USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Chugach National Forest May 2022

Biennial Monitoring Evaluation Report for the Chugach National Forest

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About our Plan Monitoring Program

Our forest plan monitoring program is designed to measure how effectively we are managing our forest resources. You can find additional information about our plan monitoring program at https://www.fs.usda.gov/detail/chugach/landmanagement/planning/?cid=stelprd3822408.

The purpose of this biennial monitoring evaluation report is to help the forest supervisor identify where we are and are not making progress toward achieving or maintaining the desired conditions or objectives for forest resources based on our forest plan. Based on the results of our monitoring, the forest supervisor will decide if we need to change the forest plan, our management activities, or the monitoring program.

The end goal of our monitoring efforts is adaptive management of our forest resources. We use the monitoring data to track the effects of our management actions over time. This way we can see if what we're doing to manage the forest is what we intended and, if not, to change either our management strategies or what we're monitoring.

We developed the forest plan monitoring program in 2020 when we revised our land and resource management plan. We selected monitoring questions and indicators that would best help us manage forest resources on the plan area [36 CFR 219.12(a)(2)]. Appendix A of our forest plan describes the monitoring program, how we selected the monitoring questions, and our plan's consistency with the 2012 planning regulations (36 CFR 219.12) (https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd907436.pdf).

As part of our monitoring program, we have also developed a monitoring guide for forest personnel that provides more specific direction for implementing the strategic plan monitoring program and details monitoring methods, protocols, and roles and responsibilities. The monitoring guide is not part of the plan decision. It is designed to be a dynamic document that will change as new science and methods emerge. You can request a copy of the monitoring guide by contacting the Supervisor's office at: 907.743.4500 or email: mailroom_r10_chugach@usda.

Providing timely, accurate monitoring information to the responsible official and the public is a key requirement of the plan monitoring program. This biennial monitoring evaluation report is the vehicle for disseminating this information.

This monitoring report does not make any land management decisions. Instead, the report provides timely, accurate monitoring information regarding our adaptive management needs to the responsible official and the public (USDA Forest Service 2020).[1] Specifically, you'll find information about:

1. The status of select watershed conditions.
2. The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
3. The status of focal species to assess the ecological conditions required under § 219.9.
4. The status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.
5. The status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
6. Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.
7. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.
8. The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land (16 U.S.C. 1604(g)(3)(C)). (36 CFR 219.12(a)).

[1] Monitoring and evaluation requirements have been established through the National Forest Management Act (NFMA) at 36 CFR 219. Additional direction is provided by the Forest Service in Chapter 30 – Monitoring – of the Land Management Handbook (FSH 1909.12).

Monitoring Objectives

The objectives of our plan monitoring program include:

- Assessing the current condition and trend of selected forest resources.
- Documenting our implementation of the plan monitoring program.
- Evaluating the relevant assumptions, changed conditions, management effectiveness, and progress we are making in achieving the selected desired conditions, objectives, and goals described in the forest plan.
- Assessing the status of previous recommended options for change based on previous monitoring and evaluation reports.
- Documenting scheduled monitoring actions that have not been completed and the reasons and rationale why.
- Presenting any new information not outlined in our current plan monitoring program that is relevant to the evaluation of the selected monitoring questions.
- Incorporating broader scale monitoring information from the draft Alaska Regional Broader Scale Monitoring Strategy that is relevant to our understanding of the selected monitoring question.
- Presenting recommended change opportunities to the forest supervisor.

Figure 1. Mouth of Resurrection Creek near Hope, Alaska

Monitoring Results Summary

This is the first biennial monitoring and evaluation report for the Chugach National Forest revised land management plan (forest plan), encompassing work and results for years 2020 and 2021. During this time, in addition to this report,

- we developed the monitoring guide that defines measures and protocols for each of the indicators of the 2020 monitoring program (described in appendix A of the 2020 land management plan); and
- we made one administrative change to the 2020 land management plan refining the monitoring program language to be more consistently applicable and within forest management authority.

We are also working with the Alaska Region 10 to coordinate the climate change monitoring program topic area.

Table 1 and table 2 summarize our recommendations for our forest supervisor and provide the status of our recommendations from past reports.

Table 1. Quantitative summary of adaptive management recommendations for all nine monitoring questions addressed in this report

Recommendation	Yes, need for change	Unsure	No
Results inconsistent with Forest Plan direction	0	0	9
Change to Forest Plan warranted	0	0	9
Change to management activities warranted	0	0	9
Change to Plan monitoring program warranted	0	0	9
Focused assessment needed	0	0	9

Table 2. Summary of findings for each plan monitoring item (questions and indicators)

1.Watershed conditions: Are management actions effective in maintaining or improving watershed integrity?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
National Best Management Practices	2021	Yes	Uncertain - More time/data are needed to understand status or progress of the Plan Component(s)	Forest Plan Standards and Guidelines, Management Activities
Watershed Condition classification ratings	2021	Yes	No	NA

2. Focal Species and Terrestrial Ecosystems: Are management strategies effectively controlling or preventing the spread of invasive species in aquatic and terrestrial systems?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Trend in the distribution and abundance of four highly invasive terrestrial plants (bird vetch, orange hawkweed, white sweetclover, and reed canarygrass)	2021	Yes	No	NA
Trend in geographic range and number of waterbodies infested with Elodea spp.	2021	Yes	No	NA

3. Ecological Conditions in riparian and wetland aquatic habitats: Are management actions maintaining or improving aquatic habitat connectivity?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Percentage of human-associated aquatic organism passage barriers improved or restored	2021	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Program is in process of gathering condition data and identifying all existing barriers.

4. Ecological Conditions for at-risk species: Are habitat conditions necessary to support populations of Dusky Canada Geese and Aleutian Cress being maintained?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Population Trends of Dusky Canada geese in the Copper River Delta	2021	Yes	No	NA
Nesting Success (Dusky Canada goose)	2021	Yes	No	NA
Nest Depredation (Dusky Canada goose)	2021	Yes	No	NA
Trends in known populations of Aleutian Cress	2021	Yes	No	NA
Tree and shrub encroachment into alpine habitat (Aleutian cress)	2021	Yes	No	NA

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Persistence of snowpack in alpine terrain (Aleutian cress)	2021	Yes	No	NA

5. Visitor use, Satisfaction, and progress toward meeting Recreation Objectives: Are recreation opportunities and infrastructure achieving desired conditions and are they sustainable?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Trends in recreation facility occupancy rate	2021	Yes	No	N/A
Trends in number of outfitter guide permits issued and administered, types of guided activities, and locations	2021	Yes	Uncertain - More time/data are needed to understand status or progress of the Plan Component(s)	Monitoring measures are in the process of evaluation
Trends in miles of trails maintained by volunteers and partners	2021	Yes	No	N/A
Trends in the number of recreation sites operated by volunteers and partners	2021	Yes	No	N/A
Trends in total forestwide deferred maintenance ($)	2021	Uncertain - More time/data are needed to understand status or progress of the Plan Component(s)	No	N/A

6. Climate change and other stressors: Is climate change affecting key ecological functions of terrestrial and aquatic habitats within the national forest?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Changes in hydrographs	New metric	Uncertain- Interval of data collection beyond this reporting cycle	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Plan Monitoring protocols: this metric is in development, monitoring measures pending results
Tree and shrub encroachment into alpine habitat and changes in recently deglaciated areas	New metric	Uncertain- Interval of data collection beyond this reporting cycle	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Plan Monitoring protocols: this metric is in development, monitoring measures pending results
Changes in water temperature on selected sites	New metric	Uncertain- Interval of data collection beyond this reporting cycle	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Plan Monitoring protocols: this metric is in development, monitoring measures pending results

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Changes in snow depth, season of snow cover (SNOTEL data)	New metric	Uncertain- Interval of data collection beyond this reporting cycle	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Plan Monitoring protocols: this metric is in development, monitoring measures pending results

7A. Desired conditions for multiple use objectives: Is the Chugach National Forest providing sustainable and predictable goods and services to communities it serves?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Trends in number of commercial recreation permits	2021	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Due to COVID safety precautions during 2020-2021, information may be atypical. Monitoring protocols are also just recently developed and more time is needed to determine trends in results.
Trends in developed recreational facility use	2021	Yes	No	N/A
Trends in sport fishing harvest	2021	Yes	No	N/A
Trends in number of forest product permits issued	2021	Yes	No	N/A
Trends in number of permits issued for subsistence harvest	2021	Yes	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	Information for joint monitoring efforts may lead to changes in permit numbers, as planned and managed
Trends in number of mineral materials permits issued and locatable mineral plans of operation	FY 2020 and 2021	Yes	Uncertain- Methods inadequate to answer monitoring question	Recommend evaluate "denied" requests for Mineral Material contracts. This could show that there was a need for material, but the Forest could not meet that demand due to lack of staffing or current mineral material sites being depleted with no further MM sites identified and developed.

7. B. Desired conditions for the Nellie Juan-College Fiord Wilderness Study Area: Is the presently existing character of the wilderness study area, including areas recommended for wilderness, being maintained?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Trends in Wildness	2021	Yes	No	N/A
Trends in Natural Conditions	2021	Yes	No	N/A

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Trends in Undeveloped	2021	Uncertain- More time/data are needed to understand status or progress of the Plan Component(s)	No	N/A
Trends in opportunities for solitude or primitive, unconfined recreation	New Metric	Uncertain- Interval of data collection beyond this reporting cycle To be provided in 2024 Biennial Monitoring Report	Uncertain - More time/data are needed to understand status or progress of the Plan Component(s)	Monitoring protocol for the two measures may need to be changed due to Barry Arm slope instability and inability to safely monitor several key locations in this area.

8. Productivity of the Land and Soils: Are management activities maintaining soil productivity?

Monitoring Item	Last Year Updated	Consistency with Plan Intent[1]	Recommendation[2]	Type of Change(s) under consideration[2]
Soil disturbance resulting from management activity, as defined in Alaska Region Soil Quality Standards	2021	Uncertain- Interval of data collection beyond this reporting cycle	No	Soils monitoring field efforts planned for 2022, results reported in 2024

1 - Plan intent: Do results demonstrate intended progress of the plan components associated with this monitoring item?

2 - Based on the evaluation of monitoring results, may changes be warranted? Refer to pages below for more details regarding any specific recommendations for change.

Forest Supervisor's Certification

This report documents the results of monitoring activities that occurred through fiscal year 2021 on the Chugach National Forest. Monitoring on some topics is long-term and evaluation of those data will occur later in time.

I have evaluated the monitoring and evaluation results presented in this report. I have found that there are no recommended changes to the 2020 land management plan at this time. I therefore consider the 2020 land management plan sufficient to continue to guide land and resource management of the Chugach National Forest for the near future and plan a deeper examination of the indicators in future assessments after longer term data have been assessed.

JEFF SCHRAMM

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Jeff Schramm
Forest Supervisor
Chugach National Forest

Date May 13, 2022

1. Status of Select Watershed Conditions

Summary

Watershed condition is the state of physical and biological characteristics and processes within a watershed that affect the hydrologic and soil functions supporting aquatic and terrestrial ecosystems. Functioning watersheds generally provide high quality water, recharge streams and aquifers, moderate climate variability, and support long-term soil productivity. Additionally, healthy watersheds generally create and sustain resilient terrestrial, riparian, aquatic and wetland habitats that support diverse populations of plants and animals capable of rapid recovery from natural and human disturbances. Properly functioning watersheds also provide many important ecosystem services and provide a substantial contribution to social and economic sustainability in southcentral Alaska.

The condition of watersheds effects just about every other natural resource. Because of this, the Forest Service has developed and continually re-evaluates and updates nationwide programs to monitor and manage water quality and watershed condition on National Forest System lands. These programs use the best available science, and include current, vetted technical field protocols, data management structures, and periodic evaluation and reporting requirements.

We evaluated our use of best management practices in our management activities; specifically, how well they were implemented and how effective they were in maintaining or improving watershed integrity. We also evaluated changes in watershed condition classification (WCC) ratings resulting from management activities across the forest in select watersheds.

The following results reflect a summary and updates from data we collected over the two-year period of 2020 and 2021 for best management practices and the 2021 five-year reevaluation of watershed condition classification status.

Monitoring Questions and Indicators

Are management actions effective in maintaining or improving watershed integrity?

Indicators:

1. National best management practices rating results
2. Watershed condition classification ratings

Key Results for National Best Management Practices Ratings:

The purpose of the best management practice (BMP) monitoring rating system is to provide a method of measuring the performance of the Forest Service in applying best management practices and protecting water quality during land management activities on National Forest System lands. Assigning a rating outcome to each National Core best management practice monitoring evaluation we are able to track best management practice performance over time at multiple scales within the agency. In addition, patterns may emerge that help us identify strengths and weaknesses of best management practice implementation and effectiveness and needed changes in processes or procedures to address identified weaknesses. The following is a summary and the results of the last two years of best management practice monitoring.

- We randomly selected twelve projects across the forest over the last two years for best management practices monitoring. We selected reviews using the national protocol with implementation and

effectiveness rated separately. We then combined these separate ratings to provide an overall best management practice performance or "composite" rating. The results are highlighted below:

Table 3. Best management practices results

Year	Resource Catagory	District	Implementation	Effectiveness	Composite
2020	Chemical use management activities	SRD[a]	Fully	Effective	Excellent
2020	Facilities and nonrecreational special uses management activities	GRD[b]	Marginal	Mostly	Fair
2020	Wildland Fire management activities	SRD [a]	Fully	Effective	Excellent
2020	Recreation management activities	CRD [c]	No BMPs	Marginal	No Plan
2020	Road management activities	SRD [a]	Fully	Effective	Excellent
2020	Mechanical Vegetation management activities	CRD [c]	Mostly	Effective	Excellent
2020	Water Uses management activities	SRD [a]	Fully	Not effective	Poor
2021	Minerals management activities	SRD [a]	Marginal	Marginal	Poor
2021	Recreation management activities	GRD [b]	No BMPs	Not effective	No Plan
2021	Road management activities	SRD [a]	Fully	Effective	Excellent
2021	Mechanical Vegetation management activities	SRD [a]	Mostly	Effective	Excellent
2021	Mechanical Vegetation management activities	SRD [a]	Marginal	Effective	Good

a – GRD=Glacier Ranger District
b – SRD=Seward Ranger District
c – CRD=Cordova Ranger District

- The best management practices implementation evaluation is designed to answer the question: "Were the site-specific BMP prescriptions implemented as designed or planned?" Implementation monitoring is a two-step process involving review of project documents to determine what site-specific

best management practices prescriptions were intended for the project followed by a field review process to assess whether appropriate best management practices prescriptions were applied. Our review of the projects shows an almost even split across the spectrum on implementing best management practices ranging from none in the project plan to full implementation.

- The best management practices effectiveness evaluation is designed to answer the question: "Were the site-specific BMP prescriptions, as implemented, effective at protecting water quality?" Effectiveness monitoring is a field review process to assess evidence of sediment or other pollutants leaving the project area and entering the aquatic management zone or nearby waterbody, or evidence of physical damage to a waterbody. Our reviews showed that more than half of the projects implemented were effective at protecting soil and water resources. The projects where best management practices implementation were not effective, for the most part had marginal implementation or no plan.
- The overall composite rating shows that 50 percent of the projects were in excellent to good condition. Of the projects that did not get a good or excellent composite rating, 80 percent had marginal implementation or no plan.
- There is no clear trend in the data from the 2020 and 2021 results associated with each of the resource category monitoring activities or across the geographic boundaries.

Recommended Changes for National Best Management Practices

The results of our two-year best management practices monitoring show we could improve on implementing best management practices. The best management practices review trends since 2014 as seen in figure 2 also illustrate that our implementation ratings have consistently scored lower than our effectiveness ratings. Implementation includes design mitigations and more involvement with soil and water resource staff in the early stages of projects, but this is a project level change, not a change to forest plan direction. Increased watershed and soils staff would be an asset and ensure success.

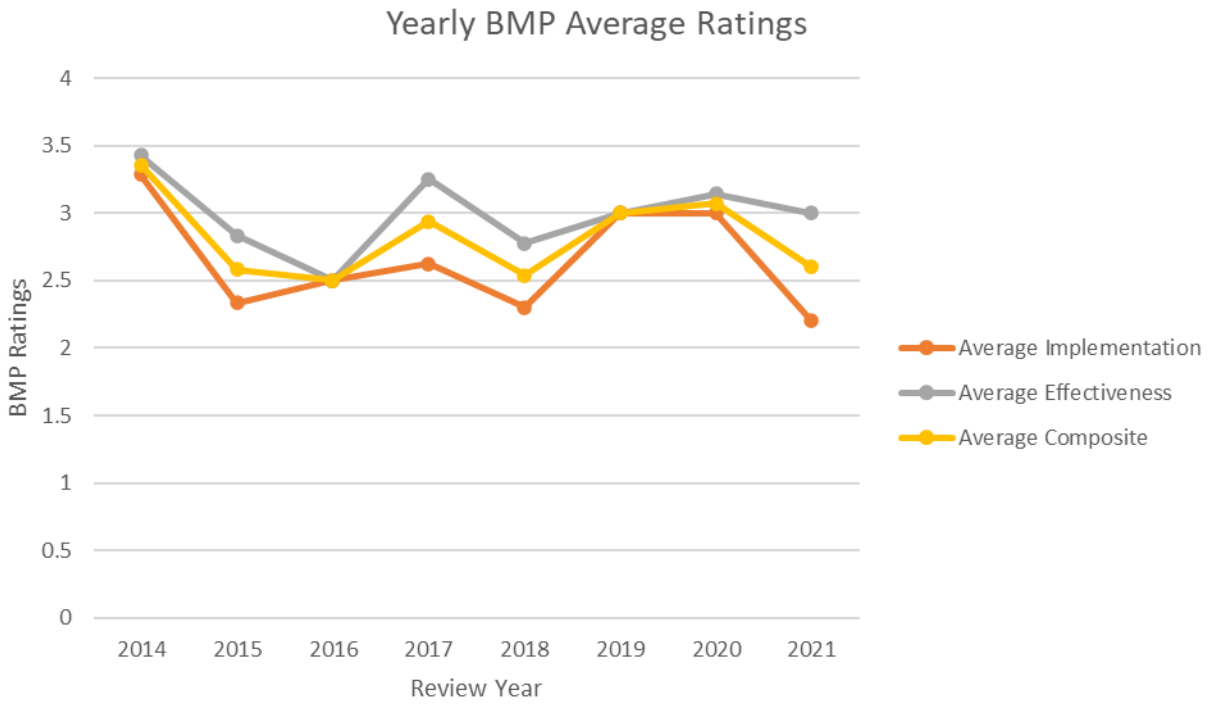

Figure 2. Annual best management practices average ratings

Key Results for Watershed Condition Classification ratings

- We completed the 5-year watershed reassessment in 2021 (Coleman 2021). Overall, watersheds on the Chugach National Forest are in good condition and functioning properly with two hundred and seventy-five watersheds in a Class 1 condition and only two watersheds in a Class 2 functioning at risk condition. The two Class 2 watersheds are Resurrection Creek and Stetson Creek – Cooper Creek on the Seward Ranger District. No watersheds on the forest are in a Class 3 - impaired function condition. Additionally, no watersheds changed condition class over the last ten years since we implemented the watershed condition framework.
- There have been minor changes in watershed condition classification ratings, as outlined in the watershed condition classification technical guide, over the last 5 – year re-assessment period because of management activities and changing environmental conditions.
- We reevaluated forty-four watersheds for watershed condition based on the watershed condition indicators and attributes. Of those, thirty-four have changed condition class ratings for indicator attributes. The results are listed in table 4.
- The primary drivers of change in watershed conditions over the last five years are the 2019 Swan Lake Fire, and insects and disease impacting forest health. However, the results of the forest health analysis are not adequately representing the current spruce beetle infestation. This may be because:
    - the analysis focuses on the forested land that was experiencing mortality from insects and disease and failed to incorporate the forested land that was “anticipated” to experience mortality; and
    - the 20-year period used for the five-year reassessment was from 1999-2019, and the stress from the 2019 drought most likely triggered the most recent infestation.
- The overall, watershed condition classification ratings showed minimal change with twenty-four watersheds showing minor improvement and four watersheds showing minor degradation. The prior 5-year assessment period saw fourteen watersheds with improvement and seven watersheds with degradation.
- Our forest has 99 percent of its watersheds in good, properly functioning condition. The 5-year reevaluation illustrates we are maintaining and improving watershed conditions and integrity as outlined in the forest plan.
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Table 4. Watershed conditions, for detailed information, see the 2021 Watershed Condition Classification Framework 5-Year Reassessment for Chugach National Forest (Coleman 2021)

Watershed Condition Indicators	National Attribute	Should we re-run this indicator? And for what watersheds?	Results	Watersheds Changed
1. Water Quality	1.1 Impaired Waters (303d listings)	No, no changes since 2016	NA	NA
1. Water Quality	1.2. Water Quality Problems (contamination from mines, consumption advisories, eutrophication, etc.)	Yes, new information related to unpublished water quality data from the Granite Mine in the Port Wells-Frontal Prince William Sound watershed (HUC 1902020121).	No Change - Re-analysis results: Due to the small percentage of the Port Wells Frontal Prince William Sound watershed (HUC 1902020121) with impairments the water quality attribute rating and overall watershed condition classification did not change.	NA
2. Water Quantity	2.1 Flow Characteristics (significant dams or diversions)	Yes. Potential change to two watersheds. Stetson Creek - Cooper Creek and Cooper Lake due to failures in the siphon on the Cooper Lake dam and Stetson Creek diversion	No Change - Re-analysis results: this indicator already considered flow alterations, so the siphon failures have little to no effect on the original analysis	NA
3. Aquatic Habitat	3.1 Habitat Fragmentation (aquatic habitat blockages)	Yes. Improved aquatic organism passage culvert replacements in the Kenai Lake and the Alaganik Slough Frontal Gulf of Alaska watersheds.	No Change - Culvert replacements in the five-year re-assessment period: Snug Harbor (Kenai Lake-190203021205); Cooper River Highway MP 20, 16.54, and COP43, COP44 & COP45 (Alagsnik Slough-190201041708). Re-analysis results for Aquatic Habitat Condition Indicator (Habitat Fragmentation attribute): No change to Kenai Lake or Alaganik Slough-Frontal Gulf of Alaska watershed. Based on the WCC condition rating rule set more than 95 percent of the historic aquatic habitats need to still be connected for a changed condition.	NA
3. Aquatic Habitat	3.2 Instream Large Wood (presence and recruitment of wood in wood-dependent streams)	No, no changes since 2016	NA	NA
3. Aquatic Habitat	3.3 Channel Shape and Function (floodplain connectivity, channel stability in response reaches)	Potential changes for a few watersheds where mining or other development has occurred (see Coleman 2021).	No Change - Minimal development or mining within watersheds over the last five years	NA

Watershed Condition Indicators	National Attribute	Should we re-run this indicator? And for what watersheds?	Results	Watersheds Changed
4. Aquatic Biota	4.1 Life Form Presence (expected communities)	No, no changes since 2016	NA	NA
4. Aquatic Biota	4.2 Native Species (expected species and communities)	Elodea treatments in two watersheds, (see Coleman 2021).	No Change- Re-analysis results: successful treatments in both of these watersheds (Cannery Ponds and Wrongway Pond) however elodea is still present within other areas of each of these watersheds	NA
4. Aquatic Biota	4.3 Exotic and/or Aquatic Invasive Species (presence and effect on native species and habitats)	Elodea Treatments in Eyak River-Frontal Gulf of Alaska and Alaganik Slough - Frontal Gulf of Alaska watersheds	No Change - Re-analysis results: Due to the treatments occurring in class "1" watersheds there were no changes	NA
5. Riparian Vegetation	5.1 Riparian/Wetland Vegetation Condition (mid to late seral, functioning properly)	Potential changes for a few watersheds where fire, mining, timber harvest or forest clearing has occurred, (see Coleman 2021).	No Change - Re-analysis resulted in little change due to mining and harvest from Devil's units and Saddlebag Vegetation projects due to riparian buffers. Riparian Management area mitigation measures for the Dusky vegetation removal also resulted in little change.	NA
6. Roads and Trails	6.1 Road and Trail Density	Potential changes for a few watersheds where new road and trails has been built (see Coleman 2021).	No Change suspected - did not end up re-assessing	NA
6. Roads and Trails	6.2 Road and Trail Maintenance (BMPs for drainage features and water crossings)	Potential changes for a few watersheds where new road and trails has been built(see Coleman 2021).	No Change suspected - did not end up re-assessing	NA
6. Roads and Trails	6.3 Proximity to Water	Potential changes for a few watersheds where new road and trail has been built and trails have been re-routed (see Coleman 2021).	No Change suspected - did not end up re-assessing	NA
6. Roads and Trails	6.4 Mass Wasting (roads on landforms subject to mass wasting)	No, no changes since 2016	NA	NA

Watershed Condition Indicators	National Attribute	Should we re-run this indicator? And for what watersheds?	Results	Watersheds Changed
7. Soils	7.1 Soil Productivity	Potential changes for a few watersheds where fire, mining, timber harvest or forest clearing has occurred (see Coleman 2021).	Results to soils due to fire, vegetation harvest, mining, and construction work in several watersheds across the forest. Reassessment of these watersheds recommended in next five years due to large number of activities. For detailed discussion, see description in Coleman 2021.	• Lower Resurrection Creek (190203020504)
7. Soils	7.2 Soil Erosion (accelerated surface erosion)	No, no changes since 2016	NA	NA
7. Soils	7.3 Soil Contamination (hazardous materials, atmospheric deposition)	No, no changes since 2016	NA	NA
8. Fire Regime or Wildfire	Fire Regime Condition Class	Potentially, a few watersheds related to the 2019 Swan Lake Fire, climate change and insects and fuel load changes (see Coleman 2021).	No Change - Re-analysis results: The 2019 Swan Lake fire and current spruce bark beetle infestations do not warrant a change in the FRCC ratings at this time. All watersheds remain at "1" ratings. However, new LANDFIRE data and the Terrestrial Condition Assessment analyses should provide more up to date FRCC data and analyses in the next 5-year re-assessment period.	NA
8. Fire Regime or Wildfire	Wildfire Effects	Yes, Swan Lake fire affected watersheds	Rated the four watersheds affected by the Swan Lake fire as "2"	• Headwaters of Mystery Creek (190203020603) • Thurman Creek (190203020601) • Upper Chickaloon River (190203020602) • Jean Creek – Kenai River (190203021406)
9. Forest Cover	9.1 Forest Cover (loss of forest cover, deforested)	Potential changes for a few watersheds where fire, mining, timber harvest or forest clearing has occurred (see Coleman 2021).	Powerline and Sterling highway clearing are exempt. All other vegetation projects occupied by forest trees did not meet the watershed percent threshold for change. The Swan Lake fire burned within four watersheds; these were analyzed for loss of forest cover utilizing BARC maps.	NA
10. Rangeland	Rangeland Vegetation (relative to site potential)	No, not applicable	NA	NA

Watershed Condition Indicators	National Attribute	Should we re-run this indicator? And for what watersheds?	Results	Watersheds Changed
11.Terrestrial Invasive Species	11.1 Terrestrial Invasive Species (extent and rate of spread)	Potential, A few watersheds with more recent Reed Canary Grass infestations (see Coleman 2021).	No Change - Re-analysis results: None of the 2016 watersheds had occurrences of highly invasive species exceeding 10 percent of the watershed area. This has not changed. Invasive weed treatments have occurred across the forest the last 5 years likely reducing the 2016 infestation levels.	NA
12. Forest Health	12.1 Insect and disease (imminent risk of forest mortality)	Maybe, will contact State and Private Forestry to determine if new information is available, particularly related to the more recent spruce bark beetle infestations	Re-analyzed forest wide primarily for spruce bark beetle affected stands over the last 20 years for both by only FS ownership and total watershed without exclusion of non-FS lands. All watersheds analyzed rated as Class "1" with only six watersheds rating as class "2" Unfortunately the data for 2020 was not utilized due to inconsistencies so these results do not reflect the recent spruce bark beetle infestations following the 2019 drought.	Twenty-seven watersheds changed from class '2' to class '1'; Four watersheds remained in class '2'; and 2 watersheds changed from class '1' to class '2'
12. Forest Health	12.2 Ozone (biomass growth)	No, no changes since 2016	NA	NA

Recommended Changes for Watershed Condition Classification Ratings

We have no recommended changes to plan components, management activities or the monitoring plan. Future considerations are for us to reevaluate the insects and disease attribute to include the “anticipated” mortality to see if there is a substantial change using the national insect and disease risk and hazard mapping data. This will ensure that our future long-term trends are accurate.

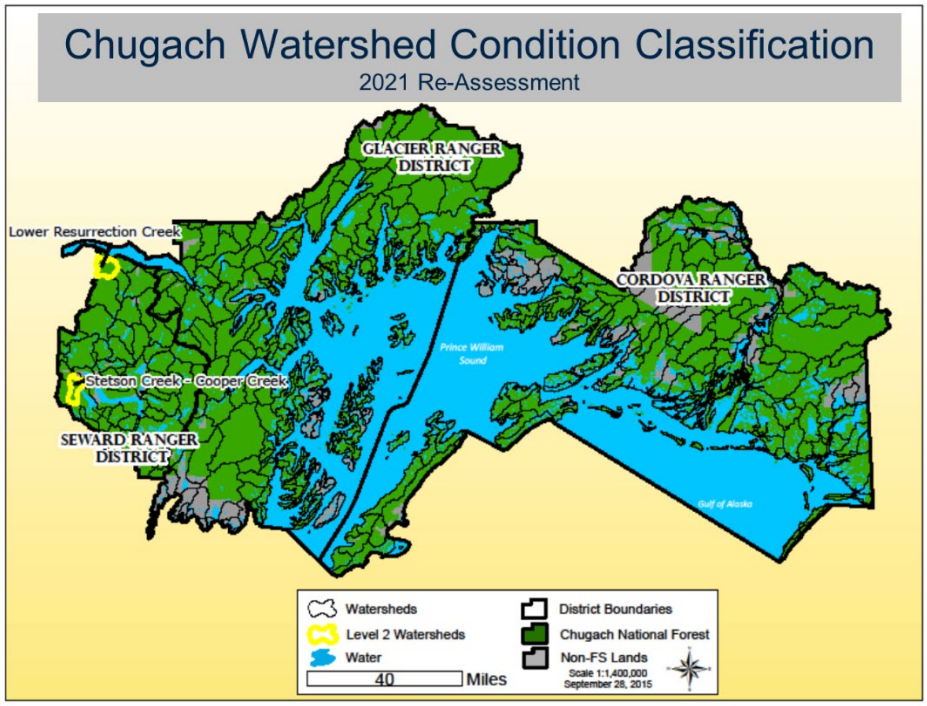

Figure 3. Chugach watershed condition class 2021 reassessment

2. Status of Select Ecological Conditions: Terrestrial Ecosystems and Focal Species

Summary for Ecological Conditions: Terrestrial and Focal Species

We are measuring the trends in distributions of four terrestrial and one aquatic focal plant species. Our goal is to determine if we are meeting the forest plan desired condition for ecological integrity and invasive species[2] (addressing forest plan component: FW-GL3-EPC-DC). These results will help us prioritize areas in need of management attention and evaluate actions that may have contributed to a spread of focal species. The following results reflect updates from data we collected during fiscal year 20-21 (October 1-September 30). We have not incorporated the new information for terrestrial invasive species from the last evaluation report (2011). We will use those data, if feasible, in the five-year analysis due in 2028.

Monitoring Questions and Indicators

Are management strategies effectively controlling or preventing the spread of invasive species in aquatic and terrestrial systems?

Indicators:

1. Trend in the distribution and abundance of four highly invasive terrestrial plants (bird vetch, orange hawkweed, white sweetclover, and reed canarygrass)
2. Trend in geographic range and number of waterbodies infested with *Elodea* spp.

Key Results:

- In 2021 we developed a focal species and terrestrial ecosystem monitoring guide to address forest plan monitoring questions related to four terrestrial and one aquatic invasive species.
- The Forest Ecology Program of Work for this reporting time frame included our treating several locations of invasive species to limit their spread. We established sampling monitoring polygons for the four terrestrial invasive species. However, we did no sampling because our protocols and methods were still in development.
- We monitored three waterbodies during this reporting time frame to determine presence or absence of *Elodea spp., however* the primary purpose of the surveys was to develop protocols that we will incorporate into the monitoring guide.
- Due to the change in monitoring priorities and guidance on monitoring for invasive species, we did not completely implement the monitoring guide to measure key indicators. Therefore, data we collected from this time frame cannot be used to identify trends in any of the five invasive species over this two-year period. We will monitor invasive species beginning in the summer of 2022 and 2023.
- Our last evaluation of trends in invasive species across the Chugach National Forest, including species not currently identified as invasive, occurred in 2011.

[2] Non-native to Alaska and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

- Our ecology staff are working with the Pacific Northwest Research Station's Alaska Forest Inventory and Analysis program to incorporate their data on invasive species distributions across the state into our analysis. The forest inventory and analysis program collects data along a systematic sampling grid which is evenly dispersed throughout the state of Alaska (excluding wilderness areas). These data points will help us determine if the distribution of our invasive species is spreading beyond areas of concentrated human use.
- Our five-year analysis (2028) will use the new monitoring guide methods and metrics to identify trends in these five invasive species. Data we collected prior to the 2020 forest plan and new monitoring guide that used different methodologies will be used when feasible for this analysis.

Recommended Changes:

Because we have not implemented much of the monitoring plan for this monitoring cycle, we cannot yet identify trends pertaining to invasive species (focal species). Therefore, we have no recommended changes to plan components or management activities at this time.

Figure 4. Student Conservation Association intern Hailey Smith cuts the flowing heads of reed canary grass to prevent seed dispersal

Figure 5. Student Conservation Association Hailey Smith displays the aquatic vegetation captured via rake throws while conducting Elodea monitoring

Figure 6. Community volunteers and agency personnel at the Seward Community Weed Pull remove bird vetch from the Seward Middle School

Figure 7. Volunteers from multiple agencies and community groups help to remove white sweet clover along the Seward Highway near Portage

3. Status of Select Ecological Conditions: Riparian, Wetland, and Aquatic Ecosystems

Summary Watershed Connectivity

We are updating the road-stream crossing aquatic organism passage (AOP) inventory and prioritizing remediation work. Using prioritization criteria, we are identifying and evaluating the function of aquatic organism passages.

Our goal is to prioritize repair, restoration or replacement of road-stream crossing structures that do not meet aquatic organism passage requirements or the requirements for current or projected stream flow. We will give Class I and II streams priority for replacement.

The results of our inventory will help us prioritize areas in need of management attention to maintain hydrologic connectivity and aquatic organism passage by eliminating barriers such as undersized culverts and maintaining fish passage infrastructure such as fish ladders.

We must verify the presence of fish at all new stream crossings. We must design all fish-bearing crossings for adequate aquatic organism passage.

The following results reflect status from the aquatic organism passage structure inventory we conducted in the summer of 2021. We are currently reviewing this new information to prioritize and identify aquatic organism passages that are not functioning for repair, restoration or replacement.

Monitoring Questions and Indicators

Are management activities maintaining or improving aquatic habitat connectivity?

The indicator selected:

1. Percentage of human-associated aquatic organism passage barriers improved or restored

Key Results: Stream Passage Barriers

Road Condition Surveys:

Our engineering staff periodically conduct road data gathering and road condition surveys for Chugach Forest roads. The purpose of these surveys is to accurately record road feature data as well as road and feature maintenance needs. We developed a plan to capture culvert data located on Chugach Forest roads during road surveys throughout summer field season 2021. During our initial data gathering in 2021, we surveyed approximately 63 percent of Chugach Forest roads. We plan to survey the remaining 37 percent of roads during the 2022 summer field season with our engineering staff collaborating with other aquatics and engineering staff. Capturing accurate culvert inventory and condition data allows us to properly plan maintenance and replacement. The initial inventory also allows us to assess whether particular culverts are considered aquatic organism passages and if the existing simple culvert is adequately designed as an aquatic organism passage.

Progress in identifying, enumerating, and remediating aquatic organism passages:

Our inventory and GIS evaluations have identified the following key metrics within the Chugach National Forest boundary, (not jurisdiction specific):

- 169 Alaska Department of Fish and Game identified fish passages (both functional and non-functional stream crossings)
- ~304 miles of road (both forest system and non-forest system roads)
- 752 Alaska Department of Transportation culverts (flood relief and stream crossings)

Recommended Changes: Stream Passage Barriers

Based on our current program status we have no recommended changes at this time as we are still in the process of identifying and prioritizing repair and replacement of inadequate stream crossings and completing those already planned and funded on the forest. We will include future recommendations for repairs and replacements in the next biennial monitoring and evaluation report.

Figure 8. Flooded culvert planned for replacement on the Copper River Delta

4. Status of Select Set of Ecological Conditions Required to Contribute to Species Recovery

Summary for At Risk Species

We are measuring six indicators, identified below, to determine the trends in population and habitat condition for dusky Canada goose and Aleutian cress on the forest. We have identified these as species of conservation concern for the Chugach National Forest. The 2020 forest plan guides us to conserve and maintain viable populations of these species. Our goal is to determine if the forest plan desired conditions for terrestrial ecosystems and at-risk species are being met (FW-GL3-TE-DC). These monitoring results will help us to prioritize areas in need of management attention in regard to species of conservation concern.

Monitoring Questions and Indicators

Are habitat conditions necessary to support populations of dusky Canada geese and Aleutian cress being maintained?

Indicators selected are:

1. Dusky Canada goose:
    a) population trends in the Copper River Delta
    b) nesting success
    c) nest depredation
2. Aleutian cress:
    a) trend of known populations of Aleutian cress
    b) tree and shrub encroachment in alpine habitat
    c) persistence of alpine snow pack

Key Results: dusky Canada goose

Population trends

- We did not conduct aerial surveys in 2020 due to COVID19 protocol
- The 2021 Total Copper River Delta bird index of 10,331 (SE=1,118) was 6 percent below the 10-year average of 10,966.
- The 2021 Total Breeding Ground Index, which includes those geese counted on Middleton Island, was 13,039 (SE=1,175); this was 11 percent below the 10-year (2012–2021) average of 14,614 (SE=1,369) and resulted in a 3-year mean of 14,334 (SE=1704).

Nest Monitoring

We monitored 375 nest islands in 2020. Of these nest islands, 366 were available for use by dusky Canada geese (97.6 percent), and nine nest islands were unavailable. This included nest islands that were devoid of vegetation (n=1), washed ashore (n=1), or in dried up ponds (n=7). We found a total of 121 dusky Canada goose nests (32 percent) on nest islands in 2020. Of these 77 were successful (64

percent). Rate of nesting attempt and apparent nesting success were below the 10-year average of 41 percent and 66 percent, respectively. Membrane evidence left in the nest after hatch yielded a total estimate of 316 goslings for the 2020 season. Other nest fates included: 35 destroyed (29 percent), 6 abandoned (5 percent), and 2 unknown (2 percent).

We monitored 374 nest islands in 2021. Of these nest islands, 369 were available for use by dusky Canada geese (99 percent). We found a total of 90 dusky Canada goose nests (24 percent) on nest islands in 2021. Of these 47 were successful (52 percent). Rate of nesting attempt and apparent nesting success were below the 10-year average of 38 percent and 65 percent, respectively. With an average clutch size of 4.2, we projected the nest island program to hatch a minimum of 199 goslings for the 2021 season. Other nest fates included: 36 destroyed (40 percent), 3 abandoned (3 percent), and 4 unknown (4 percent).

Relatively low rates of nesting attempts and below-average nesting success on nest islands in 2020 and 2021, combined with below-average estimates of indicated population abundance, suggest that the dusky Canada goose population is likely in a downward trend. Although the 3-year average of the Total Breeding Ground Index (14,334) was below the 10-year average of 14,614, this estimate is 43 percent above the 10,000-bird population index required by the Pacific Flyway Council to maintain management Action Level 1 (no change in harvest), and 91 percent above the 7,500 population index to maintain "standard" hunting season regulations. Over the past 35 years, the Total Breeding Ground Index has shown multiple oscillations from highs over 16,000 to lows of under 10,000 (figure 9). As such, the current downward trend likely represents natural fluctuations, but highlights the need for continued monitoring.

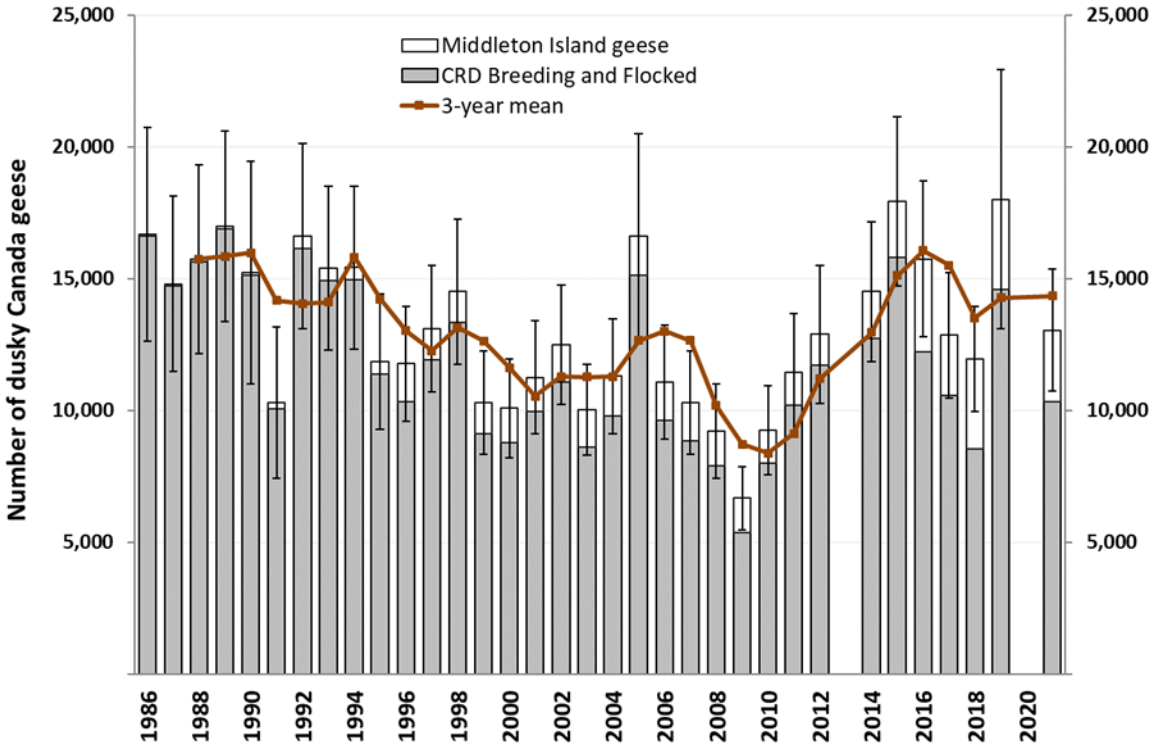

Figure 9. Total breeding ground index for dusky Canada geese, Copper River Delta and Middleton Island, Alaska, 1986–2021, with SE bars. The 3-year running average used for the management index is indicated by the solid line.

Given recent results indicating potential downward projection in dusky Canada goose abundance, we recommend that additional effort is focused on investigating ways in which the nest island program can become more productive. This includes analyses to:

1. identify nest islands that have shown low or no production over the last 10 years,
2. determine which habitat variables are associated with the most successful nest islands, and
3. predict new locations on the Delta for which to move unproductive nest islands.

Recommended Changes: Dusky Canada goose

Based on these results, there is no need for change in the forest plan as there is adequate guidance and direction to make the necessary changes listed above.

Key Results: Aleutian Cress

- The known distribution of Aleutian cress (figure 10) on the Chugach National Forest is limited to a single watershed on the Kenai Peninsula (figure 11). To date, the population of Aleutian cress on the forest appears to be stable.
- Trees and tall shrubs are expanding on less than one percent of the known distribution area of Aleutian cress on the forest, based on preliminary assessments (figure 12).
- Changes in snowpack within the known distribution area of Aleutian cress on the forest are not presently of a magnitude to apparently affect the plants persistence in the area, but we are gathering and evaluating additional information.
- During the summer of 2021, our ecology staff conducted field visits to the Palmer Creek watershed to collect baseline observations on the one known population of Aleutian cress on the forest. We completed a pilot study to test the proposed methods for measuring trends in the Aleutian cress population.
- The last survey for Aleutian cress in the Palmer Creek watershed was conducted in 2011 and documented two occurrences near the head of Palmer Creek. Our 2021 surveys confirmed these occurrences and identified 5 new occurrences, expanding the size and extent of the known population of Aleutian cress in the Palmer Creek watershed.
- We will use the information collected during the 2021 and upcoming 2022 field seasons to solidify the field methods we use to address the questions and indicators listed above.

Recommended Changes: Aleutian Cress

- Based on these results, there is no need for change.

Figure 10. Aleutian cress (*Aphragmus eschscholtzianus*) plant

Figure 11. Aleutian cress habitat at the headwaters of Palmer Creek on the Chugach National Forest

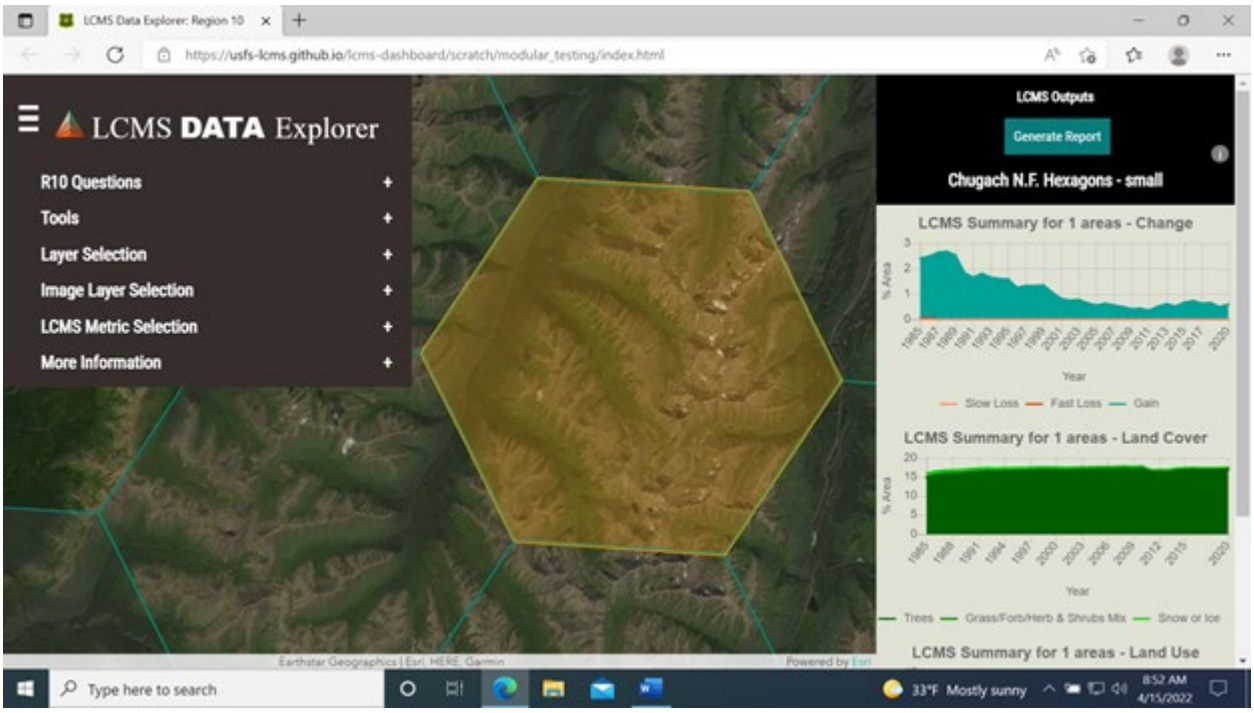

Figure 12. Screen capture of Landscape Change Monitoring System (LCMS) output summarizing results from within the small hexagon encompassing the known populations of Aleutian cress on the Chugach National Forest. The LCMS tool is in development, and further information and refinement is needed for broader applications.

5. Visitor Use, Satisfaction, and Progress on Recreation Objectives

Summary for Visitor Use

The focus of monitoring visitor uses and recreation activities on the Chugach National Forest centers on sustainability of recreation facilities and providing desired recreation opportunities. One of the key approaches to accomplish providing sustainable ranges of recreation opportunities is developing relationships and working effectively with partners and volunteers who help the Forest Service. Chugach National Forest staff are measuring levels of recreation use, sustainability of recreation facilities, and how engaged the communities, partners, volunteers, and businesses are in providing shared stewardship of recreation opportunities and infrastructure. This information will be used to determine if effort is needed to develop different recreation opportunities and facilities, more or different partnerships, engage more volunteers, and evaluate the adequacy and overall sustainability of recreation facilities. The following results reflect updates from data collected from our Natural Resource Management data portal and occupancy reporting from 2017 to December 2021, with emphasis on years 2020-2021 under the 2020 forest plan direction.

Monitoring Questions and Indicators

Are recreation opportunities and infrastructure achieving desired conditions, and are they sustainable?

Indicators selected are:

1. Recreation facility occupancy rate
2. Number of outfitter guide permits issued and administered, activities, locations
3. Number of miles of trail maintained by volunteers and partners
4. Number of recreation sites operated and maintained by volunteers and partners
5. Total deferred maintenance forestwide

Key Result: Recreation Facility Occupancy Rate

The Chugach National Forest currently has 41 public use cabins as well 13 campgrounds available for nightly rentals. Occupancy trends will be highlighted through five-year data. Weather and natural disasters, tourism trends, administrative closures and other factors can affect occupancy from year to year, but a five-year comparison provides a more holistic view of occupancy at both cabins and campgrounds.

We use the online registration portal recreation.gov (http://www.recreation.gov/) to collect the data we need to determine the occupancy rate for rental cabins. For fee-use camp sites, we determine occupancy rate by visitor use data provided by the contractor/concessionaire Alaska Recreation Management database. We pull and analyze use data annually (January 1 through December 31) to determine an annual weighted percent occupancy for each campsite during its operating season.

Our 41 public use cabins had, an average occupancy rate of 32 percent in 2020, and 36 percent in 2021. The cabins had a five-year average of 31 percent occupancy (2017-2021) (see figure 13). It's important to understand the variety of experiences offered at public use cabins across the forest. Some cabins are only accessible via floatplane or watercraft and are in remote locations, some require only a short hike on well-maintained trails located along major roads, and other cabins are more seasonal in nature. These

factors drive occupancy trends across the forest. Cabins that are more easily accessible have much higher occupancy rates than those in more remote and hard to reach locations. The occupancy rates for our ten most popular cabins shows a five-year average occupancy rate of 61.5 percent. These cabins in general are accessible from popular trailheads and often require shorter hikes to reach, thus driving up occupancy rates. Several cabins were damaged in the winter of 2011-2012 and have been closed in the intervening years which affects occupancy rates. Goose Bay was repaired and went back on the reservation system in 2021. Martin Lake Cabin will be repaired in 2022. These two cabins were part of the annual as well as the five-year occupancy data referenced above, thus driving down overall occupancy. In addition, the Swan Lake Fire in 2019 caused several cabins to close for long periods of time, while other cabins had cancelled reservations due to smoke. Nearly every cabin on the Kenai Peninsula had a drop in occupancy this year. We will also be adding a new cabin at Trail River Campground in 2022. It will be road accessible during snow free months, and a short 1-mile non-motorized route in the winter months. By building a new cabin near the road system, we are increasing the supply of easily accessible recreation opportunities which are desired by the public. By reconstructing the two damaged cabins (Goose Bay and Martin Lake) which are popular cabins accessed by air and water, we are increasing capacity at these desired cabin locations.

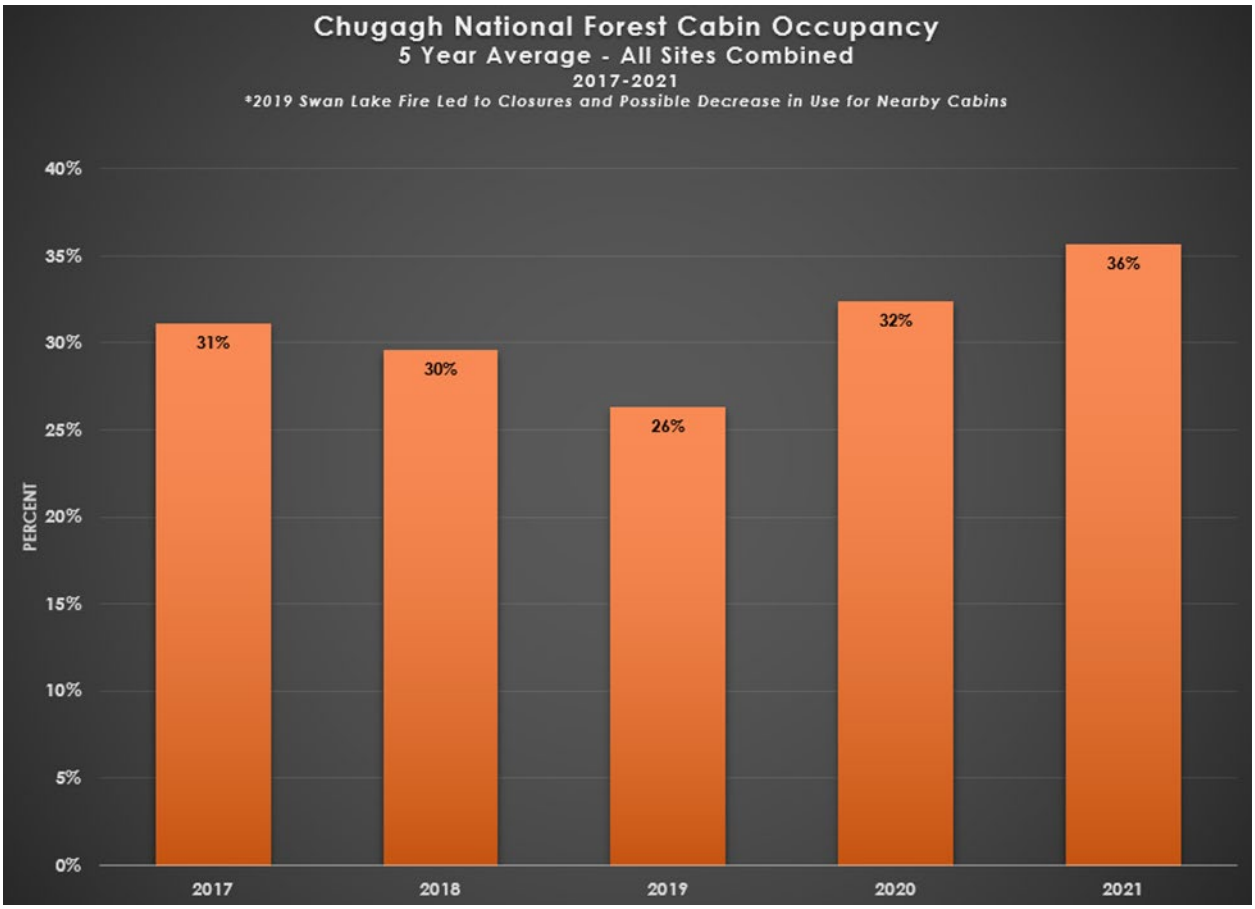

Figure 13. Five-year occupancy rates of public use cabins

Our 13 fee campgrounds managed through a concessionaire permit had an occupancy rate of 58 percent in 2020, and 59 percent in 2021. The campgrounds had a five-year average of 56 percent (2017-2021). Trends show a steady increase in occupancy over that time, with a 50 percent occupancy rate in 2017, compared to a 59 percent occupancy rate in 2021 (see figure 14). Due in part to the accessibility of these campgrounds along the road system, the occupancy rates year to year of each campground were more uniform, with the lowest occupancy rate of 38 percent at Trail River Campground and 74 percent

occupancy rate at Quartz Creek Campground. Campground occupancy varies from month to month with the peak use coinciding with the height of summer, roughly June-August. While there may be available sites in the shoulder seasons, during the peak season our campgrounds are generally at capacity. The forest has two campgrounds not under concession permit (Couer D'Alene, Child's Glacier). No fees are charged at these sites and they are not on the reservation system, therefore, there is no use data to be included in occupancy trends. The increasing occupancy trend data suggests that the Chugach National Forest is providing desired camping recreation opportunities with 13 concessionaire managed campgrounds.

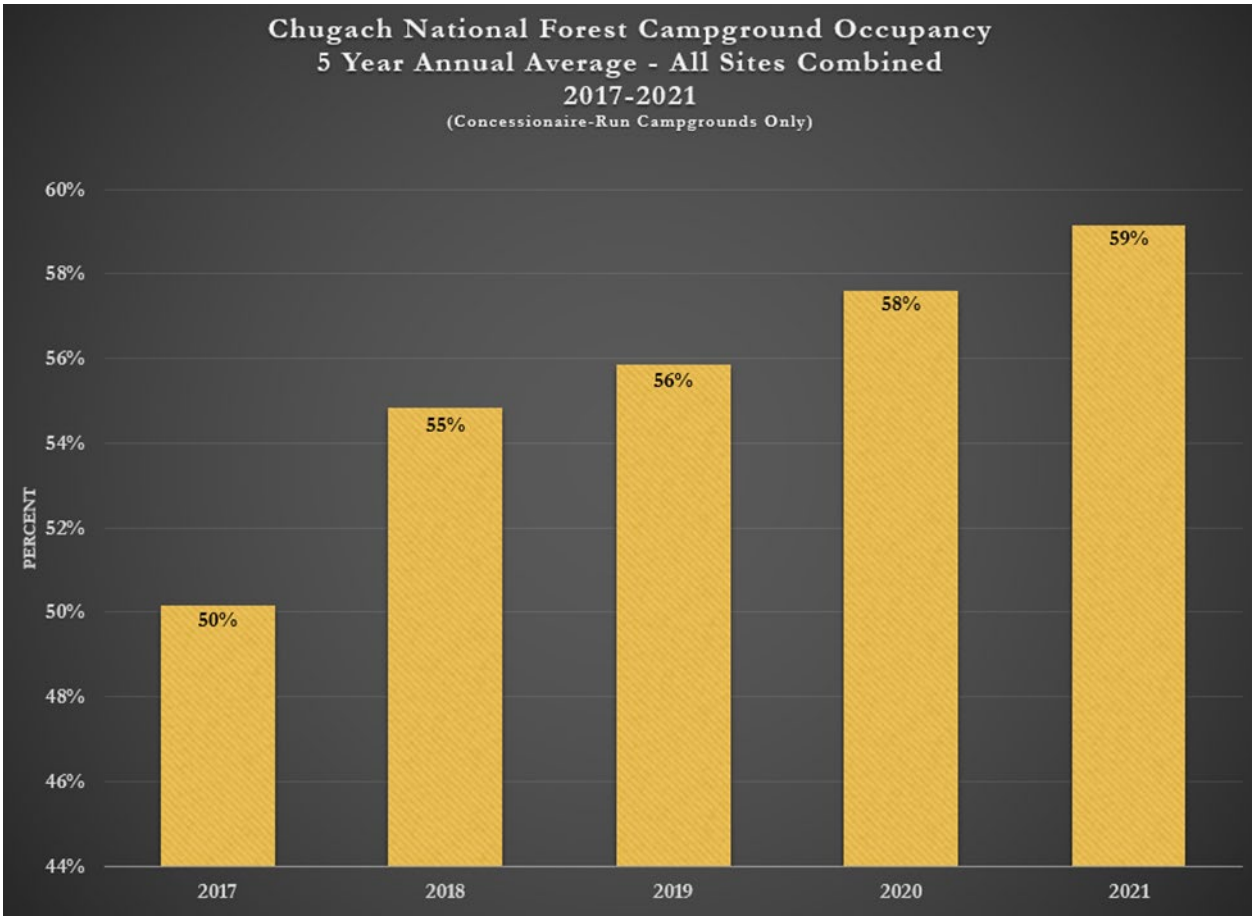

Figure 14. Five-year occupancy rates at campgrounds

Recommended Changes: Recreation Facility Occupancy Rate

The increasing occupancy trend data suggests that the Chugach National Forest is providing desired camping recreation opportunities for both cabins and concessionaire managed campgrounds. We do not need to change forest plan language or management activities.

Key Result: Miles of Trails Maintained by Volunteers and Partners

We track work completed by volunteers and partners throughout the fiscal year through a designated trail data steward from each ranger district who tracks the status of fieldwork and enters all accomplishments into the Forest Service database (INFRA). We then pull accomplishment reports from the database to determine the number of miles maintained by volunteers and partners for each fiscal year (October 1 through September 30).

Looking at the past 10-year data set for National Forest System trail miles maintained by volunteers/partners there is a wide range of results. The average miles of trails we maintained over a ten-year period was 10.52 miles (2011-2021). In 2020 due to the global pandemic only 0.2 miles were maintained by volunteers/partners and 8.9 miles maintained in 2021. In 2017 we maintained almost 30 miles of trails. These variations could be due in part to inadequate reporting, budget constraints, staffing shortages, reduced partner engagement and geographic limitations due to the rural setting of the Ranger Districts. Engaging with volunteers and partners and using these relationships to increase stewardship has been a renewed nationwide focus. Result driven initiatives like the 10-year Trail Shared Stewardship Challenge which is billed as a call to action to increase our collective capacity to care for trails and increase on-the-ground results will help us create a more sustainable trail system. Our continued effort to engage partners and volunteers to help with trail maintenance activities highlights our continued commitment to meeting this indicator and our desired condition.

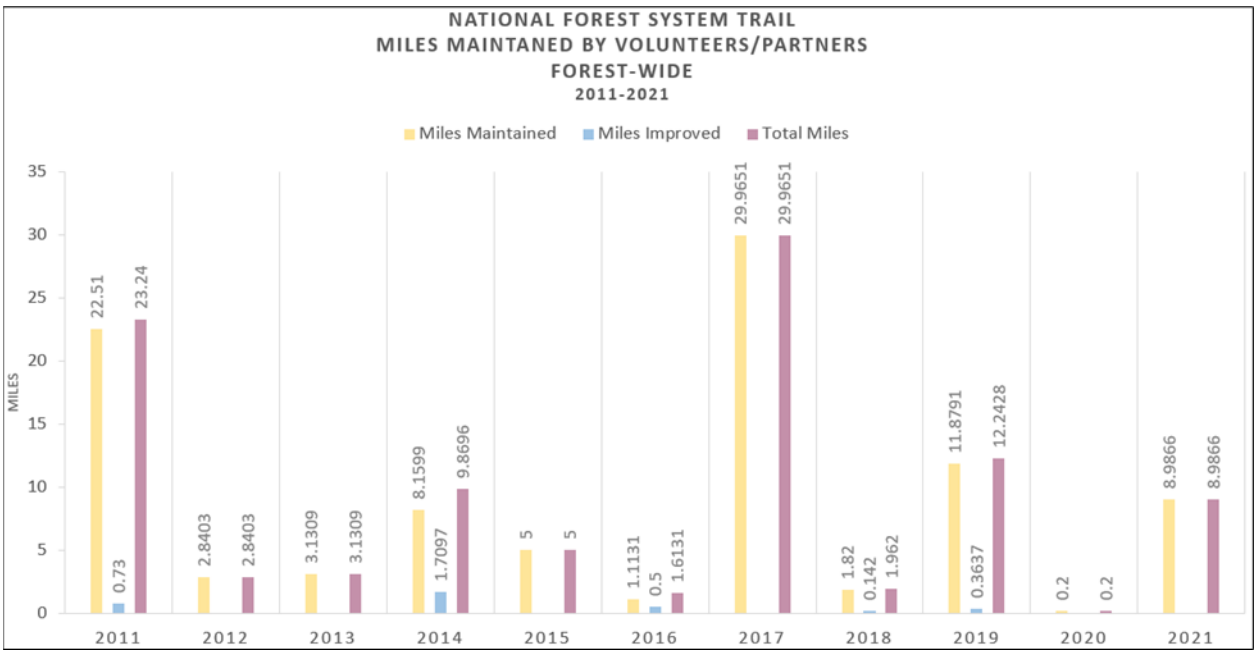

Figure 15. Ten-year comparison of miles of trail maintained by volunteers

Recommended Changes: Miles of Trails Maintained by Volunteers and Partners

Our continued effort to engage partners and volunteers to help with trail maintenance activities highlights our continued commitment to meeting this indicator and our desired condition. We do not need to change forest plan language or management activities.

Key Result: Number of Recreation Sites Operated by Volunteers and Partners

We count recreation sites operated by volunteers or partners by counting the number of sites with current concessionaire agreements as well as other volunteers and partners who help manage our recreation sites.

For the Chugach National Forest, we utilize a campground concessionaire to manage the forest's 13 fee campgrounds including the Russian River Campground which provides access the state's most popular sport fishery. The current operator is in the third year of a ten-year permit. This operator has been successful at managing our campgrounds since 1989. Through this longstanding partnership with our

operator, we have continued to provide an outstanding recreational experience to the public in clean and well-maintained campgrounds. We use the fees generated in part to address deferred maintenance at our campgrounds. This operator is a locally owned company that provides excellent customer service to the public, boosts the local economy, and provides employment for 30 staff each season. The K'BEQ' Interpretive Site is managed by our tribal partner, the Kenaitze Indian Tribe, through a concession permit. K'BEQ' (meaning "footprints" in the Dena'ina language) is a cultural site featuring information signs, a boardwalk that wraps around a Dena'ina house foundation and a gift shop. Tribal members and staff also host interpretive walks and presentations. Our 13 campgrounds and 1 interpretive site that are managed by partners have been consistently operated over the two-year period (2020-2021) since the release of the forest plan. We also rely on volunteers at other recreation sites across the forest. Volunteers play a crucial role at our visitor centers (Begich Boggs and Crooked Creek) to help deliver our educational mission and engage the public. The Streamwatch program has been active for over 25 years on the Kenai-Russian River complex with volunteers educating the public on river stewardship and complete hands-on river restoration projects on the salmon rivers of the Kenai Peninsula. Maintaining relationships with our current partners while continuing to look for new relationships will help us maintain the support of communities and partners through shared infrastructure development and maintenance, delivering information, and providing recreation services.

Recommended Changes: Number of Recreation Sites Operated by Volunteers and Partners

We do not need to change forest plan language or management activities.

Key Result: Trends in Total Forest-wide Deferred Maintenance

Total deferred maintenance is defined as maintenance that was not performed on a recreation facility or trail when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. When we allow deferred maintenance to accumulate without limits or consideration of useful life, it leads to deteriorating facilities or trails, increased costs to repair, and decreased asset value. Deferred maintenance needs may be categorized as critical or non-critical at any point in time. If we continually defer non-critical maintenance, it will normally result in an increase in critical deferred maintenance.

Total deferred maintenance for recreation sites and trails is determined by the following: 1) Deferred maintenance carried over from previous year; 2) Deferred maintenance added throughout the year; and 3) Deferred maintenance completed throughout the year. Forest-wide deferred maintenance totals will be calculated by combining the deferred maintenance totals of recreation sites and trails.

We maintain an inventory all developed recreation sites on the forest, and complete a condition survey every five years in accordance with Developed Sites National Quality Standards and the Forest Service Manual, to determine whether the rec site is being maintained to standard for use by the public. Our deferred maintenance costs in 2021 were $7,792,087, in 2020 deferred maintenance costs were $3,839,978. The five-year average deferred maintenance costs were $3,912,176 (2017-2021)- figure 16.

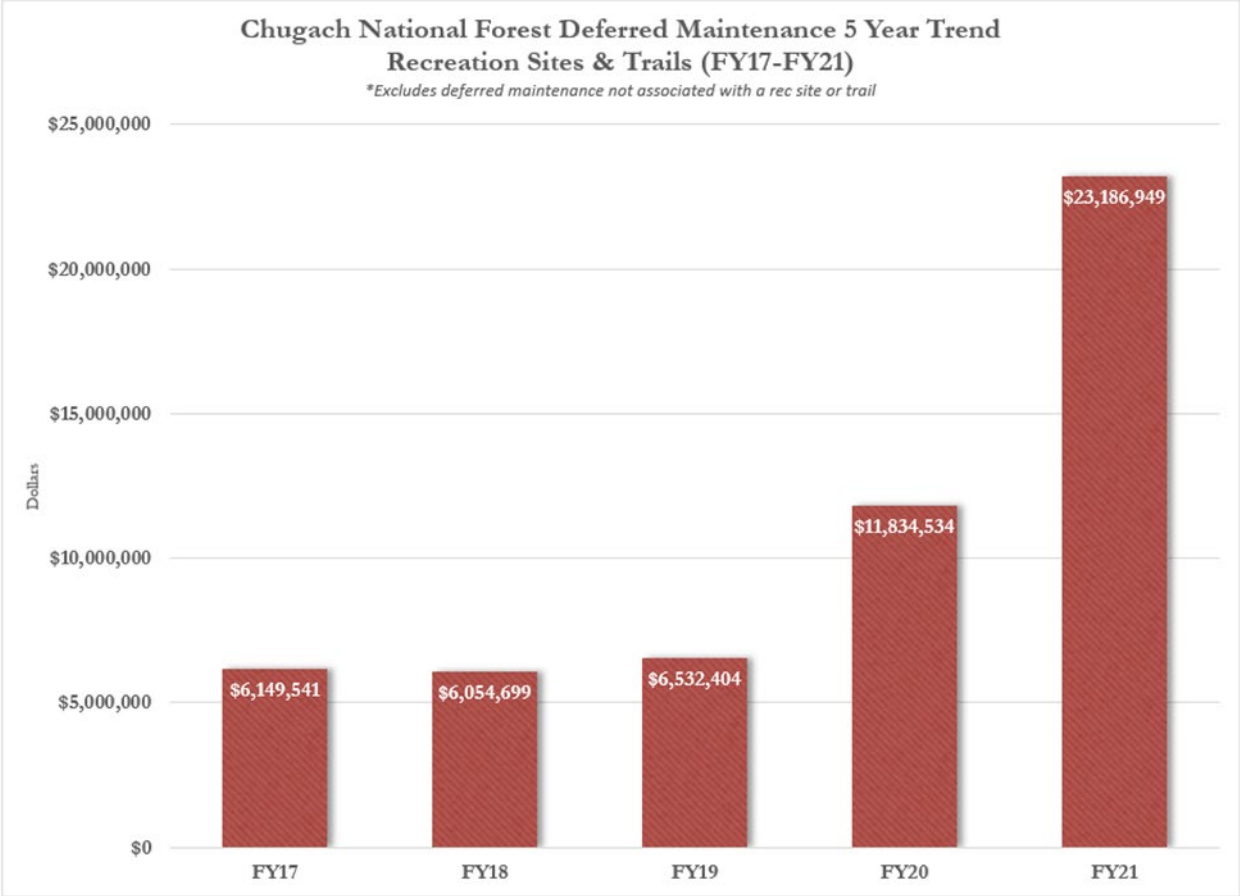

Figure 16. Five-year deferred maintenance trends

We maintain inventory all National Forest System trails and complete a Trail Assessment and Condition Survey for each, once every five years to determine whether the trail is being maintained to standard and is fulfilling its intended purpose as outlined in the trail management objective. We evaluate the current condition of the trail and prescribe deferred maintenance tasks as needed to meet National Quality Standards and the expectations of the trail management objective. Deferred maintenance costs in 2021 were $15,394,862, in 2020 deferred maintenance costs were $7,994,556. The five-year average deferred maintenance costs were $6,839,450 (2017-2021)- figure 17.

Looking at the data for trails and recreation sites we see a similar trend. We see a slight increase in deferred maintenance from 2017-2019, followed by a steep increase starting in 2020. This increase is a result of the Great American Outdoor Act. As we developed projects it became clear that we chronically underestimated our deferred maintenance costs. This was seen at a nationwide level as well. This fact was coupled with a global pandemic which put a strain on labor and materials and drove up the price of contracts.

Even prior to the Great American Outdoor Act, our total deferred maintenance increase was telling a story. The Chugach National Forest was not receiving enough resources to sustain our trails and developed recreation sites. Due to the influx of funding associated with the Great American Outdoors Act and the Infrastructure Plan it is anticipated that we will be able to reduce our deferred maintenance and set ourselves on a path to sustainability over the next five-year period.

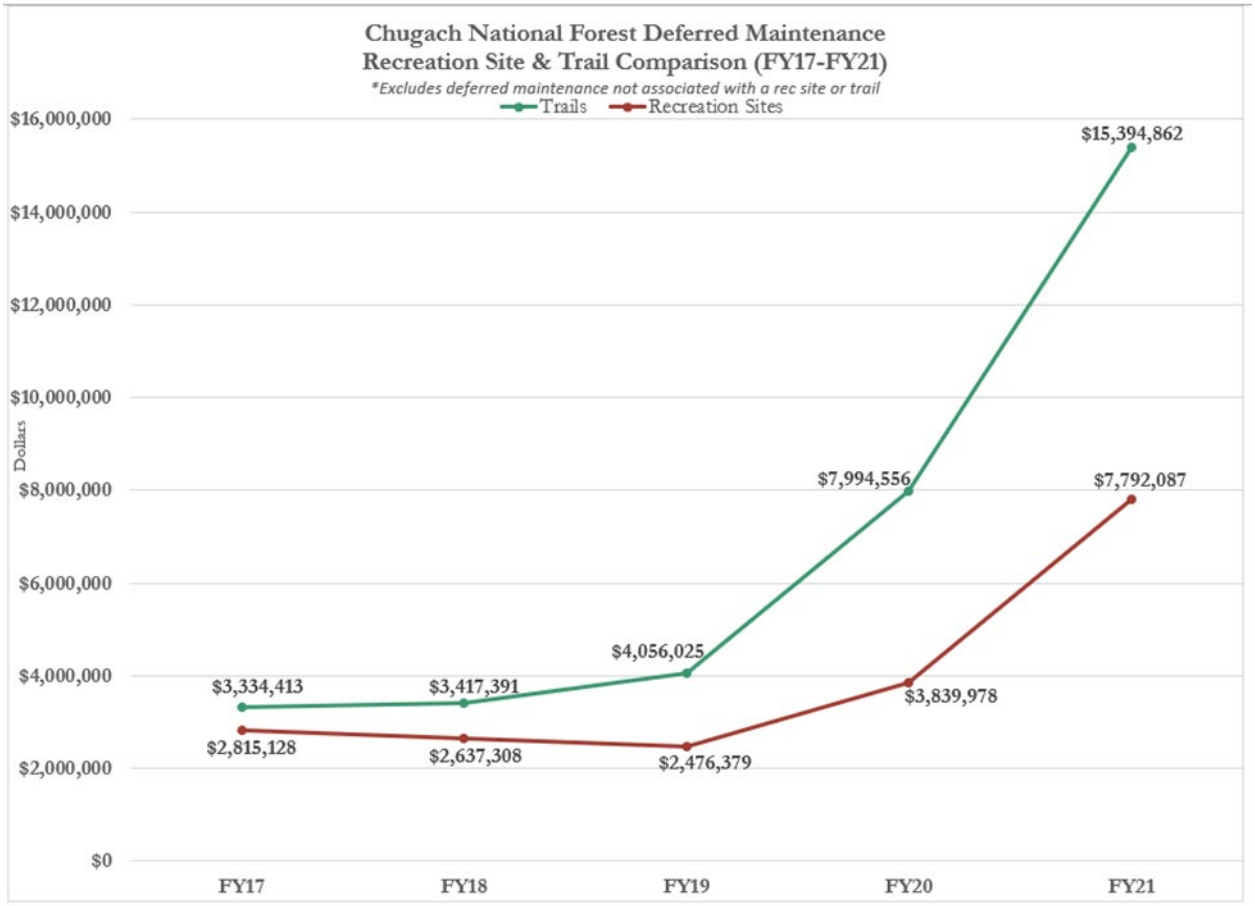

Figure 17. Five-year trail and recreation site deferred maintenance trends

Recommended Changes: Trends in Total Forest-wide Deferred Maintenance

The trend in total deferred maintenance has significantly risen for the past two years on both our trails and our developed recreation sites. While it's important to have quantifiable data regarding deferred maintenance as highlighted above, it doesn't tell the entire story. How we measure deferred maintenance can be subjective, both in determining costs of deferred maintenance and even what tasks we consider as deferred maintenance. We acknowledge our need for more consistency in our data management and how we cost each deferred maintenance task. We will have sustainable recreation facilities when timely maintenance reduces how much deferred maintenance is added to the total deferred maintenance each year and existing deferred maintenance is removed by reconstruction of aging facilities. As we focus on a consistent reporting mechanism and implement current planned infrastructure investment, the trend data on this indicator should tell a different story in future biennial monitoring evaluation reports.

Key Result: Special Use Programs -Number of outfitter guide permits issued and administered, activities, locations

This is the first evaluation of collected data. As described under methods and metrics there are two data collection methods. Only method one was used. *Data Collection Method 1 - NATURAL RESOURCE MANAGER –User Views are reports in the form of Excel spreadsheets that will be pulled by no later than September 30 each year to collect the measure data.*

To capture the measures as accurately as possible, the reports must be pulled before the start of the new fiscal year. This did not occur for 2020 or 2021 because our monitoring protocols were not established until after the end of the 2021 fiscal year. We pulled reports 1/24/2022 and 1/24/2022 for 2021 data. For 2020 data, the report was pulled on 4/24/2022.

Authorizations administered

- 2021 – 91 outfitter and guide permits were administered
- 2020 – 63 outfitter and guide permits were administered

These numbers reflect anomalies resulting from the pandemic and do not indicate an increase in the number of permits authorized and administered from 2020 to 2021. In 2020, many of the companies chose to put their permit into non-use status. When tourism increased, all but a few became active in 2021.

Activities and locations

Table 5 does not reflect all authorized activities for 2021. Activity names match the R10 Flat Fee Schedule for 2021 R10 Supplement 2709.11-2020-1 FSH 2709.11 Section 37.21c – Exhibit 01.

Table 5. Outfitter and guide permitted activities reported for 2021 by geographic area

Activity	Kenai Peninsula	Prince William Sound	East Copper River
Rafting	Yes	No	No
Camping	No	Yes	Yes
Dog Sledding	Yes	No	No
Fishing	Yes	Yes	Yes
Hunting (includes camping)	Yes	Yes	Yes
Begich Boggs Visitor Center & Day Use Sites (interpretive use)	Yes	No	No
Outfitting	Yes	No	No
Heli-Skiing Tours	Yes	Yes	No
Snowmobiling	Yes	No	No
Remote Tours: Flight-Seeing Landing Tours	Yes	No	No
Remote Tours: Helicopter Landing Tours	Yes	No	No
Remote Tours: Remote-Setting Nature Tours Hiking	Yes	Yes	Yes
Remote Tours: Remote-Setting Nature Tours Ski touring	Yes	Yes	Yes
Road-based Tours: Jet Boating	Yes	No	No
Road-based Tours: Horse Trail Rides	Yes	No	No
View Scenery / Wildlife	Yes	No	No

Table 6 reflects a reduction of some activities, as many outfitter and guide companies went into non-use status because of the pandemic.

Table 6. Outfitter and guide permitted activities reported for 2020 by geographic area

Activity	Kenai Peninsula	Prince William Sound	East Copper River
Rafting	No	No	No
Camping	Yes	Yes	Yes
Dog sledding	Yes	No	No
Fishing	Yes	Yes	No
Hunting (includes camping)	Yes	Yes	Yes
Begich Boggs Visitor Center & Day Use Sites (interpretive use)	Yes	No	No
Outfitting	Yes	No	No
Heli-skiing Tours	Yes	Yes	No
Snowmobiling	Yes	No	No
Remote Tours: Helicopter Landing Tours	Yes	No	No
Remote Tours: Remote-Setting Nature Tours Hiking	Yes	Yes	Yes
Remote Tours: Remote-Setting Nature Tours Ski touring	Yes	Yes	No
Road-based Tours: Jet Boating	Yes	No	No
Road-based Tours: Horse Trail Rides	Yes	No	No
Road-based Tours: ATV Rides	Yes	No	No
Road-based Tours: Hiking	Yes	No	No

Recommended Changes: Special Use Programs

Forest-wide open season for accepting outfitter and guide proposals for specific activities and locations began in 2018 and occurred again in 2020. We have scheduled an open season for summer of 2022. Our intent is to continue offering biannual open seasons, dependent upon capacity to ensure all current authorizations are administered to standard.

Eastern Prince William Sound and East Copper River Cordova Ranger District) have the least amount of active outfitter and guide operators, compared to the rest of the Chugach National Forest. This may be the result of a reduced ferry schedule and lack of access to the Childs Glacier Campground via the Copper River Highway. Recently we have been approached by a few interested companies to provide outfitter and guide services, but did not accept the proposals at the time because they were submitted outside of the open season.

Based on these results, we are considering the following possible change:

We have determined that it may be beneficial to accept outfitter and guide proposals on an annual basis for specific activities and locations within eastern Prince William Sound and Copper River. At this time, we are not accepting proposals for additional helicopter supported skiing and big game guided hunting due to the need to conduct the appropriate analyses and prospectuses.

6. Climate Change and Other Stressors

Summary for Climate Change

The *Climate Change Vulnerability Assessment for the Chugach National Forest and Kenai Peninsula* (Hayward, Colt, McTeague, & Hollingsworth, 2017) discusses the consequences of modeled climatic changes associated with five key elements and the associated changes in ecological services they provide. This assessment:

> …explores the potential consequences of climate change for: (a) snowpack, glaciers, and winter recreation; (b) coastal landscapes and associated environments, (c) vegetation, (d) salmon, and (e) a select set of wildlife species. During the next half century, directional change associated with warming temperatures and increased precipitation will result in dramatic reductions in snow cover at low elevations, continued retreat of glaciers, substantial changes in the hydrologic regime for an estimated 8.5 percent of watersheds, and potentially an increase in the abundance of pink salmon. In contrast to some portions of the Earth, apparent sea level rise is likely to be low for much of the assessment region owing to interactions between tectonic processes and sea conditions. Shrubs and forests are projected to continue moving to higher elevations, reducing the extent of alpine tundra and potentially further affecting snow levels. Opportunities for alternative forms of outdoor recreation and subsistence activities that include sled-dog mushing, hiking, hunting, and travel using across-snow vehicles will change as snowpack levels, frozen soils, and vegetation change over time. There was a projected 66-percent increase in the estimated value of human structures (e.g. homes, businesses) that are at risk to fire in the next half century on the Kenai Peninsula, and a potential expansion of invasive plants, particularly along roads, trails, and waterways.

Chugach National Forest staff used the climate change vulnerability assessment to guide the selection of monitoring indicators for climate change outlined.

Monitoring Questions and Indicators

Is climate change affecting key ecological functions of terrestrial and aquatic habitats within the national forest?

Indicators selected include:

1. Changes in hydrographs on selected sites
2. Tree and shrub encroachment in alpine habitat and recently deglaciated areas
3. Changes in water temperature on selected sites
4. Snow depth, season of snow cover

Specialists with the Geospatial Technology and Applications Center (GTAC) and Chugach National Forest staff are working to develop a desktop tool that summarizes landscape change monitoring system (LCMS) data relative to each of the indicators for snow, glaciers, and vegetation community changes over time. The tool is currently in testing phase, but will summarize acres of change (conversion from one land cover type to another) in time blocks deemed appropriate for the questions and indicators addressed.

Key Results: Changes to hydrographs and water temperature

- There are no monitoring results from 2020-2021. The first interval of reporting is expected in 2024 and the first report will be in 2029.

Recommended Changes: Hydrographs and water temperature

We have no changes to recommend at this time.

Key Results: Vegetation and Snow Cover Changes

- We anticipate that, based on Hayward et al. (2017), the habitat suitability for the rare Aleutian cress (*Aphragmus eschscholtzianus*) is expected to decrease over the next 50 years (of note is the estimated 100 percent loss of area with habitat suitability greater than 70 percent for Aleutian cress within the Chugach National Forest).
- We also anticipate that coastal temperate rain forest (as in Prince William Sound and the Copper River Delta geographic areas) is expected to retain most of its current distribution, while subalpine shrub and alpine tundra are likely to decline as forest and shrublands move upward in elevation (Hayward et al. 2017).
- Forest staff are working to develop a desktop tool that summarizes landscape change monitoring system data relative to each of the indicators for snow, glaciers, and vegetation community changes over time. The tool is currently in testing phase, but will summarize acres of change (conversion from one land cover type to another) in time blocks deemed appropriate for the questions and indicators addressed. Preliminary results for indicators of glacier, snow, and alpine tundra habitats will be reported in the next biennial monitoring and evaluation report in 2024.

Recommended Changes: Vegetation and Snow Cover

- We have no changes to recommend at this time. We will evaluate information after the landscape change monitoring system monitoring tool and changes are refined in the next biennial monitoring and evaluation report (2024).

7. Desired Conditions Including Social, Cultural, and Economic Sustainability

Summary for Desired Conditions Including Social, Cultural, and Economic Sustainability

Monitoring for sustainable goods and services addresses six forestwide desired conditions in the 2020 forest plan. We addressed the management question: Is the national forest providing a sustainable, predictable level of goods and services to communities? Chugach National Forest staff selected six indicators to determine trends in conditions for sustainable goods and services (described below).

If we find negative trends during assessment of these indicators, we should consider the following management responses:

- Re-evaluate the funding and priorities of the budget as well as staffing decisions and determine if additional resources (budget and employees) are needed for issuance of permits that are showing a negative trend.
- Determine if additional forest plan objectives are needed to focus effort on any aspect that is showing a negative trend.
- Determine if there is a limiting factor for making these resources available to the local communities that is beyond what is possible to change in the forest plan, budget, or staffing (for example, no additional locations available for mineral material pit development, therefore less material available).

Positive or stable trends will indicate the Forest Service is making these commodities available; negative trends may indicate funding, staffing shortages or change in priorities for the funding and staffing, or possibly the availability of the resources may be changing (such as mineral materials) which may affect the long-term sustainability of making the good or service available to the local community.

Monitoring Questions and Indicators (A and B sections)

Section A. Is the national forest providing a sustainable, predictable level of goods and services to communities?

Section A. Indicators are:

1. Trends in number of commercial recreation permits issued
2. Trends in developed recreational facility use
3. Trends in number of forest product permits issued
4. Trends in sport fishing harvest
5. Trends in number of permits issued for subsistence harvest
6. Trends in number of mineral materials permits issued and locatable mineral plans of operation approved

Section B. Is the presently existing character of the wilderness study area being maintained?

Section B. Indicators are the trends in the following four qualities of presently existing character:

1. Wildness
2. Natural conditions

3. Undeveloped
4. Outstanding opportunities for solitude or primitive, unconfined types of recreation

Section A. Desired Conditions related to Social, Cultural, and Economic Sustainability of Communities

Key Results for Indicator: Commercial Recreation Permits Issued

Information for trends in developed recreation and recommendation for change is reported in under section 5. Summary for Visitor Use under the Key Result: Special Use Programs -Number of outfitter guide permits issued and administered, activities, locations.

Key Results for Trends in Developed Recreation

Information for trends in developed recreation and recommendation for change is reported in under section 5. Summary for Visitor Use for the Key Result: Recreation Facility Occupancy Rate.

Key Results for Forest Product Permits

- Monitoring shows that we have been able to adequately provide forest products to the public and commercial entities consistently over the monitoring period. This is evidenced by annual permits remaining within the expected ranges over the last 6 years. Data is collected annually through forest products permits.
- Figure 18 below shows total forest products permits by year. The fluctuations shown are expected variations as needs of the communities change and offerings from the Forest Service vary. 2017 and 2018 saw large fuelwood offerings from the Forest Service to dispose of material from vegetation management activities. Over the last 6 years we have averaged approximately 215 permits per year and have fulfilled over 1500 permits total. During this time we have had no requests for permits that we have not been able to fulfill.

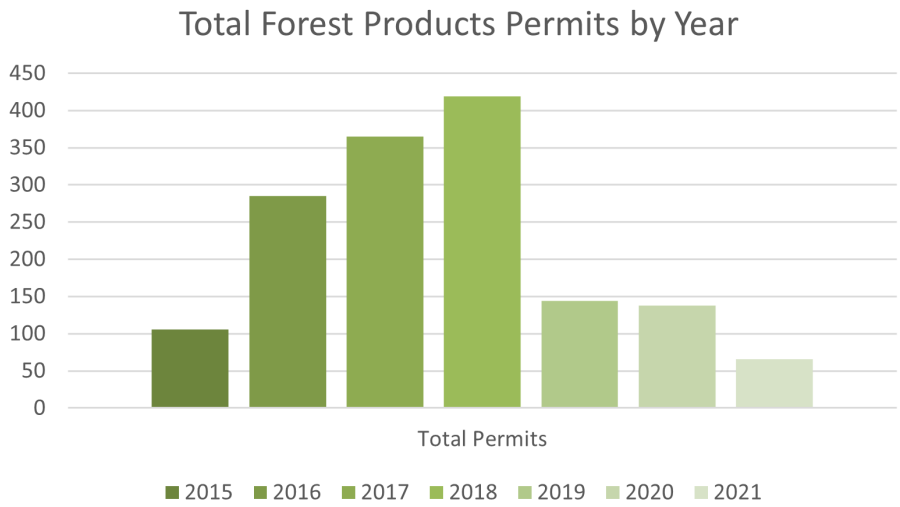

Figure 18. Chugach forest products permits issued by year

- The primary categories for forest products permits are fuelwood and commercial special forest products. Figure 19 shows number of permits and number of cords per year, indicating a steady supply of fuelwood to our communities. Figure 20 shows commercial special forest products permits along with weight and each total annually. The number of commercial special forest products permits

has remained very steady, except for 2020, where the number of commercial permits for mushroom harvesting increased dramatically following the 2019 Swan Lake Fire. This fluctuation is within the expected range of occurrences. The other metrics for commercial special forest products are very consistent over the last 6 years.

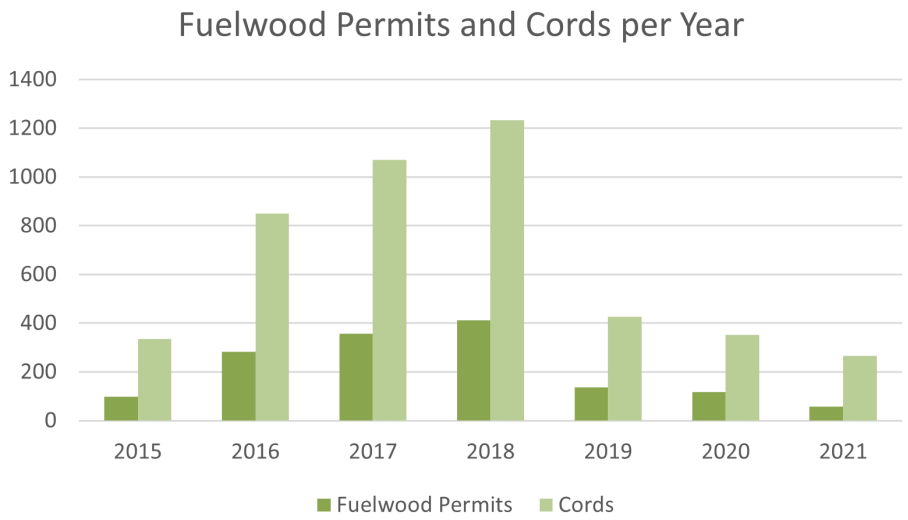

Figure 19. Fuelwood permits (dark bars) and cords (light bars) per year collected on the Chugach National Forest

Recommended Changes Forest Product Permits Issued

Based on these results, we are not recommending any changes.

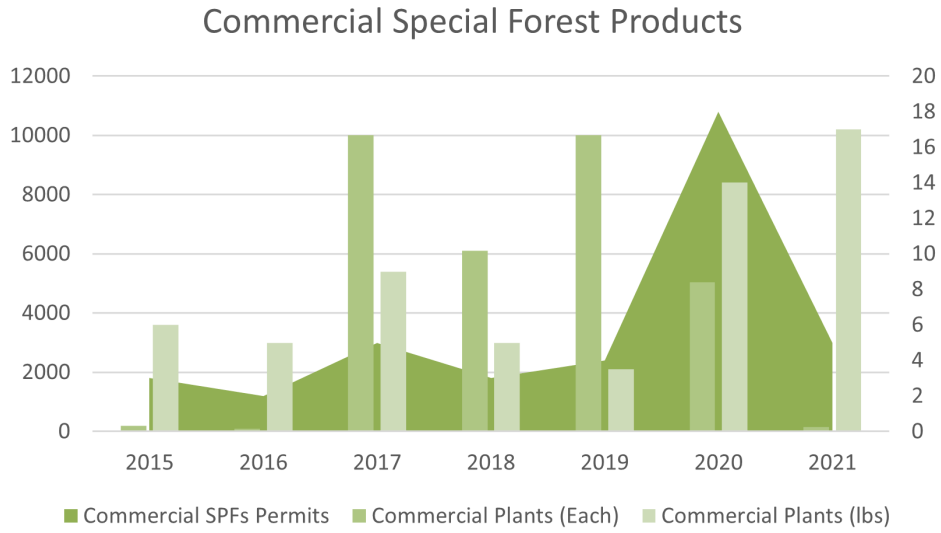

Figure 20. Commercial special forest product permits (dark bars) and weights (light bars) per year collected on the Chugach National Forest

Key Results for Sport Fisheries Harvest

- We are monitoring the number of fish harvested and caught (total fish harvested and released) by species annually in each of seven Kenai Peninsula Zone and three Prince William Sound Zone freshwater sport fisheries for a measure of sport fishing services provided by the forest. Additionally,

sport fishing effort, estimated in number of anglers per year and days fished per year, are tracked for each of the ten systems.

- Catch and Harvest for 7 Kenai Peninsula Zone and 3 Prince William Sound Zone sport fisheries (table 7) were downloaded from the Alaska Department of Fish and Game Alaska Sport Fishing Survey on March 29, 2022 (https://www.adfg.alaska.gov/sf/sportfishingsurvey/). This is the first report of these data since the Chugach National Forest 2020 Land Management Plan Monitoring Program was established. The most recent year for which results are available is 2020. Data from years 2011-2020 are presented here to provide historical context.

Table 7. Locations and species monitored for Kenai Peninsula Zone and Prince William Sound Zone sportfish harvest and catch

Location	Species
Kenai Peninsula Zone[1]	
Russian River	Coho salmon, pink salmon, sockeye salmon, Dolly Varden, rainbow trout
Resurrection Creek	Chum salmon, coho salmon, pink salmon
Sixmile Creek	Chum salmon, coho salmon, pink salmon, Dolly Varden, rainbow trout
Quartz Creek	Dolly Varden, rainbow trout
Crescent Lake	Arctic grayling, rainbow trout
Kenai Lake	Dolly Varden, rainbow trout
Twentymile River	Coho salmon, pink salmon, Dolly Varden
Prince William Sound Zone[2]	
Alaganik Slough	Coho salmon, sockeye salmon, Dolly Varden
Eyak River	Coho salmon, pink salmon, sockeye salmon, cutthroat trout
Ibeck Creek	Coho salmon, cutthroat trout, Dolly Varden

1 – Alaska Sport Fishing Survey areas PF and L.
2 – Alaska Sport Fishing Survey area J.

Kenai Peninsula Zone

- Overall 2020 catch and harvest from the 7 Kenai Peninsula Zone monitoring streams was above average for pink salmon, near average for sockeye salmon, coho salmon, chum salmon, Dolly Varden and rainbow trout, and below average for Arctic grayling (table 8). In 2020, for the Russian River sockeye salmon fishery, 37,094 sockeye salmon were harvested and 51,830 were caught (table 10 includes fisher harvested and released).Sockeye salmon harvest and catch in 2020 was slightly below the 10-year average (2011-2020) of 43,202 sockeye salmon harvested and 67,266 caught. Rainbow trout are the second most-caught fish in these Kenai Peninsula Zone streams, but relatively few are harvested. In 2020, 32,040 were caught while only 518 were harvested, slightly above the 10-year catch and harvest averages of 26,972 fish and 482 fish, respectively, with the majority of rainbow trout catch and harvest coming from Russian River and Quarts Creek.

Table 8. 2020 and 10-year average (2011-2020) harvest and catch by species in Kenai Peninsula Zone and Prince William Sound Zone streams

Location/Species	10-Year Avg Harvest	2020 Harvest	10-Year Avg Catch	2020 Catch
Kenai Peninsula Zone				
Arctic Grayling	278	12	2,377	610
Chum Salmon	117	65	648	566
Coho Salmon	5,379	5,499	9,005	7,547
Dolly Varden	445	321	21,083	18,381
Pink Salmon	2,966	5,232	16,504	19,758
Rainbow Trout	482	518	26,972	32,040
Sockeye Salmon	43,202	37,094	67,266	51,830
Prince William Sound Zone				
Coho Salmon	14,029	8,443	23,204	16,125
Cutthroat Trout	44	11	219	597
Dolly Varden	303	141	1,471	1,063
Pink Salmon	37	105	401	1,475
Sockeye Salmon	317	282	706	1,329

Table 9. 2020 effort and harvest from 7 Kenai Peninsula Zone and 3 Prince William Sound Zone streams (AG = Arctic grayling, ChS = chum salmon, CS = coho salmon, CT = cutthroat trout, DV = Dolly Varden, PS = pink salmon, RT=rainbow trout, SS=sockeye salmon)

Location	Number anglers	Days fished	AG	ChS	CS	CT	DV	PS	RT	SS
Kenai Peninsula Zone										
Crescent Lake	595	656	12						0	
Kenai Lake	505	1,196					0		0	
Resurrection Creek	3,565	5,282		22	179			3,962		
Russian River	19,089	44,391			2,769		57	370	443	37,094
Sixmile Creek	643	1,732		43	560		235	891	75	
Twentymile River	1,022	1,754			1,991		14	9		
Quartz Creek	834	1,842					15		0	
Prince William Sound Zone										
Alaganik Slough	874	2,680			2,067		80			15
Eyak River	1,363	5,859			4,150	4		105		267
Ibeck Creek	991	3,092			2,226	7	61			

Table 10. 2020 effort and catch from 7 Kenai Peninsula Zone and 3 Prince William Sound Zone streams (AG = Arctic Grayling, ChS = chum salmon, CS = coho salmon, CT = cutthroat trout, DV = Dolly Varden, PS = pink salmon, RT=rainbow trout, SS=sockeye salmon)

Location	Number anglers	Days fished	AG	ChS	CS	CT	DV	PS	RT	SS
Kenai Peninsula Zone										
Crescent Lake	595	656	610						64	
Kenai Lake	505	1,196					6		8	
Resurrection Creek	3,565	5,282		194	341			15,011		
Russian River	19,089	44,391			4,173		6,606	2,364	25,797	51,830
Sixmile Creek	643	1,732		372	582		235	2,051	109	
Twentymile River	1,022	1,754			2,451		502	332		
Quartz Creek	834	1,842					11,032		6,062	
Prince William Sound Zone										
Alaganik Slough	874	2,680			4,720		276			15
Eyak River	1,363	5,859			8,123	586		1,475		1,314
Ibeck Creek	991	3,092			3,282	11	787			

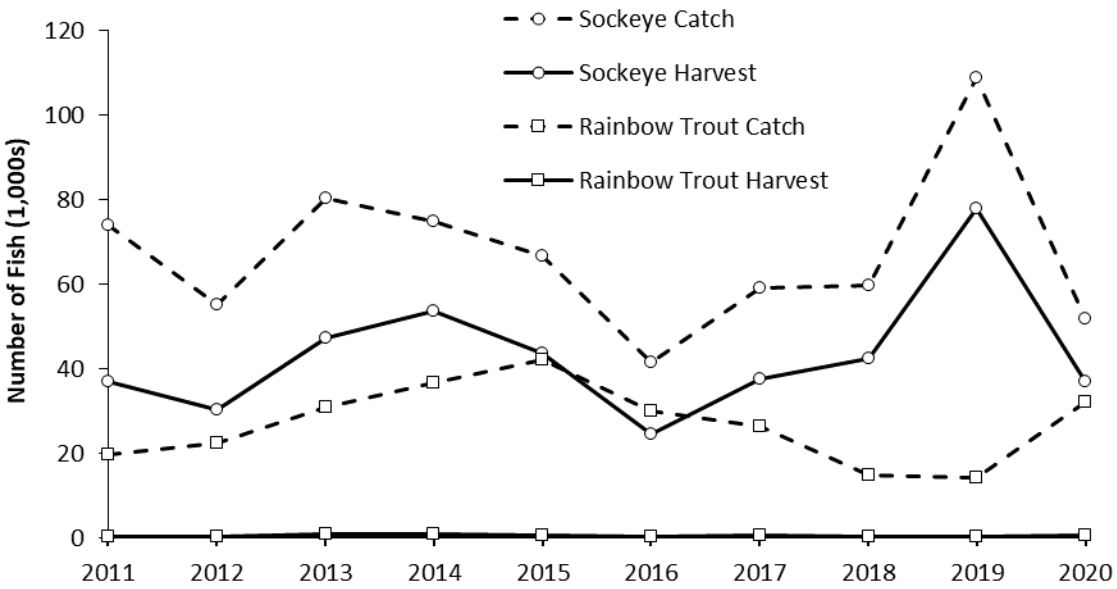

Figure 21. Kenai Peninsula Zone sockeye salmon and rainbow trout harvest and catch 2011-2020

Prince William Sound Zone

- The 2020 catch and harvest from the 3 Prince William Sound Zone monitoring streams was below average for coho salmon, near average for cutthroat trout, sockeye salmon, and Dolly Varden, and above average for pink salmon (table 8). In general, harvest and effort in the Prince William Sound Zone are highest in the Eyak River coho salmon fishery where 4,150 coho salmon were harvested (table 9) and 5,859 were caught (table 10; includes fish harvested and released) in 2020. The Prince

William Sound Zone coho salmon harvest and catch in 2020 (Eyak River, Alaganik Slough, and Ibeck Creek combined) was below the 10-year average (2011-2020) of 14,029 coho salmon harvested and 23,204 caught. However, the 10-year averages are heavily influenced by large catches and harvests of coho salmon in 2015 (figure 22), when the Copper River Delta streams saw historically large runs of coho salmon.

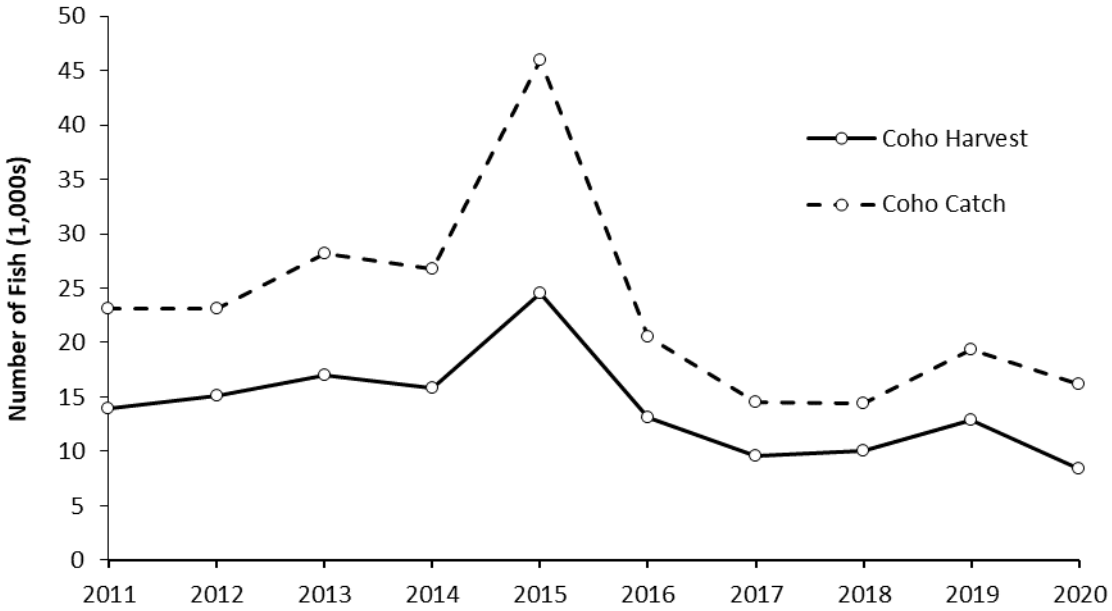

Figure 22. Prince William Sound Zone coho salmon harvest and catch 2011-2020

Recommended Changes Sport Fisheries Harvest

No changes recommended for sport fisheries harvest at this time.

Key Results for Subsistence Harvest

Chugach National Forest subsistence program serves to implement the rural preference granted by ANILCA Title VIII to rural residents residing within the boundaries of the Forest through issuing harvest permits (among other activities). Harvest permits represent demand and opportunity to harvest subsistence resources. The accompanying harvest reports represent effort and harvest. Both are tracked by the U.S. Fish and Wildlife Service's Office of Subsistence Management's Federal Subsistence Permit System database. We use the number of harvest permits as a measure of ecological services and opportunities provided by the forest.

Wildlife and fish harvest opportunity under the federal subsistence program has remained relatively stable over the past two years (2020-2021) (table 11 and table 12). These numbers generally vary according to demand, however the draw permits for Moose in Unit 6C of the Copper River Delta and Mountain Goats in Unit 7 of the Kenai Peninsula, reflect the harvestable number of animals (based on population estimates) and the Federal/State harvest allocation (determined by regulation or negotiated with the State).

Harvest has also remained relatively stable, although it can vary due to several factors such as effort, weather, population size/run strength, and other factors. In general, wildlife and fish populations have supported subsistence harvest for rural residents of the Chugach National Forest.

These data are maintained by the U.S. Fish and Wildlife Service's Office of Subsistence Management's Federal Subsistence Permit System database. The number of permits issued is available in real time, as

permits are issued throughout the year. Harvest information is generally not available until the harvest season has ended and harvest reports have been returned.

Recommended Changes Subsistence Harvest

We have no recommended changes to the forest plan components or management activities at this time. Harvest opportunity (permits) have remained available to federal subsistence users of the Chugach National Forest. The number of permits issued generally reflects demand. However, in the case of Unit 6C moose and Unit 7 mountain goats, permit numbers reflect the number of animals that can be sustainable harvest based on population estimates. The Chugach subsistence program will continue to partner with the State of Alaska to obtain current population data to ensure sustainable harvest of these species, which may result in changes to recommendations of permissible harvest levels.

Table 11. Permits issued and animals harvested through federal subsistence harvest seasons (events) within the Chugach National Forest

Zone	Unit	Event	Species	Year	Permits	Harvest
PWS[a]	6C	FM0601	Moose - bull	2020	30	26
PWS	6C	FM0601	Moose - bull	2021	35	27
PWS	6C	FM0603	Moose - cow	2020	40	39
PWS	6C	FM0603	Moose - cow	2021	35	30
PWS	6B, 6C	FM0607	Moose	2020	1	1
PWS	6B, 6C	FM0607	Moose	2021	1	1
PWS	6	FD0605	Deer	2020	5	0
PWS	6	FD0605	Deer	2021	5	-
PWS	6	FD0607	Deer	2020	5	0
PWS	6	FD0607	Deer	2021	5	0
PWS	6D	FG0604	Mountain Goat	2020	5	0
PWS	6D	FG0604	Mountain Goat	2021	9	2
Kenai	7 remainder	FM0004	Moose	2020	45	1
Kenai	7 remainder	FM0004	Moose	2021	54	1
Kenai	7	FC0702	Caribou	2020	41	0
Kenai	7	FC0702	Caribou	2021	42	0
Kenai	7	DG0703	Mountain Goat	2020	2	0
Kenai	7	DG0703	Mountain Goat	2021	3	1

a – PWS=Prince William Sound

Table 12. Permits issued and fish harvested through federal subsistence harvest seasons (events) within the Chugach National Forest

Zone	Event	Species	Year	Permits	Coho	Sockeye
PWS[a]	FPW01	Fish	2020	90	373	41
PWS	FPW01	Fish	2021	74	459	19
Kenai	KKTCI3	Fish	2020	125		1776

Zone	Event	Species	Year	Permits	Coho	Sockeye
Kenai	KKTCI3	Fish	2021	131		1334
Kenai	KKTCI2	Fish	2020	88		255
Kenai	KKTCI2	Fish	2021	78		60

a – PWS=Prince William Sound

Key Results for Mineral Materials Permits Issued and Locatable Mineral Plans of Operation Approved

The status and trends in these measures can be determined by evaluating and counting the number of locatable mineral plans of operation and the number of minerals and materials contracts issued each year on the forest.

We receive and process requests for minerals materials and locatable mineral plans of operations throughout the year as they are submitted. We tally results of the number of disposals conducted and plans of operations administered at the end of the Fiscal year.

Table 13. Monitoring results for minerals fiscal years 2020 – 2021

Results	2020	2021
Mineral Material Contracts Issued	45	37
Locatable Mining Plans of Operations Processed/Renewed	9	8

Figure 23. Mineral materials site on the Chugach National Forest

Mineral material disposals contribute to the forestwide goal to contribute to social and economic sustainability by supplying material to commercial and public entities. Economic factors and trends in construction will greatly affect the demand for material. If there is not a public demand for material, the

number of processed requests will be low. Conversely, if the demand for material is high, there will be more requests processed. Therefore, the Increase or decrease in disposals for Mineral Materials cannot be directly looked at as not meeting the target of the forest plan.

Plans of operations are the measurable data for locatable minerals mining activities. As with mineral materials, economic factors and public interest influence the number of proposed plans of operations on the forest. The Forest Service has a regulatory obligation to process these plans in a timely manner. Therefore, all plans of operations that are submitted are processed.

Recommended Changes for Trends in number of mineral materials permits issued and locatable mineral plans of operation approved

No changes are recommended

Section B. Desired Conditions for the Nellie Juan College Fiord Wilderness Study Area

For monitoring the Nellie Juan College Fiord Wilderness Study Area (wilderness study area), we addressed the monitoring question: Is the presently existing character of the wilderness study area, including areas recommended for wilderness, being maintained? Implicit in this question is that we develop measures that provide evidence of any changes or trends to the existing character of the wilderness study area. Chugach National Forest staff identified indicators and measures that can be compiled and evaluated periodically to ascertain trends in the existing character of the wilderness study area as described in the baseline report (USDA Forest Service 2021). These indicators show how authorized activities over a five-year period can affect different characteristics of the wilderness study area. They also measure how well the 2020 land management plan components are guiding management actions to maintain the wilderness study area's presently existing character and potential for inclusion in the National Wilderness Preservation System.

If we find negative trends when assessing the indicators described in the following narrative, specialists from the responsible program area should review the characteristics being degraded and determine if a forest plan amendment is needed to add new plan components to better maintain the wilderness study area's presently existing character and potential for inclusion in the National Wilderness Preservation System.

Key Results for 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.

- Since 2020, tagging 17 Kittzlet's murrelets in Columbia Bay is the only management action that adds to the existing level of actions affecting the wilderness study area's wildness quality. The birds were tagged for a multi-year research project. In 2021, there were 15 activities authorized that intentionally manipulate the biophysical environment. Most of these activities have been occurring for many years. Table 14 lists all current projects impacting wildness and shows how the addition of the murrelet tagging in 2020 compares with other ongoing actions.

Table 14. Record of authorized manipulations in 2021

Action(s)	Purpose	Year activity was first authorized
Using a weir to temporarily block salmon from upper Coghill River/Lake	Fish counts	1972
Using a weir to capture/kill salmon on Coghill River for sampling	Study hatchery escapement	1972
Enclosing, capturing, killing salmon at Cannery Creek Hatchery	Produce hatchery salmon	1982
Maintain a dam at Cannery Creek to alter water flow and store water	Create water source for hatchery	1982
Use a pipe to divert water from Main Lake	Create water source for hatchery	1978
Enclosing, capturing, killing salmon at Main Bay Hatchery	Produce hatchery salmon	1978
Maintaining a dam and fish ladders at Solf Lake	Alter level of Solf Lake to change lake outflow, enabling salmon to access the lake. Use ladders to assist fish access to lake	1997
Maintain a fish structure at Pigot Bay creek	Enhance salmon habitat and reproduction	Early 1990's
Maintain a fish structure at Shrode Lake outflow to alter hydrology	Enhance salmon habitat and reproduction	Early 1990's
Maintain a fish ladder at Otter Creek, Knight Island to increase fish access to stream	Increase fish reproduction	Early 1990's
Maintain a fish ladder at Derickson to increase fish access to stream	Increase fish reproduction	Early 1990's
Dandelions pulled at Hobo Bay	Reduce dandelion population	2019

- Data for the 'wildness' measure is gathered and evaluated annually.
- Tagging murrelets in Columbia Bay does add to the number of projects, so it increases the impacts on wildness. But as a small project with a finite timeline, the impact is considered temporary and minor.

Recommended Changes: Wildness

Based on these results, there is no need for any changes.

Key Results for Natural Conditions

We monitor the wilderness study area's natural conditions is accomplished by tracking trends in three measures:

1. Weight of marine debris collected at key monitoring sites
2. Number of miles of streams listed as "impaired" on the State of Alaska Department of Environmental Conservation 303D database
3. Trends in the Forest Service watershed condition class rating for wilderness study area watersheds.

For the first measure, the presence of marine debris at five representative sites in the wilderness study area is studied by Gulf of Alaska Keeper. Data are collected annually from the results of surveys performed by Gulf of Alaska Keeper. The data are analyzed for trends every five years. In 2021, 1,086.8

pounds of debris were collected, contributing to the total 3,195.6 pounds collected during the 2017-2021 monitoring cycle. This represents a 28.9 percent increase since the 2007-2011 monitoring cycle. Table 15 shows the increasing trend in marine debris collected since 2007.

Gulf of Alaska Keeper's data collection protocol ensures that each site is visited once annually, and that debris are collected by a consistently sized workforce. This prevents the potential skewing of data. Gulf of Alaska Keeper operates on a fixed schedule, annually collecting debris and data from each of the five monitoring sites. During each site visit, participating staff and volunteers comb the monitoring site and consolidate the debris. Debris are then sorted into 150 categories, weighed, and photographed. Monitoring data is stored in Excel spreadsheets and analyzed annually by Gulf of Alaska Keeper for overall trends in roughly six to eight categories. This systematic and consistent method of data collection provides the Forest Service with data that can be used to identify trends in known marine debris collection zones.

Table 15. Marine debris collected by Gulf of Alaska Keeper in the wilderness study area

Monitoring cycle	Value (total weight in lbs.)
2007-2011	2,388.6
2012-2016	2,564.6
2017-2021	3,195.6

The value for this measure is reported in "total weight", however, there are various data points that should be observed when evaluating trends in marine debris. Gulf of Alaska Keeper's data highlight trends that can be tied back to specific events such as the 2011 Tohoku Japan earthquake or certain container ship accidents. Examples of this include a statistically significant (R^2 >0.2) 2011-2021 increase in Styrofoam and Japanese fishing gear.

Other notable trends include a statistically significant increase in drinking bottles, floats, and a decrease in non-beverage bottles.

For the second measure, the number of miles of streams listed as "impaired" on the State of Alaska Department of Environmental Conservation 303D database, water quality continues to remain in a good condition. There are currently 110 watersheds either entirely within or partially within the wilderness study area boundary. Of these, none are currently listed as "impaired" on the 303D list by the State of Alaska Department of Environmental Conservation. However, there is 0.5 miles of stream located in the northwest portion of the Port Wells – Frontal Guld of Alaska watershed (HUC 1902020121) near the Granite Mine that has shown water quality exceedances. This data is captured within the Watershed condition classification water quality attribute ratings and is shown to be "functioning at risk" for 0.5 miles of stream.

For the third measure, trends in the Forest Service watershed condition class rating for the wilderness study area watersheds continue to reflect functioning status. Forest-wide results for watershed condition class can be found in Section 1, Watershed conditions: Key Results for Watershed Condition Classification ratings. There are currently 110 watersheds either entirely within or partially within the wilderness study area boundary. Of these, 100% are classified as 'functioning properly'. Although each watershed is classified as 'functioning properly', there are several indicators that are measured 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 don't weigh enough to impact the entire watershed score. As part of the National Five-year Watershed Condition Classification re-assessment watersheds with anticipated changed conditions were re-assessed across the forest. Only one watershed, the Port Wells – Frontal Prince William Sound (HUC 1902020121), was re-assessed for changed

conditions. This watershed was re-assessed for changed conditions for the water quality attribute (water quality problems - not ADEC listed) due to the presence of abandoned metals in the northwest portion of the watershed. An internal report, as part of the Environmental Evaluation/Cost Analysis by Hart Crowser, in 2017 documented soil and water quality exceedance levels near the Granite Creek mine related to heavy metal concentrations. However, based on the small percentage of the watershed with impairment the attribute indicator did not change and remained in a class 2 –functioning at risk condition.

Recommended Changes: Natural Conditions

Based on these results, there are no recommended changes for the marine debris collected. There are no standards or guidelines in the forest plan that would change this trend because marine debris is generated in the marine environment and is not within Forest Service jurisdiction to manage. The Chugach National Forest currently works with Gulf of Alaska Keeper, Prince William Sound Stewardship Foundation, and others to annually remove debris from select locations and track trends.

We also have no recommended changes to plan components, management activities or the monitoring plan foe miles of stream impaired and watershed conditions. Future considerations are for us to reevaluate the insects and disease attribute to include the “anticipated” mortality to see if there is a substantial change using the national insect and disease risk and hazard mapping data. This will ensure that our future long-term trends are accurate.

Key Results for Undeveloped

The undeveloped quality of the wilderness study area is tracked through the following two measures:

1. Authorized use of motorized equipment and mechanical transport
2. Authorized number of installations and developments

The data for both measures is collected annually. The monitoring protocol for assigning trends uses a weighted system for calculation of motorized uses. When reviewing the data from 2020 and 2021, the change within motorized uses is almost exclusively helicopter landings. We felt that using the weighted value in this report would be confusing because the weighting is a leveling tool across motorized uses. But since the increases are within only one use, the weighting would not be helpful for this report. The weighting value system will be used for 5 year trend analysis.

For the measure of authorized use of motorized equipment and mechanical transport, monitoring shows a 169 percent increase in helicopter use in the wilderness study area since 2020 and a slight increase in the amount of hand-held motorized tools. Most of the increased activity is due to research and installation of landslide and tsunami detection equipment in the area of Barry Arm, where a large slope instability has been identified that has the potential to create a destructive tsunami.

When the activity associated with Barry Arm is isolated, the finding is that motorized uses in the wilderness study area have generally remained static for 2020 and 2021.

Figure 24 shows trends from a baseline year of 2012, when we began tracking motorized uses in the wilderness study area. Figure 25 focuses on the last three years to highlight changes that have occurred since the slope instability was discovered in Barry Arm.

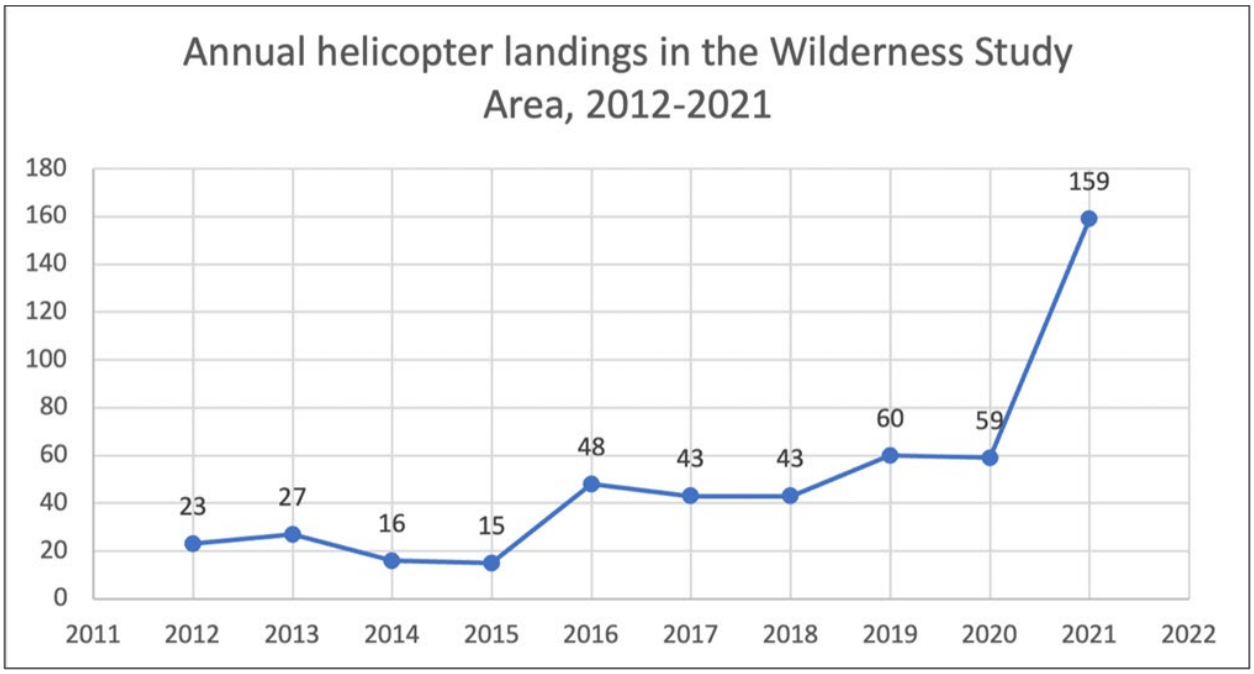

Figure 24. Annual helicopter landings in the wilderness study area

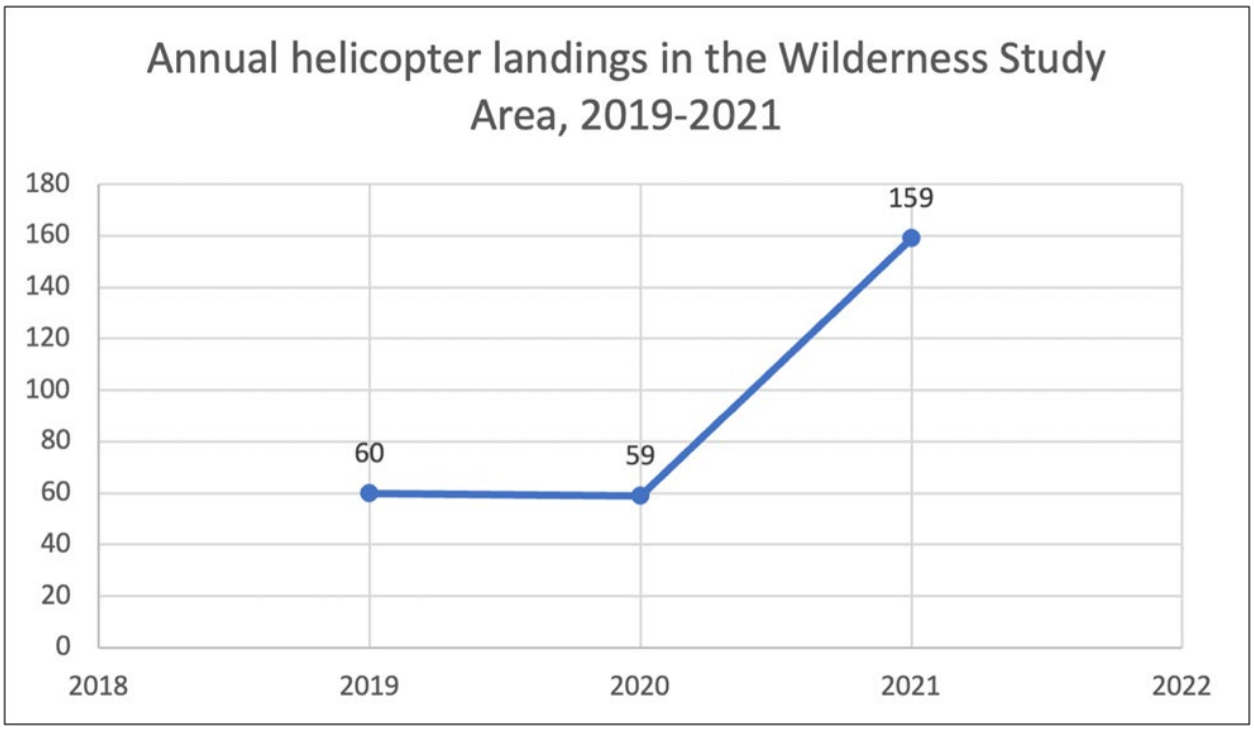

Figure 25. Annual helicopter landings in the wilderness study area 2019 through 2021

For the second measure of number of authorized installations and developments, monitoring shows an increase in the number and location of scientific installations in the wilderness study area due to monitoring and research of the slope instability in Barry Arm. Similar to motorized uses, we will use the weighted value system for analyzing changes for this measure for the five year trend analysis and not for

this report because the increase in installations and structures was only in the research related structures and installations.

Figure 26 shows the overall authorized number of installations and developments increased by 5.5 percent for 2020 and 2021. This figure represents all developments in the wilderness study area, including communication sites, hatcheries, and other features.

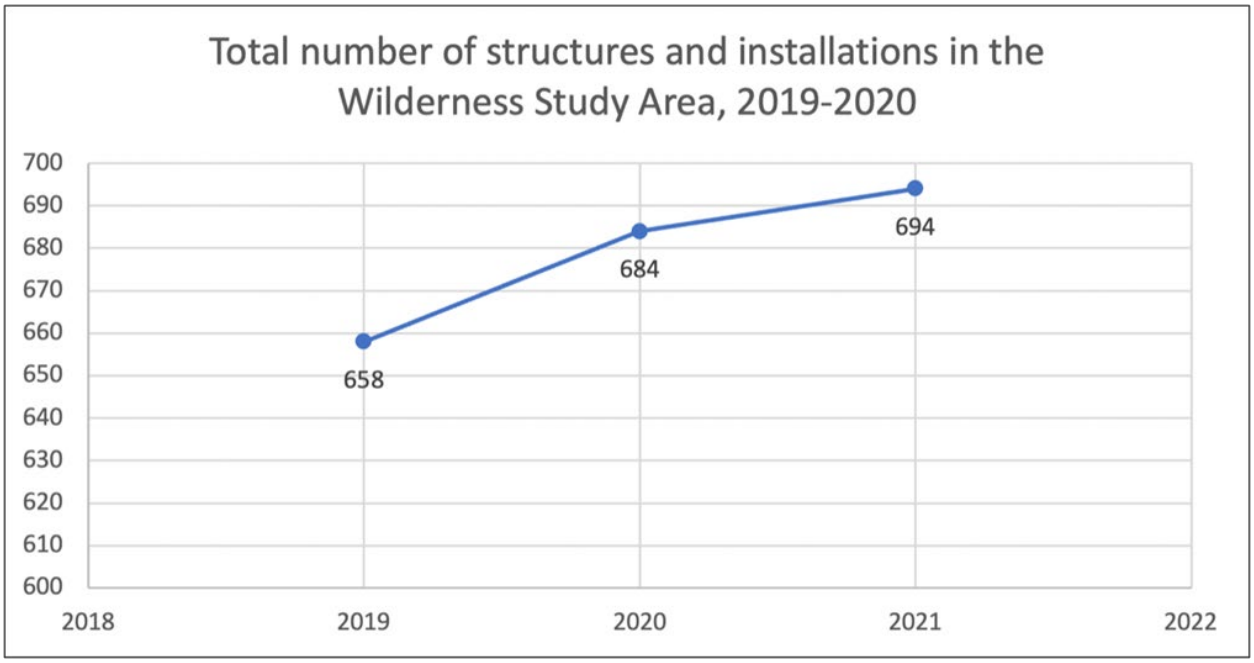

Figure 26. Total number of structures and installations within the wilderness study area 2019 through 2021

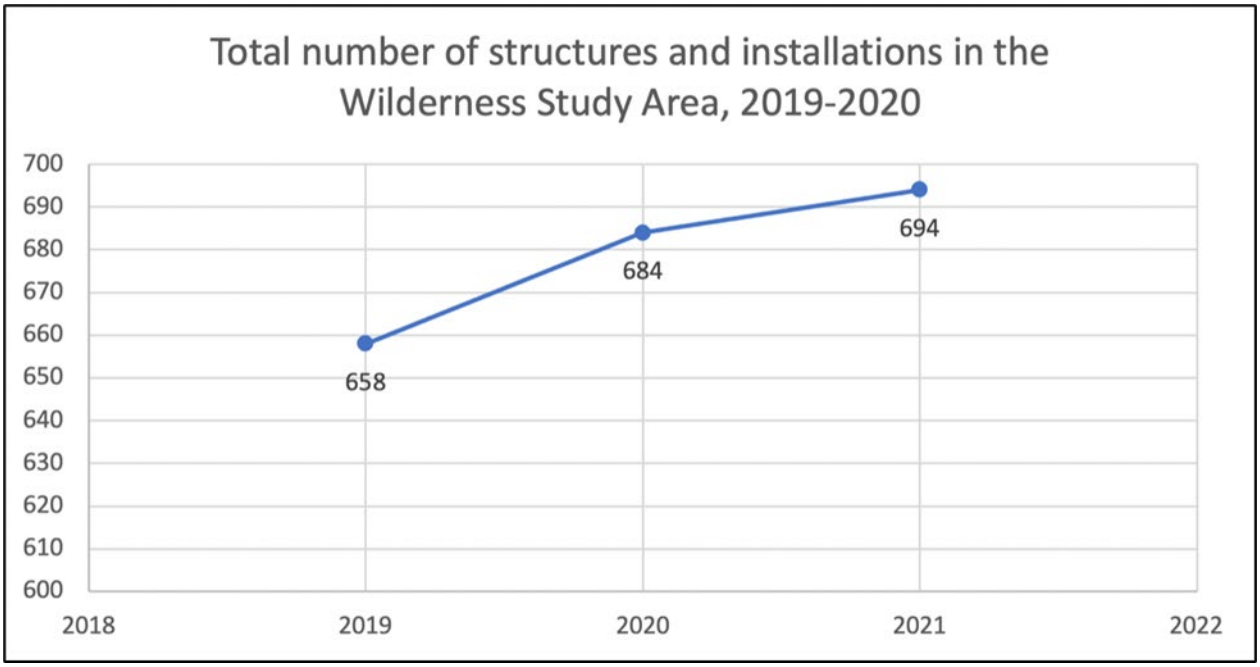

Figure 27. Research-related structures and installations in the wilderness study area 2019 through 2021

Figure 27 shows only research-related instrumentation and developments in the wilderness study area. There was an increase of 15 research-related instrumentation and developments in 2020 and an additional 10 in 2021. This represents an overall increase of 24.7 percent. All of these sites are part of the Barry Arm research.

Recommended Changes Undeveloped

We will continue monitoring trends in authorizations for motorized equipment and installations/development. Authorizing these actions to assess the hazard to human life and property from potential slope failure in Barry Arm warrants impacts to this measure. At this time, changes to the forest plan are not needed. We will continue analyzing the impact of projects such as monitoring in Barry Arm to identify when unique circumstances cause changes.

Key Results for Solitude and Primitive Recreation

Solitude or opportunities for 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.

Two measures are used to monitor the solitude and primitive recreation quality of the wilderness study area:

1. Trends in encounters monitoring
2. Trends in the condition of identified recreation sites.

For the first measure, the protocol for encounters monitoring was developed and implemented in 2019, with data collection to be analyzed every five years. Monitoring is done annually at four required sites and at 13 additional sites where monitoring occurs opportunistically. The large slope instability in Barry Arm has created risks that prevented monitoring at 2 of the 4 required sites. In 2022, we will adjust the protocol to account for changes in Barry Arm. Because of the newness of the protocol and the situation in Barry Arm, we are not yet able to report on trends.

For the second measure, we developed and implemented the protocol for conditions at identified recreation sites beginning in 2018. We gather data from sites throughout the wilderness study area on a five-year rotational basis. The first rotation will be completed in 2022. Because of the newness of the protocol, we are unable to report on trends. However, our data collection and storage are occurring on schedule.

Recommended Changes Solitude and Primitive Recreation

Based on the discovery of a large slope instability in Barry Arm, which compromises staff safely working in the area, we will adjust the encounters monitoring protocol in 2022. For an undetermined time, staff will not be conducting campsite monitoring in Barry Arm and Harriman Fiord.

8. Effects of Management Activities on the Productivity of the Land

Summary for Productivity of the Land

Soils provide many ecosystem services related to productivity such as regulating and purifying water, storing carbon, cycling nutrients, and providing suitable habitat for plant roots and soil dwelling organisms. Management activities can alter these functions, which affects soil productivity. Regional soil quality standards, along with national and regional best management practices, are utilized to minimize impacts to soil and water quality from ground disturbing activities and maintain productivity of the land.

Region 10 soil quality standards describe detrimental soil conditions that indicate decreased soil quality, including compaction, displacement, rutting, mass movement, erosion, severe burning, lack of ground cover, dense slash, and altered wetness. The soil quality standards stipulate that no more than 15 percent of an activity area should have detrimental soil conditions in order to preserve long-term soil productivity. Monitoring of adherence to soil quality standards provides an indication of the impacts of activities to soil productivity. Detrimental soil conditions, particularly erosion, also affect water quality. Therefore, water quality is inferred from detrimental soil conditions, as well as from monitoring of best management practices for soil and water quality, as discussed in the Watershed Conditions chapter of this report.

In order to determine whether management actions are effective in maintaining soil productivity, we will monitor and evaluate the implementation and effectiveness of soil quality standards and best management practices resulting from management activities. The following results reflect updates from data collected in 2020 and 2021.

Monitoring Questions and Indicators

Are management activities meeting and maintaining soil productivity and water quality standards?

The indicator selected:

1. Soil disturbance resulting from management activity

Key Results for Soils Productivity and Water Quality Standards

- In 2021, a soil monitoring guide was developed to address forest plan monitoring questions related to soil productivity. We did not conduct any soil condition monitoring or pre- and post-disturbance soil monitoring on the Chugach National Forest in 2020 or 2021 but we are planning monitoring for 2022-2023. Best management practices monitoring related to soil and water quality was conducted at several locations across the forest in 2020 and 2021, with results reported in Watershed Conditions, Chapter 1 of this report.

Recommended Changes Soils Productivity and Water Quality Standards

- No changes are recommended at this time.

9. Public Engagement Opportunities

We have had limited opportunities to engage with the public due to pandemic precautions in 2020 and 2021. We expanded outreach opportunities through web-based public meetings and events when feasible and appropriate. The following events were held in virtual or hybrid virtual environments to follow published safety protocols:

Table 16. Chugach National Forest public engagement opportunities in 2020 and 2021

Number of events	Description
2	Iceworm Festivals
1	Guided Iceworm Hunt at Sheridan Glacier
2	Themed Agents of Discovery missions along Haystack Trail (Bats/Halloween, Trees/Holiday, Iceworms, Owls, Migration/Shorebird Festival, National Trails Day)
1	Portage Valley Agents of Discovery Mission (no change in programming, but available)
2	Shorebird Festivals (virtual)
2	Kid's Fishing Days (Valdez)
3	Fungus Festivals (one joint Cordova & Girdwood event)
2	Bat Cave Halloween events
1	Goldrush Days event (Valdez)
3	Parade floats and participation in 4th of July activities
1	Salmon Jam scavenger hunt
25	Williwaw Campground Fireside Chats
15	Byron Glacier led hikes
100 days	Railroad Interpretation
100 days	Ptarmigan Interpretation
3	Forest Service led Environment of Americas virtual sessions
30	Iditarod Trail to Every Classroom educator virtual sessions
4	Avalanche Forecaster podcasts
2	Virtual Kid's Fishing Day weeks (week-long social media posts about different aspects of fishing and a video of fishing sites on the Kenai Peninsula)
1	Camp-in-a-Box hike and knot-tying recorded event
1	Haystack Trail Hike with CFRC (Cordova Family Resource Center) Summer Camp