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Draft Energy and Minerals Assessment

Tongass National Forest Plan Revision

Forest Service
Alaska Region
Tongass National Forest
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Cover Photo: Hydroelectric Powerhouse at Annex Creek.

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Forest Service, Alaska Region

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Table of Contents

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Introduction

The USDA, Forest Service manages the national forest system (NFS) to sustain the multiple use of its renewable resources in perpetuity while maintaining the long-term health and productivity of the land. Resources are managed through a combination of approaches and concepts for the benefit of human communities and natural resources. Land management plans guide sustainable, integrated resource management of the resources within the plan area in the context of the broader landscape, giving due consideration to the relative values of the various resources in particular areas.

Resource Importance

Renewable Energy

Renewable energy resources help Southeast Alaska communities reduce fossil fuel dependence, contribute to the economic well-being of Southeast Alaska communities, and lower carbon emissions by providing low-carbon energy alternatives and displacing the use of fossil fuels (USDA 2016a). Renewable energy drives economic development by reducing reliance on expensive imported fuels, creating jobs in construction, maintenance, and operation of renewable facilities. It also supports local economies through lower energy costs and potential revenue from selling surplus energy. This is especially important given the high shipping costs and fossil fuel use necessary for each fuel delivery. Access to affordable, reliable renewable energy resources enhances quality of life, providing communities with stable electricity and supports public health by reducing air pollution and fosters resilience against energy price volatility. Local sources of renewable energy provide a degree of energy independence as well, which is important for small, remote communities in Southeast Alaska that may not have reliable access to a larger power grid. Use and development of renewable energy resources also reduce carbon emissions which can help mitigate the impacts of climate change (USDA 2016a).

Renewable energy resources provide benefits not only to the people of Southeast Alaska, but also the ecosystems and environment. For people: lower energy costs, job creation, improved health, and enhanced quality of life. For ecosystems: reduced carbon footprint, preservation of natural habitats, and protection of biodiversity through sustainable energy practices.

Minerals

Southeast Alaska has a long history of mineral prospecting and mining, and the Forest Service recognizes that minerals are fundamental to the Nation's well-being. As policy, the Forest Service encourages the exploration and development of the mineral resources it manages (USDA 2016a). Additionally, Southeast Alaska communities often depend on resources managed by the Tongass National Forest, including mineral resources. For the Juneau area, mining is an economic driver. Greens Creek Mine, an underground mining operation located on Admiralty Island, opened in 1989 and produces silver, zinc, lead, and gold. As of 2023, the mine employed over 500 employees – approximately 80% of whom are local to Southeast Alaska – and milled about 805,000 tons of ore worth about $385 million (Kay 2022). Similarly, Kensington Mine, located about 45 air miles north of Juneau, is a gold mine that began production in 2010. As of 2023, Kensington employed approximately 380 employees and produced $202.5 million of gold. Approximately 50% of Kensington's total work force are Alaska residents, with more than 40% living in Southeast Alaska (Resneck 2019; Navarro 2021). Two smaller operating mines, Dawson and Calder Mines, are located on Prince of Wales Island (POW), with Dawson Gold Mine employing 50 people and Calder Marble Quarry employing 12, as of 2022.

Numerous exploration and field projects for locatable mineral claims can be found throughout Southeast Alaska. Four projects are in the advanced stages of exploration: Palmer Project (copper-zinc-silver-gold-barite prospect near Klukwan), Bokan-Dotson Ridge Project (rare earth element prospect in Kendrick Bay, on the southern end of POW), Niblack Project (copper-zinc-gold-silver prospect near Moira Sound on POW), and Herbert Gold (gold-silver prospect north of Juneau) (Loeffler and Watson 2022). Salable minerals, such as sand and gravel, are also an important commodity in Alaska.

The General Mining Law of 1872, as amended, grants every United States citizen the right to prospect and explore public domain lands open to mineral entry. The right of access is not at the discretion of the Forest Service. The Mineral Leasing Act of 1920, Mineral Leasing Act for Acquired Lands of 1947, and Oil and Gas Leasing Reform Act of 1987 also allows for exploration and development of leasable mineral resources, though management is administered by the U.S. Department of Interior Bureau of Land Management (BLM) in cooperation with the Forest Service (USDA 2016a).

Resource History and Current Management Direction

Resource History of Renewable Energy

A significant share of energy in Southeast Alaska is generated by renewable energy resources, mostly from hydroelectric power generation. In 2011, hydroelectric power accounted for 96 percent of net power generation in Southeast Alaska, with diesel supplying the other 4 percent (Tetra Tech 2015). Generally, hydroelectric power projects in the United States are regulated by the Federal Energy Regulatory Commission (FERC), under authorities granted by The Federal Power Act. Section 4(e) of the Federal Power Act requires FERC, in most cases, to determine whether projects are consistent with National Forest purposes and the land management plan. Section 4(e) also gives the Forest Service authority to impose conditions in the FERC license to ensure protection and use of National Forest System (NFS) lands and resources. These conditions are used to mitigate the impacts of a project including the location and size of a dam, associated project works (pipelines, roads, and facilities), reasonable access, etc. (USDA 2016a). There are some exemptions to FERC licensing, as detailed in 18 CFR 4.30; however, FERC exempt projects that occur on NFS lands are regulated by the Forest Service through special use permitting.

Several types of renewable energy resources can be found throughout Alaska. Many renewable energy resources rely on the movement of water, with the most common resource being hydroelectric power generation, which uses a diversion structure or a dam to supply a combination of hydraulic head and water volume to spin a turbine and generate power. Tidal and river in-stream energy convert the energy of ocean tides or river currents into electricity using hydrokinetic devices to harness the energy of moving water. Wave energy is the result of wind acting on the ocean surface, with systems utilizing the up-and-down motion of ocean waves to generate electricity (AEA and REAP 2019).

Additional types of renewable energy resources found in Alaska include solar, wind, geothermal, and biomass. Power generation via solar and wind resources are very common throughout the lower 48, and are gaining in popularity in Alaska as well. Solar power generation utilizes photovoltaic cells to capture solar radiation and convert that energy into electricity. Wind power generation uses large, fan-like turbines to convert the kinetic energy of wind into electrical energy via the turning motion of the blades. Geothermal resources, or heat energy from within the earth, can be used to create electricity, but can also be used to heat homes and buildings, as hot springs, or as hot water sources. To generate electricity, a fluid, typically water, is geothermally heated until it vaporizes, then passes through and spins a turbine,

generating electricity. Biomass refers to the harnessing of energy released through the combustion of organic materials, like plants, animal waste, and biogenic materials to generate electricity or heat.

Renewable energy planning efforts for Southeast Alaksa have included the 2012 Southeast Alaska Integrated Resource Plan (IRP), developed at the direction of the Alaska Legislature, which explored the status of energy resources in the region, as well as options for minimizing future power supply and space heating costs, while maintaining or improving power supply reliability. Also, the 2015 Energy Resource Report was developed in support of the 2016 Forest Plan Amendment to identify and evaluate potential renewable energy resources on the Tongass National Forest. As of 2016, planning efforts have identified 12 proposed renewable energy projects in Southeast Alaska that are either on or considered likely to affect National Forest Service lands. Seven of the 12 are FERC hydroelectric projects, with the remaining five consisting of three non-FERC hydroelectric projects, one wave energy project, and one geothermal project (Table 1).

Table 1. Proposed Renewable Energy Projects on or Likely to Affect National Forest System Lands.

No.[1]	Name	Ranger District	Applicant	Power Destination	Roadless Area No. & Name	Land Use Designation
1	Yakutat Wave	Yakutat	Resolute Marine Energy	Yakutat	N/A	Scenic Viewshed
2	Annex Creek	Juneau	AEL&P	Juneau	302 – Taku-Snettisham	Semi-Remote Recreation
3	Sweetheart Lake	Juneau	Juneau Hydropower, Inc.	Juneau	302 – Taku-Snettisham	Semi-Remote Recreation
4	Angoon Hydroelectric/Thayer Creek[1]	Admiralty	Kootznoowoo, Inc.	Angoon	N/A	Wilderness
5	Crooked Creek/Jim's Lake	Hoonah	Community of Elfin Cove	Elfin Cove	311 – Chichagof	Semi-Remote Recreation
6	Tenakee Springs/Indian River[1]	Sitka	City of Tenakee Springs	Tenakee Springs	N/A	N/A
7	Hiilangaay Hydroelectric (formerly Reynolds Creek)	Craig	Haida Energy, Inc.	Hydaburg, Prince of Wales Island	N/A	N/A
8	Little Port Walter[1]	Sitka	NOAA/NMFS	Little Port Walter Marine Station	334 – Port Alexander	Remote Recreation
9	Swan Lake Expansion	Ketchikan-Misty Fjords	SEAPA	Ketchikan, Swan-Tyee Intertie	526 – North Revilla	Semi-Remote Recreation
10	Bell Island Geothermal[1]	Ketchikan-Misty Fjords	B. Wilson	Swan-Tyee Intertie	529 – North Cleveland	Semi-Remote Recreation
11	Mahoney Lake[2]	Ketchikan-Misty Fjords	City of Saxman, AP&T et al.	Swan-Tyee Intertie	524 – Revilla	Semi-Remote Recreation
12	Soule River	Ketchikan-Misty Fjords	AP&T	BC and Lower 48	530 – Hyder	Remote Recreation

Notes:
1 Non-Federal Energy Regulatory Commission (FERC)
2 FERC licensed in 1998, unconstructed
Source: USDA 2016a

Resource History of Minerals

Per the Mining Claims chapter of Forest Service Manual 2800 – Minerals and Geology, the right of reasonable access for purposes of prospecting, locating, and mining is provided by statute. Such access must be in accordance with the rules and regulations of the Forest Service. However, the rules and regulations may not be applied so as to prevent lawful mineral activities or to cause undue hardship on bona fide prospectors and miners. The Forest Service works with mining claimants to provide reasonable access to their claims, minimize adverse environmental impacts on surface resources, and ensure reasonable reclamation of disturbed lands affected by mining operations. Protection of surface resources is accomplished by reviewing the mining plan of operations submitted by the claimant, disclosing impacts of the proposed mining operations in a site-specific environmental document, approving only those activities that are reasonably incident to the proposed operation, monitoring operations to ensure environmental standards are met, and ensuring prompt and reasonable reclamation of disturbed areas (USDA 2016a).

Mineral resources occurring within the boundaries of the Tongass National Forest include gold, silver, molybdenum, and lead, and nationally designated "strategic" and "critical" minerals such as, zinc, copper, vanadium, uranium, tungsten, rare earth, and platinum group metals (USDA 2016a). As mentioned above, subsurface mineral rights are managed by the BLM Alaska State Office, which adjudicates mining claims, and issues leases with the consent of the Forest Service for the lands under application in the Tongass National Forest. The Forest Service has jurisdiction only over the surface resources. Mineral development on the Tongass National Forest is guided by Federal regulation (36 CFR 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System lands. Development of locatable mineral resources in the Forest generally requires construction of an underground or surface mine complex, a millsite, road and pipeline systems, tailings and waste rock disposal areas, a marine transfer/docking facility, and lodging accommodations if the mine location is not close to an existing community. Total surface-disturbing acreage can vary markedly with specific project characteristics.

Current Management Direction

Legal and Regulatory Compliance

Renewable Energy

Neither the 1997 forest plan nor the 2008 amendment directly addressed renewable energy; rather the concept was indirectly discussed as part of the Transportation and Utility System Land Use Designation (TUS LUD) with siting of energy projects limited in certain Land Use Designations, particularly in "avoidance areas." The TUS LUD "provide(s) for, and/or facilitate(s) the development of existing and future major public Transportation and Utility Systems," which were defined as "state and federal highways, railroads, public hydroelectric power projects and associated facilities, powerlines 66 kV or greater, and pipelines 10 inches or greater in diameter."

The 2016 forest plan amendment replaced the previous renewable energy direction by removing the overlay TUS LUD, establishing specific renewable energy plan components, and identifying all NFS lands as suitable for renewable energy sites. The Final Environmental Impact Statement for the amendment addresses each of the 11 proposed renewable energy sites including all related facilities, access roads, utility lines for the transmission and distribution of electric energy, ancillary equipment sites and areas required for construction and long-term maintenance of the project.

One goal of the 2016 forest plan amendment was to proactively contribute to sustainable production of renewable energy and energy transmission and distribution across the Forest, on all lands and LUDs, after consideration of other resources and community benefits. The current management direction established new approaches so that renewable energy development is more permissible, resulting in improved flexibility in siting and development of renewable energy projects. The 2016 plan amendment recognized the need to stimulate economic development in Southeast Alaska communities, and provide low-carbon energy alternatives, thereby displacing the use of fossil fuel.

Minerals

The 1997 forest plan contained the following goals, which were carried forward in the 2008 and 2016 amendments:

- To encourage the prospecting, exploration, development, mining, and processing of locatable minerals in areas with the highest potential for minerals development.
- To ensure that minerals are developed in an environmentally sensitive manner, and that other high-valued resources are considered when minerals developments occur.
- Seek withdrawal of specific locations where mineral development may not meet underlying Land Use Designation (LUD) objectives.
- Provide for environmentally sound mineral exploration, development, and reclamation in areas open to mineral entry and in areas with valid existing rights that are otherwise closed to mineral entry.

The current management direction under the 2016 forest plan amendment is similar to previous iterations. The current desired condition states "during mining operations, mining activities are limited to the area necessary for their efficient, economic, and orderly development. Mining is carried out so that any effects on other resources are minimized to the extent feasible, all minimum legal resource protection requirements are met, and other resource uses and activities in the area do not conflict with mining operations. After the completion of mining, affected areas are reclaimed and, in most cases, the area once again provides the settings and opportunities of the underlying LUD." The current forest plan also allocates several areas of the Forest to the Minerals LUD; widely distributed across most portions of the Tongass, excluding Wilderness and LUD II lands. The Minerals LUD is an "overlay" designation that applies management prescriptions for minerals to the affected area in addition to the prescriptions of the underlying LUD, with the Minerals LUD having priority. The intent of the Minerals LUD is to encourage exploration and development of locatable minerals in areas of high minerals potential, while taking other resource values into account.

Scope and Scale of Assessment

This assessment chapter primarily considers effects on the Tongass National Forest but will consider adjacent communities and ecosystems, where there is potential for management decisions to effect conditions. Issues related to socioeconomics and environmental health of adjacent communities will be discussed further in the Socioeconomic Conditions assessment chapter. Due to the broad scope of this chapter, each section of the assessment is divided into 2 categories for individual discussion: Renewable Energy and Minerals.

For Renewable Energy, the focus is primarily on hydropower, but briefly touches on other sources such as wind, solar, biomass, tidal, and wave energy. Geothermal resources are regulatorily designated as leasable minerals, so discussion of these resources occurs in the Minerals section. For Minerals, discussion is divided based on the three subtypes of minerals, as described in 36 CFR 228: locatable

minerals (“hardrock” minerals from lode or placer deposits), leasable minerals (oil, gas, coal, and geothermal deposits), and salable minerals (“common variety” minerals such as sand and gravel). Discussion of non-renewable energy resources, such as oil, gas, and coal discussion will be brief, as no leasable minerals are currently being produced on the Tongass.

Status and Trends

Renewable Energy

There is continuing interest and investment in renewable energy resources and infrastructure in Southeast Alaska, spurred on by policies like the Infrastructure Investment and Jobs Act and the Inflation Reduction Act. These investments aim to enhance grid resilience and reduce carbon emissions, promoting a transition to cleaner energy sources. They are also catalyzing substantial investments in solar, wind, storage, and hydrogen technologies. Additionally, there is a trend of corporate commitments to renewable energy which influences energy demand. Companies are increasingly procuring renewable energy to meet their sustainability goals, driving demand for clean energy solutions (Motyka et al. 2023).

Local economic conditions and policy frameworks are also crucial. The Southeast Conference, the economic development and advocacy organization for Southeast Alaska, highlights the importance of integrating renewable energy projects with broader economic development strategies. This includes workforce development, financial incentives, and community engagement to support a sustainable energy transition.

Generally, these trends reflect a concerted effort to shift towards more sustainable and resilient energy systems in Southeast Alaska, influenced by technological advancements, policy initiatives, and economic strategies.

Southeast Alaska's unique geographic and climatic conditions also drive specific energy trends. The region's reliance on hydropower is notable, but there are growing efforts to diversify energy sources to include wind and solar. This diversification aims to improve energy security and reduce reliance on imported fossil fuels.

Hydropower

Southeast Alaska’s wet, relatively temperate climate, and the combination of high precipitation rates and mountainous terrain provides ample opportunity for hydroelectric generation. Twenty-two currently operating hydroelectric projects are located either on NFS lands or on adjacent state or private land (Table 2). The Southeast Alaska IRP also identified the potential for connecting the region’s isolated power projects into a regional grid system (the Southeast Intertie), as well as the potential for developing the AK-BC Intertie, which would connect the Southeast region to the BC Hydro transmission network in Canada (Tetra Tech 2015). If sited and designed responsibly, hydroelectric projects provide an environmentally and economically preferred source of power due to the near elimination of hydrocarbon emissions from diesel fuels and reduce the risk of diesel fuel spills associated with shipping, handling, and storing activities.

However, hydroelectric power is unevenly distributed throughout Southeast Alaska, driven primarily by a lack of power transmission and hydroelectric storage facilities. For many of the larger communities, including Juneau, Ketchikan, Sitka, Petersburg, Wrangell, Hydaburg, Skagway, and Haines, as well as some smaller communities, power requirements are met by relatively low-cost hydroelectric generation, with diesel generation used only as a back-up. Residents in these communities have some of the lowest

residential power rates in the State. Other communities are entirely dependent on diesel generation, much more expensive on a per kilowatt hour basis than hydropower, and the high cost of energy in these communities can impede economic development, as decisions to locate new commercial and industrial developments are influenced by the availability of reliable, low-cost power (USDA 2016a).

Table 2. Existing Renewable Energy Projects on Tongass National Forest.

No.[1]	Name	Type	Capacity (MW)	Date Online	Community Served
1	Dewey Lakes	Hydropower (Run-of-the-River)	0.9	1902	Skagway
2	Salmon Creek	Hydropower (Storage)	6.7	1913	Juneau
3	Gold Greek	Hydropower (Run-of-the-River)	1.6	1914	Juneau
4	Annex Creek	Hydropower (Dam/Reservoir)	3.6	1915	Juneau
5	Crystal Lake	Hydropower (Dam/Reservoir)	2.0	1920	Petersburg
6	Pelican	Hydropower (Run-of-the-River)	0.7	1941	Pelican
7	Beaver Falls	Hydropower (Dam/Reservoir)	5.4	1947	Ketchikan
8	Blue Lake	Hydropower (Dam/Reservoir)	16.9	1961	Sitka
9	Silvis Lake	Hydropower (Dam/Reservoir)	2.1	1968	Ketchikan
10	Green Lake	Hydropower (Dam/Reservoir)	18.6	1979	Sitka
11	Snettisham	Hydropower (Dam/Reservoir)	78.0	1979	Juneau and Douglas
12	Swan Lake	Hydropower (Dam/Reservoir)	22.4	1983	Ketchikan, Wrangell, Petersburg
13	Tyee Lake	Hydropower (Lake tap)	20.0	1984	Ketchikan, Wrangell, Petersburg
14	Black Bear Lake	Hydropower (Lake tap)	4.5	1995	Prince of Wales Island
15	Goat Lake	Hydropower (Storage)	4.0	1997	Skagway and Haines
16	Ketchikan Lakes	Hydropower (Dam/Reservoir)	4.3	2000	Ketchikan
17	South Fork Black Bear	Hydropower (Run-of-the-River)	2.0	2005	Prince of Wales Island
18	Kasidaya Creek	Hydropower (Run-of-the-River)	3.0	2008	Upper Lynn Canal
19	Lake Dorothy	Hydropower (Dam/Reservoir)	14.3	2009	Juneau
20	Falls Creek	Hydropower (Run-of-the-River)	0.8	2009	Gustavus
21	Whitman Lake	Hydropower (Dam/Reservoir)	4.6	2014	Ketchikan, Wrangell, Petersburg
22	Gartina Falls	Hydropower (Run-of-the-River)	0.5	2015	Hoonah

[1] Four other hydropower projects – Hidden Falls Hatchery, Jetty Lake, Betty Lake, and Burnett Inlet Hatchery – on NFS lands supply power to fish hatcheries and are not included.
Notes: Prince of Wales Island includes the communities of Craig, Klawock, Hydaburg, Hollis, Kasaan, and Thorne Bay
Upper Lynn Canal includes the communities of Haines, Skagway, Klukwan, and Chilkat Valley
Source: USDA 2016a

Several proposed hydroelectric power and intertie projects identified in recent planning efforts have had the support of local communities. The Alaska-British Columbia Intertie project, which would facilitate the export of surplus power from Southeast Alaska to Canada and the lower 48, is supported by the City of Wrangell. Tlingit & Haida Central Council, Grand Camp of the Alaska Native Brotherhood, and Sealaska Corporation have all publicly supported hydroelectric power generation and intertie projects in Southeast Alaska. The Southeast Conference has also funded several energy development plans and worked closely with Alaska Energy Authority to secure funding for specific projects (USDA 2016a).

Wind

In 2022, the Tongass National Forest approved the installation of two temporary meteorological towers on Baranof Island, near the City of Sitka, to gather data on wind resources to determine if there is sufficient and sustained wind to develop a renewable wind energy project capable of generating marketable electrical energy (USDA 2022). There are other small areas distributed throughout the region that may possess wind resources, but most utility-scale resources are in areas that are inaccessible due to terrain, or are too far from population centers (USDA 2016a).

Solar

In 2011, two solar arrays were installed on the Chickamin and Steelhead Barges, which are mobile floating Forest Service bunkhouses, eliminating about 4,000 gallons of fuel a year (USDA 2012). The 2012 Southeast Alaska IRP, a report which explored the current status of energy resources in the region, as well as options for minimizing future power supply and space heating costs, while maintaining or improving power supply reliability, recommended that solar not be used to meet the near-term needs of Southeast Alaska, but should instead be monitored and perhaps considered in the future as costs decrease.

Biomass

Large-scale, wood fired power generation ended in Southeast Alaska the 1990s with the closure of the pulp mills in Sitka and Ketchikan, but interest in using sawdust and wood wastes for lumber drying, space heating, and small-scale power production has increased in recent years. Current biomass projects are mainly geared toward heating facilities but interest in manufacturing wood pellets continues to increase (Tetra Tech 2015). Overall, successfully launched projects provide useful learning opportunities as case studies, but future projects will need to continue analyzing overall cost savings based on choosing the right technology for the local biomass fuel supply (USDA 2016a). Sealaska Corporation installed the state's first large-scale pellet boiler at its headquarters in Juneau in 2010, and wood-fired boilers have been installed elsewhere in Southeast Alaska, including Sitka, Craig, Coffman Cove, and Southeast Island School District facilities on Prince of Wales Island (Tetra Tech 2015).

Tidal

Alaska Energy Authority had granted partial funding for two tidal power reconnaissance and feasibility studies in Southeast Alaska: Port Frederick and Kootznahoo Inlet Tidal Power Projects. Port Frederick has since been dismissed by FERC, but the preliminary permit for Kootznahoo Inlet Tidal Power remains active and the project is still being investigated. The Gastineau Channel Tidal project, identified in the Southeast Alaska IRP was granted a preliminary permit by FERC in 2010, but it expired in 2013 (USDA 2016a). None of these projects are included in the Forest Service's list of Proposed Renewable Energy Projects, as detailed in the 2015 Energy Resource Report (Table 1). However, the potential for tidal energy exists in many areas of Southeast Alaska and could become more viable with technological advancements and decreases in cost. In general, much of the power generation infrastructure for tidal energy projects would likely be sited on state tidelands, shorelands, or submerged lands; however, supporting infrastructure and access roads would be on National Forest Service lands.

Wave Energy

Alaska has one of the strongest wave resources in the world, but much of this energy is dissipated on remote, undeveloped shorelines. The Renewable Energy Atlas of Alaska, produced by the Alaska Energy Authority in cooperation with the Renewable Energy Alaska Project, identified the Yakutat Wave project as perhaps the best prospect for wave energy development in Alaska (USDA 2016a). In general, much of the power generation infrastructure for tidal energy projects would likely be sited on state tidelands,

shorelands, or submerged lands; however, supporting infrastructure and access roads would be on National Forest Service lands.

Geothermal Resources and Non-Renewable Energy

These resources are discussed under the Leasable Minerals portion of the Minerals subsection below.

Minerals

As previously mentioned, mineral development on the Tongass National Forest is guided by Federal regulation (36 CFR 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System lands that are open to mineral entry. Mineral resources are legally divided into three groups and the authority of the Forest Service to influence and regulate the exploration, development, and production phases of mining operations varies with each group: locatable minerals, leasable minerals, and salable minerals. Group-specific status and trends will be discussed in each subsection, but generally, the extent to which identified and undiscovered mineral resources on the Tongass will be developed or exploited in the future will depend largely upon the level of market demand for those resources (USDA 2016a).

Locatable Minerals

Locatable minerals, commonly referred to as "hardrock" minerals, are those derived from lode (solid rock) or placer (surficial) deposits. They are minerals that are considered valuable in the usual economic sense or have a property that gives them a distinct and special value. Examples of some locatable minerals on the Tongass National Forest are gold, silver, copper, molybdenum, iron, nickel, lead, and zinc (USDA 2016a). Under the General Mining Law of 1872, mining claimants don't pay federal royalties on most hardrock minerals extracted from Forest Service lands.

One way of recognizing the importance and potential of locatable mineral resources is through the designation of the Minerals LUD in the Forest-wide land allocation. Several areas within the Minerals LUD are clustered around Juneau (near Lynn Canal, Berners Bay, Stephens Passage, Gastineau Channel, and Taku Inlet); on the north end of Admiralty Island; on Yakobi Island; on the mainland east of Wrangell; a cluster near Clarence Strait and the southern part of Prince of Wales Island; and an area near Hyder (Figure 1).

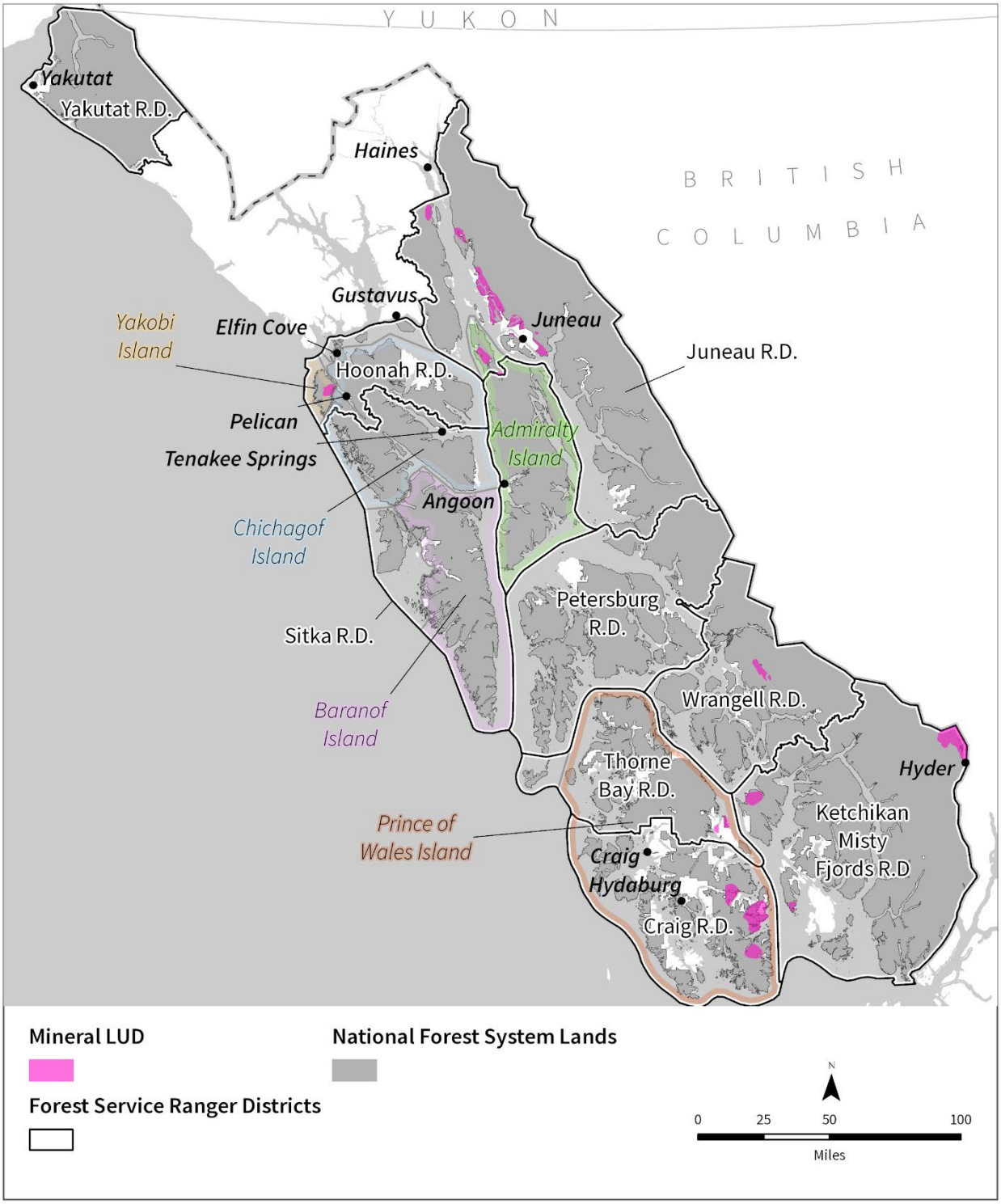

Figure 1. Tongass National Forest Mineral Land Use Designation Areas.

At the time of this report, there are over 3,000 unpatented federal mining claims on the Tongass. Unpatented claims grant the claimant rights to minerals in the ground but not ownership of the surface land itself. The Forest Service works with mining claimants to provide reasonable access to their claims,

minimize adverse environmental impacts on surface resources, and ensure reasonable reclamation of disturbed lands affected by mining operations. The tribes have expressed that they want to work with the Forest Service in developing these reclamation plans, mitigation measures and other decisions about these claims. While the majority of the mining claims on the Tongass are not related to any current activity, there are two large operating mines and numerous active exploration projects. Ultimately, mineral production in Southeast Alaska in recent years has been dominated by the Greens Creek Mine at the north end of Admiralty Island and Kensington Gold Mine located on the mainland north of Berners Bay. As mentioned in the in the introduction, two other operating mines and several other large exploration projects are currently active throughout Southeast Alaska (Table 3).

Table 3. Active Mineral Projects in Southeast Alaska (Source: Loeffler and Watson 2022)

Mining Type	Project Name	Borough or Census Area	Project Status
Hardrock	Greens Creek	Juneau	Operating
Hardrock	Kensington	Juneau	Operating
Hardrock	Dawson Mine	POW	Operating
Hardrock	Calder	POW	Operating
Hardrock	Bokan-Dotson Ridge	POW	Undergoing economic evaluation: Preliminary Economic Assessment
Hardrock	Palmer	Haines	Undergoing economic evaluation: Preliminary Economic Assessment
Hardrock	Niblack	POW	Exploration: Significant
Hardrock	Herbert Gold	Juneau	Exploration: Significant
Hardrock	Helm Bay	Ketchikan	Exploration: Initial
Hardrock	Riverside	POW	Exploration: Initial
Hardrock	Snettisham Vanadium	Juneau	Exploration: Initial
Large Placer	Icy Cape	Yakutat	Exploration: Initial

There are 11 placer mine permits (not including Icy Cape) and for there is one suction dredge permit.

Cleanup and reclamation efforts have also been undertaken recently for some legacy mines on the Tongass National Forest. Salt Chuck Mine, a former gold, silver, copper, and palladium mine on Prince of Wales Island at the northern end of Kasaan Bay, has been inactive since 1941 and was added to the Superfund National Priorities List in March 2010. Clean up efforts began in 2011 and in 2018, an EPA-conducted remedial investigation identified no unacceptable human health risks the site, and potential ecological risks were limited to copper in marine and intertidal sediment in the tailing's disposal and depositional areas in the bay (EPA 2024). Though Forest Service cleanup efforts on Tongass National Forest lands at the site are complete, a feasibility study is currently underway by the EPA to develop alternatives for remediation and reclamation of the remaining contamination on adjacent state tidelands (ADEC 2023a).

Ross Adams Mine, a former uranium mine, is also located on Prince of Wales Island at the head of Kendrick Bay. The mine operated intermittently from 1957 to 1971, beginning operations as an open pit mine before transitioning to underground operations. Per the Designated On-Scene Coordinator for the Alaska Region of the Forest Service, road construction to support cleanup efforts began in 2024 and the project is expected to be conducted in 2025-2027.

A third legacy mine, Hirst-Chichagof Mine, is a historic gold mine located on Chichagof Island at the south end of Kimshan Cove, which operated from 1905 until 1942. The mine is on private in-holdings surrounded by Tongass National Forest and the Yakobi Wilderness. The mine is listed an active contaminated site with ADEC Contaminated Sites Program due to heavy metal contamination in the

uplands and intertidal tailings disposal areas. As of 2023, the State of Alaska has been working with the Kimshan Corporation to develop a site characterization work plan, but cleanup efforts have yet to commence (ADEC 2023b).

Concerns were raised during the 2024 assessment public engagement about mineral extraction on the Tongass, expressing the need that any extraction is done in a sustainable, regenerative way that considers generations to come, protecting the Forest long-term (USDA 2024c). The Tribes, especially Tlingit & Haida, Wrangell, Yakutat, Ketchikan, Klukwan, Douglas Indian Association, Saxman, Kake, Craig, Metlakatla, Petersburg, Kasaan and Sitka Tribe of Alaska expressed concern about mineral development and potential contamination on their traditional territories and how it may impact subsistence resources that depend on a healthy ecosystem. Many Tribes also brought up existing mining projects across the border in Canada that have potential for the downstream impacts on salmon and their habitat. The Southeast Indigenous Transboundary Commission elevates the concerns of Indigenous nations on both sides of the borders about these projects and calls for coordination from the State Department. On the United States side of the border, these rivers run through lands of the Tongass National Forest. Tribes have advocated for increased protections of these watersheds.

Leasable Minerals

Certain types of minerals, primarily energy resources (e.g. oil, gas, coal and geothermal resources), are not subject to mining claim location, but are available for exploration and development under provisions of the Mineral Leasing Act of 1920, Mineral Leasing Act for Acquired Lands of 1947, and Oil and Gas Leasing Reform Act of 1987. Access to these types of minerals is provided through leases, permits, or licenses that include fee and/or royalty payment conditions. Federally owned leasable minerals include oil, gas, coal, geothermal resources, potassium, sodium, phosphates, and sulfur. The authority to manage these minerals is presently administered by the U.S. Department of Interior, Bureau of Land Management (BLM) in cooperation with the Forest Service (USDA 2016a).

No leasable minerals are presently being produced on the Tongass National Forest, and the anticipated demand is expected to remain low (USDA 2016a). Below are the mineral resource development potentials for leasable minerals in Southeast Alaska, per the Mineral Potential Report included as Appendix G of the Ring of Fire Resource Management Plan and Final Environmental Impact Statement, published by the BLM in 2006. This report assessed the development potential for mineral resources throughout Alaska within the following 10 to 15 years.

Oil and Gas

The potential for oil and gas occurrence in the Yakutat region was considered to be high and there has been exploration activity in the Yakutat area in the past; however, the resource development potential is considered low, and the BLM expects no exploration or development activity within the next 10 to 15 years. Oil and gas occurrence potential elsewhere in the Tongass National Forest is considered low to none.

Coal

Occurrences of coal are found at several locations in Southeast Alaska; however, the BLM considers development of these resources to be uneconomic in the near future, other than possibly for local use, and does not foresee associated exploration or development activity.

Geothermal

Most of Southeast Alaska has low to moderate temperature geothermal systems with surface expressions as hot springs. Thermal springs in several locations have been developed for small-scale commercial uses

such as tourism, aquaculture, community bathhouses, and heating of buildings. There has been some interest in geothermal resources in the Bell Island area. Two other geothermal exploration projects at Neka and Tenakee Inlet have occurred in the recent past as well but are no longer active. While the occurrence potential for geothermal resources is considered high in several locations and some exploration could occur, geothermal development activity is not anticipated in the near future.

Salable Minerals

Salable minerals, also known as "common variety" minerals, are sold rather than located or leased. Examples of salable minerals include crushed rock, limestone, sand, gravel, and marble. These minerals are most used as building materials and are also used for agriculture, cleaners and abrasives, and as inputs to manufacturing processes.

The predominant salable commodity extracted on the Tongass National Forest is crushed rock used to construct roads. The development of rock sources has been largely dependent upon the locations of active or past logging operations. Sand and gravel sources are scarce throughout the Forest, except within the Yakutat Ranger District. Availability of rock resources via rock pits on the Tongass was also noted as an important component for road repairs and land development during the 2024 assessment public engagement (USDA 2024c).

Limestone and marble are abundant in Southeast Alaska, and both have historically been produced from quarries in the region for use as building stone. Large quantities of limestone have been quarried from Prince of Wales and Dall Islands. Continued exploitation of these building material resources could be expected in the future.

While several areas in Southeast Alaska also have geologic formations that are favorable for the occurrence of pumice deposits, market and location conditions indicate there will be little or no foreseeable development potential for pumice (USDA 2016a).

Withdrawn Areas

By law, designated Wilderness, National Monuments, Research Natural Areas, Enacted Municipal Watersheds, and Wild River corridors (when designated by Congress) are withdrawn from mining claim location. These withdrawn areas are, however, subject to mining claims with valid existing rights established before the date the areas were withdrawn from mineral entry. Consequently, some mining claims located within existing or proposed withdrawn areas could be developed in the future (USDA 2016a).

Mineral withdrawals are the administrative responsibility of the U.S. Department of the Interior Bureau of Land Management (43 CFR 2310.1). The Regional Forester has the authority to make recommendations to the Bureau of Land Management for mineral withdrawals occurring on National Forest System lands. Mineral withdrawals are intended to protect the unique landscape from adverse effects of mining activities. No other land management activities are affected by withdrawal from mineral entry.

Since the 2016 Forest Plan Amendment, the only newly established mineral withdrawal area surrounds the Mendenhall Glacier. As the glacier recedes, the potential exists for exposing previously unknown mineral deposits. The Forest Service sought to withdraw 4,560 acres in addition to the previously existing withdrawal area at the site. The withdrawal was completed by the BLM through Public Land Order 7922 in 2023 (BLM 2023a; BLM 2023b).

Resource Development and Fish and Wildlife Habitat

Renewable energy and mineral development were mentioned numerous times during public engagement efforts for the assessment, particularly in relation to ecosystem degradation and reclamation concerns related to salmonid spawning and rearing habitat; it is important to acknowledge the particular ecological, cultural, and economic significance of salmonids, especially in Southeast Alaska.

Environmental impacts related to resource development projects are assessed at the project-level for individual operations via the NEPA process. Resource development projects are regulated and permitted by multiple agencies and entities at the federal, tribal, state, and local levels, typically with USFS coordination and with numerous best management practice and stipulation clauses included to prevent or mitigate potential impacts to the environment. However, even with prevention and mitigation efforts in place, resource development activities carry risks, especially when considered over time, and it is known that failures can occur. This will likely be exacerbated with anticipated climate change-driven changes to precipitation patterns, which can increase the likelihood of extreme events and introduce engineering challenges for designing adaptive facilities that can withstand environmental changes occurring over decades or longer. Extreme precipitation events increase the potential for runoff or spills of mine tailings material into the surrounding environment and strain mine wastewater storage and treatment infrastructure potentially beyond capacity; infrastructure which can discharge directly or indirectly into anadromous waters. Adverse impacts from resource development activities can be long-lasting, spatially extensive, and costly to mitigate and cleanup, and there is a clear need to effectively link the science and known complexity of mining impacts to risk assessment and decision-making, particularly in ecosystems that support species of cultural and economic importance (Sergeant et al. 2022).

Additional information regarding impacts to specific resources on the Tongass can be found in assessment chapters: Geology and Geologic Hazards, Aquatic Ecosystems, Other Species of Interest, The Tongass as an Indigenous Place, and Social, Economic and Cultural Resources.

Uncertainties and Data Gaps

There are a few key uncertainties regarding the status and trends of renewable energy and mineral resources on the Tongass National Forest. In general, the incorporation of Indigenous Knowledge and Traditional Ecological Knowledge has been lacking or absent in previous planning efforts regarding renewable and non-renewable energy and minerals. This presents a particularly large data gap that should be addressed. As mentioned in the Minerals subsection of Status and Trends, the primary variable driving future demand for mineral sources on the Tongass is market demand. For renewable energy resources, one unknown is how additional federal, state, and local legislation aimed at encouraging development by providing funding or tax incentives will impact development of renewable energy resources. However, the biggest unknown is the influence of climate change; how climate change is expected to affect mineral and renewable energy prospects and how it is expected to influence demand over time. Some potential direct and indirect effects on renewable energy resources are discussed below; however, much more information and research are needed to address these uncertainties and data gaps.

Mineral Resources

Increased Glacial Melt: as temperatures rise, glacial retreat could potentially expose new mineral deposits. These newly exposed deposits could lead to more claims being made and exploration and development activity. The potential for future mineral resource development would need to be considered in the context of the potential landscape and ecological values provided by newly emerged habitats to determine appropriate management direction.

Hydropower

Increased Glacial Melt: as temperatures rise, glacial melt is expected to increase, potentially providing more water for hydropower in the short term. However, over the long term, as glaciers shrink, water availability could decrease, posing a risk to hydropower sustainability.

Changing Precipitation Patterns: climate models predict alterations in precipitation patterns, with potential increases in winter rainfall and decreases in summer. This could lead to more water during the wet season but less during the dry season, affecting the stability and predictability of hydropower generation.

Wind Energy

Wind Patterns: climate change may alter wind patterns, which could affect wind energy potential. In some areas, wind speeds might increase, improving the feasibility of wind farms, while in others, they might decrease, making wind energy less reliable.

Infrastructure Resilience: increased extreme weather events, such as storms and heavy winds, could damage wind energy infrastructure, necessitating more robust designs and increased maintenance costs.

Solar Energy

Solar Radiation: changes in cloud cover and atmospheric conditions due to climate change could affect the amount of solar radiation reaching the surface. In Southeast Alaska, where cloud cover is typically high, any reduction in cloudiness could enhance solar energy prospects.

Energy Demand: as temperatures rise, energy demand patterns might shift, with potentially less demand for heating and more for cooling. This shift could align more closely with solar energy availability, particularly in the summer months.

Biomass Energy

Forest Health: Southeast Alaska has abundant forest resources, making biomass a potentially viable renewable energy source. However, climate change could impact forest health through increased risks of pests, diseases, and wildfires, affecting biomass availability.

Sustainable Harvesting: managing forests for biomass production under changing climate conditions would require careful planning to ensure sustainability and mitigate impacts on forest ecosystems.

Marine Energy (Tidal and Wave Energy)

Ocean Conditions: marine energy could be affected by changes in ocean conditions. Altered ocean currents, sea levels, and storm patterns could impact the feasibility and efficiency of marine energy projects.

Technological Development: advances in technology could mitigate some of the challenges posed by changing ocean conditions, but ongoing research and adaptation will be crucial.

Key Takeaways

- Development of renewable energy resources would help Southeast Alaska communities reduce fossil fuel dependence, stimulate economic development, and lower carbon emissions.
- Abundant water resources of the Tongass are a potential source of reliable and relatively inexpensive renewable energy, but hydroelectric power is unevenly distributed among the region's communities.

- There is increasing interest in additional renewable energy sources such as wind, solar, biomass, tidal, wave energy, and geothermal resources.
- Mineral development is guided by federal regulation (36 CFR 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System (NFS) lands.
- The Forest Service recognizes that minerals are fundamental to the Nation's well-being and, as policy, encourages the exploration and development of the mineral resources it manages.
- Locatable mineral production in Southeast Alaska in recent years has been dominated by the Greens Creek Mine at the north end of Admiralty Island and Kensington Gold Mine located on the mainland north of Berners Bay.
- The extent to which identified and undiscovered mineral resources on the Tongass National Forest will be developed or exploited in the future will depend largely upon the level of market demand for those resources.
- No leasable minerals, such as oil, gas, and coal, are presently being produced on the Tongass National Forest, and the anticipated demand is expected to remain low.
- Salable mineral commodities extracted on the Tongass are predominantly crushed rock, limestone, and marble and continued extraction of these building material resources is expected in the future.

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Glossary

Leasable minerals
Generally includes minerals such as coal, oil, gas, phosphate, sodium, potassium, oil shale, sulfur, and geothermal resources.

Mineral development
The activities and facilities associated with extracting mineral deposits.

Minerals entry
Filing a mining claim on public land to obtain the right to mine any minerals it may contain. Also the filing for a mill site on Federal land for the purpose of processing off-site minerals.

Mineral (mining) exploration
The search for valuable minerals on lands open to mineral entry.

Mineral rights
The rights of one who owns the mineral estate (subsurface).

Mineral withdrawal
A formal designation by the Secretary of Interior which precludes entry or disposal of mineral commodities under the mining and/or mineral leasing laws.

Saleable minerals
Includes common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay. In general, these minerals are of wide-spread occurrence and are of relatively low unit value. They are generally used for construction materials and for road building purposes.