USDA

United States
Department of
Agriculture

Forest Service
R10-MB-603c

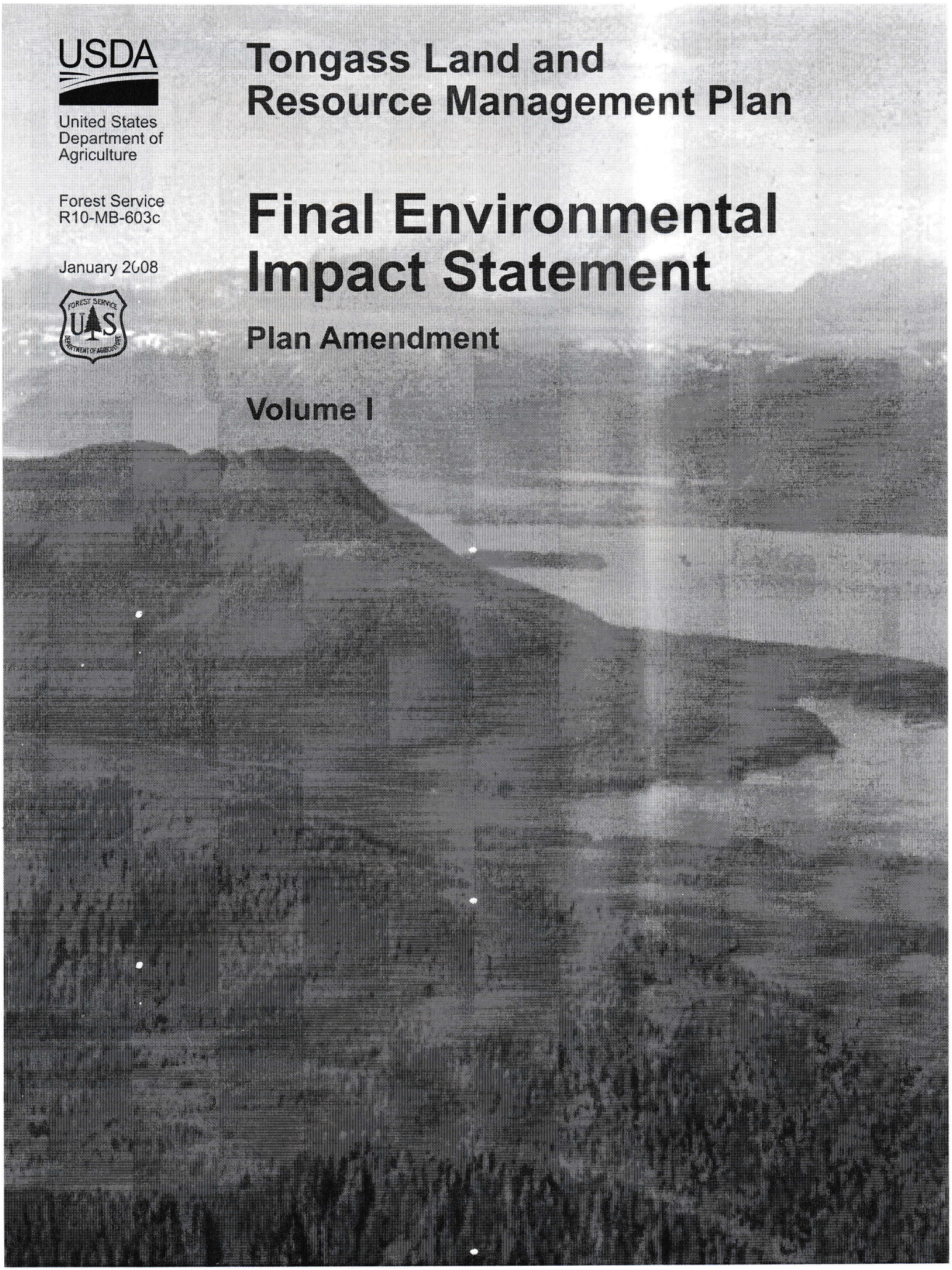
January 2008

Tongass Land and Resource Management Plan

Final Environmental Impact Statement

Plan Amendment

Volume I



Tongass Land Management Plan Amendment

Final Environmental Impact Statement

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Abstract:

A Ninth Circuit Court ruling (2005) and the 5-Year Forest Plan Review (completed in January 2005) indicated the need to consider amending the Tongass National Forest Land and Resource Management Plan. This Final EIS responds to the Court and the 5-Year Review by analyzing seven alternatives for amending the Plan, including the No-Action alternative. Maps accompanying this Final EIS depict the land use designations proposed under each alternative. A separate document, called the Proposed Land and Resource Management Plan (Forest Plan), was published with the Draft EIS and was revised, as indicated in Chapter 2 of this Final EIS, to represent the Final Proposed Forest Plan. The action alternatives incorporate this Final Proposed Plan entirely, or with modifications. A number of issues are addressed, but three key issues are identified: 1) protecting high-value roadless areas from road development and timber harvest activity in order to protect roadless area values; 2) providing a sufficient timber supply to meet the market demand and help maintain a vibrant economy in Southeast Alaska; and 3) protecting the wildlife habitat and biodiversity of the Tongass, which is affected by road development and timber harvest activities. The seven alternatives are designed to provide a range of options for addressing these issues. Direct, indirect, and cumulative effects of the alternatives are quantified and compared in Chapters 2 and 3, based on inventory data and modeling.

Minerals

Affected Environment

A wide variety of mineral deposit types and mineral resources occur within the boundaries of the Tongass National Forest, including gold, silver, molybdenum, and uranium, and nationally designated "strategic" and "critical" minerals such as lead, zinc, copper, tungsten, and platinum group metals. 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. The Secretary of Agriculture has provided regulations (36 Code of Federal Regulations [CFR] 228) to ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System (NFS) lands.

Southeast Alaska has a long history of mineral prospecting and mining. The first mineral location in Southeast Alaska was recorded in 1867 by a Russian trader near New Kasaan on Prince of Wales Island. In 1880, gold was discovered in placer gravels near Juneau. This discovery sparked keen interest and, by the turn of the century, dozens of mines were in production from the Juneau Mining District to the Ketchikan Mining District. Mining remained active until World War II. From the close of World War II to the mid-1970s, mineral exploration and production in Southeast Alaska remained low compared to the activity documented at the beginning of the century. Prospecting and exploration generally increased during the mid-1970s, in part due to the Quartz Hill and Greens Creek discoveries, improved metal prices, technological advances, and the deregulation of gold. Metal prices have maintained generally favorable trends since the mid-1980s, resulting in increased exploration and renewed interest in precious metals, mainly gold.

With respect to National Forest management, mineral resources are legally divided into three groups: locatable minerals, leasable minerals, and salable minerals. The authority of the Forest Service to influence and regulate the exploration, development, and production phases of mining operations varies with each group. As a result, the Forest Service manages mineral resource programs that are specific to each group of minerals.

Locatable Minerals

A locatable mineral is any mineral that is "valuable" in the usual economic sense, or has a property that gives it distinct and special value. These are typically what are known as "hardrock" minerals. Locatable minerals may be recovered from load deposits (solid rock) or placer (surficial) deposits. Examples of some locatable minerals on the Tongass National Forest are gold, silver, copper, molybdenum, iron, nickel, lead, and zinc.

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 guaranteed and is not at the discretion of the Forest Service. Upon discovering a valuable mineral deposit, citizens have the right to locate a mining claim and remove the mineral resources. The citizen holding a mining claim is called the claimant. The claimant is responsible for initiating mining activities and investing the capital required to conduct mineral exploration, site development, mine operation, and reclamation of the site.

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 necessary for the proposed operation, monitoring operations to ensure environmental standards are met, and ensuring prompt and reasonable reclamation of disturbed areas.

By law, designated Wilderness, National Monuments, Research Natural Areas, Enacted Municipal Watersheds, and Wild Rivers (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. As a consequence, some mining claims located within existing or proposed withdrawn areas could be developed in the future.

On the Tongass, the Primitive Recreation, Semi-Remote Recreation, Old-Growth Habitat, Experimental Forest, Special Interest Areas, Scenic Rivers, and LUD II Land Use Designations (LUDs) remain open to mining activities. Special stipulations and more stringent mitigation measures are required for mining activities in these LUDs; therefore, there is a higher cost to develop minerals in these LUDs. Modified Landscape, Scenic Viewshed, Recreational Rivers, Timber Production, and Minerals LUDs remain open to mineral activities and do not require special stipulations or more stringent mitigation measures; therefore, mineral development in these LUDs would be at an average cost.

Leasable Minerals

Certain types of minerals, primarily energy resources, are not subject to mining claim location, but are available for exploration and development under provisions of the Mineral Leasing Act of 1920. 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.

No leasable minerals are presently being produced on the Tongass National Forest, and the anticipated demand is expected to remain low. BLM recently conducted an assessment of mineral resource potential in support of a resource management plan for the Ring of Fire planning area (BLM 2006), which includes Southeast Alaska. The assessment indicated the potential for oil and gas occurrence in the Yakutat region was considered to be high, based on geologic factors (URS Corporation 2006). While there has been exploration activity in the Yakutat area in the relatively recent past, the resource development potential is considered low; therefore, BLM expects no exploration or development activity within the next 10 to 15 years. Outside of the Yakutat area, oil and gas occurrence potential elsewhere in the Tongass is considered low to none.

Occurrences of coal found at several locations in Southeast Alaska has prompted the identification of the Angoon, Admiralty, and Kuiu coal districts; the coals in the

two former districts are classified as bituminous, while the Kuiu deposits are ligmite (URS Corporation 2006). Several small mines on Admiralty Island produced coal during the late 1800s and early 1900s. Lignite deposits also occur at several other locations in Southeast Alaska, although they are of small extent. Similarly, the occurrence potential for coalbed natural gas (coalbed methane) is considered high for the Admiralty and Kuiu Islands coal deposits and the Yakutat area. BLM considers development of these resources to be uneconomic over the next 10 to 15 years, other than possibly for local use, and does not foresee associated exploration or development activity.

Geothermal resources occur in 19 known locations in Southeast Alaska. Thermal springs in several locations have been developed for small-scale commercial uses such as tourism, aquaculture, community bathhouses, and district heating of buildings (URS Corporation 2006). There has been some recent interest in geothermal resources in the Bell Island area, but BLM has undertaken no leasing activity to date. While the occurrence potential for geothermal resources is considered high in several locations and some exploration could occur, BLM does not anticipate geothermal development activity over the next 10 to 15 years.

Salable Minerals

Salable, or "common variety," minerals on NFS lands are sold rather than located or leased. These minerals include petrified wood and common varieties of sand, rock, building stone, gravel, pumice, clay, and other similar materials. Such common variety mineral materials include deposits that, although they have economic value, tend to be relatively widely available and used close to the source of production. These minerals are most commonly 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 supply of quality rock sources is largely dependent upon the locations of active logging operations. Presently, there is an adequate supply of rock sources with suitable quality (hardness and durability) in the southern third of the Tongass. However, rock quality is poor in the northern two-thirds of the Forest, and good material sources are difficult to locate in current timber production areas. Sand and gravel sources are scarce throughout the Forest, except within the Yakutat Ranger District.

All roads built in the Tongass require rock for construction because the subgrade soils have poor strength characteristics. The demand for crushed rock will closely follow the need to construct new timber sale roads. The total in-service use of rock for existing roads was 43,962,500 cubic yards, which was used to construct 3,355 miles of road. As the use of forest roads increases, and both the Alaska State Department of Transportation and the Federal Highway Administration assume responsibility for maintenance of some roads, the demand for crushed rock will increase. It will be expensive to locate mining sites with suitable quality and quantity in the northern part of the Forest, and haul distances will increase. Outside NFS lands, new and existing communities will require mineral materials for development of roads and for foundations for homes, schools, and other buildings. The demand for rock from public land in support of these growing communities is likely to increase.

Limestone and marble are abundant in Southeast Alaska, and both have historically been produced from quarries in the region for use as building stone (BLM 2006). Identified marble resources in the region are estimated at over 800 million tons. 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 (URS Corporation 2006).

Mineral Resource Inventory and Development Potential

Most estimates of locatable mineral resource potential use a format developed by the U.S. Bureau of Mines and the U.S. Geological Survey (U.S. Bureau of Mines and U.S. Geologic Survey 1980, as cited in USDA Forest Service 1997a). The U.S. Bureau of Mines was abolished in 1996. Mineral resources are divided into "identified resources" and "undiscovered resources." The Tongass contains both identified and undiscovered reserves.

Identified Mineral Resources

The identified mineral resources on the Tongass were described by the U.S. Bureau of Mines, Alaska Field Operations Center, in An Economic Analysis, Tongass Land Management Plan, Mineral Resource Inventory (Coldwell 1990). For summaries of this report, see the 1991 Forest Plan Revision Supplement to the Draft EIS and the 1997 Forest Plan Revision Final EIS (USDA Forest Service 1991, 1997a).

The methods used by the U.S. Bureau of Mines included the steps discussed below. First, a mineral resource inventory was compiled from all available sources, resulting in the identification of 148 locatable mineral deposit areas within the Tongass National Forest. These 148 deposits were assigned to a mineral deposit model (Berg 1984). Tonnage and grade were determined for each based on published information, or were calculated using models developed by Cox and Singer (1986). The gross metal value for each deposit area was calculated by combining the tonnage and grade figures with an average price from 1978 to 1987 for each commodity. Each deposit area was evaluated to determine its pretax net present value.

Next, the 148 deposit areas were grouped into 52 identified mineral activity tracts that had high mineral development potential (MDP). These 52 tracts were further ranked from 1 to 3, based on the likelihood of exploration and development activity within the next 10 to 15 years. Areas assigned a ranking of 1 have the highest potential for development. Rank 1 areas contained at least one deposit with a positive after-tax net present value (at a 4 percent discounted cash flow rate of return) and/or at least one active gold deposit (site of current industry activity). Rank 2 areas contained at least one deposit with a positive pre-tax net present value (at a zero percent discount rate) and/or at least one "critical" and "strategic" mineral deposit with a vulnerable supply source. Rank 3 areas do not meet these criteria; their lower rankings may be due to a lesser likelihood of mineral occurrence, or because of a lack of available information.

Of the 52 tracts, 22 are categorized as Rank 1, 7 are categorized as Rank 2, and 23 are categorized as Rank 3. The tracts are listed in Table 3.14-1. The gross metal value of the identified mineral resources within the boundaries of the Tongass was estimated at $37.1 billion (expressed as 1988 dollars) in the U.S. Bureau of Mines study (Caldwell 1990). Highest among the individual minerals were molybdenum ($14.4 billion) and iron ($12.7 billion), with gold third at $2.26 billion.

The Coldwell (1990) report is the most recent comprehensive study of mineral resources for the entire Tongass. Additional studies of mineral resources in the Tongass have since been conducted, however. These include Mineral Investigations in the Ketchikan Mining District, Southeastern Alaska (Maas et al. 1995); Mineral Resources of the Chichagof and Baranof Islands Area, Southeast Alaska (Bittenbender et al. 1999); and Mineral Assessment of the Stikine Area, Central Southeast Alaska (Still et al. 2002). These studies conducted further investigations on known mineral deposit areas (KMDAs) within the Tongass. These

Table 3.14-1
Identified Mineral Resources of the Tongass National Forest Displayed by Mineral Activity Tract

Tract Name	Ref. 1 (acres)	Ref. 1 Rank	Ref. 2 MDP	Ref. 3 MDP	Ref. 4 MDP/ MEP	Gold (tons)	Silver (tons)	Lead (tons)	Zinc (tons)	Copper (tons)	Moly (tons)	Iron (tons)	Other Minerals
Chilkat Peninsula	40	3				1	-	-	-	-	-	-	
Sullivan	7,938	1				-	-	-	-	-	-	-	Critical Minerals
Bohemia Basin	9,376	1		H		-	-	-	-	41,000	-	-	Nickel; Cobalt; Critical Minerals
Berners Bay	10,318	1				69	-	-	-	-	-	-	
Juneau Gold Belt	85,699	1				189	164	100,920	100,747	82	-	-	Critical Minerals
Fremming	501	3				0	1	150	2,100	-	-	-	
Douglas Island	1,319	2				12	-	-	-	-	-	-	
Funter Bay	11,499	1				-	-	-	-	1,960	-	-	Nickel; Cobalt; Critical Minerals
Greens Creek	7,528	1				22	2,880	136,500	339,500	-	-	-	Critical Minerals
Taku Mo	3,199	3				-	-	-	-	-	1,000	-	
Enterprise	1,505	3				0	-	-	-	-	-	-	
Apex-El Nido	4,603	2		H		1	-	-	-	-	-	-	
Basaltic Cu	4,484	3		M		-	-	-	-	1,360	-	-	Critical Minerals
Mirror Harbor	2,242	2		M		-	-	-	-	1,265	-	-	Nickel; Critical Minerals
Pinta Bay	1,301	3		H		-	-	-	-	-	-	-	Critical Minerals
Chichagof	12,946	1		M		25	7	-	-	-	-	-	Critical Minerals
Slocum Arm	8,625	3		L		-	-	-	-	-	-	-	Critical Minerals
Silver Bay	22,706	3		L		-	-	-	-	-	-	-	Critical Minerals
Pyrola	3,261	2				-	196	8,255	27,800	-	-	-	Barite; Critical Minerals
Hasselborg	1,860	3				-	-	-	-	-	-	-	Critical Minerals
Crystal/Friday	1,391	2				2	-	-	-	-	-	-	Platinum
Windham Bay	23,909	3				1	1	2	2	-	-	-	Critical Minerals
Sumdum	41,419	3				0	279	112	18,501	156,988	-	-	Critical Minerals
Pt Astley	2,004	3				2	3	1,200	5,893	379	-	-	Critical Minerals
Zarembo	27,886	1			L/H	0	109	5,030	15,774	567	-	-	Critical Minerals
Portage Mountain	1,280	3			L/H	0	2	-	-	-	-	-	Critical Minerals
Duncan	2,393	3			L/H	-	-	-	-	27	-	-	Critical Minerals
Grnd Hog/Glacier	15,859	1			L/H	-	23	63,115	202,115	143	-	-	Critical Minerals
Shakan	42,763	1	M			-	-	-	-	-	248	-	
N. Bradfield Cn	1,120	3			L/M	-	-	-	-	1,710	-	313,500	Critical Minerals
Hyder	56,396	1	M			4	60	26,899	2,337	960	75	-	Tungsten; Critical Minerals
Franks Ridge	5,866	3	L			-	-	-	-	-	-	-	Critical Minerals
Khayyam	23,450	1	M			0	1	-	781	1,436	-	-	Critical Minerals
South Arm	7,943	3	H			-	-	-	-	-	-	-	Critical Minerals
Niblack	8,915	1	H			-	-	-	-	-	-	-	Critical Minerals
Dolomi	8,634	1	M			-	-	-	-	-	-	-	Critical Minerals
Lime Point	900	3	M			-	-	-	-	-	-	-	Barite
Big Harbor	3,535	3	M			-	-	-	-	-	-	-	Critical Minerals
Jumbo	12,326	1	M			1	2	-	-	2,250	-	293,800	Critical Minerals
Hollis	17,148	1	L			-	-	-	-	-	-	-	
Kasaan	8,176	1	M			1	3	-	-	11,494	-	2,437,700	Critical Minerals
Salt Chuck	4,817	1	M			1	1	-	-	1,070	-	-	Palladium; Critical Minerals
Union Bay	17,492	3	M			-	-	-	-	-	-	190,000,000	
Helm Bay	7,204	1	M			4	-	-	-	-	-	-	
Tongass Narrows	4,488	1	M			6	-	-	-	-	-	-	
Thorne Arm	7,657	1	L			4	-	-	-	-	-	-	
George Inlet	6,198	3	M			3	-	156	-	-	-	-	Critical Minerals
Quartz Hill	2,402	2	M			560	69	-	-	-	1,258,698	-	
Barrier Island	4,414	3	L			-	-	-	-	-	-	-	Critical Minerals
Nichols Mountain	16,882	3	L			-	-	-	-	-	-	-	Critical Minerals
Bokan	17,750	2	L			-	-	-	-	-	-	-	Uranium; Critical Minerals
McLeod Bay	2,287	1	L			-	-	-	-	-	-	-	

Notes: Critical minerals are those minerals necessary to supply military, industrial, and essential civilian needs during a national defense emergency, and not found or produced in sufficient quantities to meet emergency needs (as defined in the Strategic and Critical Materials Stock Piling Act of 1979). Examples of critical minerals include lead, zinc, copper, tungsten, and the platinum group metals.
Reference 1: Coldwell 1990; Reference 2: Maas et al. 1995; Reference 3: Bittenberger et al. 1999; Reference 4: Still et al. 2002
L=low; M=medium; H=high; MDP=mineral development potential; MEP=mineral exploration potential

KMDAs included the original tracts studied by Coldwell (1990). Each study reported estimates of MDP as low, medium, and high for each KMDA, as well as for individual mines, prospects, and occurrences. The designations given in Table 3.14-1 for these reports are for the highest rating given for any prospect studied in that tract.

The 1995, 1999, and 2002 area studies give essentially identical definitions for the following MDP designations:

> High—High grades and probable continuity of mineralized rock exist. The property is likely to have economically mineable resources under current economic conditions. A high potential exists for developing tonnage or volume with reasonable geologic support for continuity of grade.
>
> Medium—Either a high grade or continuity of mineralization exist. Mineralization is confined by geology, structures, and/or grades are overall low. It could serve as a material source if economics were not a factor, but is presently uneconomic at existing conditions.
>
> Low—The property exhibits uneconomic grades and/or little evidence of continuity of mineralized rock. There is little or no obvious potential for developing resources or is an insignificant source of the material of interest.

Differences in MDP designations between these area studies and Coldwell (1990) reflect additional geologic and chemical data, changes in prices, and cost and likelihood of development based in part on LUDs at the time of the study. In addition, Still et al. (2002) ranked each mine prospect and occurrence by mineral exploration potential (MEP). The MEP ranking takes into account the potential for extent of mineralized rock but not current land status of the site. The highest MDP and MEP rankings for each area are summarized in Table 3.14-1.

Undiscovered Mineral Resources

The methods used by the U.S. Geological Survey, Branch of Alaskan Geology to identify "undiscovered" locatable mineral resources are detailed in their report, Undiscovered Locatable Mineral Resources of the Tongass National Forest and Adjacent Lands, Southeastern Alaska (Brew et al. 1991). Their work involved the definition of areas or "tracts" that may permit the occurrence of one or more deposit types; the estimation of the numbers of undiscovered deposits of each type in each tract, along with the expected tonnage and grade of each type; and the use of computer simulation using these estimates to produce a probability distribution of the quantities of metal contained in the tract. This resulted in the preparation of location maps along with descriptions of 930 metal-bearing localities. The 930 metal-bearing localities were grouped into four classes, based on the estimated value of undiscovered mineral resources per acre: Class 1 has a relatively high mineral value per acre, Class 2 has a moderate mineral value per acre, Class 3 has a relatively low mineral value per acre, and Class 4 has nominal mineral value per acre.

Each tract is considered likely to contain one or more different types of mineral deposits. The estimation of the number of deposits of a given type in a tract is the single most-critical step in probabilistic mineral resource assessment. It requires re-evaluating all of the factors used in initially defining the tract, together with three additional factors: thoroughness of exploration (tracts already thoroughly explored are less likely to contain undiscovered deposits), size of tracts (smaller tracts are likely to contain fewer undiscovered deposits), and physical dimensions of deposit types (different types of deposits occupy different volumes of rocks).

The U.S. Geologic Survey study (Brew et al. 1991) included estimation of the gross metal value of undiscovered mineral resources for the Tongass National Forest. In 1990, this value was $28.3 billion (expressed as 1988 dollars). Highest among the individual minerals were copper ($6.8 billion), iron ($4.6 billion), molybdenum ($4.35 billion), and tin ($3.4 billion). These totals cover the entire Tongass National Forest, and thus include areas currently withdrawn from mineral activity.

Mineral Resource Demand

The extent to which identified and undiscovered mineral resources on the Tongass will be exploited in the future will depend largely upon the level of demand for those resources. Demand for mineral resources can be inferred based on the amount of money spent by the mining industry to prospect and explore for mineral resources in Southeast Alaska. Increases in the amount of money spent on exploration reflect an increase in demand for mineral resources. Between 1982 and 1987, the mineral industry spent an average of $2.92 million per year on mineral exploration in Southeast Alaska, with a high of $5.85 million in 1987 (USDA Forest Service 1997a). Exploration expenditures increased drastically for the 1988 to 1991 period, when the industry spent more than $20 million each year. Expenditures generally declined for the next 10 years, reaching $1.6 million in 2001, before increasing again to a level of $9.4 million in 2005 (Alaska Department of Natural Resources [ADNR], Alaska's Mineral Industry annual reports and summaries for 1997 to 2005).

Demand for mineral resources can also be inferred by modeling the economic viability of identified mineral resources. Identified mineral resources with high degrees of economic viability will reflect an increase in mineral-related activities or in demand for those resources by industry. The economic viability of 148 mineral deposits located within the Tongass National Forest were modeled by the U.S. Bureau of Mines (Coldwell 1990), as discussed previously. Based on economic criteria or the presence of an active gold deposit, 22 of 52 mineral activity tracts were identified as most likely to be developed (Rank = 1), and 10 were identified as likely to provide a positive rate of return when cash flow was discounted at zero percent.

Mineral Production

Mineral production in Southeast Alaska in recent years has been dominated by the Greens Creek Mine at the north end of Admiralty Island. Greens Creek is an underground mining operation that opened in 1989 and produces silver, zinc, lead, and gold. The mine processed nearly 806,000 tons of ore in 2004 and provided 265 full-time jobs (ADNR 2005). Other Southeast Alaska mining activity in 2004 was comprised of at least 18 different rock, sand, and/or gravel operations. These mines produced a total of nearly 3 million tons of material during the year and supported 83 employees. The Forest Service approved a Plan of Operations for the Kensington Gold Mine north of Juneau in 2005, and Coeur Alaska, Inc. subsequently began construction activities on the site. However, a lawsuit was filed against the U.S. Army Corps of Engineers and the Forest Service, challenging the permitted tailings disposal facility, citing violations to the Clean Water Act. The plaintiffs failed in District Court but were upheld on appeal by the 9th Circuit Court in 2007. The Forest Service anticipates the submittal of a revised Plan of Operations in 2008.

Tongass Land Management for Minerals

As described previously, the Forest Service administers mineral exploration, development, and production activities through the legal/regulatory systems for locatable, leasable, and salable minerals. The Forest Service also accounts for mineral resources in the land management planning process. One way of recognizing the importance and potential of mineral resources is through the designation of Minerals LUDs in the Forest-wide land allocation. The intent of the Minerals LUD designation is to encourage exploration and development of locatable

minerals in areas of high mineral potential, while taking other resource values into account. The Tongass Forest Plan includes management prescriptions for those areas, and standards and guidelines specific to minerals and geology.

The current Tongass Forest Plan, as amended, allocates 13 areas of the Forest to the Minerals LUD. These areas total 170,514 acres and are widely distributed across most portions of the Tongass. Several Minerals LUDs are clustered around Juneau and Lynn Canal, and there is another cluster near Clarence Strait and the southern part of Prince of Wales Island.

Unlike other LUDs, 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. For example, a Minerals LUD in the northern part of Admiralty Island, northeast of the Greens Creek mining area, overlies part of the Young Bay Experimental Forest LUD. The Minerals LUD and Experimental Forest management prescriptions both apply in this area, with the Minerals LUD having priority.

Environmental Consequences

Trend in expenditures for mineral prospecting and exploration, the demand for access to National Forest lands for the purpose of mineral exploration, and development is expected to increase over the next 10 years. Mineral entrants will continue to submit plans of operation to the Forest Service for approval, and regulations under which those operating plans are processed will not change by alternative. Identified and undiscovered mineral resource tracts, characteristics and location of mineral deposits, and Southeast Alaska geology will not vary as a result of implementing any of the alternatives.

Direct and Indirect Effects

Locatable Minerals

Under any alternative, future exploration and development (except for valid, currently existing rights) would be precluded in areas withdrawn from mineral entry, such as Wilderness. The availability of mineral resources of the Tongass National Forest may also be affected by the allocation of other LUDs in each alternative, and the use of Forest-wide standards and guidelines during project implementation. The standards and guidelines of certain LUDs could affect the cost of conducting exploration, development, and reclamation activities, and thus influence the exploration of some areas for their mineral resources.

Most withdrawn lands are designated so by the U.S. Congress (i.e., wilderness withdrawals). On other NFS lands, the Forest Service does not have the authority to approve or disapprove most mineral operations (the exception being salable minerals), but can impose stipulations on how mineral resources are developed in order to protect surface resources. Thus, the potential effects of alternatives on mineral resources can be estimated by analyzing the relative degree to which LUDs and their associated prescriptions could economically constrain proposed mineral activities.

For this purpose, three categories of LUDs are identified: withdrawn areas (which assume higher costs for the development of valid existing rights), and two "open" categories; one with average costs and one with higher-than-average costs. Table 3.14-2 shows the LUDs corresponding to each category.

Wilderness, National Monument, and LUD II acres remain the same for all Forest Plan alternatives, as do existing withdrawals within the Research Natural Area, Enacted Municipal Watershed, and Wild, Scenic, and Recreational River designations. Open areas with higher costs generally correspond to non-withdrawn areas in the Mostly Natural Setting LUD group, while open areas with average costs correspond to those areas within the moderate and intensive development LUD

groups. Alternative 5 (No Action) retains the existing acreage in Experimental Forest and Special Interest Area designations, while all of the other alternatives would increase the acreage in these LUDs. In addition, all alternatives except Alternative 5 would add or expand three Minerals LUD overlays; one new area north of Hyder, an

Table 3.14-2
Economic Availability of Minerals Relative to Land Use Designations

Mineral Availability	LUDs
Withdrawn – Existing *(Areas remain open to mineral rights established prior to the area being withdrawn)*	Wilderness National Monument Research Natural Area Municipal Watershed Wild River
Open Areas – High Cost *(Mineral exploration and development requires special stipulations and more stringent mitigation measures)*	Remote Recreation Semi-Remote Recreation Old-Growth Habitat LUD II Experimental Forest Special Interest Area Scenic River Minerals LUD Overlay on Withdrawn Areas (prior rights only)
Open Area – Average Cost	Recreational River Scenic Viewshed Modified Landscape Timber Production Minerals LUD Overlay on All Open Area LUDs

expansion of the area near Niblack (on the north side of Moira Sound) on south Prince of Wales Island, and a new area north and south of the West Arm Cholmondeley Sound on south Prince of Wales Island. The Minerals LUD overlay may have the effect of changing the exploration and development costs from high to moderate, depending on the basic LUD of the area.

Locatable minerals are divided into identified resources and undiscovered resources. As described in the Affected Environment section, there are 52 identified mineral resource tracts on the Tongass. Using the Forest-wide acreage breakdowns of LUD groups (as grouped in Table 3.14-2) by alternative indicates the overall effects on economic availability of mineral resources. Table 3.14-3 compares the Forest Plan alternatives using the cost/LUD group concept for the 52 areas with identified mineral resources (593,000 acres). For all seven alternatives, 25 percent of the acreage of identified mineral resources is in areas that have been withdrawn. Alternatives 7 and 4 have the fewest acres of identified mineral resources in allocations potentially causing higher costs for their exploration and development; Alternative 1 has the most acreage. The other four alternatives fall between these two in a fairly close grouping near the middle of the range.

Rank 1 mineral tracts are those most likely to see mineral exploration or development. Identified mineral resource areas in the Rank 1 category encompass an area of approximately 380,000 acres on the Tongass. Table 3.14-4 compares the Forest Plan alternatives using the cost/LUD group concept for these Rank 1 identified mineral resource areas. The results are similar to those indicated in Table 3.14-3. For all seven alternatives, 15 percent of the acreage of Rank 1 mineral

Table 3.14-3
Effects on Economic Availability of Identified Mineral Resources[1]

Alternative	Withdrawn Areas	Open Areas	
		Higher Cost	Average Cost
Alternative 1	25%	36%	39%
Alternative 2	25%	29%	45%
Alternative 3	25%	26%	49%
Alternative 4	25%	20%	55%
Alternative 5	26%	29%	45%
Alternative 6	25%	25%	50%
Alternative 7	25%	18%	56%

[1] Percentage of total area (593,000 acres) within each category.

Table 3.14-4
Effects on Economic Availability of Rank 1 Identified Mineral Resources[1]

Alternative	Withdrawn Areas	Open Areas	
		Higher Cost	Average Cost
Alternative 1	15%	36%	50%
Alternative 2	15%	28%	58%
Alternative 3	15%	25%	61%
Alternative 4	15%	19%	66%
Alternative 5	15%	31%	54%
Alternative 6	15%	24%	61%
Alternative 7	15%	17%	68%

[1] Percentage of total area (380,000 acres) within each category. Rank 1 mineral tracts have the highest likelihood of being developed.

resources has been withdrawn. Alternatives 7 and 4 again have the fewest acres of Rank 1 mineral resources in allocations potentially causing higher costs for their exploration and development, at 17 and 19 percent, respectively; Alternative 1 has the most (36 percent). The other four alternatives fall between these two in a fairly close grouping near the middle of the range.

A similar analysis has been performed for the 6.6 million acres of undiscovered mineral resources, as shown in Table 3.14-5 below. Here Alternative 1 again has the most acres in allocations potentially causing higher costs, followed by Alternatives 2, 3, and 5 or 6. Alternative 1 has the least area of LUDs assumed to have average costs for mineral development.

Table 3.14-5
Effects on Economic Availability of Undiscovered Mineral Resources[1]

Alternative	Withdrawn Areas	Open Areas	
		Higher Cost	Average Cost
Alternative 1	35%	57%	8%
Alternative 2	35%	51%	14%
Alternative 3	35%	45%	20%
Alternative 4	35%	35%	30%
Alternative 5	35%	41%	23%
Alternative 6	35%	41%	23%
Alternative 7	35%	33%	31%

[1] Percentage of total area (6.6 million acres) within each category.

The undiscovered mineral resource areas are also classified according to their estimated development potential, based on resource value. Class 1 and 2 undiscovered mineral areas are believed to have moderate to high per-acre mineral values. Table 3.14-6 shows the distribution of these Class 1 and 2 areas among the different LUD groups, by alternative. These table entries again show a consistent pattern in which Alternatives 7 and 4 are the least restrictive and Alternative 1 is the most restrictive with respect to likely mineral development costs.

Table 3.14-6
Effects on Economic Availability of Class 1 and 2 Undiscovered Mineral Resources[1]

Alternative	Withdrawn Areas	Open Areas	
		Higher Cost	Average Cost
Alternative 1	38%	50%	12%
Alternative 2	38%	43%	19%
Alternative 3	38%	37%	25%
Alternative 4	38%	26%	36%
Alternative 5	38%	39%	23%
Alternative 6	38%	36%	26%
Alternative 7	38%	25%	37%

[1] Percentage of total area (989,000 acres) within each category. Class 1 has a high mineral value per acre; Class 2 has a moderate mineral value per acre.

Only the 52 mineral activity tracts (identified resources) and adjacent areas were considered for allocation to the Minerals LUD. Table 3.14-7 shows how these allocations are distributed by alternative in terms of likely development cost. Even though all LUDs in the Open Area categories are expected to have average costs if they have a Minerals LUD overlay, it is likely that, even with the Minerals LUD overlay the higher cost LUDs identified in Table 3.14-2 would have slightly higher costs than the average cost LUDs. Therefore, Table 3.14-7 provides an indication of these smaller differences. With Alternative 1, 97 percent of the lands assigned the Minerals LUD overlay have underlying LUDs in the high-cost category. By comparison, Alternative 7 would result in only 43 percent in the high-cost category. Alternatives 2, 3, and 6 are similar to Alternative 1 in placing a higher proportion of the Minerals LUDs in high-cost areas than the average-cost areas, while Alternatives 4 and 5 have percentage distributions closer to Alternative 7.

Table 3.14-7
Effects on Economic Availability of Areas Covered by the Minerals LUD Overlay[1]

Alternative	Withdrawn Areas[2]	Open Areas[3]	
		Higher Cost LUDs, in the absence of Minerals LUD Overlay	Average Cost LUDs, in the absence of Minerals LUD Overlay
Alternative 1	1%	97%	2%
Alternative 2	1%	85%	14%
Alternative 3	1%	69%	29%
Alternative 4	1%	50%	49%
Alternative 5	0%	49%	51%
Alternative 6	1%	58%	40%
Alternative 7	1%	43%	56%

[1] Percentage of total area (249,570 acres).
[2] Note that the 3,000 acres in the Withdrawn Category are in Wilderness and cover prior rights only.
[3] Note that the Minerals LUD overlay converts all of these areas to the Average Cost category; however, there may still be some differences in cost.

Leasable and Salable Minerals

The effects of the Forest Plan alternatives on leasable minerals are not discussed in detail, as there are no aspects of the Forest Plan that would have a specific direct or indirect effect on activity related to leasable minerals. The Tongass has no current leasable mineral activity, and the anticipated demand for leasable minerals is expected to remain low. The Forest Service is aware of some level of interest in oil and gas, coal, and geothermal resources in specific areas of the Tongass. The proposed Forest Plan includes revisions to the standards and guidelines to address management of potential future leasable mineral activity. In general, those revisions provide that any mineral leasing activity would need to be consistent with the standards and guidelines for the respective LUDs affected by leasing. The revisions also include surface occupancy and other prescriptions intended to protect Forest resources in areas of leasing activity. The effects of any mineral leasing activity will be analyzed at the appropriate future time if the Forest Service receives specific requests for access to leasable minerals.

Salable or common variety minerals, primarily crushed rock, are utilized in each of the alternatives. Their predominant use is to construct roads in support of the Tongass National Forest transportation system, and thus the amounts used will correspond closely to the miles of new road construction by alternative. These are shown in *Chapter 2* as well as the *Transportation* section of this chapter.

Effects on Other Resources

The development of mineral resources in the Forest generally requires construction of an underground 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; the operating Greens Creek mine involves about 320 acres for facility development, and the proposed Kensington mine project will use about 280 acres. The effects of any such development are analyzed at the time a specific project is proposed.

Cumulative Effects

The potential for cumulative effects associated with Forest Service management of minerals on the Tongass will depend upon the extent to which mining interests elect to pursue mineral exploration, development, and production activities on NFS lands in the future under the amended Forest Plan. Impacts from future mineral resource activities on the Tongass would add to the baseline impacts from past, present, and ongoing mineral activity within Southeast Alaska. Alterantive 5 would allocate about 171,000 acres to the Minerals LUD, and all of the other alternatives would allocate about 250,000 acres. This difference may indicate that Alternative 5 has a slightly lower potential for long-term cumulative effects; however, no major projects are proposed on these additional acres and NEPA analyses would need to be conducted prior to any project authorizations. Alternatives 4 through 7 allocate similar proportions (66 to 68 percent) of the Rank 1 known mineral resource tracts to LUDs expected to produce average mineral development costs, while the other alternatives would allocate from 50 to 61 percent of these areas to average-cost LUDs. Therefore, Alternatives 4 through 7 would have a relatively greater, but unknown, potential to contribute to cumulative effects associated with mineral activity. Other than mineral resources that are currently under development (specifically, the Kensington deposit), the Forest Service does not have sufficient information to identify any specific mineral development as reasonably foreseeable.