Conservation Assessment for the Large Round-leaved Orchid (*Platanthera orbiculata* (Pursh.) Lindl. on the Tongass National Forest, Alaska Region

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Executive Summary

Platanthera orbiculata (Pursh.) Lindl. (Large round-leaved orchid) is an endemic of North America. It is found to occur throughout Canada, south to Washington, South Dakota, Minnesota, Tennessee and South Carolina. It is not listed as threatened or endangered or as a species proposed for listing by the US Fish and Wildlife Service. It is listed as sensitive by the USFS in Region 2 (Rocky Mountains), Region 9 (Midwest and Eastern US) and is proposed as sensitive in Region 10 (Alaska). It currently is designated as an S2 in Alaska (imperiled in the state).

This orchid has a disjunct distribution in southeast Alaska in the humid temperate forests in the southern portion of the Alexander Archipelago. There are 88 documented occurrences on the Tongass in low elevation, productive old- growth hemlock forests and forested wetlands. It appears to have a strong association in forests with a red cedar component (*Thuja plicata*), although it is associated with many conifers and hardwoods across its range in North America. The persistence of the species on the Tongass National Forest is unknown. However, what limits its population on the forest is probably related to its interactions with other organisms such as mycorrhizal fungi as much as environmental factors, such as climate. Large extents of productive forested wetland habitats that may be preferred habitat for this orchid occur across the Tongass.

Management activities such as timber harvest and road building may cause direct damage to plants or severely alter its habitat. Other management activities like recreation, mining, and fuelwood harvest may also damage individual plants or change the habitat. All activities may impact the different stages of the orchid life cycle at various intensities. Because *P. orbiculata* often exists in small populations and may also temporally go dormant, a small spatially isolated disturbance event could possibly destroy all potentially reproducing plants in an area. Long-term persistence of the species depends upon protection of known populations and areas of the potential suitable habitat on the forest. Silvicultural treatments of second growth may enhance conditions for recolonization in certain areas, although no monitoring has occurred to document this. Predicted climate changes characterized by wetter and warmer conditions may be another risk to the orchid and its habitat. More surveys in *P. orbiculata* habitat and monitoring known populations will aid in determining its distribution, demography and life history characteristics. A monitoring plan has begun with some known occurrences on the Tongass. This plant is proposed as a Region 10 sensitive species, which may eventually require managers to consider how projects will impact local occurrences and its viability on the forest.

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I. Introduction

Large round-leaved orchid (*Platanthera orbiculata* (Pursh.) Lindl.) is endemic to North America. It has a transcontinental distribution extending from Newfoundland west to Yukon, British Columbia and southeastern Alaska, south to Washington, Idaho and South Dakota and southeast to Tennessee and South Carolina (USDA Plants 2007, NatureServe 2007)(Figure 1). It occurs in a variety of habitats throughout its range including temperate, boreal, deciduous, and wetland forest types. In a large portion of its eastern and southern range it is considered rare due to land use conversion and habitat fragmentation (NatureServe 2007). The pollinator and mycorrhizal fungal species associated with this plant have not been studied in Alaska. The assessment goals are to 1) present a summary of scientific knowledge, 2) provide discussion of broad implications of that knowledge, and 3) outline information needs. The assessment does not seek to define specific management recommendations. Instead, it provides the ecological and scientific background upon which management must be based and focuses on the consequences of changes in the environment that result from management (i.e., management implications). Furthermore, it cites management recommendations proposed elsewhere and examines the success of those recommendations that have been implemented. Species nomenclature follows USDA NRCS Plants Database (2008).

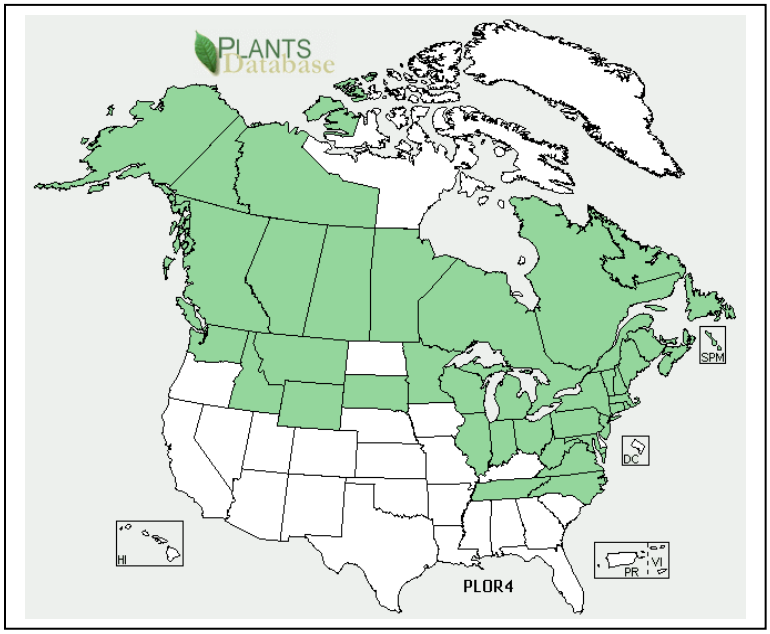

Figure 1. Distribution of *P. orbiculata* in North America (in green). Map from PLANTS database.

II. Current Conservation Situation

The global conservation rank of *Platanthera orbiculata* is G5 and is considered globally secure. It has a wide geographic range in North America, especially throughout Canada. It occurs across the northern areas of North America from Newfoundland to Alaska, and south to Tennessee and South Carolina (USDA Plants 2008). It is considered rare in the Pacific region, and its occurrence increases with increasing continentality (Klinka et al. 1989). In the United States, this orchid is possibly extirpated (SH) in Connecticut, Oregon and Rhode Island, and presumed extirpated (SX) in Indiana. It is vulnerable (S3) in Idaho, Tennessee, North Carolina and Wisconsin, imperiled (S2) in South Dakota and Alaska, and critically imperiled (S1) in Wyoming and Illinois (NatureServe 2008). It is vulnerable yet presently secure (S4) in New York, Ohio and Virginia and West Virginia (NatureServe 2008). All the remaining states where it is known it is not ranked and the conservation status is under review (Massachusetts, Maine, Michigan, Minnesota, Montana, New Hampshire, Pennsylvania, South Carolina, Vermont, and Washington)(Nature Serve 2008). In summary, over 50 % of the states where *P. orbiculata* is known, it is vulnerable to threats such as habitat fragmentation and destruction, and orchid collectors.

In Canada, *P. orbiculata* is considered secure in Ontario, vulnerable to secure (S3S4) in British Columbia, Newfoundland and Labrador, New Brunswick, and Quebec (NatureServe 2008). It is considered vulnerable to imperiled (S3S2) in Manitoba, Alberta, Nova Scotia, Prince Edward Island, Saskatchewan, and the Yukon. It is not ranked in Northwest Territories.

Since Hultén's (1968) documentation of this species in Alaska, there have been 97 additional occurrences of this orchid in the southern portion of the Tongass National Forest and some private lands including: five from Forest Inventory and Analysis plots in the southern Tongass (District unknown); three on the Craig Ranger District, 71 on the Ketchikan/Misty Fiords Ranger District, four on the Thorne Bay Ranger District and five on the Wrangell Ranger District (including one occurrence on the Cleveland Peninsula in 1982) (Tongass rareplant database 2008; Arcos 2008). The status of *P. orbiculata* on

private lands is eight known occurrences from Gravina and Revillagigedo Islands. These populations will not be considered further in this assessment.

Several occurrences have been relocated and monitoring has begun. The northern most occurrence on the Tongass is from Etolin Island with 10 individuals (5 of them flowering in August 2006; 56.17857° N) (Figure 2). An August 2007 revisit documents that this occurrence still contained 10 individuals but only 3 flowering. These plants are within a proposed timber harvest, threatened by flooding from adjacent beaver dam, and possibly visible from the road by recreation users. One occurrence on Ketchikan Ranger District first reported to contain over 1000 plants in 2004(Trimble 2005). The area was revisited in 2006 and was documented to contain roughly only 100 plants (Stensvold 2006). This occurrence is threatened by proposed road building and timber harvesting. The dormancy cycle and the disappearance of vegetative individuals over time of this orchid are not understood across its range, including in southeast Alaska.

Figure 2. Individual from the most northern documented *P. orbiculata* occurrence on the Tongass National Forest, Wrangell Ranger District, Etolin Island. Photo by K. Dillman, USFS

III. Natural History

A. Taxonomic/Nomenclatural History

The genus *Platanthera* in the Orchidaceae family was created by L. C. Richard (1818) in order to distinguish orchids with concave, recessed stigmatic surfaces from those of *Habenaria* Willd. with convex projecting stigmatic processes (Reddoch and Reddoch 1993). *Platanthera* was not widely accepted in the botanical literature throughout the later part of the 1800's and during the first half of the 1900's. At that time, *Platanthera* was often considered as *Habenaria sensu latu*. It was not until the mid to late 20th century when botanists began accepting *Platanthera* and *Habenaria* as separate genera (Luer 1972, 1975; Stoutamire 1974; Webb 1980; Inoue 1983). Table 1 is a summary of the chronological development and synonyms of *Platanthera orbiculata* (Pursh) Lindley nomenclature (Sheviak 2002).

Table 1. Synonyms of *Platanthera orbiculata*

Orchis orbiculata	Pursh	1814
Habenaria orbiculata	Torrey	1826
Habenaria orbiculata var. menziesii	Lindley	1835
Habenaria orbiculata var. lehorsii	Fernald	1950
Platanthera orbiculata var. lehorsii	(Fernald) Catling	1982

B. Species Description

1. Morphology

The orchid is characterized by a pair of large, succulent, shiny, deep green and nearly round leaves that lay on the ground. Often, the emerging leaves hug the ground so close that they follow the contours of objects that are not pushed aside as the leaves expand (Luhr 1975). From a distance, a young plant without an inflorescence can often look similar to the occasionally associated plant *Clintonia uniflora* (Queen's cup or Bluebead). However, the leaf margins of *C. uniflora* possess minute hairs and the leaves are less succulent and less rounded.

Platanthera orbiculata is a perennial plant with a fleshy tuberous root. A single glabrous flowering stem ranges between 17-62 cm tall, and contains scattered bracts (1-6). **Leaves** are usually two, in a subequal basal pair ranging from 5-21 x 3-22 cm in size.

Inflorescence is a lax to dense spike with pale to deep whitish green flowers (ranging between 5 and 25 flowers). The **flowers** have a lip that is somewhat descending to somewhat reflexed, linear –oblong to linear lanceolate, and without basal thickening. The **spur** is slenderly clavate between 14 and 27 mm long. **Pollinaria** are nearly straight and 3-4.5 mm long with pollinia remaining enclosed in anther sacs. The **fruit** is a curved and erect capsule (Sheviak 2002; Douglas et al. 2001).

Sheviak (2002) notes that considerable variation in leaf size and shape occurs. A few places in coastal Canada and Alaska have small and few flowered plants with narrow leaves (Figure 3). This is similar to some Asiatic species such as *Platanthera freynii* Kränzlin. Further DNA work is being conducted at the Rancho Santa Ana Botanical Gardens by Robert Lauri. At this time, all the genetic material analyzed from North America (including some specimens from the Tongass) contain their genetic origins in North America. Until good Asian material is obtained, it is unknown if the Asian *P. freynii* is related to the North American (B. Lauri pers comm. 2008).

Figure 3. Narrow leaf version of vegetative stage of *P. orbiculata* from Etolin Island, Tongass National Forest. Genetic material of this plant and others analyzed from the Tongass indicate North American origin at this time. Photo by P. Rak USFS

2. Reproductive Biology

Platanthera is the largest genus of temperate orchids in North America with approximately 200 species (Sheviak 2002). This genus displays great orchid floral diversity and has made an ideal model for co-evolution studies between pollinator proboscis length and nectar spur length and breeding system evolution (Inoue 1983; Catling and Catling 1991; Johnson and Nilsson 1999; Maad and Reinhammer 2004; Little et al 2005). Presently, little information exists about the pollinators of *P. orbiculata* in Alaska and the Pacific Northwest (Lesher and Henderson 1998). However, the pollinators of the genus *Platanthera* in other regions of North America are noctuid moths, which are generally nocturnal insects (Reddoch and Reddoch 1993). A subfamily of noctuid moths (known as Plusiinae) is known from southeast Alaska (Opler et al. 2006, Opler pers. comm. 2008). Flowers that have spurs similar to those of *P. orbiculata* tend to be pollinated by lepioptera, but the shorter the spur, the greater number of pollinator classes can occur (Catling and Catling 1991). No pollination studies or observations have occurred with *Platanthera* orchids in southeast Alaska.

For effective cross pollination, the spur must be short enough for the proboscis of the insect to reach the nectar at the end. Additionally, the head of the insect must come into contact with certain parts of the flower for correct placement of the hemipollinaria on the eyes or the base of the proboscis (Reddoch and Reddoch 1993). Catling and Catling (1991) report that many North American *Platanthera* species possess the gradual bending of the pollen stalk that favors cross pollination. However, the bending of the pollen stalk to the orientation needed to make contact with the stigmatic surface appears to be dependent on the amount of time an insect spends at a plant (Catling and Catling 1991). Other factors such as the number of flowers available on the plant, reward production, pollinator behavior and pollen carryover also affect the level of cross-pollination (Johnson and Nilsson 1999). Orchids without strong pollinarium bending can lead to geitonogamy (self pollination between flowers on the same plant) within a population (Maad and Reinhammer 2004). This type of self-pollination generally does not contribute to guaranteed reproduction for a plant (Schoen and Lloyd 1992). No studies are available that have indicated whether *P. orbiculata* flowers strongly favor cross pollination or geitonogamy.

The minute seeds of temperate North American terrestrial orchids do not germinate without a fungal infection, or do so with great difficulty (Arditti et al 1990). Fungal specificity appears to be a very important feature of seed germination in north and south temperate climate orchid species compared to tropical climate orchids (Arditti et al 1990). Little is known about North American fungal specificity for temperate orchid seed germination. Some inoculation work was completed with seeds from the genus *Platanthera*, yet with minimal success (Smreciu and Currah 1989). In one study, *P. orbiculata* had the poorest germination success and development, and occurred with only one species of fungus (Smreciu and Currah 1989).

The flowering period for .*P. orbiculata* in southeast Alaska is generally mid to late June until late August (personal observations by Tongass botanists). An abundance of tiny seeds are produced and are generally thought to be dispersed by wind. It is also plausible for orchid seeds to be dispersed by animals on their fur or feet for long distances (R. Lauri pers comm. 2008).

3. Ecology

Orchids are the most diverse monocot family, and are considered as one of the largest families of flowering plants (Sheviak 2002). Terrestrial orchids are not commonly cultivated, which may be a function of the difficulty in reproducing and maintaining the fungal association in horticultural conditions. Terrestrial orchids (compared to most tropical epiphytes) require a fungal association for seed and establishment of all life stages (Currah et al 1990; McCormick et al 2006). Many terrestrial orchids are associated with specific groups of fungi throughout their life cycle, which may be a contributing factor in the decline of many species facing changing climatic conditions (McCormick et al 2006). Restricted by fungicidal production in the orchid, the endophytic fungal associate penetrates and grows into specific cells of the orchid (Beyrle et al 1995 in McCormick et al 2006). Regardless if the orchid is able to photosynthesize, the fungal associate provides additional and often the only carbon sources to the orchid. During the non-photosynthetic protocorm stage (a mass of cells after a seed germinates), orchids are totally dependent on their mycorrhizal fungi for all nutrition (Rasmussen 2002). McCormick and others (2006) report that the protocorms of the orchid *Goodyera*

pubescens under laboratory conditions were able to switch one fungal associate to another but did not simultaneously associate with multiple fungi. This suggests that some orchids may be able to switch to a different fungal partner during periods of modest environmental variation (McCormick et al 2006).

Two species of mycorrhizal fungi, *Leptodontium orchidicola* and *Sebacina* sp. are reported to associate with the mycorrhizae of mature *P. orbiculata* plants from boreal Canada (Currah et al 1990). The relationship the mycobionts have with other life stages of *P. orbiculata* in Alberta is unknown. The mycobiont *Sebacina* is now known to be identified as *Tulasnella* (Lee Taylor pers. comm.). No information is available for the mycobiont from *P. orbiculata* in Alaska from the protocorm or adult life cycle stages.

C. Known Sites in Alaska and nearby States and Provinces

1. Alaska

Platanthera orbiculata is widespread across North America as (see under Current Conservation Condition). In Alaska it is only known from southern southeast Alaska, with most occurrences primarily on the Tongass National Forest (Figure 4). The earliest collection of this plant in Alaska is documented from 1889, and the collector and exact location are unknown (NH). The sighting information for southeast Alaska plants includes; four sightings by Hultén (1968), one by Hodgman in 1963 in Ketchikan (Arcos 2008), one by Ver Hoef in 1982 on the Cleveland Peninsula near Frosty Bay (Arcos 2008), eight sightings on private lands (Tongass rareplant database), and an additional 88 on the Tongass National Forest for a total of 97 sightings. The sightings on private lands and in the 1982 and earlier records will not be examined further in this assessment. However, any site information available will be used to model the habitat in future work.

Sighting information of *P. orbiculata* on the Tongass is recorded in GIS database as part of the botany program. Some sightings were recorded before GPS technology and therefore locations were approximated on aerial photos before digitized. Revillagigedo Island contains the most documented sightings (59), followed by nearby Gravina Island (12) (Table 2). Sightings were documented as part of rare plant surveys during proposed management activities, discovered indirectly by resource specialists while conducting

other field duties, and from FIA plots. For example, sightings on South Etolin Island Wilderness were found and documented by Tongass wilderness rangers but have not been relocated by a Tongass botanist. Of the 88 sightings of *P. orbiculata* on the Tongass National Forest, 67 are in timber production or modified landscape land use designation (ML and TM in GIS Land Use Designation (LUD) layer). Two sightings are in wilderness (WW). Fourteen sightings are found in old growth reserves (OG), research natural areas (RA), scenic value areas (SV) or special interest areas (SA). The land use for where the five plants found during FIA work are not in wilderness. In other regions, *P. orbiculata* has observed periods of dormancy, during which time no evidence of its presence is visible (Hornbeck et al. 2002). The number of occurrences on the Tongass may only reflect the extent and intensities that the federal lands have been surveyed. Therefore, the number of occurrences reported may not necessarily indicate complete or accurate distribution. However, rare plant surveys have been conducted for over 20 years across the Tongass. Some areas more than others have received greater amount of time spent on the ground due to management activities.

Table 2. Known *Platanthera orbiculata* locations on the Tongass National Forest. Numbers of sightings are from the Tongass Rareplant database and exclude private land sightings. Ecological subsection information is from a GIS layer for individual points.

Island	Sightings	District	Ecological subsection
Etolin	5	Wrangell	Clarence Strait Volcanics, Etolin Granitics
North POW	4	Thorne Bay	Central POW Volcanics, Central POW Till Lowlands, North POW-Kuiu Carbonates
South POW	3	Craig	Skowl Arm Till Lowlands, Hetta Inlet Metasediments, South POW Granitics
Gravina	12	Ketchikan	Clarence Strait Volcanics
Revilla	59	Ketchikan	Ketchikan Mafics-Ultramafics, Traitors Cove Metasediments, Princess Bay Volcanics
2007 FIA plots	5	Ketchikan and Wrangell	unknown

2. Yukon and Northwest Territories

This assessment summarizes approximately ten sightings of *P. orbiculata* within the two territories. The range of *P. orbiculata* in northwestern Canada is primarily within the border area in the southeast corner of the Yukon Territory with British Columbia and Northwest Territories (roughly 60°N and between 123-127°W). Herbarium records from

the Yukon Government and the private herbarium of Bruce Bennett of the Yukon Department of the Environment contain collections from seven boreal forest locations. Documented locations are near LaBiche River, Lower Beaver River, Fantasque Lake, and Larsen Creek. This plant is considered common in the lower LaBiche River valley and less frequent west of this region of the Yukon (B. Bennett pers comm.). Collections were made in 1994, 1997, 1998, and 2004.

There are several documented locations of *P. orbiculata* in the southwest portion of the Northwest Territories near Ft. Laird, where it is considered rare in this primarily boreal forest region (McJannet et al 1995, Porsild and Cody 1980).

3. British Columbia

This assessment summarizes 804 known locations of *P. orbiculata* in British Columbia. The range of *P. orbiculata* in western Canada extends throughout the British Columbia (BC) province, and excludes the Queen Charlotte Islands (Klinkenberg 2007; Calder and Taylor 1968). This plant is infrequently found south of 55°N, and rarely on the coast (Douglas et al 2001). The Biogeoclimatic Ecosystem Classification project with the Ministry of Forests and Range recorded 717 plots containing this orchid from over 20, 000 plots inventoried (Klinkenberg 2007). Only a few locations are from Vancouver Island (Klinkenberg 2007). Herbarium records from Vancouver contain 72 collections from across British Columbia, including several near the headwaters of the Stikine River (UBC Herbarium). The majority of the collections date from the 1940's, 50's and 60's. The herbarium in Victoria contains 15 specimens collected from mainland BC (UV).

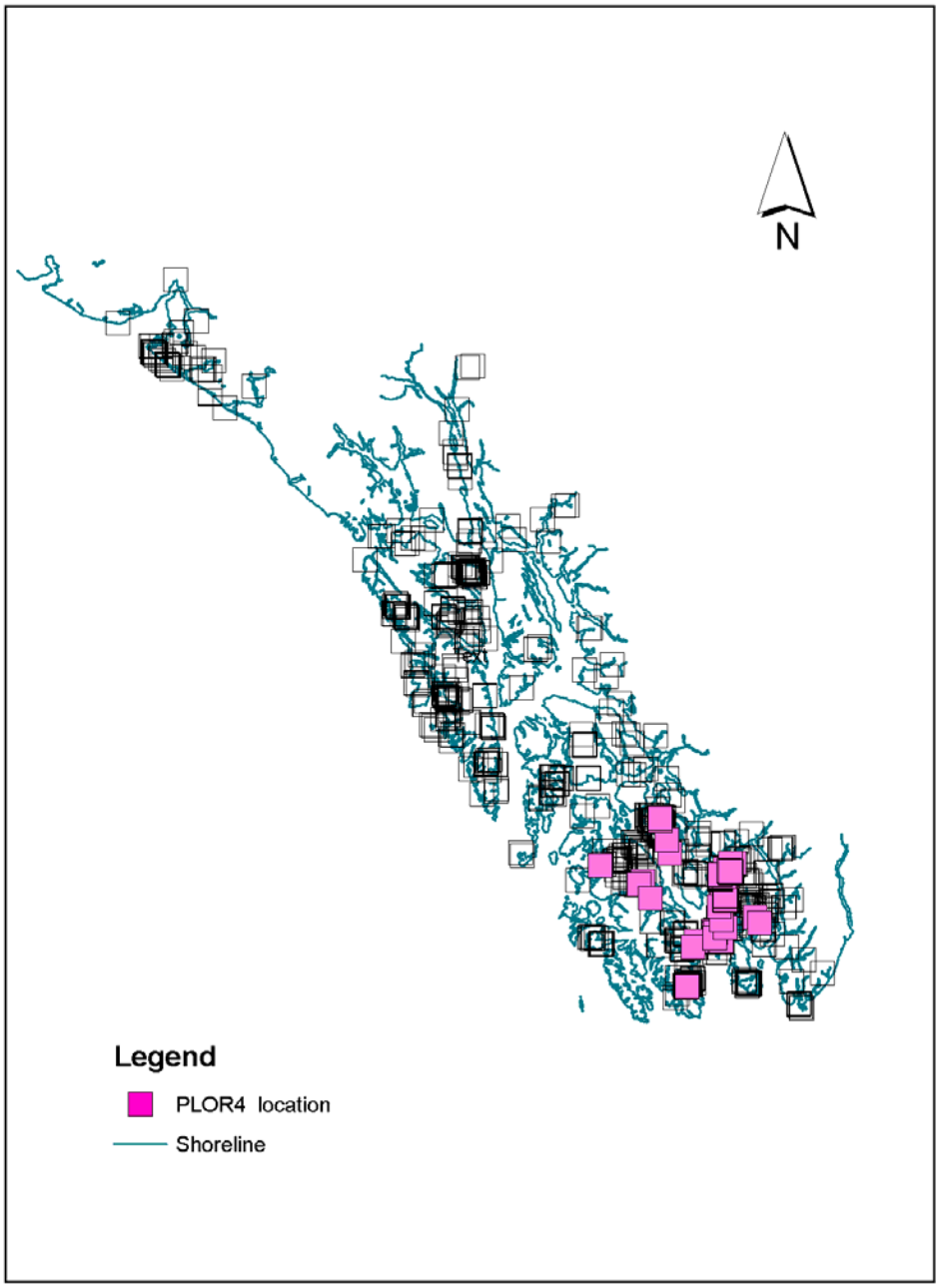

Figure 4. Database location on the Tongass National Forest and nearby private lands of *Platanthera orbiculata*. Black squares are other rare plants documented on the Tongass.

4. Washington and South Dakota

Platanthera orbiculata is reported from approximately 180 locations in Washington. It is restricted to the northern Cascades and is not documented south of the Cedar River watershed (R Lesher pers. comm.). It is found in a couple isolated areas in the eastern Olympics and historically was documented in the San Juan Islands near Friday Harbor but not relocated (R. Lesher pers. comm.). On the Colville National Forest and vicinity in NE Washington it occurs in two locations for a total of 2048 plants (K. Ahlenslager pers. comm.) Most of the sightings in Washington are on the Mt Baker-Snoqualmie National Forest (Lesher et al 2002). This orchid is reported to occur in 25 locations on the Black Hills National Forest in South Dakota, with a total of 747 individual plants (Hornbeck et al 2003).

D. Species Abundance and Habitat Characteristics

1. Species Abundance

Platanthera orbiculata is considered uncommon or rare throughout most of its range in North America (see above under Current Conservation Conditions). Species abundances presented (colony size and overall number of known individuals) are from database records from the Tongass and other published references from North America. General habitat descriptions presented are compiled from database records, herbarium material, and other references.

Throughout its range, this orchid is not generally abundant where it occurs. This is true on the Tongass, as 50% of the sightings contain one to approximately 8 individual plants in a small area. Generally, not all individuals are flowering. A total of approximately 1800 individual plants are presently known on the Tongass, including the largest known colony with between 800 and 1000 individual plants (Trimble 2004). However, this number was reduced to close to one hundred when the site was revisited a few years later (Stensvold 2006). Therefore, the 1800 individuals is based on the high end of the estimates in the database.

Records from Washington indicate that few populations consist of more than a couple of individuals (Lesher et al 1998). The Colville National Forest documents one sighting

with about 2000 plants in 1992, but has not been revisited (K. Ahlenslager pers comm. 2008). Occurrences in South Dakota's Black Hills range between 1 and 126 individual plants, with an average occurrence size of approximately 25 plants (Hornbeck et al 2003). Reddoch and Reddoch (1997) report that *P. orbiculata* occurs in colony sizes of one to 190 individuals in the Ottawa District in Eastern Canada. Colony or population estimates are not available for other Canadian provinces.

2. General Habitat Descriptions

Habitat information for *P. orbiculata* in Alaska is based on GIS information of species presence and notes recorded during botanical surveys. Information presented is from the Tongass GIS layers: *Soils (including wetland habitat), Geology, Ecological Subsection (see Table 2), Existing Vegetation (including forest productivity, forest type, stand size class, volume class), Elevation Range, and Slope Class.* The reported habitat conditions for *P. orbiculata* should not be viewed as habitat requirements since the requirements as well as the habitat may change over time. The variability of *P. orbiculata* habitat indicates that this orchid can survive in multiple habitats and it may survive at one location long enough for a plant community to change through succession.

From GIS, occurrences of *P.orbiculata* have been most frequently found within the habitat parameters listed in Table 3. Certain GIS parameters lack data for some sightings due to location on private land or GPS errors. See Appendix A for all habitat parameters and number of sightings for each.

From 49 field records reviewed for this assessment, the most commonly associated plants with *P. orbiculata* include *Tsuga heterophylla* (TSHE; 88% of the records) and *Thuja plicata* (THPL; 80% of the records) (Figure 5). Other associated plants include *Vaccinium* sp. (VACCI; 78% of the records), and *Cornus canadensis* (COCA 13; 39% of the records) (Figure 5). High bryophyte cover is a common substrate component including *Hylocomium splendens* (HYSP70), *Rhytidiadelphus loreus* (RYLO70) and *Sphagnum* sp. (SPHAG2) (Figure 5). However, all of these associated plants are generally ubiquitous in old growth forests and cannot be considered indicator species for finding *P. orbiculata* or its habitat. Except for the bryophytes, shrubs and overstory

species, the percent cover for most of the associated plants is very low, indicating that the micro- habitat does not contain a high diversity or high forb layer. Other plants occurring in less than three records for *P. orbiculata* are listed in Appendix B. A few records document this orchid in second growth forests. It is unclear if plants colonized after harvest or are residual plants that survived the overstory removal.

Table 3. Habitat parameter and percent frequency of sightings within a given parameter on the Tongass National Forest. Data are from GIS layers. Percent frequency is the number of *P. orbiculata* sightings for that particular parameter divided by the number of actual sightings that contain data for a particular parameter.

Habitat parameter	Percent frequency of sightings with GIS data
Wetland habitats	60.0 of 90 sightings
Non-wetland habitats	27.7 of 90 sightings
Forested wetlands	51.2 of 80 sightings
Forested non-wetlands	30.0 of 80 sightings
Geology MzPzms Metasedimentary rocks	54.5 of 88 sightings
Geology Kpg Plagioclase-porphyritic granodiorite and quartz diorite rocks	17.0 of 88 sightings
Western Hemlock overstory	87.1 of 62 sightings
Hemlock-Spruce overstory	10.0 of 62 sightings
High volume class of 9-30 MBF/acre	88.7 of 62 sightings
Stand size class -old growth saw timber over 150 years	93.5 of 62 sightings
Elevation range between 0 and 500 ft	81.3 of 91 sightings
Forest productivity greater than 20 cu ft/acre	71.6 of 81 sightings
Slopes between 15 and 35 %	40.8 of 71 sightings
Slopes between 35 and 75%	33.8 of 71 sightings

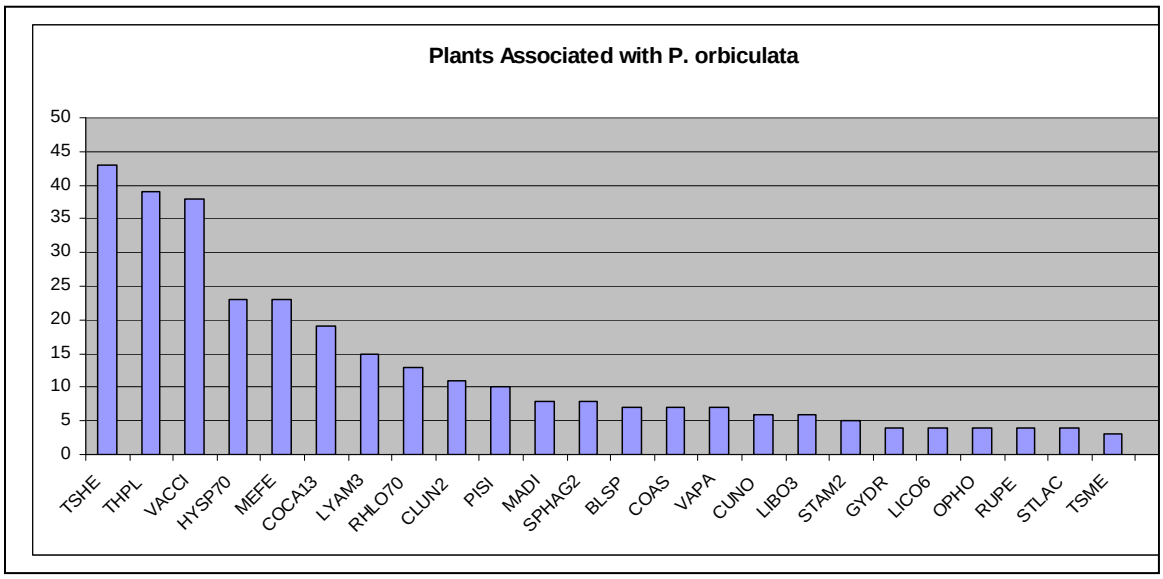

Figure 5. Plants associated with *P. orbiculata* from 49 field records on the Tongass National Forest. X axis is the plant name from USDA PLANTS database and Y axis is number of sightings with the plant associated out of 49 records. See Appendix B for scientific names.

Ecological subsections where the sightings of *P. orbiculata* are found are the following: Clarence Strait Volcanics, Etolin Granitics, Central POW Volcanics, Central POW Till Lowlands, North POW-Kuiu Carbonates, Skowl Arm Till Lowlands, Hetta Inlet Metasediments, South POW Granitics, Ketchikan Mafics-Ultramafics, Traitors Cove Metasediments, and Princess Bay Volcanics

Based on GIS and field notes, the general habitat and micro-habitat characteristics for *P. orbiculata* in Alaska include: low elevation forested wetlands; medium to high volume old growth hemlock forests; slopes between 15 and 75%; high bryophyte cover; red cedar component; low forb cover; forest edges or near gaps in otherwise shady forests; near open water or boggy areas; metasedimentary geology (non-carbonate); mesic soils; deep organic duff layer; on decaying logs, stumps or base of old trees.

Outside Alaska, *P. orbiculata* is found in similar forested habitats throughout its range in North America. Reddoch and Reddoch (1997) describe the habitat as shady, old growth coniferous swamps in eastern Canada, with moist, but not wet, soils. The forest floor generally contains patches of swamp mosses (genera unknown) or often with only leaf litter (Reddoch and Reddoch 1997). In the Yukon and Northwest Territories it is mostly associated with shady boreal forests consisting of *Populus balsamifera*, *P. tremuloides*, *Picea glauca*, *P. contorta* and *P. mariana* overstory in varying amounts (YGH and Bennett Herbarium). Herbarium records indicate the substrate often has a high cover of bryophytes (*Hylocomium splendens*) (YGH 2008). In Washington it is found associated with mature to old growth forests of *Tsuga heterophylla*, *Picea engelmannii*, and *Abies amabilis* overstory and with substrates containing thick bryophyte layers (Lesher et al 1998; Ahlenslager pers. comm. 2008). A disjunct population from the Black Hills area in South Dakota occurs in similar boreal forested habitats where it is found in Canada. Typical habitat includes dense to partially open canopy of mid to late successional *Betula papyrifera/Corylus cornuta*/*Picea glauca* forests with filtered light, damp humic soils with a deep litter and high moss cover (Hornbeck et al 2003).

In coastal British Columbia it is considered a plant characteristic of soils of the Mor humus forms, which is a 5 cm layer (or more) of compacted organic materials (matted by fungal mycelia) and overlying mineral soils that are non carbonate (Klinka et al 1989). It is found in mossy, semi-open coniferous forests of the montane zone consisting of mesic soils of medium nutrient class, on 15% slopes averaging approximately 3000 ft elevation (Klinkenberg 2007). Some commonly associated plants in BC are *Clintonia uniflora* (forb) and *Pleurozium schreberi* (bryophyte) (Klinka et al 1989).

IV. Threats

A. Risks and Response of Habitat and Plants to Threats

Threats to *P. orbiculata* in Alaska can be operative singly or in combination with others. Threats to rare plants can be considered direct or indirect, biotic or abiotic, and naturally occurring or anthropogenic (CPC 2006) Threats to the viability of this plant or its habitat on the Tongass and in Alaska include: 1) timber harvest (direct, indirect); 2) road building (direct, indirect); 3) recreation site users (direct, indirect); 4) extent of dormancy period (naturally occurring, indirect); and 5) climate change (indirect, biotic and abiotic, and anthropogenic).

1.Timber harvest and road building

The relatively small number of known occurrences in Alaska and their distribution concentrated in the southern Tongass increases the risk of altering the persistence of this species on the Tongass and in Alaska. Of the 88 known occurrences on the Tongass, roughly 76% are within past and present timber harvest planning areas (Tongass rareplant database 2008). New Forest Plan direction recommends avoidance, buffers or partial cutting of trees near sensitive and rare plants (USDA 2007). However, many of the known populations were discovered before the latest protection was added for rare plants and have already been NEPA cleared. Some plants in units that were surveyed 10 or more years ago were flagged, but it is generally unknown if protection during harvest or unit and road design was given to these plants. Some plants were discovered before GPS was available, and exact locations are unknown, and therefore difficult to protect during design and project activities. The lack of long term continuity of District botanists

involved in the planning of timber sales has greatly reduced the botany program ability to maintain a high level of scrutiny of recommendations to protect rare plants.

The level of harvest near or directly on the plants will influence the level of impact on succession and competition. The greatest concern during any timber harvest or other tree removal is the direct damage to plants during this activity from churning of soils, and burying of photosynthetic parts. The second concern is the abrupt change in solar radiation and hydrologic regimes due to the removal of the canopy or other ground disturbing activities near the plants. With the added protection of rare plants in the recent Tongass Land Management Plan (TLMP 2007), future occurrences of this plant and other rare plants in timber units and road right of ways will receive greater protection.

2. Recreation

Very few occurrences are documented near or within recreation areas on the Tongass. Most are on Revillagigedo Island along trails or near recreation sites. Threats to these plants include people collecting or trampling plants where they are visible from a trail or road.

3. Dormany period

This plant may exhibit dormancy during certain period in its life cycle. This has been observed in several locations on the Tongass, as large populations have appeared to decrease after one or two years. An exact population census was not performed on these occurrences to accurately conclude that dormancy was a factor. Some other biotic or abiotic reason could exist that effects the number of individuals. Although dormancy is a natural feature of some orchids, it may be a threat in broad terms because plants may not be found during a particular year's survey for a project area. The area is cleared for management activities without adequate protection of plants that could appear later.

4. Climate change

Since the last little ice-age, climate change has been occurring in SE Alaska (TLMP 2007). In addition to this natural change, anthropogenic forces have accelerated climate

changes during the last several decades (IPCC 2007). Predictions for SE Alaska include wetter warmer winters (Bonsal & Prowse 2006). It is unknown if the lack of snow at lower elevations that function as protection for plants during winter and spring frosts will have an impact on plants that occur in these low elevation habitats. Hennon and Shaw (1997) hypothesized that Alaska Yellow Cedar is on the decline due to temperature changes in the winter and lack of snow. Glaciers are retreating and changes in snow melt period have been documented to change the flowering period of some high altitude plants in the Rocky Mountains (Inouye 2008).

V. Conclusions and Information Needs

The Tongass National Forest supports nearly all of the known occurrences of *Platanthera orbiculata* in Alaska. Its long term persistence on the Forest and in Alaska is difficult to evaluate or predict. Little is known about the plant's demographics, life history, threshold level for viability, and specific habitat requirements in Alaska. This assessment summarizes habitat data from roughly 50% of the field notes taken from known occurrences. The remaining field notes were not available during the preparation of this document. GIS data from occurrences mapped in the Tongass database are available, but not all occurrences contain sufficient data for all the GIS parameters to confidently identify the orchids' affinity to a particular habitat. Furthermore, the GIS information and mapping scale may be too broad of habitat categories and too large a mapping unit to accurately model the preferred habitat. For example, there is no GIS cover that maps high bryophyte cover on the forest floor, or availability of decaying wood, both of which have shown to be present where *P. orbiculata* occurs.

Little information exists as to the degree of dormancy this orchid displays in the temperate rainforest of Alaska. The suspected dormancy period may hinder protection of this orchid. In some cases it may not be detected during botanical surveys, yet may become visible after surveys are completed and activities begin years later. Known occurrences have not been monitored on a regular basis to determine the percent of dormancy. Temporal variation in the degree of dormancy in a given population probably depends on climatic cues that are unpredictable and immeasurable at this time.

In summary, the information needs for *Platanthera orbiculata* are the following:

- Who is/are the pollinator(s)?
- A Population Viability Analysis.
- What is the dormancy period for individuals in a population?
- What are the habitat requirements that can be mapped?
- What is the preferred habitat and what parameters are important?
- What are the mycorrhizal associated species?
- What spatial or temporal factors preclude this orchid to be found across all of SE Alaska?
- The identification, inventory, and monitoring approach of "core" occurrences (by geographic distribution and size). Core occurrences are considered central to maintaining the metapopulation of a disjunct species range.

VI. Management Recommendations from Other Regions

This orchid was part of the Survey and Manage Pacific Northwest Forest Plan in the 1990's (USDA 1994). It is presently not considered sensitive in Region 6, but was previously considered a monitor species by the state of Washington in the late 1990's (WNHP 1997). At that time, large areas of forested lands along I-90 were planned to be commercially thinned, and *P. orbiculata* was found to occur in these areas (Fuentes et al 2002). Buffers were recommended around existing populations of *P. orbiculata* that were twice the height of the average tree on the site. This was prescribed in order to maintain the microclimate for the orchid such as the associated duff layer, and the shade and hydrological regime. The ecology program managers planned to monitor the effectiveness of these recommendations (Fuentes et al 2002).

The management practices in the Black Hills of South Dakota are unlikely to impact the habitats of *P. orbiculata* in this region. Habitats are too steep for logging and the overstory tree species are less desirable timber product (Hornbeck et al 2003). However, road building has a potential to indirectly impact the orchid and its habitat. The birch stands where this orchid tends to occur, act as natural fire breaks. Prescribed burning,

patch cutting and selective thinning of dense conifer stands are used to create a mosaic of seral stages. This results in patches of paper birch that provide firebreaks, and potential habitat of the orchid.

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Appendix A.
Parameters from Tongass GIS layers with number of associated *Platanthera orbiculata* sightings.

WetHab: 80 sightings	**Volume Class: 62 sightings**
FW Forested Wetlands: 41	0 to 8 MBF/acre:2
FNW Forested Non-wetlands: 24	9-20 MBF/acre:28
FMS Forested Wetland/Moss muskeg complex >50%	20-30 MBF/acre:27

forested: 1	
FI Forested Wetland/Forested non-wetland >50% each: 1	30-50 MBF/acre: 3
FW Forested wetland/forested non-wetland complex >50% wetland: 1	More than 50 MBF/acre: 2
FIC Forested wetland/forested non-wetland complex >50% forested: 1	
MP Moss muskeg:1	
NWH Forested Non-wetland/nonforested non-wetland complex <50% forested :1	
SEC Forest-Non-Forested Complex >50% forested: 8	
SES Scrub-Shrub evergreen/emergent wetland <50% scrub-shrub evergreen: 1	
Wetland: 90 sightings	**Forest Type: 62 sightings**
Wetland: 49	Hemlock :54
Non-wetland: 25	Hemlock Spruce: 6
Water error on beach fringe or nearby:13	Spruce: 2
Mixed wetland-non wetland complex: 3	
Timber Size Class: 62 sightings	**Elevation Range: 91 sightings**
Poletimber, trees w/DBH between 5” and 9”: 2	0 to 500 Ft:74
Young-growth sawtimber: 9”+but not over 150yrs: 2	5001 to 800 ft.:11
Old growth 9” and above > 150 years- 58	Greater than 800 ft: 6
	1201 to 1500 ft elevation: 1
Forest productivity: 81 sightings	**Slope Class: 71 sightings**
Greater than 20 Cu. Ft/acre: 58	0 to 15%: 5
Low prod. due to high elevation: 17	15-35%:29
Low productivity due to muskeg: 6	35-55%:11
	35 -75%: 24
Geology	55-75%: 7
MzPzms Metasedimentary Rocks: 48	>75%: 2
Kpg pyroxene and gabbro of Salt Chuck mine area: 15	
KJgv 7	

Appendix B
List of plants associated with *P. orbiculata* from 49 records of notes taken during botanical surveys on the Tongass national Forest.

Plant name	Symbol	Number of records
Tsuga heterophylla	TSHE	43
Thuja plicata	THPL	39
Vaccinium sp	VACCI	38

Hylocomium splendens	HYSP70	23
Menziesia ferruginea	MEFE	23
Cornus canadensis	COCA13	19
Lysichiton americanus	LYAM3	15
Rhytidiadelphus loreus	RHLO70	13
Clintonia uniflora	CLUN2	11
Picea sitchensis	PISI	10
Maianthemum dilatatum	MADI	8
Sphagnum sp.	SPHAG2	8
Blechnum spicant	BLSP	7
Coptis aspleniifolia	COAS	7
Vaccinium parvifolium	VAPA	7
Cupressus nootkatensis	CUNO	6
Linnea borealis	LIBO3	6
Streotopus amplexifolius	STAM2	5
Gymnocarpium dryopteris	GYDR	4
Listera cordata	LICO6	4
Oplopanax horridus	OPHO	4
Rubus pedatus	RUPE	4
Streptopus lanceolatus	STLAC	4
Tsuga mertensiana	TSME	3
Listera caurina	LICA10	2
Pteridium aquilinum	PTAQ	2
Athyrium filix- femina	ATFI	2
Dryopteris expansa	DREX2	2
Elliothia pryroliflora	ELPY	1
Lycopodium annotinum	LYAN2	1
Alnus sp	ALNUS	1
Deschampsia cespitosa	DECE	1
Tiarella trifoliata	TITR	1
Pyrola secunda	PYSE	1
Vaccinium vitis-idaea	VAVI	1
Streptopus streptopoides	STST3	1