding screening levels in Bridge Creek and tidal lagoon sediment, as well as copper, lead, and silver exceedances in lagoon sediment. Arsenic and silver screening levels were exceeded in Bridge Creek surface water. An evaluation of historical samples collected from waste rock, tailings, and soil found arsenic, manganese, and mercury exceeding screening levels (Hart Crowser Inc. 2018). Streamlined evaluations were conducted to assess risks to site users and to on-site plants and animals. Arsenic, manganese, and mercury could pose risks to hikers through incidental ingestion and dermal contact with waste rock and tailings. Arsenic in Bridge Creek may also pose a risk to hikers if used for drinking water. Metals in the tailings and sediment may affect the growth or reproduction of some individual plants, animals, and soil microbes that live on the waste rock and tailings.

Measure Baseline Value

One-half (0.5) mile

Years of Data Used for Baseline Value Calculation, Frequency Collected

2020, 5 years

Data Sources

Data were sourced from Alaska Department of Environmental Conservation Water Quality Inventory, Monitoring, and Assessment Reports (2010, 2013, 2016, 2020); local knowledge of Chugach National Forest Hydrologist, Angela Coleman; and internal reports and correspondence with the Alaska Regional Environmental On-Scene Coordinators: Michael Wilcox and Linda Riddle.

Measure: Watershed Condition Class Rating

This measure assesses the average watershed condition class, based on Forest Service Watershed Condition Classification data. Data are compiled from the Forest Service Watershed Condition Framework website and validated locally.

Background and Context

The wilderness study area's watersheds are fundamental in sustaining both terrestrial and aquatic life in western Prince William Sound. Water quality can be compromised by a variety of factors, including deposition of airborne pollutants, oil spills, and contamination from mining. Water temperature, spring discharge volume, and stream flow can be affected by climate change, leading to impacts on biotic communities and ecological processes. Analyzing these conditions allows for assessment of biotic integrity, resiliency, connectivity, recharge of streams, and other ecosystem services in the wilderness study area. Watersheds are rated by their "watershed condition class," which consists of three classes: properly functioning, functioning at risk, and impaired function.

There are currently 110 watersheds either entirely within or partially within the wilderness study area boundary. Of these, 100 percent are classified as "functioning properly." A complete list of watersheds and their score can be found in Coleman (2016).

Although each watershed is classified as "functioning properly," there are several measures, in addition to water quality, that are evaluated to establish this score. These indicators point to resources that should be considered when monitoring this measure. While certain indicators may be considered at risk, they do not weigh enough to impact the entire watershed score. Water quality and soils for Port Wells is functioning at risk due to the presence of abandoned metals in the northwest portion of the watershed. Within the Falls Lake watershed, flow characteristics are "functioning at risk" because of Main Bay Fish Hatchery diverting water from the lake and streams at the head of the bay. The following watersheds received a "functioning at risk" score due to trail or road proximity: Columbia Bay, Unakwik Inlet, Eaglek Bay, Coghill River, Pigot Bay, Cochrane Bay, Port Wells, Long Bay, Port Nellie Juan, Jackpot Bay, and Falls Lake. Passage Canal received an "impaired function" listing under this indicator (Coleman 2016).

A number of beaches in the wilderness study area were previously listed as impaired under Section 303(d) in 1990 as a result of petroleum products from the *Exxon Valdez* oil spill. These beaches have been placed in Category 4b because of restoration efforts specified in the *Exxon Valdez* Restoration Plan. The *Exxon Valdez* Oil Spill Trustee Council includes lingering oil on these beaches as a contributing factor to the ongoing injured status of the wilderness study area.

Measure Baseline Value

100 percent of all watersheds functioning properly (110 of 110)

Years of Data Used for Baseline Value Calculation, Frequency Collected

2016, 5 years

Data Sources

Forest Service Watershed Condition Framework website. Data for this measure were compiled by Brandon Boxler, GIS specialist. Verified by Angela Coleman, Chugach National Forest Hydrologist.

Indicator: Undeveloped

The undeveloped indicator is defined as the degree to which the wilderness study area is without permanent improvements or mechanization (such as helicopter or chainsaw use). Without buildings, roads, evidence of other people, or improvements on the landscape, the undeveloped quality speaks to the idea that humans are visitors that do not remain.

Description of Measures: Two measures are proposed to determine trends in the status of this indicator: 1) an index of authorized non-recreational physical development, and 2) an index of motorized vehicle use authorizations.

Measure: Index of Authorized Non-Recreational Physical Development

This measure is an index that consists of a count of, and periodic change in, the number of non-recreational structures, installations, and developments weighted by the class of development and its relative influence on the undeveloped nature of the landscape. This index is modeled after the format for non-recreational developments used in the Tongass National Forest Wilderness Character Monitoring Plan (USDA FS 2012b).

Background and Context

The measurement index assigns a weight to each development or installation to reflect its relative influence on the undeveloped quality of the wilderness study area's existing character. The weighted values are combined for a total value for the area.

The Nellie Juan-College Fiord Wilderness Study Area contains a range of different classes of non-recreational developments. ANILCA contains provisions that allow for construction of fish hatcheries and performance of fisheries management activities, communication sites, navigational aids, and certain temporary camps for the taking of fish and wildlife and similar activities. Installations and other development in the wilderness study area range from small research equipment to hatchery facilities and antenna towers. ANILCA provisions also allow for the continued traditional use of land and feasible access to remote areas.

Of the various locations in the wilderness study area that contain non-recreation developments, the majority occupy less than one acre of land. In many cases, sites consist of a single sign, survey marker, or cluster of scientific instruments. By acre, the largest development sites are the Cannery Creek Hatchery (35 acres), Main Bay Hatchery (35.2 acres), and Naked Island Communication Site.

Hatchery sites have seen a substantial increase in development since their initial construction. A 1988 Cannery Creek permit indicates a small number of developments with an index value of 88. The 2020 index value is 208, signifying a 136 percent increase in development.

Since the Forest Service began tracking non-recreational development data in 2012, there has been a decrease in buildings and installations. Between 2014 and 2016, the Forest Service removed 60 abandoned fuel barrels from Granite Mine (Port Wells), removed the abandoned Federal Aviation Administration communication site on North Dutch Island, and concluded a wildlife study on Knight Island.

Measure Baseline Value

2,176 index value (count of number of non-recreational structures, installations, and developments weighted by the class of development and its relative influence on the undeveloped nature of the landscape)

Years of Data Used for Baseline Value Calculation, Frequency Collected

2012, 5 years

Data Source

Special use permits and leases, communication with permit holders, and site inspections by Chugach National Forest staff. Data collected for this measure are summarized in table 3.

Table 3. Number of undeveloped structures and installations with index values, from 2012 and 2017. Index is a count of number of non-recreational structures, installations, and developments weighted by the class of development and its relative influence on the undeveloped nature of the landscape.

Development Type	Index values 2012	Index values 2017
Hatchery and Fisheries Development	341	354
Research	221	274
Navigation Aides	30	30
Survey Markers	60	60
Communication Sites	170	165
Setnet Camps	79	77
Dams and other Instream Structures	60	50
Mines	6	6
Oil Spill Response	85	85
Temporary Research Sites	30	475
Unauthorized Developments	1094	549
Total	2176	2125

Measure: Index of Motorized Vehicle Use Authorizations

This measure assesses authorizations to use motor vehicles, motorized equipment, or mechanical transport. An index score is calculated based on the number of pieces of equipment, type of equipment, and the days of use.

Background and Context

Motorized and mechanized equipment are authorized for various administrative purposes in the wilderness study area. These uses are categorized as administrative or special provision authorizations, and are linked to the maintenance of research sites, communication sites, and recreational resources, among other purposes. These authorizations include use of motor vehicles, motorized equipment, or mechanical transport for emergency incidents (such as search and rescue or fire operations), or those used by the public for traditional activities, subsistence purposes, and travel to and from villages and homesites.

High concentrations of motorized uses occur at the two wilderness study area fish hatcheries, where heavy equipment, four-wheelers, cars, trucks, generators, drones, and other equipment are in varying but regular use. After hatcheries, the Naked Island Communication Site has the next highest concentration of use, with periodic helicopter landings and generators that operate daily.

Helicopters are used about eight times annually to access the U.S. Geological Survey research sites in Columbia Bay and the Wolverine Glacier Research Natural Area. The Forest Service lands helicopters two to three times annually at a communication site on Esther Island. Less-than-annual helicopter landings occur at seismic research sites on Glacier Island, Esther Island, Naked Island, and north of Pigot Bay. The Nellie Juan-College Fiord Wilderness Study Area has seen a recent increase in helicopter use in and near Barry Arm, where a research site has been installed.

Measure Baseline Value

2,560 index score; 3-year rolling average of use-level (calculated based on the number of pieces of equipment, type of equipment, and the days of use).

Years of Data Used for Baseline Value Calculation, Frequency Collected

2012, 1 year.

Data Source

Chugach National Forest staff and various reporting documents available in local files (summarized in figure 1 and table 4).

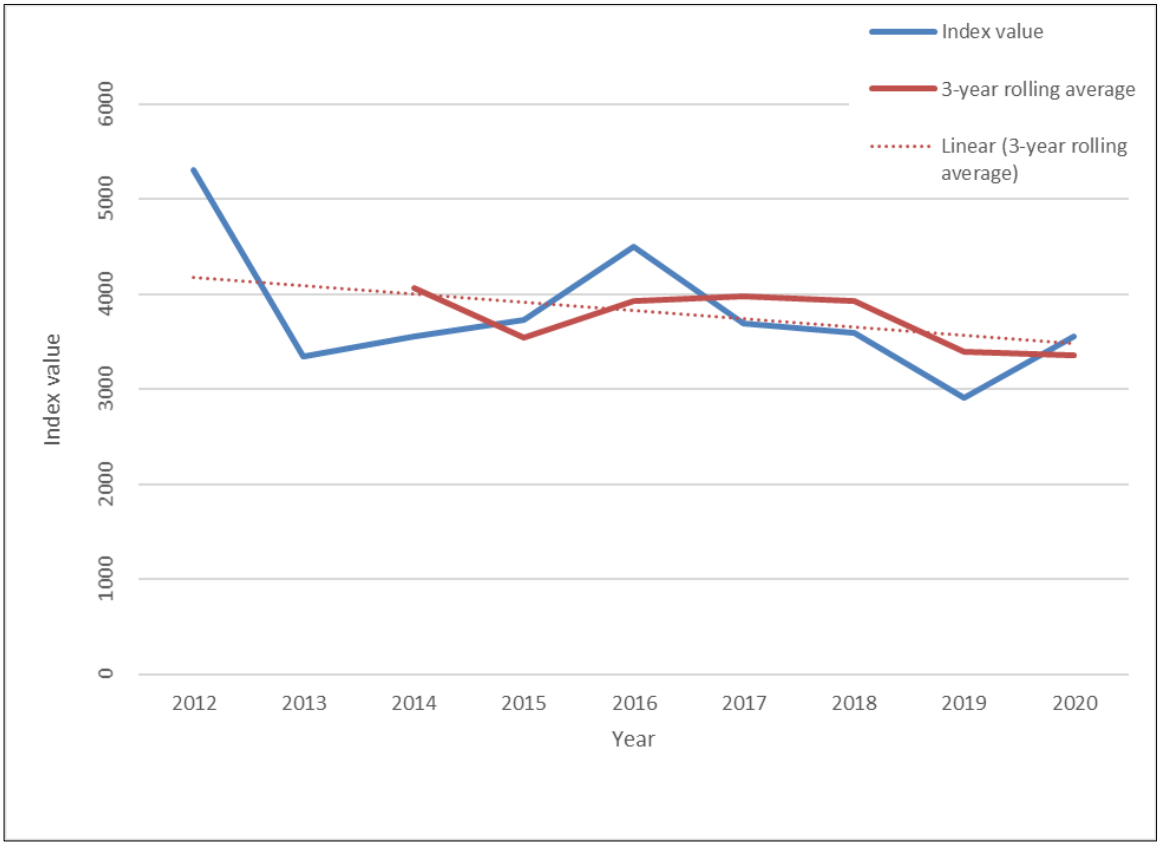

Figure 1. Historical value of motorized and mechanized use authorization index values. Index is calculated based on the number of pieces of equipment, type of equipment, and the days of use.

Table 4. Index of motorized and mechanized use authorization index values, 2012–2020, calculated based on the number of pieces of equipment, type of equipment, and the days of use

Fiscal Year	Index value of authorizations	3 year rolling average
2012	5308	—
2013	3344	—
2014	3557	4040
2015	3730	3544
2016	4503	3930
2017	3690	3974
2018	3591	3928
2019	2912	3398
2020	3558	3354

Indicator: Opportunities for Solitude or Primitive and Unconfirmed Recreation

Solitude or primitive and unconfined recreation is described as the opportunity for visitors to experience remoteness from sights and sounds of human activity inside the wilderness study area. As populations increase and technology advances, the area provides opportunities for solitude or for a primitive and unconfined type of recreation that are not available in many other places.

Description of Measures: Two measures are proposed to determine trends in the status of this indicator: 1) an index of encounters, and 2) an index of recreational sites within primary use areas.

Measure: Index of Encounters

The index of encounters provides a count of human encounters to a visitor by assessing traveling encounters experienced by a traveler within the wilderness study area boundary. The measure value will collect data to calculate the mean number of traveling encounters experienced per hour. A draft solitude monitoring plan and protocol has been completed for this area, and will be completed on April 15, 2022 as directed in the 2020 land management plan.

Background and Context

By monitoring for encounters within the wilderness study area, management can evaluate how much of the area is affected by modern sights and sounds. The immense size and diverse topography of the wilderness study area protects opportunities for solitude throughout the vast majority of the area's boundary. On-forest encounters rarely occur when exploring the upland areas, as visitor use is concentrated along shorelines. Visitation is also unevenly distributed in Prince William Sound. Factors that impact spatial use include proximity to access communities, glaciers and post-glacial landscapes, beach accessibility, protected anchorages, sport fish streams, cabins, and wild game concentrations.

Solitude monitoring efforts have been taking place in the wilderness study area since the mid-1990s. Monitoring was conducted opportunistically but never with a consistent protocol. Encounter data were collected using paper data collection forms and written reports but were never stored in an electronic database. In 2019, a solitude monitoring program was created to provide a protocol for continued monitoring that makes use of past data. This program has been implemented, setting the baseline year at 2019. Previous monitoring work helped build a baseline of information and can satisfy the 2020 land management plan objectives where visitors are to find "outstanding opportunities for solitude" in the Nellie Juan-College Fiord Wilderness Study Area (USDA FS 2020a). The season that sees the highest potential for overlapped use is spring when recreational beach use coincides with hunting and fishing. During summer, use is centered on beach-based recreation and fishing, while fall is the primary season for hunting. Winter use is very low. A primary recreational season of May 15 through September 15 has been defined based on previous monitoring information by the Forest Service. Solitude monitoring trends from 2011 to 2019 confirm that most encounters occur within this timeframe. Managers will continue to monitor opportunistically during the low-use seasons of winter and fall. This information will be further described in the Recreation Site and Encounter Monitoring Plan and Protocol, expected to be finalized in October 2021.

Anecdotal evidence and historical data speak to a potential increasing trend of visitation in the Nellie Juan-College Fiord Wilderness Study Area, but this information is from access points to and around the entire Prince William Sound area, and does not directly translate into increases in vessel landings upon forest lands. This is expressed in increased rates of aviation and boat traffic adjacent to the wilderness study area uplands, and a slight increase in human encounters on National Forest System land as shown by the measured encounter rate in figure 2.

Measure Baseline Value

Stable or consistent visitation as a measure of encounters from first monitoring cycle (baseline year: 2019).

Years of Data Used for Baseline Value Calculation, Frequency Collected

2019, 5 years

Data Source

Personal correspondence with district staff were used to update the index of encounters from the Tongass National Forest monitoring program (USDA FS 2012b). Contacts included Tim Lydon and Barbara Lydon. Historical data can be retrieved from the "Visitor Experience Access Database," which holds data from the 1990s through present time. Data can be queried to analyze visitor trends in specific areas. All historical monitoring data were digitized in 2019. Data collected previously for this measure are summarized in figure 2 and table 5.

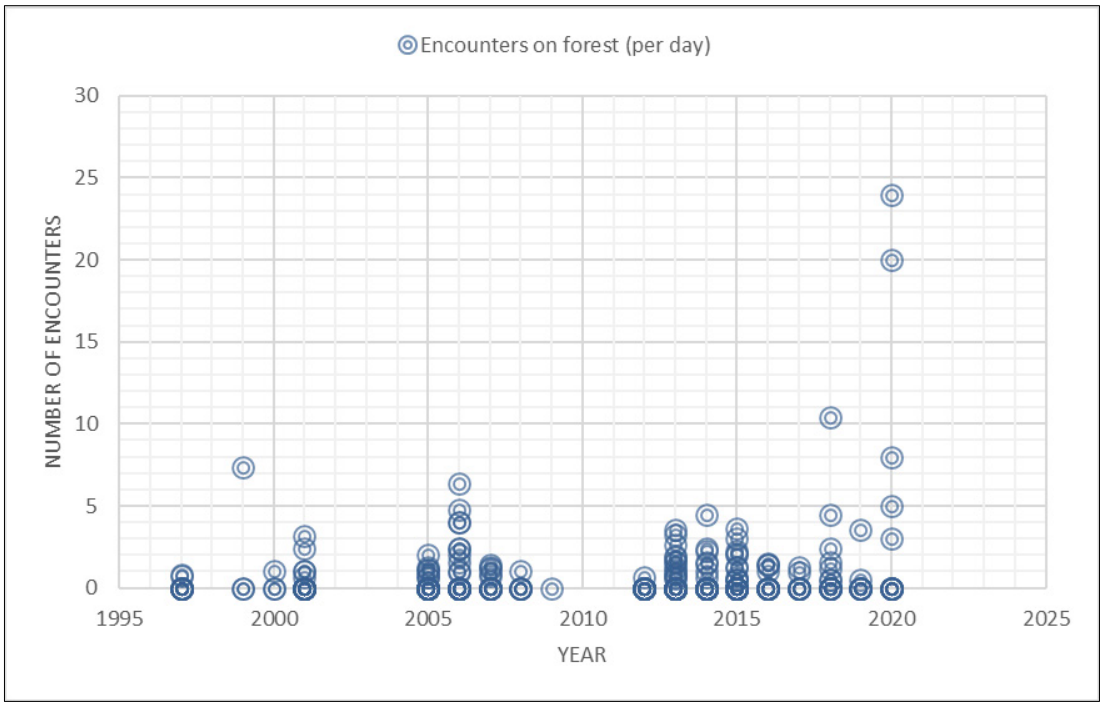

Figure 2. Number of encounters per 8-hour monitoring day, 1997–2020, Chugach National Forest

Table 5. Average number of encounters per day over time, 1997–2020, Chugach National Forest

Year	Number of Encounters
1997	0.13
1998	Not collected
1999	2.45
2000	0.35
2001	0.40
2005	0.21
2006	1.02
2007	0.37
2008	0.17
2009	0.00
2012	0.03
2013	0.47
2014	0.40
2015	0.48
2016	0.32
2017	0.22
2018	1.40
2019	0.44

Measure: Index of Recreation Sites within Primary Use Areas

This measure is an index that is calculated from the number of recreation sites multiplied by their condition and summed for each five-year period, based on the national protocol for recreation site monitoring. A recreation site is a place where visible impacts to vegetation or soil from recreational use are documented. Sites given a score of “0” indicate light use, while sites given a score of “9” indicate heavy use. Scores are compiled from a variety of factors, including “ground disturbance" and “tree damage.” Data are compiled and stored in Forest Service databases on the Girdwood Ranger District and will be provided forestwide as described in the 2020 land management plan monitoring protocols. Chugach National Forest recreation staff calculate the measure value following the national recreation site monitoring standards outlined in the Forest Service Handbook for recreation site monitoring.

Background and Context

The intent of this measure is to monitor user-created sites (not facilities provided by the agency). Recreation sites are at a higher risk of vegetation damage and cut tree limbs, amongst other resources. In order to understand trends in visitor impacts, wilderness study area recreation sites are monitored through both qualitative and quantitative metrics.

Recreation site monitoring has been conducted since the 1990s, although there was not protocol consistency until 2018. In 2018, Glacier Ranger District partnered with Society for Wilderness Stewardship to develop a protocol, monitoring site rotation, and a digitized method of data collection, storage, and analysis. This system utilizes ArcGIS Collector to collect data and Microsoft Access to store data. The 1997–2018 monitoring efforts were manually entered into Access and the different monitoring protocols were synthesized to the current protocol to establish uniformity and data usability.

Recreation site data collection is further described in the Recreation Site and Encounter Monitoring Plan and Protocol, expected to be finalized in 2021.

Measure Baseline Value

315 index value of recreation sites (calculated as the number of sites multiplied by their condition for each of the condition categories 0–9 and summed).

Years of Data Used for Baseline Value Calculation, Frequency Collected

1997–2001, 5 years

Data Source

Files containing site visit information stored at the Glacier Ranger District digitized in an Access database. Data collected previously for this measure are summarized in figure 3 and table 6.

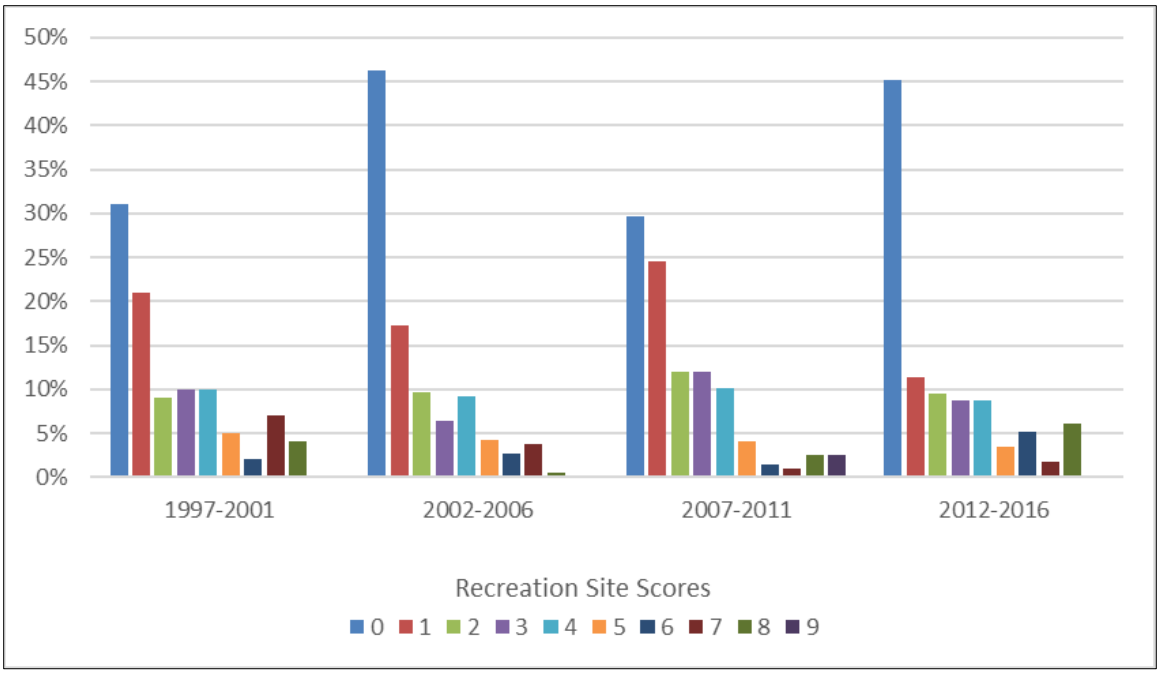

Figure 3. Recreation site scores given throughout each monitoring cycle (1997–2016). The number of sites visited is shown with their respective condition rating for each monitoring period. Sites given a score of "0" indicate light use, while sites given a score of "9" indicate heavy use. Scores are compiled from a variety of factors, including "ground disturbance" and "tree damage."

Table 6. Historical monitoring information for recreational site condition rating and number of sites in each condition class through the four monitoring periods (5-year monitoring intervals). The index value is calculated as the sum of the number of sites multiplied by the condition rating for each year.

Condition Rating	1997–2001 (number of sites)	2002–2006 (number of sites)	2007–2011 (number of sites)	2012–2016 (number of sites)
0	42	86	59	52
1	29	32	49	13
2	12	18	24	11
3	13	12	24	10
4	13	17	20	10
5	7	8	8	4
6	3	5	3	6
7	10	7	2	2
8	6	1	5	7
9	0	0	5	0
Total sites visited	135	186	199	115
Index value	315	299	406	231

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Appendix A: Narrative

Introduction

In southcentral Alaska, there is a place that tells a story of resilience and change, where mountains, glaciers, and fiords provide a testament to an ever-changing and evolving landscape, and where the northernmost temperate rainforests of North America are found. In this place, the ecological relationship of land and sea is exemplary of a thriving natural system. This area is a traditional homeland for Alaska Native peoples and a landscape where many people subsist, work, and recreate. This special place is the Nellie Juan-College Fiord Wilderness Study Area.

The objective of the narrative is to describe the of presently existing, less tangible, human experience of the Nellie Juan-College Fiord Wilderness Study Area. This narrative defines four landscape qualities that relate to the wilderness study area's presently existing character and potential for inclusion in the National Wilderness Preservation System. The qualities are derived from the 2020 Chugach National Forest Land Management Plan (hereafter 2020 land management plan), the Alaska Supplement to Forest Service Manual 2320, and the criteria described in the Forest Service Handbook 1909.12, Chapter 70 Wilderness Recommendation (USDA FS 2020, USDA FS 2008, USDA FS 2015). The four landscape qualities that contribute to the wilderness study area's presently existing character are: "wildness," "natural conditions," " undeveloped," and "opportunities for solitude or primitive and unconfined types of recreation." This narrative section highlights local features or outstanding opportunities associated with each quality and summarizes relevant conditions on the ground. Together, these qualities define the wilderness study area's baseline conditions and will be used to compare future conditions through monitoring.

The qualities of existing character within the wilderness study area are distinct yet interwoven. To varying degrees, the effects of any proposed management action within the area highlights the inherent tension involved in conducting restorative actions in an area managed to maintain its existing character. A management action meant to positively influence one quality may have impacts on a separate quality. For example, the development of a fish ladder may benefit the natural quality if it helps restore an injured fish population, while the presence of the ladder might also detract from the undeveloped quality. Although individual actions impact distinct qualities, managers must approach management holistically to ensure the area maintains its potential for inclusion in the National Wilderness Preservation System. While individual actions may prioritize one quality over another, decision makers must consider how certain actions impact the wilderness study area's overall character to ensure balance over time.

Legislative History: A Lands Conservation Vision Emerges for Western Prince William Sound

Prince William Sound first received recognition as a potential reserve in 1904 following an examination by prospector W.A. Langille as directed by Gifford Pinchot (Rakestraw 1981). This proposition was met with opposition, as the designation of a preserve could hinder economic development. Despite objections, the Chugach National Forest was proclaimed in June of 1907. There was relatively limited opportunity for sawtimber extraction in Prince William Sound; however, between the early 1900s to the 1960s, a variety of uses in the forest were authorized under special use permit.

Administrative records show support for a federal wilderness designation in western Prince William Sound had gained formal agency attention by the early 1970s. In 1973, the Roadless Area Review and Evaluation (RARE), a nationwide analysis of the suitability of national forest lands for wilderness designation, recommended a 704,000-acre Nellie Juan Wilderness in western Prince William Sound (USDA FS 1972). In 1978, during a second nationwide Roadless Area Review and Evaluation (RARE II), the Forest Service expanded the recommendation to include a Nellie Juan Wilderness of 696,000 acres, a College Fiord Wilderness of 847,000 acres, and a Prince William Sound Wilderness Study Area of 460,000 acres (USDA FS 1979). These three areas, along with parcels added to the Chugach National Forest in 1980, eventually became the wilderness study area as designated by Congress in the Alaska National Interest Lands Conservation Act (ANILCA).

The Roadless Area Review and Evaluation process of the 1970s was the first time the Forest Service analyzed areas in western Prince William Sound for the social and ecological landscape characteristics that form the basis of a federal wilderness designation. Specific characteristics, derived from the wording of the 1964 Wilderness Act, included naturalness, natural integrity, opportunities for solitude or primitive recreation, and other features of ecological, geological, scientific, educational, scenic, or historical values (USDA FS 1979).

The areas recommended for wilderness and wilderness study in western Prince William Sound consistently scored in the high percentile of the RARE II rating system for potential wilderness (USDA FS 1979). The Forest Service also reported these areas were “not a controversial issue for Alaskans or for citizens residing outside Alaska” (USDA FS 1979, page A-12).

The RARE II wilderness recommendations for the Chugach National Forest informed 1978 congressional debate over what would eventually become the 1980 Alaska National Interest Lands Conservation Act. During the debate, wilderness designations on the Tongass National Forest absorbed much of the attention of Congress related to national forest wilderness in Alaska, due largely to impacts on the Southeast Alaska timber industry. Regarding Prince William Sound, debate about wilderness centered on a desire to further evaluate Alaska Native Corporation and State of Alaska land selections and State of Alaska aquaculture development interests in western Prince William Sound (USDA FS 1979). These issues were discussed and debated leading to a bill passed by the House of Representatives in May 1978 designating the Nellie Juan and College Fiord wilderness areas. The Senate combined the two areas into a wilderness study area.

The final version of ANILCA did not designate any federal wilderness on the Chugach National Forest, nor did it designate the area as a conservation system unit. ANILCA provided little management direction for the wilderness study area, leaving it open to investigation. The Secretary of Agriculture was directed to study the area’s potential for inclusion in the National Wilderness Preservation System and report findings and any recommendation for wilderness designation to Congress. The study, completed in 1987, states “These areas are recommended for wilderness designation because of the outstanding scenery, intact ecosystems, outstanding opportunities for solitude or primitive recreation, broad public support for designation of these areas, and because the best use of the land after evaluating other resources is to preserve its natural conditions” (USDA FS 2002).

In the decades since, the Chugach National Forest has evaluated the area's potential for wilderness designation and produced subsequent administrative recommendations for congressionally designated wilderness in 2002 and 2020. In each case, the Forest Service used criteria like that in the RARE process of the 1970s and derived language in the 1964 Wilderness Act. In 2020, the Forest Service used guidance from the Forest Service Handbook (USDA FS 2015) to inform management direction for the wilderness study area found in the 2020 land management plan. Recommendations and legislative history surrounding the wilderness study area serve as a major component of what defines the presently existing character of the area and is addressed in detail in attachment 1.

Since ANILCA did not provide comprehensive wilderness study area management direction, the Alaska Region of the Forest Service and the Chugach National Forest determined in the early 1980s that the area would be managed to maintain its presently existing wilderness character and potential for inclusion in the National Wilderness Preservation System (USDA FS 1984). In general, that management direction has remained in place for four decades (table 7).

Forest Service management direction for the Nellie Juan-College Fiord Wilderness Study Area reflects ANILCA provisions that apply to the area. They include possible allowances for construction of fish hatcheries and performance of fisheries management activities in the wilderness study area, to be performed in a way that "minimizes adverse impacts to the area's wilderness character" (ANILCA 1315(b)). Such facilities and activities may be authorized to include motorized uses, buildings, and other developments. These types of authorizations may affect certain qualities of the area's existing character.

Other provisions of ANILCA that apply to the wilderness study area include allowances for public use cabins and motorized and mechanical uses for subsistence and certain traditional activities. Additionally, Forest Service management direction allows managers to permit communication sites, navigational aids, and certain temporary camps for the taking of fish and wildlife. The ANILCA provisions and Forest Service policies strike a balance that maintains traditional uses and human access to Alaska's remote landscape while also supporting maintenance of the area's physical and social character.

Table 7. Significant historical management documents for Nellie Juan-College Fiord Wilderness Study Area

Document	Purpose of Document	Relevance to the Wilderness Study Area (WSA)
1973: RARE I	Nationwide analysis of the suitability of national forest lands for wilderness designation	Proposed 704,000 acres for Nellie Juan Wilderness
1978: RARE II	An updated nationwide analysis of the suitability of national forest lands for wilderness designation	Informed congressional debate of the WSA's wilderness suitability
1980: ANILCA	Attempted to resolve a host of longstanding lands issues in Alaska, including subsistence and traditional activities on conservation lands	Designated the 2.1-million-acre Nellie Juan-College Fiord WSA. Directed the Forest Service to study the WSA for possible inclusion in the National Wilderness Preservation System.
1984: Chugach National Forest Land and Resource Management Plan	Sets forth resource management direction for the Chugach National Forest	Recommended to Congress 1.8 million acres of wilderness. Directs the Forest Service to manage entire WSA to maintain presently existing wilderness character pending further action by Congress

Document	Purpose of Document	Relevance to the Wilderness Study Area (WSA)
1987: Report to Congress	Describes the recommendations for wilderness designation resulting from the revision of the Chugach National Forest Land and Resource Management Plan	Recommended that 1,412,230 acres of the Chugach National Forest, be added to the National Wilderness Preservation System
1994 *Exxon Valdez* Oil Spill Restoration Plan	Provides long-term guidance for restoring the resources and services injured by the *Exxon Valdez* oil spill	Listed the WSA as an injured resource
2002: Chugach National Forest Land and Resource Management Plan	Sets forth resource management direction for the Chugach National Forest	Administratively recommended approximately 1.4 million acres within the WSA as suitable for wilderness area designation. Directs FS to manage the entire WSA to maintain presently existing wilderness character pending further action by Congress
2020: Chugach National Forest Land Management Plan	Sets forth resource management direction for the Chugach National Forest	Administratively recommended approximately 1.4 million acres within the WSA as suitable for wilderness area designation. Directs Forest Service to manage the entire WSA to maintain presently existing character and potential for inclusion in the National Wilderness Preservation System pending further action by Congress

Overview of the Nellie Juan-College Fiord Wilderness Study Area

The Nellie Juan-College Fiord Wilderness Study Area, established by Congress under the 1980 Alaska National Interest Lands Conservation Act (ANILCA), encompasses 1.9 million acres of the approximately 5.4 million-acre Chugach National Forest. Located in western Prince William Sound, rugged peaks of the Chugach Mountains intertwine with over 2,000 miles of dynamic shoreline. The land is defined by a series of narrow fiords, each with its own distinct character. In this interface of freshwater and sea, ocean currents circulate from the Gulf of Alaska, mixing with turbid glacial meltwater and the freshwater yield from extensive forests. Glacial melt adds essential nutrients to surrounding ocean, fertilizing marine ecosystems. With a rapidly evolving geological history, 21 tidewater glaciers can be seen calving, retreating, and dictating the landscape's next chapter.

The North American temperate rainforest, spanning the vast coastal region from Northern California to Southcentral Alaska, is the largest temperate rainforest in the world. It is a blend of ancient spruce and hemlock tree-lined shores dwarfed by mountains that rise thousands of feet above the sea. The mountains and sea are woven together to create a profoundly stunning network of inlets, bays, and waterways. The rich forest, mountainous topography, and intricate mix of land and sea support diverse communities of fish and wildlife. This includes five species of Pacific salmon, which depend on the hundreds of generally short stream systems, estuarine, and glacial front zones of the area, and represent a defining feature of the rainforest ecosystem in all stages of life—from developing young fish to decaying carcasses of adult fish. These ecological communities also provide critical support for a diverse array of wildlife, including important seabird colonies and marine mammal haul-outs. Many of these species are important to people for wildlife viewing, and for sport and subsistence hunting.

The vast majority of the wilderness study area's landscape reflects primeval natural conditions and remains unaffected by modern humanity. The area's historical, geologic, scenic, and educational values are reflective of the area's globally unique ecosystem. Ocean currents, stemming from Japan, generate storms that shift toward Prince William Sound's towering coastal mountains. These storms produce enough moisture to support the region's uncharacteristically high latitude temperate rainforest. As fall and winter bring cool temperatures, storms deposit snow and perpetuate the area's glacial activity. The intermingling of land and sea are defined by glacial movement, which continues to carve the network of fiords that serve as a pillar of the area's recreational value. This interplay of ocean and terrestrial environments creates scenic viewing opportunities that are incredibly unique. Black bears congregate at salmon streams and move freely along shorelines, a reminder that the area is at the heart of North American salmon habitat. There are few places on earth where one species serves as a unifying pillar of the mosaic of terrestrial and marine wildlife.

Humans have inhabited this landscape for thousands of years. Long before the modern era, Alutiiq stories and place names described the land in intimate detail, conveying a strong connection between people and place. Oral histories and archaeological evidence show that at least eight permanent village sites and areas of seasonal use were spread throughout the area's bays and fiords. These sites are associated with the Chenega people. Sites were often tied to food resources such as marine mammals, fish (particularly salmon), berries, and many other foods that remain important sources of nutrition for their people today.

The earliest occupation known in Prince William Sound was between 4,400 and 3,300 years before present (J. Kinsner, pers. comm. 2020). Little is known of these people. They were a sea going people who relied on marine mammals and fish for subsistence and utilized both chipped stone and ground slate tools. The Chugach Phase of the area's history began approximately 2,400 years ago. Around this time, Sugpiaq speaking Chugach people, who were likely descendants of earlier occupants, are known to have occupied islands and bays in various areas of Prince William Sound. A period of Russian and European contact began in the 18th century, centered first on the fur trade. Impacts to indigenous communities included disease epidemics that decreased populations and shifted areas of habitation. At the end of the Russian period only four of the eight known native settlements continued to exist in Prince William Sound.

Russian presence in Prince William Sound is not clearly reflected in the ecological landscape today. The evolution of industry and contemporary human use was catalyzed by the 1867 purchase of the Alaska territory from Russia. With the transfer of territory came the first wave of American industry: the American fur trade. This era saw overhunting, peaking in the 1880s until its eventual collapse in 1898 (Simeone and Miraglia 2000). At the end of the 19th century, the commercial salmon industry gained traction in Prince William Sound. Salteries and canneries, which provided infrastructure to process the abundance of salmon commercially caught in surrounding waters, brought new development to the area in the early 20th century.

Around the same time, potential for mining resources brought the next wave of European influence into Prince William Sound. Within the wilderness study area, Granite Mine in Port Wells, Mineral King Mine in Bettles Bay, and the Alaska Homestake Mine in Harriman Fiord experienced major development. Mineral extraction reached its peak before 1920 and declined throughout the 1920s (Koschmann 1968). Around this time, fox farming gained momentum as a lucrative pursuit as

farmers leased entire islands as habitat for blue, red, and silver fox. The fur market peaked in the mid-1920s before its eventual decline (Wooley 2002).

Western Prince William Sound has seen logging, although this industry's reach is not as noticeable as mining or commercial fishing. This period of history is evidenced by isolated patches of clearcut timber harvest, such as above Pakenham Point. In recent years, cleanup and rehabilitation efforts have been directed toward the removal of unauthorized structures and garbage at mining sites. The remnants of the industry can now be explored without the associated clutter, providing visitors with context to the area's diverse history.

There is strong historical human connection to the area that endures today. Five communities are located in Prince William Sound. The Alutiiq Alaska Native villages of Chenega and Tatitlek are located close to the Nellie Juan-College Fiord Wilderness Study Area boundaries and their traditional lands extend throughout the area. The Native Village of Eyak and the community of Cordova, located in southeastern Prince William Sound, are closely connected to wilderness study area lands, notably through commercial fishing activity. The cities of Valdez and Whittier, the only Prince William Sound communities linked to Alaska's road system, also share close connections to wilderness study area lands. The bond is especially visible in a vibrant recreation and tourism industry that supports scores of waterfront businesses that bustle with visitors each summer. Residents of these communities, along with others, also value wilderness study area lands for subsistence, sport hunting and fishing, recreation, and as a place to relax or connect with nature. These pursuits rely on the area's entwined terrestrial and marine ecosystems.

1989 *Exxon Valdez* Oil Spill

The Nellie Juan-College Fiord Wilderness Study Area continues to recover from an event that occurred shortly after midnight on March 24, 1989. While transiting Prince William Sound with 53.1 million gallons of oil onboard, the *Exxon Valdez* oil tanker ran aground at Bligh Reef south of the community of Valdez. Throughout four days, 10.8 million gallons of oil spilled into Prince William Sound and eventually impacted over 1,000 miles of Alaskan coastline (State of Alaska 1990). Portions of the wilderness study area shorelines were hit first and hardest. This event affected the natural and social wellbeing of the area.

The effects of the spill are still felt today. Of 28 resources and four human services originally listed as injured by the spill, four resources remain unrecovered, according to the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC 2014b). The wilderness study area is listed as a recovering resource and will not be listed as recovered until lingering oil is no longer encountered, and the public perceives that the area has recovered from the spill. Impacts, however, are not limited to the presence of lingering oil, and include effects on the landscape qualities, as described in the sections below.

Today, an estimated 21,000 gallons of lingering oil is still present on beaches and above mean high tide line (EVOSTC 2014b, 2014c).The presence of oil contributes to the area's current listed status of "recovering" (EVOSTC 2014a). Surveys of shorelines in 1992 in Prince William Sound and along the Kenai Peninsula disclosed that surface oil remained on about one-third of the affected shorelines. It was determined that the cost, feasibility, and potential environmental impact of further cleanup was greater than the problems caused by leaving the oil in place (EVOSTC 1994).

In the decades following the spill, the *Exxon Valdez* Oil Spill Trustee Council updated the injured resources list to reflect the steady recovery of most species, habitats, and services. Today the *Exxon Valdez* Oil Spill Trustee Council still lists marbled murrelets and pigeon guillemots, two species inhabiting the wilderness study area, as "not recovering" from the oil spill (EVOSTC 2014b). Two additional species, Pacific herring and certain orca populations, which inhabit marine waters adjacent to the wilderness study area, are also listed as "not recovering." Although the latter species are not terrestrial species, they remain important contributors to the natural conditions of the area due to the interwoven character of Prince William Sound's marine and terrestrial environments. Many onshore visitors seek marine wildlife viewing opportunities and closely associate healthy marine wildlife populations with the wilderness study area's character. Each of these injured species show ways that the oil spill continues to impact the natural quality of the area's character.

1964 Earthquake

The 9.2 magnitude earthquake that occurred in Prince William Sound in 1964 played a major role in altering the area's landscape. During this event, the landscape shook with profound force for four and a half minutes, uplifting coastlines, displacing water, and demonstrating the forces of the dynamic, changing landscape that is still observed today (U. S. Geological Survey 2014). Just east of the Nellie Juan-College Fiord Wilderness Study Area boundary, the seafloor uplifted 33 feet, serving as testament to the power of the event. This is the greatest tectonic uplift of land on record (U. S. Geological Survey 1995). Other lands in the wilderness study area subsided up to six feet (Plafker 1969).

The earthquake also impacted the human use and occupation of some areas of Prince William Sound. As the earth violently shook, a series of tsunamis were triggered by underwater landslides. Displaced water raced across Prince William Sound. The Native Village of Chenega suffered 23 deaths and severe structural destruction, resulting in abandonment of the village site (Simeone and Miraglia 2000). The communities of Valdez and Whittier also experienced serious damage and loss of life as tsunamis ripped through harbors and residential developments. An estimated 139 people were killed because of structure collapses and tsunamis.

Land Ownership within Western Prince William Sound

Land ownership patterns have a bearing on assessing the existing character of the Nellie Juan-College Fiord Wilderness Study Area. While Chugach National Forest lands surround broad swaths of western Prince William Sound, large tracts of land are also owned and managed by Alaska Native Corporations and the State of Alaska. These lands are wholly managed by the landowner. In some areas the result is a patchwork of land ownership and management priorities. These ownership patterns reflect important moments in Alaskan history.

For instance, in 1958 the Alaska Statehood Act authorized the State of Alaska to select approximately 104 million acres of public lands, including 400,000 acres of national forest. These lands were selected for "the purposes of furthering the development of and expansion of communities," among other purposes (Alaska Statehood Act, section 6). The land selection process, which had to allow time for the United States Congress to settle Alaska Native land claims and resolve lands conservation issues related to federal lands in Alaska, took several decades to complete. Most State land selections were completed in the 1980s with a majority of these parcels

being conveyed to the State. As a result, a total of 186,069 acres within the wilderness study area boundary are owned by the State, including areas around Port Wells, Eshamy Bay, and Esther Island. The Alaska Division of Parks and Outdoor Recreation manages 30,200 acres. Of this total, 10,200 acres are legislatively designated Alaska State Marine Parks and managed for recreation, tourism, wilderness and other values (J. Blackwell, pers. comm. 2020). The State also manages land for purposes including aquaculture, fish and wildlife habitat, recreational opportunities and development, and wilderness values (State of Alaska 1988). Approximately 1,156 acres of lands within the wilderness study area remain selected by the State but these lands have not been conveyed to date. Marine waters, and those portions of inland rivers and lakes legally determined navigable for purposes of title through either a quiet title action in the federal courts or an administrative recordable disclaimer of interest, are generally outside Forest Service jurisdiction (USDA FS 2020). The boundary between State and federal lands along the coast where these tidelands either avulsed or submerged during the 1964 earthquake is unresolved. Without a defined boundary, the Forest Service and State of Alaska have been operating under a 1992 memorandum of understanding for management of these lands.

In 1971, the Alaska Native Claims Settlement Act (ANCSA) sought to extinguish Alaska Native land claims through a cash settlement, land conveyances, and the creation of for-profit Alaska Native corporations. The corporations were authorized to select public lands from their regional or village areas to serve for-profit purposes. Like the State land selections, the Alaska Native corporations selections occurred over a span of decades and in some cases, conveyances of land are ongoing today. As a result, in Prince William Sound, Alaska Native regional and village corporations possess fee title to 56,609 acres of land within the wilderness study area boundary. Examples include areas around Knight Island, Glacier Island, Chenega Island, and areas near the Nellie Juan Lake and Nellie Juan River. These are private lands managed for purposes determined by the corporations.

As part of restoration efforts following the 1989 *Exxon Valdez* oil spill, the federal government purchased land or partial interest in land in the spill area. This included 211,735 acres of surface estate in Prince William Sound, which were made part of the Chugach National Forest when purchased in 1997. Chugach Alaska Corporation owns the subsurface to these lands, including the areas within the wilderness study area boundaries around Jackpot Bay and parts of Knights Island. In the 2020 Chugach National Forest Land Management Plan, these surface lands are not managed as part of the wilderness study area, but and are managed under EVOS-Acquired Lands Management Area 6 (MA6). As stated in management direction for MA6, these lands are managed in perpetuity under the terms of conservation easements associated with the purchase agreements for these lands (USDA FS 2020).

The John D. Dingell, Jr. Conservation, Management, and Recreation Act of 2019 calls for a study of land ownership and use patterns within the Chugach Region of Alaska to provide recommendations for land exchange options that will, among other benefits, consolidate ownership of the surface and mineral estate of federal land under the acquisitions program. The need for this study arises from the acquisitions program of the *Exxon Valdez* Oil Spill Trustee Council and resulting social and economic impacts within the region and to the Chugach Alaska Corporation lands conveyed via ANCSA. The Bureau of Land Management is currently completing this study which may affect future land ownership within the wilderness study area.

Section 14(h)(1) of ANCSA also allows Alaska Native regional corporations to apply for title to lands containing Alaska Native historical or burial sites. To date, 93 parcels totaling approximately 1,670 acres that are adjacent to or surrounded by the wilderness study area have been conveyed to the Chugach Alaska Corporation for this purpose (Hickel 2020) and approximately 3,805 acres have been selected but not conveyed under this section of ANCSA. Selections under this section of ANCSA continue today. An additional 4,694 acres have also been selected by Alaska Native regional and village corporations under other sections of ANCSA and these lands have not been conveyed to date (USDA FS 2020).

Wildness

Wildness refers to the extent to which the ecosystem processes in the wilderness study area are natural and free from managerial intervention. This quality is monitored by tracking management actions that manipulate processes associated with air, water, vegetation, or animal life. Minimizing actions that manipulate the landscape is critical to maintaining the presently existing character of the area and its potential for inclusion in the National Wilderness Preservation System.

Ecological systems throughout the wilderness study area remain generally unaffected by direct human manipulation. Wildlife and fish populations move freely throughout their natural habitats. The vast majority of vegetative communities and waterways are under natural influence. ANILCA authorized manipulations are primarily associated with fish hatcheries, fisheries management activities, or restoration from the 1989 *Exxon Valdez* oil spill.

Provisions in ANILCA allow managers, under certain circumstances, to authorize activities in the Nellie Juan-College Fiord Wilderness Study Area. They may include management and enhancement of fish populations, the construction of fish hatcheries, and performance of certain aquaculture and fisheries management activities, to be conducted in ways that minimize impacts to the wilderness study area's "wilderness character" (ANILCA 1315(b)). ANILCA 1314(a) allows the State to manage fish and wildlife on public lands. Additionally, the Chugach National Forest has the authority to permit research, restoration, or other projects. These actions can affect the area's wildness quality. The 2020 Chugach National Forest Land Management Plan outlines standards and guidelines and monitoring questions that are designed to promote management activities for each quality to maintain the wilderness study area's presently existing character.

ANILCA 1315(b) allows for the possible authorization of certain aquaculture activities in the wilderness study area. Congress struck a balance between protecting and enhancing Prince William Sound's fishery resource while also preventing adverse impacts to the "wilderness character" of the area. Two hatchery operations within the wilderness study area contribute to the area's altered wildness quality. Main Bay Hatchery, which produces over 12 million sockeye smolt annually, was originally established with broodstock from Coghill Lake. As a result of the infrastructure associated with the hatchery, there is now a returning run of sockeye salmon. Hatcheries further alter the wildness quality by controlling the reproductive cycle of salmon. Upon arriving at the hatchery, salmon swim into holding pens and are sorted before their eggs are removed. Manually processing and propagating the eggs allows lower mortality during the first phase of the salmon's lifecycle.

Permanent artificial fish passage structures are closely linked with the topographic impacts of the 1964 earthquake. During this event, the earthquake uplifted land in parts of Prince William Sound (Plafker 1969), inhibiting the movement of salmon upstream by creating waterfalls and steep stream gradients impassible to fish in some places. The Pigot Bay stream was channelized (widened and deepened) to increase flow capacity. Each year fisheries personnel inspect the ladders, perform any maintenance needed, and ensure fish passages are not blocked. The six fish ladder locations in the wilderness study area include: Derickson Bay, Red Creek, Shrode Lake, Solf Lake, Otter Creek, and Pigot Bay. These management actions generate habitat and facilitate spawning for pink, sockeye, coho, and chum salmon, and were considered intentional manipulations of the environment for management purposes, being counted as part of the existing conditions.

Salmon populations have experienced varying manipulations in the wilderness study area. As a result of the *Exxon Valdez* oil spill, sockeye salmon were listed as an injured species by the *Exxon Valdez* Oil Spill Trustee Council. In an effort to restore the population, nutrient enrichment took place from 1993–1996 at Coghill Lake, increasing salmon smolt populations from about 263,600 to 940,400 during treatment (Edmundson et al. 1997). Additionally, fish stocking occurred at Solf Lake throughout 1998–2001 with the intention of restoring the sockeye population. During this period, an average of 110,000 fry were added annually (Gillikin 2001). Stocking resumed in 2003 and continued throughout 2007 (Stash 2007). Fish stocking and nutrient enrichment do not occur in this area today as the sockeye salmon resource is listed as recovered, but previous authorized actions were counted to develop the baseline level of activities (EVOSTC 2014b).

Ongoing impacts from the Exxon Valdez oil spill continue to contribute to the wilderness study area's injured status and include authorized actions that were counted as part of the baseline conditions of wildness. Management actions undertaken with the intent of supporting the recovery of resources and services injured from the spill have decreased over time and are expected to continue to do so.

Other authorized actions counted as part of the existing baseline conditions for wildness are the ongoing management efforts to restore the Naked Island pigeon guillemot population that remains listed as not recovering (EVOSTC 2014b). Monitoring studies have been ongoing since the late 1970s and data show that numbers of breeding pigeon guillemots dropped from 1,000 to fewer than 100 following the *Exxon Valdez* oil spill (USDI FWS 2013). In the decades following the spill, researchers pointed to mink predation as a possible factor prohibiting pigeon guillemot reproductive success and recovery (Barto and Pratt 2017). In 2014 the Chugach National Forest and Alaska Department of Fish and Game authorized trapping of mink in potential pigeon guillemot nesting areas on Naked Island. These efforts occurred between 2014 and 2018. The trapping of mink is intended to improve conditions for protected bird species. To reestablish pigeon guillemot and rhinoceros auklet populations, call boxes have been placed throughout Naked Island to encourage nesting. Call boxes intentionally influencing wildlife behavior and are therefore counted as part of the authorized actions in the existing conditions of wildness for the wilderness study area.

In some cases, land managers may decide that controlling or manipulating certain aspects of the environment within the wilderness study area is necessary for preserving other qualities of the area's presently existing character. Noxious weeds and nonnative invasive species, both aquatic and terrestrial, may impact existing ecosystem health and function across the area. To limit the

spread of invasive or nonnative plant species, managers may use manual, biological, and chemical controls. The Prince William Sound Zone Terrestrial Invasive Plant Treatment Project Environmental Assessment (USDA FS 2017a) provides guidance for conducting invasive plant removal in the wilderness study area. Examples of management actions to address invasive species include: the removal of European black slugs from the Eshamy Bay area between 2014 and 2018; the removal of nonnative dandelions from Hobo Bay and two locations in Harriman Fiord; and the removal of nonnative poppies from Pigot Bay.

Researchers have conducted studies on certain wildlife species in the wilderness study area, including the capture, collaring, and tagging of individual animals. Concerns over a potentially sharp decline in the black bear population in the last fifteen years in western Prince William Sound prompted a study in which 15 to 20 bears were collared annually in the wilderness study area between 2016 and 2018 (Lydon et al. 2016). This was a collaborative effort between the Forest Service and the Alaska Department of Fish and Game. The process of capturing an animal is considered an intentional manipulation, warranting the tracking of this management action to determine affects to the area's wildness quality. In addition to the tagging of black bear, oystercatchers have been tagged within the wilderness study area to determine effects of recreation on nesting success. Oystercatchers were tagged and tracked in 2005 through 2006 in the Harriman Fiord area (Spiegel et al. 2012).

Natural Conditions

Natural conditions describe the integrity of ecosystems within the wilderness study area, with a focus on plants, animals, air and water, and ecological processes. This quality is monitored by evaluating the effects from management actions as well as influences originating from outside of Forest Service jurisdiction. Attributes that compose the natural conditions quality include both biotic and abiotic elements, like plant and animal communities, soil, water, and air. Contemporary use and anthropogenic influence play a major role in shaping environmental conditions.

Throughout recent history, Prince William Sound's landscape and natural resources have seen dynamic changes through several events that have altered the area's natural composition. As a result of the 1964 earthquake, gradient barriers were created at stream mouths, preventing upstream fish migration. The uplifted areas that were previously intertidal zones eventually became vegetated, forming new forested habitat.

While some lands lifted, others subsided, sending the earth and its deep-rooted trees into saltwater. Century old spruce trees reached the end of their lives but remain standing as a tribute to where past forested stands once were abundant. It is eye-catching for those who do not know of the tree's origin. Some visitors make the mistake of harvesting branches for firewood, unaware of the uniqueness of this resource. The salt-preserved skeletons provide nesting habitat for shorebirds and serve as a reminder of the profound tectonic force that led to landscape-scale changes.

Twenty-five years after the earthquake, the Exxon Valdez oil spill occurred, affecting the natural conditions of the Nellie Juan-College Fiord Wilderness Study Area in profound ways. The 1994 Exxon Valdez Oil Spill Restoration Plan (EVOSTC 1994) originally listed 28 species, habitats, and services that were injured by the oil spill. Each is found within the wilderness study area or its adjacent marine waters. The area as a whole was additionally referenced as an injured resource

due to the presence of oil and intense cleanup seasons from 1989 to 1990, which resulted in a temporary increase of people, noise, and activity in the area's undeveloped and normally sparsely populated landscape (EVOSTC 2014a).

Despite its history of geologic and anthropogenic disturbances, the wilderness study area remains exemplary of a thriving ecosystem, evidenced by the interconnectedness between plant and animal species. The temperate rainforest understory, carpeted with sphagnum moss, salmonberry brambles, devils club and ferns, captures and filters water that is fed into braided, pristine streams. These freshwater systems serve as an essential pillar for the biodiversity and health of the forest. Approximately 400 streams in the wilderness study area support the return of spawning salmon (Johnson and Blossom 2019). With each spawning cycle, adult salmon return to their natal streams. There they spawn and die, providing nutrients to both animals and the old growth temperate rainforest. Bald eagles, black bears, and ravens, among others, consume salmon and bring carcass parts into the forest, adding nutrients to the soils as they decompose. Upwards of 30 percent of nitrogen stored in surrounding vegetation comes from the dissolved organic matter released by decomposing carcasses (Bilby et al. 1996). This salmon ecosystem provides for a healthy forest, creating a well-balanced, nutrient-rich habitat for plants, animals, and fish to flourish.

There are four remote salmon hatcheries in western Prince William Sound. Two hatcheries are on National Forest System lands within the wilderness study area and two hatcheries are on State-owned lands surrounded by the wilderness study area. A portion of the hatchery fish do not return to the hatcheries and stray into natural stream habitats used by wild fish. Research suggests that salmon originating from hatcheries that stray and spawn in natural environments have a lower fitness (defined as the number of progeny that survive to adulthood and return to spawn) than wild origin salmon adapted to the same location (Berejikian and Ford 2004). Potential effects include shifting spawning times, altered genetic traits, and stress and competition from crowding at spawning areas of wild salmon stocks. The effect of these stray hatchery fish may impact the productivity and fitness of wild salmon in Prince William Sound (Leskak et al. 2019).

There is a network of set net commercial fishing camps located in Main Bay. The Forest Service manages these permits in accordance with ANILCA Section 1316(a). Three diesel spills at set net sites have occurred in recent years. Remediation of these spills are monitored by the Forest Service and in coordination with Alaska Department of Environmental Conservation, as they impact both soil and water quality in the surrounding freshwater waterways. An additional spill occurred in 2013 at Cannery Creek hatchery. During this event, 300 to 500 gallons of heating fuel leaked on site (Engles 2013).

Soil and water contamination are also present at the historical Granite Mine site, a 42-acre parcel where gold mining operations were conducted from 1913 until 1964 (Coleman 2016). Remnants of these activities include two mine adits, three waste rock piles, two tailings impoundments, and several dilapidated buildings and pieces of equipment. Arsenic, mercury, and several other heavy metal contaminants associated with gold mining in the area were found in the soil, sediment, and surface water at the mine site during a 2002 study (State of Alaska 2020).

Some natural conditions of Prince William Sound are undergoing rapid change as a result of a warming climate. Tidewater glaciers are calving and receding at an accelerated rate, ocean temperatures are rising, and winters are becoming shorter with milder temperatures (Maraldo 2020). Shorter periods of snowpack are resulting in longer growing seasons, vegetating areas that have not historically supported plant growth. The colonization of plant species as they move further north and higher in elevation is an indicator of a changing climate (Morton 2020). Additionally, climate change may be contributing to changes in vegetation community composition and structure. For example, yellow cedar (*Cupressus nootkatensis*) in Prince William Sound are currently considered to have thriving populations, but this species is seeing increasing mortality rates in its northernmost distribution zones, which may result in changes to the current natural ecosystem.

The wilderness study area has a large density of glaciers, creating valuable opportunity for climate research. Columbia Glacier has been studied extensively, generating the world's longest and most detailed observational record of an ocean-terminating glacier in rapid retreat (USDA FS 2017b). Since the onset of rapid retreat in the early 1980s, 50 percent of the glacier's total volume has been lost, making this one of the fastest changing landscapes on earth today (Consultants, W.T. Pfeffer Geophysical 2014). Over 100 square kilometers of new landscape have been uncovered from under ice. Most of the unglaciated area is now a new fjord. Columbia Glacier alone is responsible for about 10 percent of ice loss in the Alaska Region, and close to 1 percent of global eustatic sea level rise (Campbell 2020).

Additionally, snow and ice monitoring indicate changes in glacial ice on the forest over time. Monitoring has taken place at several long-term benchmark sites that provide insight into glacier movement, glacial mass changes, and stream runoff. Wolverine Glacier is one of four long-term monitoring "benchmark glaciers" in North America. Data have been gathered at the monitoring station since 1967, providing the only high-elevation, long-term, year-round climate data for the mountains of southcentral Alaska (Mayo et al. 2004). Findings reveal that the glacier's retreat accelerated after 1988. In 1984, the Wolverine Glacier area was proposed for research natural area designation in the first Land and Resource Management Plan of the Chugach National Forest (USDA FS 1984). In 2002, the area was designated a research natural area in the record of decision for the 2002 Chugach National Forest Land and Resource Management Plan. This designation was retained in the 2020 Chugach National Forest Land Management Plan.

Air pollutants present in the wilderness study area originate from a vast geographic range of human activity. Pollution generated from trans-Pacific energy production in Asia is carried to the inlets and fiords of the area along with particulate matter from adjacent oceanic shipping lanes. Locally generated pollution from cruise ships, ferries, and recreational and fishing boats produce exhaust, adding to the pollution emitted from remote hatchery diesel consumption. To measure air quality, lichen communities are used as a bioindicator. Monitoring results show contaminants at several sites have exceeded thresholds identified by U.S. Forest Service Alaska Region air and plant specialists for target lichen species (Brenner et al. 2015). This may indicate damage to lichen communities from air pollution.

Within Prince William Sound, evidence suggests pollutants from local shipping have declined in the Nellie Juan-College Fiord Wilderness Study Area in recent years (Starcrest Consulting Group 2015). Cruise ship traffic, which in 2004 amounted to 161 visits to College Fiord and Whittier, has since declined to 39 annual visits. Additionally, rules from the International Convention on the Prevention of Pollution from Ships (MARPOL) took effect in Prince William Sound in 2015, resulting in the decreased use of high-pollutant fuels in oil tankers. A study conducted by the Prince William Sound Regional Citizens Advisory Council suggests that particulate matter, oxides of nitrogen, and oxides of sulfur will all reduce in upcoming years (Starcrest Consulting Group 2015). Subsequent data for these measures have not been collected.

Marine debris washes ashore across many miles of wilderness study area shorelines, impacting the area's natural conditions. Monitoring performed by Gulf of Alaska Keeper and reporting by the Chugach National Forest shows the debris originates both locally and from sources in Asia. Various forms of plastic comprise a significant share of the debris, which is deposited in soils and even freshwater lagoons by tides and storms. Wildlife sometimes consume the debris and evidence suggests the debris contaminates soils and freshwater as it degrades (Engler 2012). Although inland shores in the wilderness study area are often protected from marine debris, many islands and exposed shores are commonly affected. The heaviest concentrations are at various sites on Knight Island, Elrington Island, Port Bainbridge, Perry Island, Naked Island, and mainland shores near Unakwik Inlet.

Invasive plant and animal populations also will likely have future impacts to current ecosystem structure and function within the wilderness study area. Invasive plants are currently rare in remote locations across Prince William Sound. However, several occurrences are known to exist at popular campsites and public use cabins within the area. The cities of Whittier, Valdez, and Cordova are known to harbor several highly invasive plant species that have become established within intact native plant communities thereby creating potential to spread to other areas of the sound from visitor traffic.

Invasive plants have known ecological impacts, while invasive animal species, including the European black slug, are becoming more widespread within the wilderness study area with unknown ecological impact. European black slugs are currently known to be present at several sites in Prince William Sound, including Cordova, Chenega, Whittier, and Eshamy Bay. This species can become established in pristine environments and do not require disturbance, although they are most prevalent near disturbed and heavily populated areas (Gotthardt 2010). When invasive species become established at frequently visited sites in remote areas, these sites can become vectors for further spread into more remote areas (USDA FS 2017a). Invasive plant and slug populations may spread to remote sites should seeds, animals, larvae, or eggs from these sites contaminate gear.

Additional examples of other nonnative species that have spread into the wilderness study area include the spruce aphid and the alder sawfly. At this time, these species are not causing extensive vegetation damage, however, this has the potential to change (Swenson, pers. comm. 2020). Sitka black-tailed deer were introduced into Prince William Sound between 1916 and 1923 on Hawkins, Hinchinbrook, and Montague islands (Westing 2018) and are now established across much of the low-elevation lands in the area.

Spread of invasive species is generally considered an indicator of declining ecosystem health and function. The 2020 land management plan monitoring plan includes questions pertaining to the spread of focal invasive species on the Chugach National Forest. A new monitoring protocol will be developed to track invasive species spread of five plant species on the Chugach National Forest, including within the wilderness study area. Monitoring human use sites for invasive species has been ongoing across the forest since 2004 under an earlier land management plan monitoring protocol (USDA FS 2002).

Undeveloped

The undeveloped quality describes the degree to which the wilderness study area is without permanent developments or growing mechanization (such as helicopter or chainsaw use) (Landres et al. 2020). The construction and maintenance of non-recreational infrastructure such as hatcheries, set net camps, and research sites are examples of features considered when describing the area's undeveloped quality. The use of motorized equipment and means of transportation, including aircraft, snow machines, and motorized boats also impacts the undeveloped character of an area, which in turn affects other qualities of the landscape's character.

When navigating remote inlets and bays by watercraft, or walking along beaches lined with dense swaths of brambles and spruce, human-created developments are rarely seen. Reminders of modern occupation stem primarily from navigational aids, research or monitoring equipment, and fishing camps concentrated near hatcheries (Lydon 2016). As an area that remains largely undeveloped by people, the land provides an opportunity to observe a primeval landscape at play.

In the Nellie Juan-College Fiord Wilderness Study Area, developments include both temporary structures and permanent roads and facilities. Between Main Bay and Cannery Creek hatchery, about one mile of road supports hatchery operations. Non-recreational developments in the wilderness study area range from individual survey markers and scientific instruments to hatchery facilities and antenna towers. The most common purposes for installations are aquaculture and fisheries management, communications, and research. In recent years, the number of developments has decreased (Lydon 2016).

In the decades following the *Exxon Valdez* oil spill, research was crucial for tracking an area's response to an unprecedented ecological disaster. This data guided management decisions across the Forest Service, Alaska Department of Fish and Game, and Alaska Fish and Wildlife Service. Of four permanent research camps located in the wilderness study area, two are long-term wildlife studies initiated in response to the spill. Seven installations are associated with research at Columbia Glacier, and additional installations are tied to the ongoing pigeon guillemot study. This includes twenty game cameras and eight sets of decoy auklets.

Human activity continues today within the wilderness study area. Fisheries enhancement programs, which support local subsistence and commercial harvest, are located throughout the area. Amongst the most predominant developments is the Main Bay Hatchery, located on Forest Service land. Covering 35.2 acres, there are a series of developments associated with the post-ANILCA wilderness study area designation operation. Although the colors and textures of the hatchery facilities are largely uniform with the natural landscape, their forms contrast with the natural features of the surrounding area (USDA FS 1994).

Cannery Creek Hatchery, located on the east shore of Unakwik Inlet, encompasses 40 acres of National Forest System land. After Main Bay, this area holds the second highest concentration of structures in the Nellie Juan-College Fiord Wilderness Study Area. This hatchery predates wilderness study area designation and supports the enhancement of pink and chum salmon. The highest concentration of motorized uses in the area occur at the two fish hatcheries, where heavy equipment, four-wheelers, cars, trucks, generators, and other equipment occur in varying but regular use.

Other sources of development in the wilderness study area are the thirteen commercial set net fishing camps, two cabins, and one warehouse located between Main Bay and Eshamy Bay. These structures are allowable under ANILCA Section 1316(a). Also allowable by ANILCA 1316(a) is the use of generators and motorized tools for the maintenance and repair of equipment necessary for the taking of fish. These uses are authorized under Chugach National Forest special use permits, which include stipulations to protect the area in which they are located.

The wilderness study area's undeveloped quality is also altered by two communication sites that provide public safety links in Prince William Sound: one communication site located at Naked Island and the other at Esther Island. Additionally, recent deglaciation in Barry Arm fiord has exposed a steep slope of unstable land that has the potential to collapse, posing a tsunami threat. This concern has warranted the installation of three research and monitoring sites, allowing State and federal agencies to gather data and initiate warning systems to inform public safety (State of Alaska 2020). Research in Prince William Sound has long informed organizations, federal agencies, and the public of safety and ecological recovery. Generators operate daily and helicopters periodically land at the Naked Island Communication Site, which was first developed in 1985. Esther Island has a Chugach National Forest communication site and serves as a safety resource for Forest Service operations in the area.

Each year, a salmon weir is constructed at Coghill River for six weeks by the Alaska Department of Fish and Game. At the end of each season, the weir is dismantled and stored partially in a permanent structure located on site. Other portions of the weir are stored as far from the river as possible, but not within a structure. Permanent structures on site include an A-frame cabin, several storage sheds, and an outhouse. The data collected at this site are used to inform in-season commercial fisheries management decisions, ensuring sufficient escapement of adult sockeye salmon reaches the lake to spawn and produce the next generation of fish.

The Forest Service completed a variety of removal and restoration projects throughout the wilderness study area. In 2016, an abandoned Civil Aeronautics Administration communication site was removed from North Dutch Island. Asbestos, lead paint, and petroleum contamination were present at the site. Remediation at the site included removal of buildings, oil tanks, and contaminated soils. Heavy equipment was used to accomplish the cleanup, resulting in short-term disturbance with long-term benefits to the undeveloped quality (Lydon 2016). In 2015 to 2016, contamination at Granite Mine was remediated through removal of several oil drums that tested positive for leaking petrochemicals (Coleman 2016). The Forest Service has also removed a variety of unauthorized sites, including tent platforms, abandoned camps, and gear caches.

Over the past century, human use and occupation within Prince William Sound has affected natural conditions and the undeveloped quality at varying scales and locations. In many ways, modern human history in western Prince William Sound is reflected in the area's character today. Visitors are able to experience the area's various industrial periods through the presence of ruins, debris, and abandoned equipment. While some areas have become overtaken by the temperate rainforest, other sites remain a distinct stamp on the land.

Opportunities for Solitude or Primitive and Unconfined Types of Recreation

"Outstanding opportunities for solitude and primitive recreation" refers to the conditions where visitors may experience remoteness from sights and sounds of human activities inside the wilderness study area. This type of recreation is not available throughout the entire wilderness study area. Uninterrupted solitude allows the visitor to escape the human-created sights and sounds that are embedded in the modern world. Similarly, the concept of primitive recreation refers to a lack of mechanized transportation and accessible infrastructure, which also leads to a dependence on personal ability. Unconfined recreation possesses a similar quality, highlighting freedom from managerial control. It is precisely this seclusion from outside pressures that renders wild spaces so valuable from a recreation standpoint; it offers the opportunity to be alone, and to explore the associated physical and psychological challenges. These attributes allow visitors to connect with nature in a way not readily available in contemporary society.

At nearly 2 million acres, the Nellie Juan-College Fiord Wilderness Study Area provides outstanding opportunities for solitude, unconfined and primitive types of recreation. Hundreds of remote and unnamed mountains line the coastline, with meadows and forests that invite exploration. Especially away from shorelines, a visitor could travel on foot for hours or even days without encountering another person. The sense of freedom associated with this quality allows visitors to rely on primitive skills. Most areas lack developed trails or recreational infrastructure and are generally free from the constraints of regulation. Forest Service regulations and common practices, such as the prohibited use of power tools and "Leave No Trace" principles are not included because they do not present significant confinement to the visitor (Landres et al. 2020).

Recreating within the wilderness study area is unique due to the lack of land-based access. When departing from port communities, visitors must transition to a marine vessel or board an aircraft to reach their destination. Waterways surrounding the national forest are used heavily by recreational boaters, kayakers, fishing boats, large cruise ships, and ferries. When sitting on remote shorelines, human encounters may be rare, but marine vessels are frequently seen and heard.

Solitude

Due to the unique configuration of the wilderness study area, human encounters seldom occur in the upland forested area or along remote game trails leading to sweeping alpine views. Tucked-away coves and remote inlets offer infinite opportunity for visitors to stroll along pebble-lined coastlines and meander through dense coastal rainforest vegetation. True solitude free from human-created sights or sounds, however, can be difficult to find for longer than a few consecutive minutes, even while away from shorelines. Prince William Sound lies beneath a major flight corridor, where commercial jets pass at elevations ranging from 12,000 to 18,000 feet when

approaching or departing Anchorage International Airport. In the last two decades, the airport has become one of the world's busiest hubs for global air cargo movement (Bradner 2017). Forest Service monitoring indicates it is not uncommon for visitors to hear as many as eight jets in an hour, or more than thirty jets in a day. With the airport located approximately seventy miles west of the wilderness study area, this major artery generates noise both day and night. This is especially noticeable during periods of clear weather.

While outstanding opportunities for solitude exist, they fluctuate based on location and time of year. The most consistent and highest quality opportunities are found away from shorelines and outside of the core summer season of late May through August. In general, visitors can expect to find the most opportunities for solitude at greater distances from Whittier, Valdez, and areas of concentrated commercial fishing. However, especially in summer, visitors will experience sights and sounds from aircraft and boats, even when a considerable distance from these communities and inland from shore.

Since its designation, the Nellie Juan-College Fiord Wilderness Study Area has seen varying patterns of human presence. Following the *Exxon Valdez* oil spill, a wave of remediation efforts brought up to 5,000 workers to western Prince William Sound (Skinner and Reilly 1989). This was accompanied by heavy clean-up equipment, boats, barges, and associated camps. Although there is no longer disruption from crude oil clean-up, certain research facilities, installations, and abandoned materials associated with oil spill recovery continue to impact opportunities for solitude.

Historical recreational use information and Forest Service outfitter guide permit reports confirm that most of the human use within Prince William Sound is concentrated in the western portion (Poe and Gimblett 2010). This is due to ease of access from Whittier, which is close to Anchorage, Alaska's major population center. The highest use levels were found at areas closest to Whittier (Blackstone Bay and Harriman Fiord) and Valdez (Columbia Bay).

Several areas of concentrated commercial fishing also affect opportunities for solitude during certain times of year. Fishing is particularly busy near any of the four remote fish hatcheries in Prince William Sound, including those that are not on national forest lands. Areas including western Knight Island Passage, Main Bay, Unakwik Inlet, Esther Island, and the mouth of the Coghill River are exposed to sights and sounds associated with the fishing fleet. Bright lights and engine noise can be heard from scores of vessels, while beach fires or repair of fishing equipment frequently occurs onshore. The activity affects the feeling of solitude along shorelines and from inland areas where the coastline is visible.

Several recent trends in technological advancements have affected opportunities for solitude within the wilderness study area. Mechanical improvements such as increasing fuel efficiency, size, power, and navigational tools in motorized vehicles have affected opportunities for solitude within the wilderness study area. Advances in technology have enabled visitors to travel much farther into remote areas and resulted in changed use patterns. At the same time, decreasing winter snow may have reduced snow machine travel in some parts of the wilderness study area.

Another action that altered human use patterns within the wilderness study area was the reconstruction of the Anton Anderson Memorial Tunnel in 2000 (Whittier Tunnel). The project allowed vehicle traffic to reach Whittier for the first time without being transported by train, thus

providing increased access for recreation, hunting, fishing, and other uses in the area. The widened tunnel opened Prince William Sound to much higher visitation from the population centers of Southcentral Alaska. In the summer of 2000 (June through September), 106,053 vehicles accessed the tunnel through Whittier. By 2007 the summer traffic numbers reached 194,944 vehicles and has since remained relatively static (Alaska Department of Transportation and Public Facilities 2020). Not all drivers accessing Whittier through the tunnel visited the wilderness study area, but Chugach National Forest monitoring and State Fish and Game harvest data indicate a steep rise in visitation to the western Prince William Sound following the tunnel's opening.

There are over 30 permitted outfitters and guides in the wilderness study area, many with businesses dependent on the area's wild setting. This number is anticipated to grow as pending permit requests are approved. Clients expect to experience solitude when exploring vast waterways and tucked away coves. These businesses, however, directly increase visitation in the area. Through careful consideration and monitoring, the Chugach National Forest works to allocate outfitter and guide authorizations in a way that maintains or enhances opportunities for solitude.

Opportunities for solitude can be affected by developments and installations in the wilderness study area. Seismic, climate, and wildlife research installations contain instruments along shorelines, upland areas, and glacial ice fields. The presence of these developments impacts a range of wilderness study area qualities, which plays a part in defining the visitor's experience. The presence of marine debris further impacts opportunities for solitude. Visitors looking to escape the sights of modern humanity are often reminded of both localized and distant human activity through the presence of washed up debris including fishing nets, buoys, and plastics.

Primitive and Unconfined Recreation

The wilderness study area serves as the backdrop for true untethered exploration. Visitors rarely encounter management restrictions within the area's boundary. Shorelines closer to port communities offer a range of established use areas, although these locations do not typically contain infrastructure. When traveling to the more remote and untouched inlets, coastlines and upland areas provide the opportunity to experience unconfined enjoyment of the land. Signage exists only when critical for public safety or resource protection, encouraging visitors to find self-reliance. Leave No Trace principles are encouraged for visitors, as they are expected to gently interact with the land. This discourages the cutting of tree limbs, the construction of fire rings, and groups larger than 15 individuals. The lack of commercial enterprises and lodges and very few miles of maintained trail gives the area outstanding opportunities for primitive and unconfined types of recreation.

A few recreation sites within the Nellie Juan-College Fiord Wilderness Study Area, particularly areas easily accessed from Whittier, are defined by areas of repeated human use, evidenced by worn vegetation and user-created trails. Twelve percent of recreation site visits in the wilderness study area indicate heavy use, scoring six or higher on a nine-point scale. In spots of heavy use, sites may have fire rings, cut branches, and garbage. Cutting of trees with chainsaws has resulted in local changes to the natural conditions of the area. As visitor use increases in the area, the fragile vegetation near desirable anchorages and frequently used areas faces potential for long lasting impacts. After significant public comment, the Forest Service determined site hardening is the best approach for protecting resources currently impacted by regular visitor use at certain sites. In 2003,

2008, and 2019 the Chugach National Forest hardened a total of eight campsites. By hardening sites, opportunities for primitive recreation are impacted, while the natural conditions of the area are protected.

The wilderness study area has seen increased cellular coverage in recent years. The Naked Island Communications Site tower initially brought rudimentary coverage to surrounding areas, although its coverage has expanded over time. A similar trend has occurred with the communications tower at Pigot Bay, although this communications site is outside the wilderness study area boundary. A new cell tower began operating the summer of 2020 on private lands on LaTouche Island, bringing cell coverage to a large area previously out of range. This incremental change influences and parallels trends in increased visitation, higher concentration of fishing vessels, and decreased primitive recreation.

Public use cabins within the wilderness study area provide added infrastructure, affecting opportunity for primitive recreation. The Chugach National Forest manages six public use cabins in the wilderness study area. All of the cabins are concentrated in the Port Wells, Cochrane Bay, and Culross Passage areas, which are the closest wilderness study area locations to Whittier and see high use. Paulson Bay cabin, for example, sees the most use with an average of 170 nights a year reserved for use. The wilderness study area also includes seven developed trails maintained at the Class I level. These primitive routes are generally clustered in the same area as the public use cabins and monitoring indicates they receive light use.

Conclusion

The Nellie Juan-College Fiord Wilderness Study Area is comprised of a unique blend of functioning, natural ecosystems. Together, these vast, wild spaces lay the foundation for a myriad of experiences for its visitors and occupants. The area supports various uses, including the pursuit of adventure and solitude, opportunities for time with family, subsistence needs, and economic activity tied to commercial fishing, recreation, and tourism. In various parts of the wilderness study area, the qualities are affected by certain activities and historical events, but they remain intact across large parts of the landscape. The area is of high value to the public, as demonstrated throughout the decades-long legislative history of ANILCA and ongoing public engagement in stewardship of the land. In various parts of the wilderness study area, ecosystems are affected by human activity and historical events, but the area's untouched character remains intact across much of the landscape. This widely primeval landscape fosters opportunity for exploration and education, as the geological and ecological landscape speaks for a changing climate. Western Prince William Sound has the highest concentration of tidewater glaciers in Alaska, many of which are undergoing rapid retreat (Campbell 2020). As rapidly retreating glaciers steadily expose new earth, visitors from around the world are exposed to one of the fastest changing landscapes on the planet. The values of these immense, dynamic, and resilient ecosystems are difficult to quantify, but become ever more apparent as our world changes.

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Attachment 1: Nellie Juan-College Fiord Wilderness Study Area Legislative History

The following timeline of events describes the legislative history leading to the designation of the Nellie Juan-College Fiord Wilderness Study Area. The findings are linked back to the greater legislative history of the Alaska National Interest Lands Conservation Act (ANILCA), which was finalized December 2, 1980 after a series of Senate and House of Representative committee discussions, reports, and amendments.

Discussion surrounding the selection of land in Alaska gained momentum in 1971 with passage of the Alaska Native Claims Settlement Act (ANCSA). Section 17(d)(2) of ANCSA authorized the Secretary of Agriculture to withdraw up to 80 million acres of federal lands in Alaska to study potential for inclusion in the National Park, National Wildlife Refuge, National Wild and Scenic Rivers, and the National Forest System.[1] In December 1973, the legislative proposal was submitted to Congress. Congress was given five years to act on this suggestion, setting the proposal's expiration date at December of 1978.

On January 4, 1977, a bill (H.R. 39) was introduced in the House of Representatives calling for 115 million acres of conserved land. H.R. 39, which eventually became ANILCA, was heavily debated throughout 1977 and 1978. Discussions of wilderness and wilderness study area designations on the Chugach National Forest came into focus during hearings before the House Committee on Interior and Insular Affairs between January and May 1978. A key resource for lawmakers was a February 1, 1978 set of wilderness recommendations for the Tongass and Chugach national forests provided to the committee by Secretary of Agriculture Bob Bergland. For the Chugach National Forest, it recommended a Nellie Juan Wilderness of 696,000 acres, a College Fiord Wilderness of 847,000 acres,[2] and a Prince William Sound Wilderness Study Area of 460,000 acres, which included the coastal areas surrounding the Nellie Juan parcel. These three areas, along with parcels later added to the Chugach National Forest, eventually formed much of the wilderness study area designated in 1980 by ANILCA. The 1978 recommendations forwarded by Secretary Bergland also included a 1.5-million-acre wilderness study area for the Copper River Delta area of the Chugach National Forest, which was not acted upon by Congress.

The Nellie Juan and College Fiord wilderness recommendations and Prince William Sound Wilderness Study Area recommendation were developed by the U.S. Department of Agriculture (USDA) as part of the agency's second Roadless Area Review and Evaluation (RARE II) process, which was ongoing at the time.[3] RARE II was a nationwide evaluation of National Forest System lands for their suitability for wilderness designation. The evaluation was conducted in accordance

1. Alaska Native Claims Settlement Act (ANCSA). December 18, 1971. Public Law 92 203, (85 Stat. 688) 92nd Congress.

2. H.R. 39 95th Congress 1st Session. February 15, 1978. Digitized ANILCA Legislative History, Volume 2. Section 605(a)(b). Page 63.

3. Senate Report 95-1300. October 9, 1978. Committee on Energy and Natural Resources. Digitized ANILCA Legislative History, Volume 33, Page 360.

with requirements of the 1964 Wilderness Act[4] and its criteria focused on certain social and ecological landscape characteristics identified in the Wilderness Act.[5] The characteristics included naturalness, natural integrity, opportunities for solitude or primitive recreation, and other features of ecological, geological, scientific, educational, scenic, or historical values. Wilderness recommendations were also analyzed for their consistency with relevant law and potential impacts on other "resource values," including timber, energy, minerals, wildlife, and motorized recreation use (RARE II FEIS, page 21 III).

As a historical note, the overall components of the RARE II analysis closely resemble those used in subsequent analyses of the 1980 designated wilderness study area that would be conducted by the Chugach National Forest in 1984, 2002, and 2020. They are also much the same as the criteria described in the Forest Service Handbook 1909.12, Chapter 70 Wilderness Recommendation for evaluating wilderness suitability.

Throughout RARE II, the Nellie Juan, College Fiord, and Prince William Sound areas consistently scored in the high percentile of the RARE II rating system (RARE II FEIS, page 115). A 1979 Forest Service analysis of RARE II public comments found the recommendations for the Chugach National Forest were "not a controversial issue for Alaskans or for citizens residing outside Alaska."[6] In 1978, USDA officials "strongly" recommended the areas for inclusion in the bill that would eventually become ANILCA.[7] In early 1978 versions of the bill, the House of Representatives included the Nellie Juan Wilderness, College Fiord Wilderness, and Prince William Sound Wilderness Study Area.

Secretary Bergland's February 1978 recommendations explained that recommendation for a 460,000-acre Prince William Sound Wilderness Study Area was intended to provide time to evaluate State and Alaska Native corporations land selections and "the potential for extensive aquaculture development" in coastal areas of western Prince William Sound. In committee hearings during subsequent months, Alaska Congressman Don Young and others discussed at length the issues of fisheries research, management, and development of salmon hatcheries in the western Sound. Section 1315(b), which allows for the possibility of activities and structures associated with aquaculture, was added to draft legislation in April 1979.[8]

Throughout the legislative process, the discussions of Chugach National Forest wilderness areas were dwarfed by Congress' concern over proposed Tongass National Forest wilderness areas and their impact on the Southeast Alaska timber industry. In comparison, proposed Chugach National Forest wilderness occupied a small amount of the discussion, and lawmakers did not express concern over the limited commercial timber resources in Prince William Sound. The primary sticking point was the possibility of impacts on fishery activities and State and Alaska Native

4. The Wilderness Act. September 3, 1964. Public Law 88-577 (16 U.S. C. 1131-1136) 88th Congress, Second Session. Section 3.

5. The Wilderness Act. September 3, 1964. Public Law 88-577 (16 U.S. C. 1131-1136) 88th Congress, Second Session. Section 2c.

6. Roadless Area Review and Evaluation II, January 1979. U.S. Department of Agriculture. Page A-12.

7. 96th Congress, 1st Session in the House of Representatives. H.R. 39, January 13, 1979. Digitized ANILCA Legislative History, Volume 19, Page 513.

8. 96th Congress, 1st Session. House Report No 96-97 Pt II. April 23, 1979. Digitized ANILCA Legislative History, Volume 35, Page 80.

corporations land selections, which were also related to fishery activity. At various times, members of Alaska's congressional delegation expressed support for the USDA assessment of the wilderness potential of the Chugach National Forest lands in Prince William Sound. The legislative record does not show delegation members questioning the wilderness suitability or qualities of the lands.

Following debate over fisheries activity, Section 606 (1) and (2) of the final version of H.R. 39 passed on May 19, 1978 designated the Nellie Juan Wilderness and the College Fiord Wilderness but did not include the 460,000-acre Prince William Sound Wilderness Study Area that comprised some coastal areas of the originally recommended Nellie Juan Wilderness.

Additionally, the final House bill specified in Section 607(c) that "fishery research, management, enhancement and rehabilitation" activities may be permitted in national forest wilderness areas or wilderness study areas, subject to reasonable regulations to preserve the "wilderness character" and other values of the area. In Section 607(d), the House bill furthermore reserved certain areas in the Nellie Juan Wilderness (Shrode Creek and Princeton Creek) as "Potential Wilderness Areas" that would be available for fish hatchery development for ten years past the date of the final law's passage. If no fish hatchery was built on the sites, they would become federal wilderness. If hatcheries were built, they were to be constructed, operated, and maintained in a manner that minimized adverse impacts on the adjacent Nellie Juan Wilderness.

Sections 606 (1) and (2) and 607(c) and (d) represent the House bill's attempt to balance the need for wilderness with fishery management and hatchery development in western Prince William Sound.[9] Language in these sections form early versions of the eventual Section 1315(b), added in 1979.

Following the passing of H.R 39 in the House of Representatives, the bill then entered and remained within the Senate Energy and Natural Resources Committee until October 9, 1978. Once again, Tongass National Forest wilderness designations and their impact on the Southeast Alaska timber industry dominated discussions. Chugach National Forest wilderness discussions focused on the need for further evaluation of fishery management potential and State and Alaska Native corporations land selections. Lawmakers did not disagree with USDA assessment of the wilderness qualities of the Prince William Sound lands. However, at this time language surrounding the Nellie Juan and College Fiord wilderness recommendations experienced a major shift. Details are scant, but Senate Committee transcripts from August 23, 1978 show that wilderness status was removed from the Nellie Juan and College Fiord areas, stating "Someone suggests that the whole area be put in the study." The "whole area" refers to the three areas: Nellie Juan Wilderness, College Fiord Wilderness, and Prince William Sound Wilderness Study Area. There were no objections in the Committee, resulting in the statement "Without objections, it will be agreed to."[10] The Senate version of H.R. 39 (Senate Report no. 95-1300) proceeded to recommend a 2 million-acre Nellie Juan College Fiord Wilderness Study Area.[11]

9. 95th Congress 2nd Session H.R. 39. May 19, 1978. Section 606, Section 607.

10. Transcripts of Proceedings, United States Senate, Alaska (d)(2) Lands. United States Senate on Energy and Natural Resources. Digitized ANILCA Legislative History, Volume 31, Pages 663–669.

11. 95th Congress 2nd Session Senate Report No. 95-1300. Report of the Committee on Energy and Natural Resources, United States Senate together with Minority, Additional and Supplemental Views. October 9, 1978. Digitized ANILCA Legislative History, Volume 33, Page 189.

With the December 1978 deadline approaching, the Senate and House of Representatives had still not reached an agreement. Senator Gravel further slowed the process by using delaying tactics,[12] including the filibustering of a House proposed extension to pass H.R. 39. As a result, the 95th Congress concluded without the bill becoming law and the 1978 ANCSA deadline was missed. In response, on December 1, 1978, President Carter used the Antiquities Act to establish eleven national monuments totaling 56 million acres on national forests and proposed parks and wildlife refuges in Alaska. The only national forest monuments—Misty Fiords and Admiralty Island—were on the Tongass National Forest. No actions were taken on Chugach National Forest lands. However, Carter's threat of further monument designations assured Congress would take up the Alaska lands bill again.

Between December 1978 and December 1980, the recommended wilderness areas for western Prince William Sound remained in the "wilderness study area" status. Lawmakers focused most of their attention on Tongass National Forest wilderness designations and their impact on the Southeast Alaska timber industry. Lawmakers did not disagree with USDA assessments of the wilderness suitability of the Nellie Juan and other Prince William Sound recommendations. Debate accelerated in late 1980, following the results of the presidential election. Consequently, the final version of ANILCA signed into law on December 2, 1980 did not include any federal wilderness for the Chugach National Forest and instead designated the Nellie Juan-College Fiord Wilderness Study Area, comprising 2.1 million acres of the Chugach National Forest.

In the decades following the wilderness study area designation, Chugach National Forest has periodically analyzed the wilderness suitability of the Nellie Juan-College Fiord Wilderness Study Area as part of regular land management planning efforts in 1984, 2002, and 2020. The analyses followed methods and criteria that largely resemble the RARE II analysis. The resulting wilderness recommendations are shown below in table 8

Also, as part of the regular planning process, beginning in the early 1980s the Chugach National Forest outlined its wilderness study area management intent to maintain the area's "existing wilderness character" and potential for inclusion in the National Wilderness Preservation System according to ANILCA. In the 2020 Chugach National Forest Land Management Plan, the direction was to maintain the area's "existing character" and potential for inclusion in the National Wilderness Preservation System.

Table 8. Chugach National Forest wilderness recommendations, 1987–2020

Planning Year	Acres Recommended for Wilderness Designation by Chugach National Forest
1987	1,703,000
2002	1,412,230
2020	1,387,510

12. Buck, Eugene B. Alaska Lands Interest Lands (D-2) Legislation. Environment and Natural Resources Policy Division. The library of Congress, Congressional Research Service, Major Issue System. Archived 12/20/80. Digitized ANILCA Legislative History, Volume 1.