BIOLOGICAL EVALUATION FOR SENSITIVE PLANTS

WRANGELL ISLAND PROJECT

Wrangell Ranger District

Tongass National Forest

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INTRODUCTION

Purpose

The purpose of this biological evaluation (BE) is to analyze the effects of proposed actions of the Wrangell Island Project on federally listed threatened, endangered, or sensitive (TES) plant species. This report supports the Environmental Impact Statement (EIS) for the Wrangell Island Project which is being implemented under the 2008 Tongass National Forest Land and Resource Management Plan (Forest Plan; USFS 2008a).

Forest Service policy requires that an effects analysis be conducted for activities that could affect species listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS). The only plant in Alaska that is federally listed or proposed as threatened or endangered by the U.S. Fish and Wildlife Service is Aleutian holly fern (*Polystichum aleuticum*), which is listed as endangered. It is known only from Adak in the Aleutian Islands chain and is not expected to occur on the Forest; therefore, it will not be addressed further in this document.

Sensitive plants are those species identified by the Regional Forester as having potential for loss of viability, as evidenced by 1) significant current or predicted downward trends in population numbers or density, and/or 2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (Forest Service Manual 2670.5 - Regional supplement, 2005). These species are given special consideration by US Forest Service regulations and manual direction. The regulatory and policy framework concerning the management of sensitive plants is contained within FSM 2670. Seventeen vascular plant and one lichen species are designated as sensitive in the Alaska Region (USFS 2009).

Project Area

The Wrangell Island Project encompasses approximately 134,300 acres on Wrangell Island in southeast Alaska. The project area is located on the Wrangell Ranger District of the Tongass National Forest (the Forest). Wrangell Island is located in the Zimovia Strait Complex ecological subsection within the Alexander Archipelago of southeastern Alaska (Nowacki et al. 2001). Wrangell Island is separated from the mainland by Eastern Passage and the narrow Blake Channel. The northern end of Wrangell Island lies near the mouth of the Stikine River. To the west are Woronkofski Island and Zimovia Strait. Etolin Island is located to the west and southwest, and Deer Island and Ernest Sound lie to the south. The city of Wrangell is situated at the northern tip of the island. The topography of Wrangell Island is generally steep and mountainous, with mountain ridges separated by broad valleys and creeks.

Proposed Action and Alternatives

Five project alternatives were developed to meet the purpose of and need for the Wrangell Island project.

Alternative 1: No Action

Under the no action alternative (Alternative 1) no timber harvest or other activities would occur. The no action alternative is required by CEQ Section 1502.14(d) to provide a baseline for comparing alternatives. No timber would be harvested, no roads would be constructed or reconstructed.

Alternative 2: Proposed Action

Alternative 2 is the proposed action. It is designed to provide the greatest volume of timber supply for the timber industry, while protecting scenic quality, old growth habitat and connectivity, and other resources as specified in the Forest Plan. Timber harvest would occur on approximately 5,309 acres (Table 1). Silvicultural prescriptions include approximately 3,528 acres of uneven-aged management (partial harvest) and 1,781 acres of even-aged management (clearcut) that will be achieved using conventional cable, shovel, and helicopter logging systems. This alternative also proposes construction of 17.2 miles of new NFS roads and 13.2 miles of temporary roads. All temporary roads would be decommissioned after timber harvest and hauling is completed.

Table 1. Proposed timber harvest and new road construction by project alternative.

Alternative	Timber harvest (acres)	Road construction (miles)
1	0	0
2	5,309	30.4
3	3,185	28.9
4	3,531	31.4
5	3,804	22.4

Alternative 3: Scenery

This alternative is designed to reduce the scenic effects of timber harvest by emphasizing less intensive harvest prescriptions and reducing the total acres of treatment, thereby reducing the scenic and recreational impact and maintaining wildlife habitat and connectivity while incorporating some economic considerations. Timber harvest would occur on approximately 3,185 acres. Silvicultural prescriptions include approximately 1,484 acres of uneven-aged management (partial harvest) and 1,701 acres of even-aged management (clearcut) that will be achieved using conventional cable, shovel, and helicopter logging systems. This alternative also proposes construction of 15.7 miles of new NFS roads and 13.2 miles of temporary roads. All temporary roads would be decommissioned after timber harvest and hauling is completed.

Alternative 4: Timber Economics

The objective of Alternative 4 is to maximize the economic value of the timber harvest while protecting scenic quality, old growth habitat and connectivity, and other resources as specified in the Forest Plan. Alternative 4 proposes both even-aged and uneven-aged timber harvest on suitable land with the associated roads. Timber harvest would occur on approximately 3,531 acres. Silvicultural prescriptions include about 1,738 acres of uneven-aged management (partial harvest) and about 1,793 acres of even-aged management (clearcut) that will be achieved using conventional cable, shovel, and helicopter logging systems. This alternative also proposes construction of 16.1 miles of new NFS roads and 15.3 miles of temporary roads. All temporary roads would be decommissioned after timber harvest and hauling is completed.

Alternative 5: Wildlife

This alternative is designed to protect wildlife habitat while providing an economically viable timber sale. It is similar to Alternative 3 harvest in applying less intensive harvest prescriptions than the allowable under the Forest Plan and reducing the total acres of treatment, thereby reducing the acres of wildlife affected and providing wildlife habitat connectivity. Timber harvest would occur on approximately 3,804 acres. Silvicultural prescriptions include about 2,868 acres of uneven-aged management and about 936 acres of even-aged management that will be achieved using conventional cable, shovel, and helicopter logging systems. This alternative also proposes construction of 12.4 miles of new NFS roads and 7.8 miles of temporary roads. All newly constructed roads would be closed following timber harvest activities.

METHODS

Analysis Area

The analysis area for direct and indirect effects to sensitive plants is the project area, which consists of the entirety of Wrangell Island. Direct effects are those which are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. The analysis area for cumulative effects was also constrained to Wrangell Island because of its geographic isolation from nearby lands by sea passages, which could restrict biological interactions with other sensitive plant occurrences on the Forest. Cumulative effects are those that occur when the effects of an action are added to or interact with effects of other actions in the past, present, and foreseeable future in a particular place and within a particular timeframe.

Review of Existing Information

A review of existing information was conducted to document the sensitive plants that occur in the project area and to identify habitats likely to contain sensitive plant species that are known or suspected to occur in the project area. The Forest Service Natural Resource Information System (NRIS) database for Threatened, Endangered, and Sensitive Plants (TESP) was searched for known sensitive plant occurrences in the project area. Additionally, the University of Alaska Fairbanks ARCTOS herbarium database and the Consortium of Pacific Northwest Herbaria were also searched for other possible locations of sensitive plants in the project area (UAMH 2015, University of Washington 2015).

Suitable habitat characteristics for sensitive species that are known or suspected to occur in the project area were identified based on relevant literature, habitat descriptions from regional floras, and Forest species conservation assessments. Depending on the habitat requirements of each species, landscape information selected to assess potential habitat included landform, elevation, aspect, slope, slope position, soil type, surface geology, proximity to shoreline, and vegetation cover type. Relevant geographic information system (GIS) map layers were then analyzed to quantify the amount and location of suitable habitat for each species (Table 1). Acreage estimates based on map overlays are approximate and may tend to overestimate the potential habitat because they are based on macro-habitat information currently available in GIS, and no statistical analysis or accuracy assessment is applied; nevertheless, they provide a means of comparing the effects of the alternatives by assessing the relative proportion of each habitat that is affected (USFS 2008b). In addition, habitat map layers based on statistical modeling were used to identify suitable habitat for some of the sensitive plant species on the Forest (Turner 2012). For each species, the habitat model with the highest assessed accuracy was used.

Field Surveys

Botanical field surveys were focused primarily in habitats of sensitive plants known or suspected to occur in the project area. Areas where impacts to sensitive plants or habitat could most likely occur under the action alternatives but that had not been previously surveyed were given the highest priority, such as within potential harvest units and road corridors. Where feasible, suitable habitat outside of but near areas of potential activity were also surveyed, in order to locate additional plant occurrences within the project area if possible.

Focused (intuitive controlled) surveys were conducted to search for any undocumented occurrences of sensitive plants (Appendix A). In focused surveys, suitable habitat is identified for each species of interest and the survey is focused on that habitat. The field surveys were conducted from 2010 to 2012 during the appropriate time of year to locate and identify sensitive plants, which in southeast Alaska occurs approximately mid-June to mid-August. For each survey, a Threatened, Endangered, and Sensitive Plants (TESP) Daily Plant Survey form was completed, and a complete list of plant species encountered on the survey route was compiled. Any sensitive plant occurrence identified in the survey was documented on a TESP Element Occurrence (EO) form. Survey routes were mapped using a hand-held global positioning system (GPS) unit. Plant identifications were based on Hitchcock and Cronquist (1973), Hultén (1968), Tande and Lipkin (2003), and Douglas et al. (1998). Taxonomic nomenclature followed the Natural Resources Conservation Service PLANTS database (NRCS 2013).

Seventy-three surveys were completed within the project area, covering a total of 448 acres. Fifty surveys included portions of the available timber harvest unit pool, and approximately 128 acres were surveyed occurred within these areas. The remaining surveys were in habitats located outside potential

harvest units. Field survey and element occurrence data, including survey routes and sensitive plant occurrences, were entered into the NRIS-TESP database.

Effects Analysis

All project alternatives were analyzed to determine the direct and indirect impacts to sensitive plant species known or suspected to occur in the project area. The cumulative effects of other past, present, and foreseeable future activities were also considered in determining the effects of the Wrangell Island project on these species. Using this information, the overall likelihood and consequences of effects as described in Appendix B were then assessed using a standardized risk assessment (Stensvold 2011) for each proposed alternative.

Direct and Indirect Effects

Direct effects mainly occur through physical damage and/or destruction to individual plants. Crushing can cause physical injury or death to individual plants, and burying will also likely result in death. When a plant is injured, its ability to optimally produce and store food, reproduce, compete for nutrients, and resist pests and herbivores may be compromised, which can negatively affect its growth and survival in a particular location. Some plants are more vulnerable to injury than others, depending upon the growth form of the plant and the habitat in which it occurs.

The direct effects of proposed timber harvest were analyzed by overlaying proposed timber harvest unit boundaries for each project alternative over known sensitive plant occurrences and their suitable habitat in the project area. Any habitat located within the units, or occurrence or that was either wholly or partially within the units, was assumed to be directly impacted by the activity. Direct effects of proposed new road construction were analyzed by overlaying proposed road segment lines over known sensitive plant occurrences and their associated suitable habitat in the project area. A 13 m (42.6 ft) buffer on either side of the road segment line was used to represent an average road corridor width of 26 m (85 ft) for forest logging roads (Powell 2014). Suitable habitat within the road corridor, or occurrence that was either wholely or partially located within proposed road corridor, were assumed to be directly impacted by road construction, including vegetation clearing and road bed preparation.

A 50 m (164 ft) buffer was chosen for this analysis to account for potential indirect effects such as windthrow or hydrologic changes that may occur over the long term in undisturbed areas due to activities in adjacent areas. Some effects may occur beyond 50 m but the likelihood and consequences usually become more limited as distance increases. Indirect effects of proposed timber harvest were analyzed by buffering timber harvest unit boundaries for each project alternative by 50 m and then overlaying this buffer on known sensitive plant occurrences and their suitable habitat in the project area. Indirect effects of proposed road construction were analyzed by buffering the 26 m width of the road corridor by 50 m and overlaying the buffered area over known sensitive plant occurrences and their suitable habitat in the project area. Occurrences or habitat located outside road corridor but either wholely or partially located within the 50 m buffer were assumed to be indirectly impacted by road construction.

Cumulative Effects

Cumulative effects result from incremental impacts of proposed actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Reasonably foreseeable actions are those that are currently planned or scheduled to occur. The accumulation of direct and indirect effects on sensitive plants can affect overall viability of the

species by reducing the numbers of individuals and the distribution of occurrences, which in turn adversely impact reproduction success, genetic variability, and resilience to future disturbances.

The direct and indirect impacts of past actions were analyzed by overlaying a GIS map layer of previously harvested stands and existing roads on known locations of sensitive plant occurrences and estimated suitable habitat in the project area. Impacts of present and reasonably foreseeable future actions were assessed by summarizing the effects of actions that are likely to occur in the project area and evaluating their risk of impact to sensitive plants.

AFFECTED ENVIRONMENT

General Vegetation

Roughly half of Wrangell Island is productive forest land, with the rest consisting mostly of forested and nonforested wetlands and sphagnum bogs that occur on poorly drained till underlying a deep layer of organic material. Alpine and subalpine vegetation covers relatively small areas because most elevations on the island are below 2,000 feet. Middle and lower elevations are habitat for forests of western (*Tsuga heterophylla*) and mountain hemlock (*Tsuga mertensiana*), Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), yellow-cedar (*Callitropsis nootkatensis*), and shore pine (*Pinus contorta* var. *contorta*). Productive forest cover types include western hemlock and/or mountain hemlock, Sitka spruce, and mixed hemlock-Sitka spruce. Low productivity forest types include those that are at high elevation, have a low site index, are in muskeg, are dominated by rock cover, or are located in a recurrent slide zone. These are often open-canopied forests consisting of a mix of conifer species including western and mountain hemlock, western red cedar, yellow-cedar, and shore pine. Nonforest vegetation types include alder brush, brush, grassland, alpine, uplifted beach, muskeg-meadow, and recurrent slides/talus slopes.

Sensitive Plants

Lesser roundleaved orchid is the only sensitive plant species that is known to occur within the project area (Table 2). Due to the presence of suitable habitat, six sensitive plants/lichens are suspected to occur in the project area: edible thistle, mountain lady's slipper, Calder's lovage, lung lichen, Alaska rein orchid, and Henderson's checkermallow (Stensvold 2013). Eleven other sensitive plant species are not known to occur within the project area and they are not suspected to occur, either because suitable habitat for these species does not exist in the project area or because the project area is located outside of their known or suspected geographic range of distribution. Since there is no risk of impacts to these species, they will not be addressed further in this document.

Table 3 shows the number of known sensitive plant occurrences and estimated potential habitat in the project area. Eleven occurrences of lesser roundleaved orchid have been documented in the project area. The amount of estimated habitat for known or suspected sensitive plant species in the project area ranges from 11 acres for Henderson's checkermallow to 34,112 acres for mountain lady's slipper.

Table 2. Alaska Region sensitive plant and lichen species known or suspected to occur in the Wrangell Island project area.

Common name	Scientific name	Habitat	Presence in project area
Alaska rein orchid	*Piperia unalascensis*	Open forests, grassy slopes, meadows, bogs, heath, and streambanks in the lowland and montane zones.(1,2)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.
Calder's loveage	*Ligusticum calderi*	Forest edges, meadows, and calcareous areas in the montane, subalpine, and alpine zones. (1)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.
edible thistle	*Cirsium edule* var. *macounii*	Dry meadows and talus slopes, and open forests in the upper montane to subalpine/alpine zones. (1)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.
Henderson's checkermallow	*Sidalcea hendersonii*	Upper beach meadows and beach/forest ecotone in the lowland zone. (1)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.
lesser roundleaved orchid	*Platanthera orbiculata*	Old growth forest, open forest, forest edges, and bogs in the lowland to montane zones. (1, 3)	Known. Documented occurrences in the project area.
lung lichen	*Lobaria amplissima*	Trunks of old-growth trees in lowland beach/forest ecotone that is exposed to open ocean. (1, 4)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.
mountain lady's slipper	*Cypripedium montanum*	Upper beach meadow, Forest edge, open forests and wet meadows in the lowland, montane, and subalpine zones. (1, 5)	Suspected. Project area contains suitable habitat within known or suspected geographic range of the species.

References: (1) Stensvold 2013; (2) Dillman 2011a; (3) Dillman 2008; (4) Dillman 2011b; (5) Turner 2011.

Table 3. Number of occurrences and acreage of estimated suitable habitat for sensitive plant species known or suspected to occur in the project area.

Species	Known Occurrences	Estimated suitable habitat (acres)
Alaska rein orchid	0	1,043
Calder's lovage	0	25,410
Edible thistle	0	14,480
Henderson's checkermallow	0	11
Lesser roundleaved orchid	11	24,868
Lung lichen	0	1,852
Mountain lady's slipper	0	34,112

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Action Alternatives

Direct Effects

Direct effects of the project would only occur within timber harvest units and proposed road corridors and associated infrastructure such as log landings and rock quarries. Timber harvest has varying degrees of direct impacts on vegetation, depending on the harvest method used. An even-aged harvest method usually has the greatest and potentially longest impacts. The timber yarding method can cause varying impacts, with the severity correlated to the amount of soil disturbance the yarding method creates. Even-aged harvest usually results in dense regeneration of conifer saplings, which can suppress understory vegetation due to insufficient light penetration under the canopy. Precommercial thinning can delay the period of understory suppression, but eventually the canopy can close again and suppress most understory species. Uneven-aged harvests may have less severe and more temporary direct effects on vegetation, since a large portion of unharvested trees are left clumped or scattered across the harvest unit. However, sensitive species can also be affected by less intense harvest methods because they often have specific habitat requirements such as old-growth forest structure (Dillman 2008).

Road construction completely crushes or buries plants located in the road bed, and plants that are located along the road right-of-way can also be crushed, buried, or damaged as a result of vegetation clearing or road maintenance activities. Road construction usually affects vegetation more completely and permanently than timber harvest because it involves intense ground disturbance. Log landings and rock quarries are usually constructed adjacent to roads and are considered as part of road construction in this analysis. Excavation of rock material will crush, bury, or damage plants in the immediate location

of the quarry. Since most soil is removed in the excavation process, quarries will remain in a long-term unvegetated state.

Indirect Effects

Indirect effects to sensitive plants from project activities can occur both within and adjacent to harvest units and road construction areas. Indirect effects may include changes in soil physical and chemical properties, surface and groundwater flow, solar exposure, species composition, and risk of future disturbance such as windthrow or landslides. The magnitude of indirect effects from an action can depend on many variables, including the type and intensity of the action, the distance from the action, the time since the action occurred, and the physical and biological conditions of a site. Although it is possible that indirect effects on sensitive plants could occur at long distances from an action, the probability and magnitude of effect generally decrease rapidly with increasing distance from the action.

The indirect, long-term impact of actions such as timber harvest or road building to adjacent vegetation is uncertain. Past studies of microclimate of forests adjacent to harvests indicate that edge-related microclimate effects may occur up to and beyond 200 meters from the harvest edge, with most change occurring within 20 m of the harvested edge. However, the magnitude of an effect can differ among the climatic variables of interest (Chen et al. 1993, 1995; Concannon 1995; Russell et al. 2000). Because it is difficult to statistically test changes in rare or uncommon species, the actual duration and magnitude of edge effects on these species is uncertain. However, rare or uncommon species may be more susceptible than common species to disturbance or to other random effects that lead to extirpation of a population (Nelson and Halpern 2005; Heithecker and Halpern 2007). Furthermore, a lack of immediate, edge-related declines in a population does not preclude the possibility of future declines. Research on edge effects on forest vegetation adjacent to harvests indicates that changes in temperature and light availability are greatest at the edge, but decline sharply inside adjacent unharvested forest Declines among some groups of vascular and nonvascular plants is often greatest approximately 5-10 meters from the edge (Heithecker and Halpern 2007). However, frequency and intensity of disturbances such as windthrow could further compromise the edge, resulting in changes in microclimate further into the adjacent vegetation than what resulted initially from the harvest. It is important to note the limitations of these studies, particularly the short duration of sampling following harvest. Species composition could eventually return to that of the original plant community, although it may take several decades.

Comparison of Alternatives

Since no timber harvest or road construction would occur under Alternative 1 (the No-Action alternative), no direct or indirect impacts to any known or suspected sensitive plant occurrences or habitat in the project would occur. Additionally, none of the Action alternatives are expected to have direct or indirect impacts to any known sensitive plant occurrences in the project area, and no alternative would affect suitable habitat for Henderson's checkermallow or lung lichen.

Direct and indirect effects of proposed timber harvest and road construction under the Action alternatives on suitable habitat for sensitive plants are summarized in Table 5. Alternative 5 would have the least impact on overall habitat for sensitive plants, including about seven percent of the estimated habitat of lesser roundleaved orchid. Next by increasing overall levels of overall impact on sensitive plant habitat is Alternative 4, followed by Alternative 3. Alternative 2 would have the most potential impact on sensitive plant habitat, including about twelve percent of suitable habitat for lesser roundleaved orchid.

Table 5. Estimated acreage of sensitive plant habitat directly or indirectly affected by proposed timber harvest and road construction under the action alternatives.

Species	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Alaska rein orchid	49	34	50	50
Calder's loveage	1,409	1,059	1,322	847
Edible thistle	56	47	50	42
Henderson's checkermallow	0	0	0	0
Lesser roundleaved orchid	2,050	1,510	1,479	1,149
Lung lichen	0	0	0	0
Mountain lady's slipper	1,028	756	723	668
Total	4,592	3,406	3,624	2,756

Cumulative Effects

On Wrangell Island, activities causing past and present disturbance to vegetation are largely a result of timber harvest, road construction, special uses, and dispersed recreation. Timber harvests and road construction have contributed most to the past disturbances on Wrangell Island and the Forest. Approximately 6,800 acres of past timber harvest has occurred in the project area. Past harvest areas can be found over much of the island, including areas that are currently in Land Use Designations (LUDs) where timber harvest is no longer allowed. Timber harvests can alter habitat quality for sensitive plants which are most commonly found in old growth forests, such as lesser roundleaved orchid. The current effects on sensitive plants may be dependent on the length of time since harvest as well as the harvest method. Forest stands harvested by less intensive methods (e.g. selective tree, helicopter yarding) may require fewer years to recover than those harvested by more intensive methods (e.g. clearcut, shovel yarding).

An extensive network of National Forest System (NFS) roads exists on Wrangell Island. This road system was primarily constructed to support past timber management activities. There are currently 97 miles of existing NFS roads on Wrangell Island. It is uncertain if sensitive plants have been lost or damaged due to past road construction. However, road construction usually involves intense ground disturbance, and any sensitive plants in the road corridor would likely have been destroyed, with long-term impacts on habitat, especially from permanent roads. It is also uncertain what the effects of past recreation, mining, or building construction activities may have had on sensitive plants. These activities have been infrequent in the project area and are not likely to have contributed to substantial loss of sensitive plants or their habitat, and no substantial changes in the frequency of these activities are anticipated.

None of the 11 occurrences of lesser roundleaved orchid documented in the project area have been directly affected by past timber harvest. Two occurrences have been indirectly affected by past timber harvest. No known occurrences have been directly or indirectly affected by past road construction on

NFS lands. Sensitive plant habitats that have likely been minimally affected by past timber harvest and road construction activities are those of Henderson's checkermallow, Alaska rein orchid, lung lichen, and edible thistle, while the largest affects of past management activities likely have been in potential habitat of lesser roundleaved orchid and Calder's lovage (Table 6). It is important to note that quantifying the magnitude of actual effects from past activities requires monitoring the changes to affected occurrences and habitat over time; this information is not available from past activities in the project area. Some locations where activities such as timber harvest occurred many decades ago may have recovered some or all of their undisturbed habitat characteristics. Areas with more recent harvests may not recover their previous habitat characteristics for decades into the future. Some highly modified areas, such as permanent roads and rock quarries, may never recover from the original disturbance.

Present activities that could impact sensitive plant species in the project area include timber harvest, road construction, and other land development actions. At present, no such projects are being implemented on NFS lands in the project area, except for small roadside timber 'micro-sales'. Although some timber harvest may currently be occurring on private or state-owned lands in the project area, the amount of impact is uncertain, because information on sensitive plant occurrences or habitat on non-NFS lands is not available.

Several future activities are planned within the project area, both on NFS lands and on other land ownerships. For the purposes of this analysis, foreseeable future timber harvests are generally those that are expected to occur within the next five years. Potential future timber harvests on NFS lands on Wrangell Island include two Forest Service projects: roadside timber sales and pre-commercial tree thinning. The annual amount of roadside timber harvested is variable but can be up to 500 MBF/year. The location of harvests is also variable but is most likely to occur along existing roads on Wrangell Island. The location and extent of pre-commercial thinning is uncertain at this time, but will always occur in previously harvested stands that have a dense regrowth of young trees. Impacts to sensitive plants are possible due to these activities, but the risk is relatively low, because these activities will be concentrated either along existing roads or in previously harvested areas, which have already been

Table 6. Acres of sensitive plant habitat located in areas directly or indirectly affected by past management activities on National Forest System lands in the project area.

Species	Timber harvest	Road construction
Edible thistle	38	9
Mountain lady's slipper	875	1,319
Calder's lovage	3,771	1,678
Lung lichen	70	6
Alaska rein orchid	0	6
Lesser roundleaved orchid	4,486	2,459
Henderson's checkermallow	0	0

impacted by previous activities. However, undocumented occurrences that have already been indirectly affected by past activities could be further impacted.

The Alaska Mental Health Trust Land Office (AMHT) has initiated timber harvest in the project area totaling 104 acres, with 0.6 miles of road construction. AMHT also conducts an annual land sale program which could impact lands in the project area. The locations and extent of future timber offerings have not yet been determined. The Alaska Department of Natural Resources - Division of Forestry has published a five-year Schedule of Timber Sales (2013-2017). The amount of annual offerings are not determined until the offering is publicized. The Earl West Cove Area timber sale will potentially harvest 535 acres of timber and a construct 4.4 miles of roads. The State is still in the process of completing its Alaska Statehood Act of 1959 entitlement selections for the 16,683 acres of NFS land identified near Thoms Lake/Thoms Place on Wrangell Island. Some of this land could be eventually harvested, but the amount and location are undetermined. All of the foreseeable road construction work in the project area by the Alaska Department of Transportation is concentrated around the city of Wrangell and the airport. The potential impacts of these activities on sensitive plant occurrences and habitat on non-NFS lands are uncertain, because the final locations and extent of activities is not currently known, and information on sensitive plant occurrences and habitat on non-NFS lands is generally lacking.

Summary of Effects

Alternative 1

Under this alternative, no actions would be implemented. Because timber harvest and road construction would not occur, the likelihood of adverse effects to sensitive plants is none. Therefore, Alternative 1 will have no impact on any sensitive plant species known or suspected to occur in the project area.

Alternatives 2, 3, 4 and 5

Edible thistle

There are no documented occurrences of this species in the project area, but it is suspected to occur because suitable habitat is present. Timber harvest or road construction could occur in upper montane and subalpine areas, which could adversely affect suitable habitat for this species. It is also possible that disturbance from timber harvest or road construction could create conditions that are favorable for establishment of this species. However, the persistence of such favorable conditions is uncertain. The likelihood of impacts to this species is low because only a limited proportion of habitat would be affected by timber harvest and road construction would occur in upper montane and subalpine forests and meadows. The consequence of impacts is moderate because project activities could adversely impact habitat quality or undocumented occurrences of this species. The overall risk of effects to this species is low because most suitable habitat in the project area will not be affected by project activities. Therefore, implementation of Alternatives 2, 3, 4, or 5 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Mountain lady's slipper

There are no documented occurrences of this species within the project area, but it is suspected to occur because suitable habitat is present. The likelihood of impacts to this species is low because timber harvest and road construction would occur in only limited areas in open-canopy forests or meadows. The consequence of impacts is moderate because project activities could adversely impact

undocumented occurrences of this species. The overall risk of effects to this species is low because most suitable habitat in the project area will not be affected by project activities. Therefore, implementation of Alternatives 2, 3, 4, or 5 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Calder's lovage

There are no documented occurrences of this species within the project area, but it is suspected to occur because suitable habitat is present. The likelihood of impacts to this species is low because timber harvest and road construction would occur in only limited areas in montane to subalpine forests or meadows. The consequence of impacts is moderate because project activities could adversely impact habitat quality or undocumented occurrences of this species. Although some habitat may have been affected by past activities, the majority of suitable habitat in the project area will not be affected by the proposed activities. The overall risk of effects to this species is low because most suitable habitat in the project area will not be affected by project activities. Therefore, implementation of Alternatives 2, 3, 4, or 5 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Lung lichen

There are no documented occurrences of this species within the project area, but it is suspected to occur because suitable habitat is present. The likelihood of impacts to this species is none, because no timber harvest or road construction would occur within 1000 feet of the shoreline, and existing facilities will be utilized for shoreline transfer of harvested logs, thus avoiding impacts on habitat quality or undocumented occurrences. Therefore, implementation of Alternatives 2, 3, 4, or 5 would have no impact on this species.

Alaska rein orchid

There are no documented occurrences of this species within the project area, but it is suspected to occur because suitable habitat is present. Only a very small percentage of suitable habitat could be adversely impacted by timber harvest or road construction, which would be limited in low productivity open forests or bogs, where suitable habitat for this species is most likely to occur. The consequence of impacts is moderate because project activities could adversely affect habitat quality or undocumented occurrences of this species. The overall risk of effects to this species is low because most suitable habitat in the project area will not be affected by project activities. Therefore, implementation of Alternatives 2, 3, 4, or 5 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Lesser roundleaved orchid

Eleven occurrences of lesser roundleaved orchid have been documented in the project area. No known occurrences will be directly or indirectly impacted by project activities. Between 4 and 7 percent of suitable habitat in the project area could be directly or indirectly impacted by timber harvest, and about 1 percent of habitat could be directly or indirectly impacted by road construction. The project area is located at the edge of the known range of this species on the Forest, so occurrences may be more susceptible to changes in habitat conditions than at other locations on the Forest. The likelihood of adverse impacts to this species is low to moderate because timber harvest could occur in relatively large areas of suitable habitat, however no known occurrences would be adversely impacted. The consequence of impacts is moderate because project activities could adversely impact habitat quality or undocumented occurrences of this species. Although some habitat may have been affected by past

activities, all currently known occurrences and the majority of suitable habitat in the project area will not be affected by the proposed activities. Therefore, the overall risk of effects to this species is low to moderate. Implementation of Alternatives 2, 3, 4, or 5 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.

Henderson's checkermallow

There are no documented occurrences of this species within the project area, but it is suspected to occur because suitable habitat is present. The likelihood of adverse impacts is none because no harvest activities, road building, or associated activities would occur within 1000 feet of the shoreline, where suitable habitat for this species is most likely to occur. Therefore, implementation of Alternatives 2, 3, 4, or 5 would have no impact on this species.

MITIGATION AND MONITORING

Since no known sensitive plant occurrences will be directly or indirectly affected under any alternative, mitigation measures to protect sensitive plants are not necessary. If any previously undiscovered sensitive plants are encountered in timber harvest units or road construction areas at any time prior to or during implementation of this project, Forest Plan standards and guidelines that are designed to protect sensitive plants should be implemented as mitigation measures. The implementation and effectiveness of any such mitigations should be monitored during and/or after the commencement of related project activities.

This biological evaluation was prepared based upon currently available information. It must be amended if the proposed action or alternatives are modified in a manner that causes new effects not previously considered, or a new sensitive plant species is listed and either a Record of Decision has not been completed for the project or a decision has been made but has not yet been implemented (FSM 2670 R10 Supplement).

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Appendix A: Definitions for Floristic Survey Types

Source: Threatened, Endangered, and Sensitive Plants Survey Field Guide (USFS 2005).

Survey type	Description
Field Check	The survey area is given a quick "once over" but the surveyor does not walk completely through the project area. The entire area is not examined.
Cursory	A Cursory survey is appropriately used to confirm the presence of species of interest identified in previous surveys or in the pre-field analysis. By its nature, the cursory survey is rapid, and does not provide in-depth environmental information. The entire area is traversed at least once. For example, stand condition as seen in aerial photography can be verified by a cursory survey. Also, a cursory survey can be used to determine if a plant population that had been previously documented at a site remains present or intact.
General	The survey area is given a closer review by walking through the area and its perimeter or by walking more than once through the area. Most of the area is examined
Focused (Intuitive Controlled)	The Focused, or Intuitive Controlled, survey is the most commonly used and most efficient method of surveying for TES plants. During pre-field analysis, potential suitable habitat is identified for each species of interest and the survey effort is focused in those areas. This method requires adequate knowledge of suitable habitat in order to accurately select the areas of focused searching. When conducting intuitive controlled surveys, an area somewhat larger than the identified suitable habitat should be searched to validate current suitable habitat definitions.
Random	Random surveys employ an undirected, typically non-linear, traverse through a project area. They are employed either when there is inadequate natural history information about a species to discern its suitable habitat and the surveyor is simply searching for occurrences, or when a target species is very abundant within a search area and the surveyor is attempting to make estimates of population parameters such as intra-patch variations in density or the occurrence of predation or herbivory. However, a stratified random survey may be more effective in these latter cases.
Stratified Random	This survey is most often used within known population areas of target species, or when an area to be surveyed is of unknown habitat suitability and is relatively large. Stratified random surveys employ a series of randomly selected plots of equal size within a project area that are each thoroughly searched for target species. When conducting a stratified random survey, it is important to sample an adequate number of plots that are of sufficient size if statistical inference regarding the survey area is desired.
Systematic	Typically used in limited areas where the likelihood of occurrence of a target species may be evenly distributed throughout the survey area. Systematic surveys are often employed either within focused search areas (e.g., stratified random and intuitive controlled methods), or when a project is likely to produce significant habitat alterations for species that are especially sensitive to the proposed activities.

Appendix B

Criteria for assessment of risk to sensitive plants (Stensvold 2011).

Factor 1. Likelihood of Adverse Effect from a Particular Activity	
NONE	Activity will not affect habitat or population. (No further risk assessment needed).
LOW	Activity controllable by seasonal or spatial restrictions and is not likely to affect habitat or populations.
MODERATE	Activity not completely controllable or intense administration of project needed to prevent adverse effects on habitat or population. Adverse effects may occur.
HIGH	Activity not controllable and adverse effects on habitat or populations likely to occur.

Factor 2. Consequence of Adverse Effect from a Particular Activity	
LOW	None, or questionable adverse effect on habitat or population. No cumulative effects expected.
MODERATE	Possible adverse effects in habitat or on population. Cumulative effects are possible.
HIGH	Obvious adverse effects on habitat or population. Cumulative effects are probable.