
CHAPTER 3: AFFECTED ENVIRONMENT



Photograph courtesy of Pat Mills.

Gilbert Mills, Jr. (“Butch”) and Katherine B. Mills gathering eggs on North Marble Island.

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This chapter describes the glaucous-winged gull and other cliff/ground nesting bird populations, Steller sea lions, harbor seals, wilderness, and ethnographic resources that may be affected by the alternatives. The specific subjects covered in this chapter reflect the impact topics identified in Chapter 1 of this document.

3.1 PHYSICAL ENVIRONMENT

Glacier Bay National Park encompasses a recently deglaciated fjord surrounded by vegetated upland habitat as well as glaciers, ice fields, and recently exposed barren rock. The outer coast of the park extends 161 km along the Pacific Coast and is exposed to rough seas and frequent Pacific storms.

With the exception of some lowlands in Glacier Bay's southeastern and southwestern margins, much of the entire area was under ice or ice-generated outwash about 250 years ago. The rapid glacial retreat that followed left an exposed landscape re-inhabited by plants and animals over time. In general, lower Glacier Bay supports a wider array of plants and animals from late successional communities than the more recently deglaciated upper portions of the Bay. Numerous islands dot the Bay itself and a number of offshore islands are found along the southern end of Glacier Bay's outer coast. Depending on their location in the Bay as well as substrata, exposure, and other factors, some of these islands consist of little more than barren rock with occasional clumps of herbaceous vegetation while others much farther along in the successional process support dense thickets of alder (*Alnus sitchensis*) and/or mature stands of spruce (*Picea sitchensis*).

South Marble Island, located in the central portion of Glacier Bay, typifies this scenario. The 1.5-km² island has been exposed from glacial ice since the mid 1800s. Since then, vegetation has grown over most of the limestone substrate. Dense spruce forest currently dominates the western half of the island and grassy rounded hilltops and steeply sloped cliffs characterize the eastern half. A small, partially vegetated islet connected only at low tide extends from the southern end of the island. Coves at the northern and southern end contain small cobble beaches.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Glaucous-winged Gull (*Larus glaucescens*] Population

Population Status, Distribution and Demographics

Larus glaucescens is primarily a coastal breeder, nesting on rocky cliffs of the northern Pacific, from Alaska and the Aleutians south to northern Washington State (Godfrey 1986). Although formerly almost exclusively coastal in distribution, recent proliferation of garbage dumps and other sources of offal have drawn the glaucous-winged gull further inland. The population of *L. glaucescens* has increased around three and a half times in the last 50 years, mostly due to accessibility of human wastes (Verbeek 1988).

Interbreeding between *L. glaucescens* and the herring gull is common and widespread in Alaska. *L. glaucescens* also hybridizes with the western gull (*L. occidentalis*) along the coast of Oregon and Washington states (Merilee 1974, Hoffman et al. 1978).

Natural History

Glaucous-winged gulls are colonial nesters, preferring to nest on “coastal cliffs, grassy slopes, bare flats esp. on small islands” (Ehrlich et al. 1988:176). Adult birds frequently return to the same colony year after year, often re-pairing with a mate from the previous year. The nest is a mound of dried plants and seaweed, but sometimes includes fish bones and feathers, built amongst ground cover on low islands or rocky ledges of higher islands or headlands.

Lay Dates and Clutch Size: A single brood is laid from mid-May to mid-June, consisting of one to four buff or olive-buff eggs marked with darker brown spots. Zador (unpubl. data) found that gulls on South Marble Island in Glacier Bay began laying on May 26 in 1999 and May 18 in 2000 with median lay dates (the date on which 50% of nests had one or more eggs) of June 5 in 1999 and May 30 in 2000.

Baicich and Harrison (1997:8) state that a full clutch of glaucous-winged gull eggs is “usually 3, often 2, rarely 4;” of which the latter may represent nests tended by two females. Patten’s (1974:27) study of 353 glaucous-winged gull nests at North Marble Island in Glacier Bay reported the average completed clutch to be 2.80 in 1972 and 2.96 in 1973. He noted that “the optimum clutch size in the herring, glaucous-winged and western gulls is evidently around three but as in other species there is probably some variation in the optimum number from locality to locality as well as from year to year” (Patten 1974:41-42). Zador et al. (2006) reported 84 percent of nests from both years contained three eggs, 12 percent contained two eggs and 4 percent contained one egg with an average clutch size of 2.8 eggs/nest.

Once the female begins to lay she will continue laying at a rate of one egg laid every two days until she has a full clutch of three eggs (less often one, two, or four). When this “target clutch size” is achieved, the female’s capacity to produce new eggs shuts down. “The onset of incubation probably causes developing follicles to atrophy... and ovulation to cease...” (Kennedy 1991:110). The male and female then begin to incubate the eggs, typically for 26-29 days.

Replacement Laying: *L. glaucescens*, like other large gulls are “indeterminate layers,” that is, they respond to the loss of eggs by laying more (Ehrlich et al. 1988:165, cf. Kennedy 1991; Zador 2001:2). Replacement laying likely evolved in ground nesting birds as a response to egg loss due to natural factors such as floods, inclement weather, and predation (Brown and Morris 1996). Indeterminate layers are “cued” to relay only when a nest is empty – that is, if all the eggs from a clutch are removed. If only one or two eggs of a three-egg clutch are lost, the parents will incubate the remaining eggs, but will not relay those lost.

The ability to replace clutches is influenced by seasonal effects (Parsons 1976, Wendeln et al. 2000), breeding experience (Wooler 1980), food availability (Pierotti and Bellrose 1986), and the age of the lost clutch (Parsons 1976, Wooler 1980). Gulls that lose their eggs earlier in the

season are more likely to relay (Zador et al. 2006). Presumably, there is a threshold date beyond which relaying would not occur following egg loss. This threshold date likely represents the date beyond which eggs could not successfully hatch and fledge young before environmental conditions became too harsh for chick survival.

Replacement Laying in a Simulated Harvest: Stephani Zador simulated the effects of egg loss (due to human harvest or predation) on the glaucous-winged gull population on South Marble Island by removing eggs from known nests and recording relaying and hatching success. She found that the variables that were important for predicting whether or not gulls would reneest following egg loss differed between years (Zador 2001:26). Lay date and the age of the clutch at removal were significant factors in her 1999 logistic model. The probability that gulls would reneest increased with earlier lay dates and younger clutches at the time of removal. In 2000, the date of removal appeared to be the sole factor affecting the probability of reneesting. The probability of reneesting increased with earlier removal dates.

In her harvest simulation, Zador (2001:27) found that most (95%) gulls parenting one egg clutches from which the single egg was removed continued to lay one to three more eggs; of these, 78 percent laid replacement clutches of three eggs, 18 percent laid two eggs, and 3 percent laid only one egg. These birds began relaying 2.06 ± 0.14 days after the single egg was removed from the nest. Following egg removal, 46% of pairs laid the remainder of their clutches in new nest structures built an average of 2.20 ± 0.42 meters ($n = 15$ nests) from their original structures, presumably within the same defended territory (Zador 2001:27). Pairs with their first egg removed laid on average 1.24 (in 1999) and 1.06 (in 2000) more eggs than those in the unmanipulated group, but there was no difference in the number of eggs that hatched in either year. The total number of eggs laid at the manipulated nests did not differ between the years.

When Zador removed an entire clutch of three eggs from gull nests, most (93%) gulls from these nests laid replacement clutches of one to three eggs; 82 percent laid second clutches of three eggs, 13 percent laid two eggs, and 5 percent laid one egg (Zador 2001). The proportion of replacement clutches that contained three eggs did not differ from the proportion of unmanipulated clutches that contained three eggs. Two pairs in 1999 abandoned their nests after the manipulation, but laid replacement clutches ten and fourteen days later. One pair did not lay a replacement clutch in 1999 and two pairs did not relay in 2000. The number of days between the clutch removal and the lay date of the first egg of the second clutch was 12.18 ± 0.18 days. Pairs laid their second clutches in new nests an average of 2.19 ± 0.31 meters ($n = 28$ nests) from their first nests. Pairs with their entire clutches removed laid on average 2.71 (in 1999) and 2.01 (in 2000) more eggs than those in the unmanipulated group, but there was no difference in the number of eggs that hatched in either year.

Glaucous-winged gulls rarely replace a second lost clutch with a third clutch. Zador (unpubl. data) noted that one pair of gulls in 1999 and one pair in 2000 may have laid a third clutch following natural predation of their previous clutches on South Marble Island. She also documented two possible third clutches in pairs whose eggs had been artificially removed. If glaucous-winged gulls do lay third clutches, it appears to be a very rare phenomenon.

Costs of Relaying: Egg production is energetically costly for females (Monaghan and Nager 1997). Females must have sufficient calcium, lipid and protein resources to produce eggs (Walsberg 1983). These resources come from stored reserves and increased food intake (Walsberg 1983). Egg laying can also incur costs in males. In glaucous-winged gulls, males provide supplementary food to their mates before and during the laying period. When laying replacement eggs becomes necessary, males must extend this provisioning period (Salzer and Larkin 1990, Mawhinney et al. 1999). Increasing food intake for females through self-feeding and male provisioning requires increased foraging effort which may indirectly reduce fitness and effect physiological stress (Kitaysky et al. 1999).

The costs of relaying may be reflected in poorer quality eggs or chicks (Monaghan et al. 1998, Nager et al. 2000), reduced productivity rates (Risch and Rohwer 2000), and/or reduced chick survival. The composition and size of the replacement eggs changes during protracted laying (Parsons 1976) which may negatively affect chick survival (Nager et al. 2000). Costs have been measured directly through physiological measures such as body condition (Wendeln et al. 2000) and metabolic rates (Ward 1996). Zador (2001: 30) found no measurable changes in physiological condition of male or female gulls following replacement laying. However, females that replaced a clutch secreted lower maximum levels of corticosterone than those that incubated their original clutch (Zador 2001:31). Corticosterone is secreted in birds in response to stressful events and regulates body maintenance processes by modifying behavior (Kitaysky et al. 1999). Elevated levels of corticosterone can result in behavior (such as abandonment of breeding) which promotes self-maintenance at the expense of reproductive effort. However, some bird species can suppress their stress responses, presumably to increase reproductive success, in moderately unfavorable conditions (Kitaysky et al. 1999). Zador's study indicates that gulls at South Marble Island subjected to the energetically higher cost of relaying had reduced corticosterone levels which likely permitted them to continue laying.

Hatching and Fledging: Chicks are first capable of flight around 35-54 days after hatching, attaining a fully adult plumage in the fourth year (Campbell 1968, Murphy et al. 1984). Zador and Piatt (1999) noted that first chicks hatched on June 22 in 1999 and June 20 in 2000 (unpubl. data), respectively on South Marble Island, 29 and 33 days after researchers noted the first eggs laid.

Despite disturbance by predators, Patten measured an average fledgling success rate for the North Marble Island colonies of 1.75 and 1.80 per nest, which may be compared with an estimated 0.92 chicks fledged per nest as "sufficient to maintain a stable population" of herring gulls at another colony (Patten 1974:64). Zador (2001) found similar hatching rates in unmanipulated nests of 1.61 (1999) and 1.81 (2000); however, she did not report fledging success rates. Hatching success for manipulated nests was similar; in 1999 nests with one and three eggs removed hatched 1.71 and 2.00 eggs respectively. In 2000, nests with one and three eggs removed hatched 1.92 and 1.67 eggs respectively.

Predation: Egg predation in gulls colonies can cause near or complete reproductive failure (Spear and Anderson 1989, Ewins 1991, Vermeer et al. 1991) and egg predation by one predator species may facilitate predation by conspecifics (Hand 1980, Good et al. 2000). Common ravens (*Corvus corax*) (Patten 1974), American crows (*Corvus brachyrhynchos*) (Verbeek 1988), bald

eagles (*Haliaeetus leucocephalus*) (Thompson 1989, Good et al. 2000), individuals of the same species (Verbeek 1988, Good et al. 2000) and humans (Hunn et al. 2002) all prey on gull eggs and young hatchlings. Zador and Piatt (1999) also noted river otter (*Lutra canadensis*) trails in the forested area of South Marble Island and other researchers noted an otter moving through a gull nesting area which caused the birds to give alarm cries and flush (L. Dzinich, pers. comm.).

With regard to the impact of disturbance and predation on nesting activities, Patten (1974:40) found no adverse effect on egg hatching resulting from his presence in the colony every 1-4 days. He noted that, “The loss of eggs through predation was the principal factor influencing hatching and fledging rate in both years” of his study (Patten 1974:43), the principal predator being other gulls in the colony, although he observed predation on eggs by ravens and crows. “[Bald] eagles disturbed the North Marble Island gull colonies repeatedly. The approach of an eagle caused immediate high-intensity alarm calls and flight of the entire colony at once” (Patten 1974:52-53). Zador and Piatt (1999:4, 13-14) also noted significant bald eagle predation on gull eggs, concluding that eagles were the primary predators of nesting glaucous-winged gulls on South Marble Island. Zador (unpubl. data) noted that many one and two-egg clutches (73% and 50% in 2000 and 1999, respectively) were depredated within five days of when the last egg was laid.

Glacier Bay Population

Glaucous-winged gull nesting in Glacier Bay has been documented since the late 1930s (Appendix 2). Trager (1939) noted that, “[g]ulls nest in very large numbers each spring in the southern part of the area, particularly on North and South Marble islands and the small islands of Geikie Inlet.” Been (1940:38-39) also noted that North and South Marble islands “has been a nesting place for seagulls for many years. Gaucase wing gulls [*sic.*] predominated to inclusion [*sic.*] of nearly every other gull except a few haring [*sic.*].” Jewett (1942) estimated 100 pairs each on North and South Marble islands on July 14, 1941.

By 1972 and 1973, Patten (1974:18) estimated that approximately 500 pairs of glaucous-winged gulls were nesting on North Marble Island. Though he did not estimate the number of nesting pairs on South Marble Island, he and other observers suggested that both islands supported similarly sized colonies, suggesting that approximately 1,000 pairs nested in the area (Patten 1974). Paige’s (1975) estimate for North and South Marble islands combined was also 1,000 nests (Zador and Piatt 1999).

Sometime before the 1990s, North Marble Island ceased to support significant numbers of nesting glaucous-winged gulls, most likely because vegetational succession made habitat unsuitable for nesting. Zador and Piatt (1999) counted only 25 birds on the grassy slope on the southwest corner of this island on May 24, 1999. Furthermore, Zador (2001:27) notes that the forest on “South Marble Island appears to facilitate eagle predation...” Thus, ecological succession may also increase predation on eggs at the surviving colonies.

By 1999 and 2000, the Glacier Bay gull population appears to have declined; Zador (2001:5) estimated approximately 700 glaucous-winged gulls nesting (with a maximum count of 829) and a total of 285 visible nests on South Marble Island. In 2005, Arimitsu et al. (2007) observed 200

glaucous-winged gull nests on South Marble Island. They surveyed other locations, noting number of adults and number of nests when present or visible (Table 3-1 & Table 3-2).

Table 3-1. Number of glaucous-winged gulls, nests and eggs/nest in selected colonial nesting areas in Glacier Bay National Park.

Location	Number of glaucous-winged gulls	Number of nests; eggs/nest
Boulder Island	600 +	41; 2.53 eggs/nest
Flapjack Island	57	26; 1.68 eggs/nest
North Marble Island	-	1
Lone Island	266	115
Geikie Rock	147	48
Muir Inlet, north shore	77	32
Russell Island islets	80	0
Sealers Island	1	1
Sebree Island	-	4
Sturgess Island	-	2
Tlingit Point islets	28	4

From Arimitsu et al. 2007.

Other colonies past and present in Glacier Bay for which population numbers are not available include: Margerie Glacier (E. Hooge, pers. comm.); Drake Island (1995-1996) (see also Been 1940: 29, on a Drake Island colony); Riggs Glacier (above the kittiwakes colony, young seen in 1996); Kashoto Glacier in Johns Hopkins Inlet (just north of the kittiwake colony); an island near the head of Muir Glacier (Been 1940: 32); Triangle Island; Beardslee Island; and Wolf Point, off McBride Glacier (B. Paige pers. comm.).

3.2.2 Other Cliff and Ground Nesting Bird Populations

Pigeon Guillemot (*Cepphus columba*)

Population Status, Distribution and Demographics: The pigeon guillemot is a medium size pelagic bird that dives for food from the waters' surface and only comes to shore to breed. The species breeds on coasts and islands from northern Alaska south to southern California and

Table 3-2. Nest/territorial pair counts and adult counts (in parentheses) for specific locations in Glacier Bay National Park.

Locations	Arctic tern	Black-legged kittiwake	Black oystercatcher	Glaucous-winged gull	Horned puffin	Tufted puffin	Pigeon guillemot
Boulder Island	0/1 (2)		2/0 (15)	41/0 (600)			
Flapjack Island		0/0 (1125)	1/1 (43)	26/0 (200)			
Giekie Rock			3/2 (7)	48/0 (123)			0/0 (36)
Lone Island		8/47 (146)	2/1 (9)	115/0 (195)		0/0 (4)	0/0 (29)
Muir Inlet, north shore	2/0 (2)		6/11 (42)	31/1 (77)			0/0 (36)
North Marble Island			5/0	1/0			
Sealers Island	46/0 (75)		4/0 (7)	1/0 (1)			
Sebree Island	25/0		3/0	4/0			
South Marble Island	0/0 (1)	34?/311 (807)	3/0 (8)	200/90 (1042)	0/0 (8)	?/3 (29)	0/0 (41)
Sturgess Island			6/2	2/0			
Tlingit Point islet	25/0 (60)		3/1 (17)	4/0 (28)			

Adapted from Arimitsu et al. 2007.

spends winters offshore. Guillemot populations declined in the early 1900s due to oil pollution and disturbance from humans and livestock and probably because of food shortages during warm-water years. Today, guillemot populations appear to be stable.

Natural History: Pigeon guillemots typically lay two eggs on rocky cliffs. Their nests consist of a shallow scrape in sand, soil, or gravel. Eggs are also placed in a cavity, crevice, or burrow, usually in cliff or boulder fields. Guillemots are sensitive to disturbance at their nest sites during the incubation stage. Eggs are incubated for 30-32 days; young are fledged between 29 and 39 days after hatching (Ehrlich et al. 1988).

Glacier Bay Population: Grinnel (1909) noted breeding guillemots on South Marble Island in 1907. Patten (1974) observed as many as 150 individual guillemots there in 1970. Zador and Piatt (1999) censused pigeon guillemots on and near South Marble Island in 1999, counting 122, 155, and 171 adults on three separate counts. Zador and Piatt (1999) also located 28 guillemot nest sites. The first egg was laid June 8 (\pm 2 days). Six nests still contained eggs when last

checked on July 20. The guillemots laid an average of 1.8 ± 0.1 eggs in 26 nests. Eggs disappeared in six nests before they could have hatched. One egg failed to hatch. The first chick hatched on or before July 6. Mean hatching success was 1.3 ± 0.2 ($n = 26$ nests) chicks per nest. The researchers were unable to determine fledging success in those nests because they left the island before chicks fledged.

Black-legged Kittiwake (*Rissa tridactyla*)

Population Status, Distribution and Demographics: The black-legged kittiwake is a colonial nester which breeds along Arctic and subarctic coasts in Alaska and Canada, southward to the Alaskan panhandle and the Gaspé Peninsula. They also nest across the northern coasts of Eurasia. Global populations are estimated at 2.6 million in the Pacific region (Baird 1994) while the Alaskan population is estimated at 1.4 million (USFWS 2003). Population stability is considered variable both globally and within the state of Alaska (Baird 1994, Dragoo et al. 2003).

Natural History: Kittiwake nests are constructed on cliff ledges of offshore islands, sea stacks, or inaccessible areas of coastal mainland. They are composed of wet and dry vegetation and mud (sometimes seaweed, feathers, and barnacles) on top of a mud/vegetation platform. Kittiwakes lay one to three brown, blue, gray, olive or tan eggs, with dark brown-gray speckling.

Glacier Bay Population: Kittiwakes were first documented at South Marble Island in 1989 in a colony on the southern portion of the island (Streveler 1989a). The earliest record of chicks at this colony was in 1994. Kittiwakes began nesting at a more northern colony on the island in 1996 (E. Hooge, pers. comm.). Although the island continued to serve as a nesting area, kittiwakes produced few or no chicks there or elsewhere in Glacier Bay in the early 1990s (E. Hooge, unpubl. data.; Hooge 1995), a phenomenon known to occur when foraging is poor.

Zador and Piatt (1999) counted 45 and 96 adult kittiwakes occupying nests in the southern colony on May 15 and 24, 1999 respectively, and observed 74 feathered chicks and two fledged chicks on July 24, 1999. They estimated that 38 to 76 pairs successfully raised one to two chicks each. At the northern colony, Zador and Piatt (1999) counted 59 and 63 adults occupying sites on May 14 and May 24, respectively. No chicks were seen in this colony during the counts on July 24 and August 12. They postulated that the difference in reproductive success between the northern and southern colonies was due to predation, likely by eagles. A small colony (>20 pairs) was noted on the islet just south of South Marble Island in July 2006.

Arimitsu et al. (2007) counted 807 adults with 34 possible nests and 311 territorial pairs on South Marble Island (Table 3-2). On Lone Island, they observed 146 adults, eight active nests, and 47 territorial pairs of kittiwakes.

Black Oystercatcher (*Haematopus bachmani*)

Population Status, Distribution and Demographics: Oystercatchers are found along the Pacific Coast from the Aleutian chain and southern Alaska southward to Baja California. They

nest on rocky seacoasts and islands, less commonly on sandy beaches. They are considered common and widespread.

Natural History: Oystercatchers lay two to three eggs on rocky beaches in nests that are little more than indentations or scrapes, occasionally lined with shells. Eggs are incubated for 24-29 days, typically hatching on or near the 35th day following laying. The U.S. Shorebird Conservation Plan lists black oystercatcher as a "species of high concern," based on relative abundance, threats on breeding grounds, and non-breeding distribution. The species' small population size places it at risk from large-scale disturbances, such as oil spills. Oystercatchers are particularly sensitive to human disturbance.

Glacier Bay Population: Glacier Bay has been documented to have the highest concentration of breeding oystercatchers in Southeast Alaska (Nelson and Lenhausen 1983). Lentfer and Maier (1995) found high nesting density and productivity in the Beardslee Islands. Zador and Piatt (1999) monitored 10 pairs of oystercatchers occupying territories on South Marble Island. Nine of these pairs laid eggs; at least five of these nests hatched at least one chick. Eggs were laid between May 19 and June 19.

Arimitsu et al. (2007) observed eight adult oystercatchers and located three active nests on South Marble Island (Table 3-2). They noted two active nests and one territorial pair on Lone Island, three active nests and two territorial pairs on Geikie Rock, 15 nests and two territorial pairs on Boulder Island, and one active nest and one territorial pair on Flapjack Island.

Common Murre (*Uria aalge*)

Population Status, Distribution and Demographics: Common murres are circumpolar breeders, nesting along the Arctic and subarctic coasts south to central California and the Gulf of Saint Lawrence. They prefer rocky coasts. Estimates of global abundance are 13.0-20.7 million individuals (Ainsley et al. 2002); within the state of Alaska, the population estimate is approximately 5 million (USFWS 2003) and the population trend is unclear (Dragoo et al. 2003); however, murres are highly susceptible to oil spills and gill netting and Pacific coast populations were affected by both in the recent past.

Natural History: Common murres are colonial nesters, laying their eggs in a shallow depression on rocky ledges or on steep cliffs. The egg of the common murre is so pointed at one end that when placed on a flat surface and pushed, it rolls around in a circle. This shape may help keep the egg from rolling off of its nesting shelf.

Glacier Bay Population: Records indicate murres nested on North Marble Island from at least 1967 through 1974 (Appendix 2) but they were last documented there in 1975. The earliest record of murres on South Marble Island is from 1978 (Appendix 2). Anecdotal information suggests murres have been attending the same cliff since this time. Zador and Piatt (1999) observed common murres infrequently around South Marble Island in rafts of up to 17 birds. They observed murres repeatedly on one section of cliff just above the northern kittiwake colony and concluded that some level of breeding might be occurring on the island although they did not locate nests.

Horned (*Fratercula corniculata*) and Tufted (*F. cirrhata*) Puffin

Population Status, Distribution and Demographics: Horned puffins breed on islands and coastlines of northern Alaska south to the British Columbia border. They spend winters at sea south to Washington and rarely to California. Approximately 75 % of colonies and 87 % of individuals breed in Alaska. Drift-net fisheries on the high seas killed tens of thousands of horned puffins until the practice was largely eliminated by the early 1990s. Coastal fisheries still cause some horned puffin deaths.

Breeding colonies of tufted puffins are found on islands and some portions of mainland coastlines throughout the north Pacific, from the Chukchi Peninsula in Siberia to the Channel Islands off southern California. Bycatch in fishing nets killed tens of thousands of tufted puffins each year into the 1980s. Elimination of drift-nets on the high seas has reduced mortality, although bycatch in coastal fishing nets still kills large numbers of puffins. In addition, nesting tufted puffins are highly vulnerable to red and arctic foxes, river otters, brown bears, and other mammals. Where present, mammalian predators have devastated or eliminated tufted puffins from many islands, but programs to eradicate introduced fox species have led to dramatic recovery of puffin populations.

Natural History: Horned puffins prefer cold ocean waters, sea cliffs, and rocky or grass-covered islets and rocks, nesting in rock crevices and cliffs. The tufted puffin is a seabird of the open waters, islands, and coastal cliffs of the north Pacific. It nests mostly in deep burrows that it digs into cliff edges and slopes.

Glacier Bay Population: Horned puffins have been documented nesting on South Marble Island since 1907 (Appendix 2). The breeding population has remained relatively constant at two to six birds since that time. Eleven were seen in 1972, but it is unclear whether these were all breeding birds. Tufted puffins have been seen at or near the island in numbers of 17 to 50+ birds since 1920.

Zador and Piatt (1999) observed up to 18 tufted puffins flying or rafting within the vicinity of South Marble Island from May 14 to July 20. Puffins likely nested in burrows visible in the vegetated portions of the cliffs on the east side of the island. Only one horned puffin was sited at South Marble Island (Zador and Piatt 1999).

Pelagic (*Phalacrocorax pelagicus*) and Double-crested (*P. auritus*) Cormorant

Population Status, Distribution and Demographics: Cormorants breed in coastal areas from northern Alaska southward to northern Baja California and are also found from the Asian Arctic to Japan. Although cormorant numbers were reduced by human and natural disturbances from 1850 to 1900s, their populations appear stable at present. Increasing cormorant populations have caused conflicts with people as they may have played some role in the collapse of some fisheries.

Natural History: Cormorants are found in inshore coastal waters. Their breeding and roost sites include rocky habitat along outer coast, bays, inlets, estuaries, rapids, coves, surge narrows, harbors, lagoons, and coastal log-storage sites. Their nests are compact shallow bowls lined with

grass and seaweed, but also moss, sticks, feathers and general marine debris (including rope, plastic, and other human-made objects); lined with dry vegetation. Nests are placed on narrow ledges on high, steep, inaccessible rocky cliffs, facing the sea.

Glacier Bay Population: South Marble Island appears to be an important roosting area for both breeding and non-breeding pelagic cormorants. Cormorants have been seen at the Island in numbers of 50 to 300 since 1907 (Appendix 2). Zador and Piatt (1999) observed pelagic cormorants roosting in flocks of up to 192 birds on the cliffs on the east side and the wash rocks south of South Marble Island. The maximum number of cormorants counted in one day was 201. Flocks consisted of juveniles and adults in breeding plumage. In 1999, two pairs constructed nests on the cliff above the northern kittiwake colony, but these nests were not attended regularly and no eggs or chicks were observed. Fewer than five double-crested cormorants were observed roosting among pelagic cormorants on the wash rocks south of the island (Zador and Piatt 1999).

3.2.3 Steller Sea Lion (*Eumetopias jubatus*) Population

Population Status, Distribution and Demographics

Steller sea lions (*Eumetopias jubatus*), also known as northern sea lions, are the largest member of the Family Otariidae and range throughout the North Pacific rim from California to Japan (Loughlin et al. 1984). The population of Steller sea lions was divided into two stocks based primarily on mitochondrial DNA sequence distribution (Bickham et al. 1996) and also on differences in population trajectories (York et al. 1996). The division between the eastern and western stock occurs at Cape Suckling (144° W longitude) in the north central Gulf of Alaska between Prince William Sound and Icy Bay, which is approximately 495 km west of Gustavus, Alaska (Loughlin 1997). More recent mitochondrial DNA analysis supports the recognition of three stocks including an Asian stock, the western stock, and the eastern stock with moderate rates of migration estimated among stocks (Baker et al. 2005).

In 1990, Steller sea lions were declared “threatened” throughout their range under the U.S. Endangered Species Act. In 1997, the western stock was listed as “endangered” (Loughlin et al. 1992, 62 FR 30772) as a result of the precipitous decline in the Alaskan population from 140,000 in 1956 to 60,000-68,000 sea lions in 1985 (Merrick et al. 1987). Worldwide, the population dropped from 240,000-300,000 to 116,000 sea lions (Loughlin et al. 1992) during a 30-year period. Overall, the western stock declined by approximately 85 percent between the early 1970s and 2001 (Sease et al. 2001) with some breeding rookeries in the Aleutians declining as much as 87 percent between 1960 and 1989 (Loughlin et al. 1992). In contrast to the western stock, the overall abundance of the eastern stock has increased at a rate of 3.1 percent/year since the 1970’s (Calkins et al. 1999; Sease et al. 2001; Pitcher et al. 2007). In Southeast Alaska, counts of non-pups at trend sites increased by 56 percent (from 6,376 to 9,951 with no correction factor applied) from 1979-2002 (Merrick et al. 1992, Sease et al. 2001). Specifically in Southeast Alaska, sea lion numbers have increased by an average of 5.9 percent per year between 1979 and 1997 based on counts of pups at rookeries. However pup numbers increased at a slower rate (1.7% per year) between 1989 and 1997 (Calkins et al. 1999). Approximately two-thirds of the pups produced in the eastern stock are born in Southeast Alaska (Calkins et al.

1999). In contrast to the western population, the abundance of the eastern population has increased at an average annual rate of 3.1 percent since the 1970s (Pitcher et al. 2007). In addition, during the last 80 years there has been a northward shift in distribution of both rookeries and animals in the eastern population (Pitcher et al. 2007). The minimum population estimate for the eastern U.S. stock of Steller sea lions is 43,728 (not corrected for the numbers of animals which were at sea; Angliss and Outlaw 2005). Although Kruse et al. (2001) reported that abundance of the eastern stock may be the highest ever recorded and that reevaluation of the threatened listing is warranted, the eastern stock is still listed as threatened (Angliss et al. 2001).

Natural History

Steller sea lions forage in the marine environment and use terrestrial sites for birthing, breeding, caring for young, resting, and avoidance of aquatic predators (Bartholomew 1970, Bonner 1984). Terrestrial sites used for breeding are referred to as rookeries and are used predominantly during the breeding season. Terrestrial sites used for resting and caring for young are referred to as haul out sites and may be occupied seasonally or year round.

In Southeast Alaska, five known rookeries are located at Hazy Islands, White Sisters, Forrester (Lowrie) Island, Biali Rocks, and Graves Rocks (Pitcher et al. 2007). Graves Rocks in Glacier Bay National Park, located on the outer coast near Cape Spencer, was historically a haul out site but recently transitioned into a rookery in 1998 (Gelatt et al. 2007, Pitcher et al. 2007).

Killer whales prey on Steller sea lions, although the impact of these predators is not known (NMFS 1992). Natural mortality is likely highest for pups, and includes drowning, starvation, crushing by males, disease, predation, and aggression from females other than the mother.

Glacier Bay National Park Population

Steller sea lions use several terrestrial sites in Glacier Bay National Park and Preserve including South Marble Island, Graves Rocks, Point Carolus, Tarr Inlet, and areas in the Alsek River (Figure 3-1; Womble et al. 2005, Womble et al. 2009). South Marble Island, Point Carolus, Tarr Inlet and islets in the Alsek River are haul out sites, whereas Graves Rocks is a rookery. Some terrestrial sites, such as South Marble Island, are used year round whereas other sites are used only seasonally for brief periods (Womble et al. 2009).

Trends in the numbers of sea lions counted in the Glacier Bay/Icy Strait region have increased by 9.4percent/year from 1976 to 2006. At South Marble Island, the primary sea lion haulout site in Glacier Bay, the number of sea lions counted has increased by 22.9percent/year from 1991-2004 (G. Pendleton, pers. commun.). South Marble Island is used by all sex and age classes of Steller sea lions including pups, juveniles, adults, and lactating females. Newborn pups have been observed on the island during the breeding season, suggesting that birthing occasionally occurs at this site (J. Womble, pers. comm.).

Sea lions were not observed using the South Marble Island haul out prior to the early 1980's; however by 1988, 250 sea lions were reported from an aerial observation (Streveler 1989b). Opportunistic visual estimates from a boat by NPS staff from May to September 1993 were

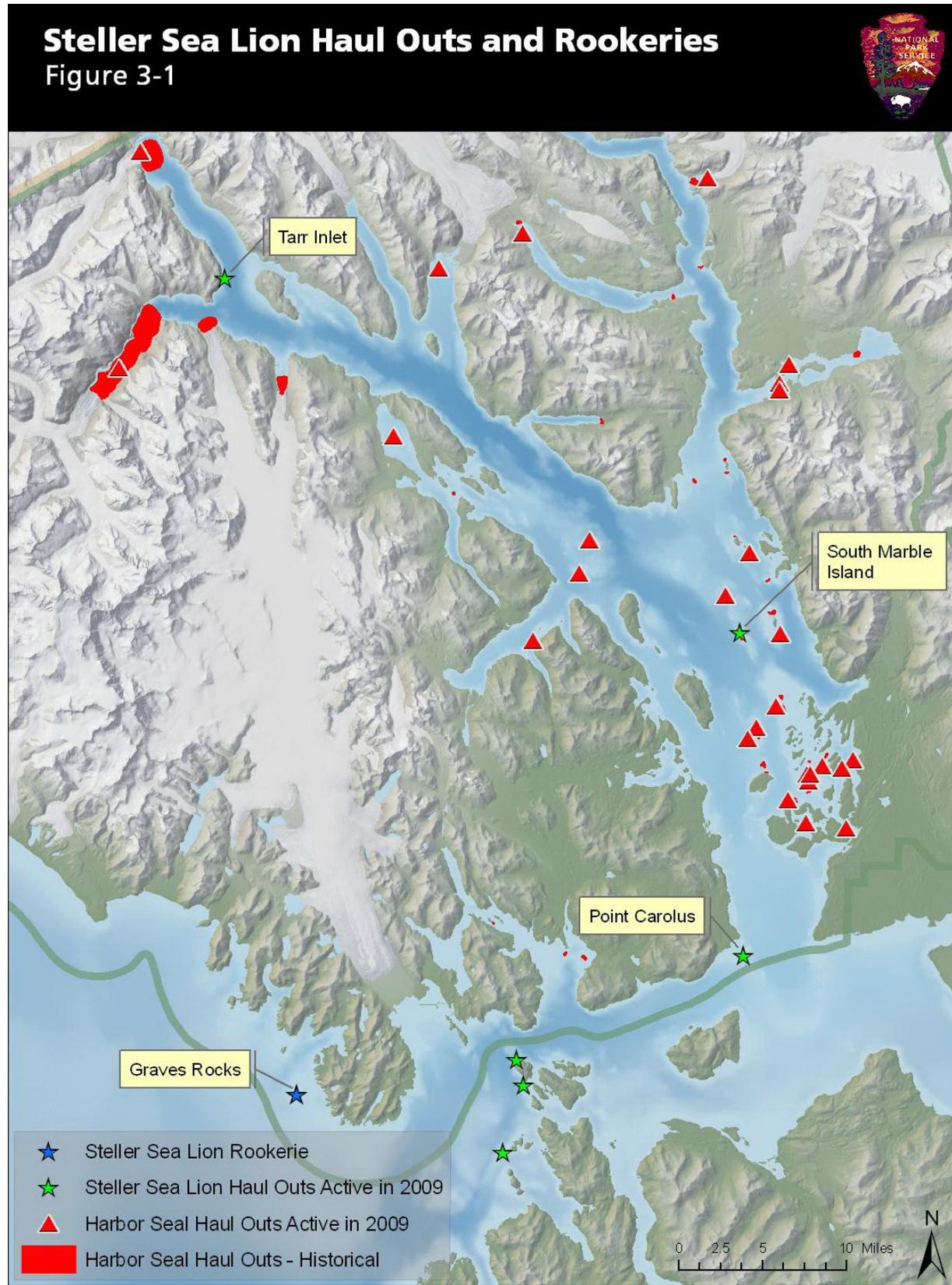


Figure 3-1. Steller sea lion and harbor seal haul outs in Glacier Bay National Park.

highly variable and ranged from 1-200 sea lions (Mathews 1993). In 1998, NPS staff observed high counts of 270 animals in July and more than 500 sea lions in August, compared to fewer than 100 animals in 1988 and 1989 (NPS unpubl. data).

Systematic monthly aerial surveys conducted from March 2001 to May 2004 indicate that South Marble Island is currently occupied year round by sea lions (Womble et al. 2009) with up to 791 sea lions documented at South Marble Island in October 2002 (Womble et al. 2005). The abundance of sea lions oscillates seasonally with peaks in abundance of sea lions occurring typically in spring and fall (Womble et al. 2009). Seasonal changes in the abundance of sea lions may be influenced by various factors including the presence of seasonal aggregations of energy-rich prey species, such as eulachon (*Thaleichthys pacificus*), herring (*Clupea pallasii*), and salmon (*Oncorhynchus* sp.) (Womble et al. 2005, Womble et al. 2006, Womble et al. 2009) as well as seasonal movements to rookeries located along the outer coast of southeastern Alaska.

Steller sea lions may travel great distances from rookeries (Raum-Suryan et al. 2002). Branded juveniles have been sighted up to 1,785 km from natal rookeries; however, pups (<1 year old) typically remain within 500 km of their natal rookery (Raum-Suryan et al. 2002). Sea lions from both the eastern and western U.S. stock have been observed in Glacier Bay at Graves Rocks and at South Marble Island (Jemison 2006, Gelatt et al. 2007). Sites in Glacier Bay have the greatest diversity of brands sighted compared to other areas and include individual sea lions from Marmot Island, Sugarloaf Island, and Seal Rocks from the western stock and sea lions from rookeries throughout southeastern Alaska, Rogue Reef (Oregon), and Shilshole Bay (Washington) from the eastern stock (Jemison 2006). More western-stock branded sea lions have been seen within Glacier Bay than in any other area in the eastern stock (Gelett et al. 2007).

Steller sea lions branded at rookeries in Southeast Alaska have been resighted in Glacier Bay. Pups from Forrester (Lowrie) Island have been observed at South Marble Island (Mathews 1996, Raum-Suryan 2001), a distance of more than 322 km. A juvenile female Steller sea lion branded as a pup in 2000 at Sugarloaf Island in the western stock was resighted at South Marble Island in 2001, a straight-line distance of 923 km. Sea lions branded outside of Southeast Alaska at Sugarloaf Island and Marmot Island (near Kodiak), Seal Rocks and Fish Island (near Prince William Sound), and St. George Reef in California have also been resighted at South Marble Island and Graves Rocks in Glacier Bay (ADF&G, unpubl. data).

Recent genetic evidence collected from sea lion pups at the Graves Rocks rookery in Glacier Bay suggests that the rookery was established in part by females from the western sea lion stock (Gelatt et al. 2007). The presence of these “western stock” haplotypes in newborn animals and the age of the rookeries suggest that Graves Rocks was founded by females from both the eastern and western stocks after the designation of the original population subdivisions which created the stock boundary. Furthermore, the number of pups observed at Graves Rocks has increased since they were first observed there in 1998 to 91 pups counted at Graves Rocks on July 11, 2005 and 155 pups counted on July 19, 2006 (Jemison 2006).

3.2.4 Harbor Seal (*Phoca vitulina richardsi*) Population

Population Status, Distribution and Demographics

Harbor seals range from Baja California; north along the western coasts of the U.S., British Columbia, and Southeast Alaska; west through the Gulf of Alaska and the Aleutian Islands; and in the Bering Sea north to Cape Newenham and the Pribilof Islands. Currently, harbor seals are delineated into three stocks in Alaska: the Southeast Alaska, Gulf of Alaska, and Bering Sea stocks (Angliss et al. 2001).

Large population declines have been observed for some areas in the Gulf of Alaska from the mid-1970 through the mid-1990s (Pitcher 1990, Frost et al. 1999); however, recent data from the 1990's show increasing trends in the number of seals but with counts still far less than in the 1970's (Jemison et al. 2006). Harbor seals at trend sites near Ketchikan and Sitka in southeastern Alaska have been stable or increasing (Small et al. 2003). The number of harbor seal increased by 5.6 percent per year from 1994-1998 at Ketchikan area trend sites. At Sitka area trend sites, the number remained stable from 1984-2001 (0.7%/year) and 1995-2001 (-0.4%/year) (Small et al. 2003). The trends near Ketchikan and Sitka are in contrast to trends in the number of harbor seals counted in Glacier Bay where the number of seals counted declined by up to 75 percent from 1992-2002 (Mathews and Pendleton 2006).

Harbor seals in Southeast Alaska are currently classified as a single management stock with a minimum population estimate of 35,226 (Angliss and Outlaw 2005). Genetic evidence from mitochondrial DNA suggests that the genetic structure of harbor seals may be structured at a finer resolution than expected (O'Corry-Crowe et al. 2003); however, Herreman et al. (2009) suggest wider patterns of male-biased dispersal and less genetic differentiation based on the analysis of microsatellite data from seals in Glacier Bay and Prince William Sound. The National Marine Fisheries Service and the Alaska Native community are currently evaluating genetic evidence with the goal of making a recommendation for harbor seal stock structure in Alaska (Angliss and Outlaw 2005).

Natural History

Harbor seals inhabit estuarine and coastal waters, hauling out on rocks, reefs, beaches, and glacial ice flows. Harbor seals may be non-migratory during the breeding season, but move locally with the tides, weather, season, and food availability, and to find suitable habitat for reproduction (Scheffer and Slipp 1944, Fisher 1952, Bigg 1969, Bigg 1981). However, recent studies from terrestrial sites indicate that both juvenile and adult harbor seals may travel significant distances during the non-breeding season (Small et al. 2005), whereas adults were found within 190 km of the tagging location in Prince William Sound (Lowry et al. 2001). The smaller home range used by adults in the Sound may be suggestive of a strong level of site fidelity (Pitcher and Calkins 1979, Pitcher and McAllister 1981, Lowry et al. 2001).

Preliminary data from seals tagged at a glacial ice site in Johns Hopkins Inlet in Glacier Bay suggests that juvenile and adult female seals ranged extensively throughout the inner and outer waters of northern southeastern Alaska and the eastern Gulf of Alaska during the post-breeding season (September to April) (J. Womble, pers. commun.).

Female harbor seals give birth to a single pup while hauled out on shore or on glacial ice flows. The mother and pup remain together until weaning occurs at three to six weeks (Bishop 1967, Bigg 1969). Seals also use haul outs to rest, suckle (Ronald and Thomson 1981), and molt (Feltz and Fay 1966, Thompson and Rothery 1987).

Glacier Bay Population

Glacier Bay National Park has historically supported one of the largest breeding populations of harbor seals in Alaska (Calambokidis et al. 1987). Up to two-thirds of the harbor seals counted in Glacier Bay seasonally use glacial ice calved from tidewater glaciers in John Hopkins Inlet (JHI) and Tarr Inlet in the upper West Arm and in McBride Inlet in the East Arm. In addition approximately 20 tidally influenced terrestrial resting areas are occupied by seals during the breeding and molting season (Figure 3-1).

The number of harbor seals in Glacier Bay declined from 1992 to 2002 (Mathews and Pendleton 2006). In 1992, 6,200 individual seals were counted on icebergs and terrestrial haul outs; however, only 2,550 seals were counted at the same sites in 2002. Adult and juvenile numbers in the glacial fjord declined by 6.6 percent per year (-39% over an 8-year period) in June and by 9.6 percent per year (-63% over an 11 year period) in August and at all other haul outs by 14.5 percent per year (-75% over a 10-year period) during August. In the glacial fjord the number of pups remained steady from 1994 to 1999, comprising an increasing proportion of seals counted (5.4%/year). The proportion of pups peaked at 34 to 36 percent (Mathews and Pendleton 2006).

The most recent data (1992-2008) indicate that the decline in the number of seals in Glacier Bay has not abated or reversed. Over the seventeen year period from 1992-2008, population trend estimates for the number of seals counted in Glacier Bay were negative both at terrestrial and glacial ice sites. Trend estimates for seals in JHI were similar to those of Mathews and Pendleton (2006) with one primary exception: pup counts in JHI in June had a significant negative trend (-5.1%/yr) for the 15-year period from 1994 to 2008. Long-term trend estimates for non-pups in June and August in JHI were also negative. In addition, long-term trend estimates (-12.4%/year) for seals at terrestrial sites were also similar to those reported by Mathews and Pendleton (2006) (Womble et al. in review).

Because little is known about the ecology, life history, movements, and behavior of harbor seals in Glacier Bay, it is difficult to discern the causal factors that may have contributed to the decline. In 2004, studies were initiated by the Alaska Department of Fish and Game (ADF&G) and the NPS to assess vital rates, genetics, body condition, contaminant load, movements, dive behavior, foraging ecology, and post-breeding season movement patterns of harbor seals in Glacier Bay National Park. Analyses are ongoing.

Predators of harbor seals in Glacier Bay include killer whales (*Orcinus orca*) (Calambokidis et al. 1987; Womble et al. 2007), Steller sea lions (Mathews and Pendleton 2006, J. Womble, pers. comm.) and possibly Pacific sleeper sharks (*Somniosus pacificus*) (Taggart et al. 2005).

3.3 HUMAN ENVIRONMENT

3.3.1 Wilderness Resources

Under the Alaska National Interest Lands Conservation Act (ANILCA), about 2,658,186 acres (1,075,730 hectares) of the park’s total of 3,283,168 acres (1,328,651 hectares) are congressionally designated as part of the National Wilderness Preservation System (Table 3-3).

The acreage totals in Table 3-3 differ from those listed in section 701 of ANILCA because more exact mapping techniques are now available and because isostatic rebound has increased land above mean high tide. These wilderness resources include most of the land in the park and five marine wilderness waterways: the Beardslee Islands, Dundas Bay, the Hugh Miller / Scidmore complex, Adams Inlet, and Rendu Inlet. Unless within designated wilderness waters, land below mean high tide is not designated wilderness. All of the potential gull egg harvest sites, including South Marble Island, lie within designated wilderness.

Table 3-3. Designations within Glacier Bay National Park and Preserve

Designation	Acres (hectares)	Percentage of Total
Land		
Wilderness land	2,610,548 (1,056,451)	97.7%
Non-wilderness preserve land	54,811 (22,181)	2%
Non-wilderness land	8,504 (3,441)	0.3%
Total Land Acreage	2,673,863 (1,082,073)	100%
Water		
Non-wilderness waters	559,418 (226,388)	92%
Wilderness waters	47,638 (19,278)	8%
Total Water Acreage	607,056 (245,666)	100%

Source: NPS 2002.

Note: Non-wilderness preserve land includes a large contiguous area south and west of Dry Bay, incorporating most of the preserve. Non-wilderness park land is located mostly at and near Bartlett Cove.

With its calving tidewater glaciers, temperate rainforest, plant diversity, and terrestrial and marine wildlife, including threatened and endangered species, the Glacier Bay wilderness encompasses a large, intact ecosystem with few lasting impacts from human intrusion. Although the Huna Tlingit lived in Glacier Bay for centuries and non-native trappers, miners, and fishermen lived and worked throughout the park, little evidence of human settlement or activity is visible to the typical visitor. Existing developments within wilderness areas are limited to severely deteriorated remains of indigenous and historic structures which are largely hidden from

public view. Although visitor use is largely confined to waterways and a narrow band of coastline, there is little evidence of litter or other recent human use (i.e., cut branches, campfires, etc.) (NPS files). Importantly, Glacier Bay wilderness provides unique opportunities for visitors to experience solitude and unconfined recreation in a largely pristine environment. With the exception of commercial and sport fishing effects, ecological processes proceed, for the most part, without interference from humans.

3.3.2 Ethnographic Resources: Huna Tlingit Gull Egg Harvest Practices

The Huna Tlingit

The Huna Tlingit are one of as many as 18 *kwaans* or “tribes” (contemporary Huna Tlingit prefer *kawoo* as their self-designation) of the Alaskan Tlingit language group or nation. The Huna are comprised of four major clans (the Chookaneidi, Kaagwaantaan, T’akdeintaan, and Wooshkeetaan) with original ties to Glacier Bay as well as members of other clans who married into the tribe (in particular, the Lux’nax.adi and Shangukeidi). Each of the four clans claim territory within or near present day Glacier Bay National Park with traditional village sites (now unoccupied) spread throughout the area. The village of Hoonah across Icy Strait from Glacier Bay is their primary permanent settlement.

The Huna Tlingit have occupied their traditional territory for thousands of years. The local archaeological record locates cultures dating to 10,230±800 BP near Point Couverden on the Tongass National Forest and a Northwest Coast cultural tradition by 1020±70 AD (Ackerman et al. 1979). Oral histories indicate that they occupied Glacier Bay before the last glacial advance of the Little Ice Age that ultimately expelled them from their homeland after A.D. 1700 (Thornton 1995, Monteith et al. 2007). However, following glacial retreat, the Huna Tlingit returned to the new landscape and were actively hunting, fishing and gathering in the area when the first European explorers arrived in the area in 1794 (Vancouver 1801, Menzies 1993).

Tlingit society underwent profound changes as a result of myriad pressures exerted by western society in the late 1800s and early 1900s. Within several decades of white settlement in the area, the combination of missionary efforts, the advent of canneries, and government policies requiring that youth attend territorial schools shifted the Huna Tlingit away from dispersed settlements and seasonal harvest rounds to increased aggregations (largely in the village of Hoonah), sedentarism, and reliance on the cash economy. Although the Native Allotment Act of 1906 allowed individuals to apply for 160-acre “homesteads” within their traditional territory, few have actually been conveyed into Native ownership. As a result, the Huna Tlingit were increasingly separated from many traditional harvest sites and alienated from much of their traditional territory.

Despite societal forces, many Tlingits were initially able to incorporate traditional ways of life into newly developing western economies. For example, the summer’s commercial fishing activities were dovetailed with traditional fishing, hunting, and gathering outings, and the transition to gas-powered boats facilitated access to more distant traditional harvest locations. Traditional harvest activities remain important today, not only as a means to supplement store bought food supplies, but more importantly as a means of perpetuating cultural traditions and

connecting with homeland.

The Community of Hoonah Today

The small community of Hoonah supports a population of approximately 860 people, 69% of whom are Alaska Native/American Indian (largely Tlingit) (U.S. Census Bureau 2000). Historically, the community supported itself through the commercial fishing and logging industries. However, in recent years, Hoonah has suffered an economic crisis resulting from changes in both of these economic sectors. In 2002, the single largest employer in the community, Whitestone Logging, ceased operation, leaving numerous families without steady income. Declines in the fishing industry have been particularly detrimental; a community that once supported 42 purse seine vessels (with crews averaging five to seven individuals) now sustains a single vessel.

Nutritional issues are of particular concern to the largely Native population of Hoonah. In particular, the Hoonah Medical Center fears that obesity and diabetes are reaching epidemic proportions. Many researchers attribute the decline in the health of Alaska Natives to changes from traditional diets to western diets heavily laden with sugars and unhealthy fats.

Although Hoonah residents historically relied heavily on locally abundant wild foods, a number of factors have reduced the communities' traditional food gathering practices. In the mid-1900s many cultural practices, including traditional food harvesting, were viewed as inappropriate or "backwards" by people struggling to convert to a money-based economy and were given up, neglected, and not passed down to younger generations. Hunting and trapping became illegal in much of the traditional homeland of the Huna Tlingit when Glacier Bay National Monument was established although early NPS administrators continued to allow some practices such as seal hunting. Other changes in hunting, fishing and gathering regulations have confused many residents and many have chosen to give up traditional food gathering in the face of apparent regulatory hurdles. Importantly, the demise of commercial fishing has deprived many families of their primary venue for food harvesting; historically, fishing families hunted and gathered while commercial fishing. These families often do not have the means (i.e., vessels or tools) to practice subsistence activities now that they no longer fish commercially. Logging and fishing industries once allowed community members to maintain contact with traditional life ways and provided opportunities for young people entering adulthood to work with, and learn from, their elders. These mechanisms for interaction between youth and adults are now lacking. Because the traditional intergenerational social structure of the Tlingit has been altered, youth no longer learn subsistence skills or cultural practices from their elders. They have few opportunities to practice traditional ways and no longer feel they have a meaningful role in supporting their community. Most importantly, activities which once provided healthful diets and an active lifestyle are not being passed down to children. Elders who once received traditional foods from their extended families are now forced to rely on western diets.

Significance of Traditional Food and Food Gathering Activities

The title of a recently re-released publication epitomizes the value afforded traditional food gathering, preparation, and consumption by the Tlingit; *Haa Atxaayi Haa Kusteeyix Sitee, Our*

Food is Our Tlingit Way of Life documents the many ways in which *atxaayi* practices (those related to food) define the Tlingit as people. The abundance of food in the coastal Pacific Northwest and southern Alaskan environments allowed the leisure time which facilitated social and political systems to develop and artistic and ritualistic practices to flourish. In essence, the wide array of abundant marine and terrestrial foods made the Tlingit who they are – a highly structured society with a well-developed political, social, artistic, and spiritual tradition. For the Tlingit, gathering traditional foods is much more than an economic activity, it is also a “moral and religious occupation” (de Laguna 1990: 209) and is one of the many ways in which Tlingit individuals maintain and reassert their Native identity (Newton and Moss 2005). Traditional foods are gathered and eaten not only to sustain the body, but also to sustain the culture itself.

The Tlingit relationship to food resources goes beyond the need to acquire and absorb nutrients. Tlingit individuals view themselves as an integral part of the ecosystem that also includes plants, animals, and natural processes. Failure to participate in a pre-determined relationship between hunter-gatherers and resources essentially unbalances what western ecologists call the food web. The Tlingit speak frequently of the negative consequences experienced when resources are not harvested. From a purely practical perspective, Tlingits believe that populations left “unchecked” may become overabundant, thereby negatively impacting other resources. For example, many Huna Tlingit fear that sea lions and sea otter populations which can no longer be hunted in Glacier Bay are decimating populations of fish and other marine species. From a spiritual and cultural frame of reference, many feel that refusing to accept the gifts such resources offer is insulting. Food resources are sentient beings, imbued with spirits and lives similar to those of humans; they understand human speech and only allow themselves to be caught if treated with respect. Many Tlingit place names reflect the special status held by plants and animals harvested there; these places are essentially “owned” by the species that inhabit them.

Numerous Tlingit myths detail the dire consequences that befell those who carelessly disrespected a food resource through ridicule or improper use. Death, famine, or catastrophic events have resulted from ridiculing or improperly handling fish or other foods (see Swanton 1909). Of note, the tragic events that forced the Huna clans to flee Glacier Bay were caused by the disrespectful way in which a young girl used a piece of dry fish to call down the glacier.

The Tlingit treated food resources with respect as fellow “beings,” but also recognized that the respect shown through effective conservation practices would ensure a continued supply of food into the future. Patchy resources of critical importance, such as salmon spawning areas and berry patches were owned by families who monitored such resources and controlled access to them. A number of key resources were cultivated by weeding (strawberries), fertilizing (berries), and transplanting (soapberries, salmon, deer, shellfish) (Thornton 1999; O. James, pers. comm.). The traditional practice of returning fish offal to streams long preceded modern ecologists’ awareness that the nutrients provided by salmon carcasses are vital to riparian ecosystems.

The quantitative contribution of a food resource to the Tlingit diet does not necessarily reflect its cultural significance to the Tlingit (Thornton 1999). For example, berries have profound spiritual and social significance for the Huna Tlingit although they form a relatively small portion of the Tlingit diet.

Tlingit participation in food gathering activities also embodies the traditional value of hard work, industry, ambition, and self-sufficiency. Individuals who harvest adequate resources to sustain themselves and their family through the year achieve special status in the community. Such status may be even more highly esteemed today as those individuals who continue traditional food harvesting practices do so in the face of ever increasing pressure to assimilate into western economies. Individuals in the community of Hoonah today with the skills and knowledge to harvest traditional foods are held in high regard by elders and young people alike. Individuals integrated into modern economies trade with these community hunters and gatherers to gain access to traditional foods.

For many hunting-gathering peoples, food species symbolically represent the particular places where they are harvested and harvest places are elements of a broader sacred landscape (Thornton 1999). Thornton (1999) notes that berries “were said to ‘hold’ or represent the landscape from whence they came; this symbolized Tlingits’ material, social and spiritual ties to the land that nurtured them.” de Laguna (1972:58) describes this attachment to place as a self reinforcing mechanism whereby individuals gather resources at locations they learned about from elders, become culturally and spiritually attached to these places, and in turn pass such knowledge and sentiment to their own children. Thus food resources gathered in the sacred landscape of Glacier Bay connect the Huna Tlingit to the ancestors who have also harvested there. Food harvested in Glacier Bay is also considered a delicacy – it simply tastes better than food harvested elsewhere (Moss 2006).

Perhaps most importantly, food holds a spiritual, ritual, and religious significance to the Tlingit as it plays a vital part in the *koo.eex* or potlatch even today. These special events incorporate traditional foods as offerings to ancestors through fire bowl ceremonies, in the highly ritualized portion of the ceremony when berries are distributed, in the gift giving portion of the party when jarred and preserved foods are portioned out, and throughout the event as multiple traditional meals are served to guests. The ceremonial importance of food at such events is evidenced in the manner in which it is presented in finely carved feast bowls and platters (Newton and Moss 2005). A recently deceased elder’s only wish concerning his memorial potlatch was that “the guests leave with full stomachs” (O. James, pers. comm.). The ability of a clan to feed their guests well and send them off with stores of traditional food also reinforced their place within the hierarchical structure of Tlingit society.

The Seasonal Round as Ritual

Hunting-gathering economies are characterized by a “seasonal round,” in which families move through a landscape in response to the maturation and movements of plant and animal resource species. Oberg (1973:65-78) dedicates an entire chapter to describing the Tlingit seasonal round of activities.

This process of moving through the landscape in an ordered way maintains Tlingit ties to the whole of their territory and to a process that – despite adaptations wrought by entrance into a western economy - has changed very little for millennia. Each phase in the seasonal round is linked to the phases before and after in a seamless fabric that binds the Huna Tlingit both to their homeland and to their ancestors. Seasonal harvest rounds are essentially a ritual enacted for

millennia which symbolically ties living individuals to their ancestors and future generations. Ritual actions go far beyond the physicality of the action itself, they literally transform the individual or individuals performing them through symbolic association – the Huna Tlingit gathering food becomes the ancestor who also gathered food. Thus, the ritual of participating in the whole of a seasonal round, moving through an ordered landscape in a proscribed manner, ties the Tlingit individual to the hundreds of ancestors who have moved through the cycle in just the same way.

This concept is embodied in the Tlingit phrase “*haa shagoon*” which ties ancestral souls to living and future generations of Huna Tlingit not only through reincarnation, but also through ritual actions including food gathering. *Shagoon* refers to a tribe’s origin or heritage (its ancestral past) as well as its destiny or fate. Austin Hammond referred to this concept as: “it is what we are now, what we have been since the beginning and everything that our children must become...” (Thornton 2004:370).

In Tlingit society, children (and occasionally adults) are given the name of an ancestor which often reflects some action or event memorialized in story or song. The ancestor’s soul is thus effectively transferred into the newly named individual who becomes the new “keeper” of the associated story or songs. Living individuals are thus “connected” to their ancestors through the child and the child’s actions. The social fabric of the ancient Glacier Bay landscape is kept alive in modern society and, if the culture remains vibrant, is projected in perpetuity into the future. For the chain to remain unbroken, however, current and future generations must know and understand the stories behind the ancestral names, and they must know the places to which the names and events are attached. Huna Tlingits believe that the best way for them to do this is to visit the sites and carry out meaningful activities that facilitate the transfer of traditional knowledge. Much of this information sharing occurs throughout the course of the yearly round of food gathering.

The essence of ritualized seasonal round is also captured in the names given to the “moons” or months of the Tlingit calendar. Names such as “Salmon Moon,” “Land Plant Budding Moon,” and “Digging (cockles and clams) Moon” each describe some aspect of a natural event that occurs during that period; most reflect a “cue” used by the Tlingit to prepare for, or gather, a resource available during that period.

History of Gull Egg Harvesting in Glacier Bay National Monument/ Park and Surrounding Areas

Presumably, gull egg harvest has occurred in and around the area now known as Glacier Bay National Park for as long as gulls have nested in the area although written documentation of harvest is not available until the mid-1900s and oral histories rarely clarify the years in which harvest occurred. It is likely that gulls moved into the newly created landscape of the lower Bay soon after deglaciation; the Marble islands were uncovered sometime in the mid-1800s, revealing open limestone rock, presumably suitable for nesting soon after.

Although numerous visitors to the area noted Tlingit presence in Glacier Bay in the late 1800s and early 1900s, few specifically noted egg harvest practices. Members of the 1899 Harriman

expedition were, however, treated to a meal of “gulls eggs, boiled marmot and seal” while in Dundas Bay (Goetzmann and Sloan 1982).

Following establishment of the monument in 1925, the NPS presence was nominal until the late 1930s; at that time NPS representatives on summer patrols described a Native culture involved in trapping, seal hunting, commercial fishing, prospecting, fishing, berry picking, and egg gathering (Traeger 1939, Been 1940). Throughout the 1940s, 1950s and early 1960s, NPS policy toward this traditional use was “to permit the Indians to continue to take hair seals and to collect gull eggs and berries as they have done in the past until a definite wildlife policy can be determined...” By 1965, however, the NPS began enforcing the Migratory Bird Treaty Act and related NPS policies which prohibited egg harvest. It is likely that the Native community of Hoonah was still uncertain as to the exact NPS policy regarding egg collecting as the activity continued at some level in the late 20th century. For example, Schroeder (1995) found that Huna Tlingit use, although diminished in intensity, continued throughout all areas of the park well into the 1980s.

The eventual enforcement of these laws and regulations strained relationships between Huna Tlingits and the NPS. Even authorized uses (including berry picking, seaweed harvest, personal use fishing) began to decrease as a result of tension between Huna Natives and the NPS as Huna Tlingits did not feel welcome in Glacier Bay.

It is likely that some level of illegal egg harvest continued within park boundaries into the early part of the 21st century. Likewise, harvest outside the park was facilitated when, in 2001, 2002, and 2003 the Hoonah Indian Association applied for and received a Special Purpose Permit from the U.S. Fish and Wildlife Service and Cultural Education Permits from the State of Alaska to collect gull eggs at Middle Pass Rock outside the boundaries of Glacier Bay National Park. The National Park Service provided logistical support to the Hoonah Indian Association in 2001, 2002, and 2003, providing vessel transportation to Middle Pass Rock and assisting with permit applications and reporting requirements. HIA tribal members harvested eggs in each of these three years although the island yielded fewer than 80 eggs on each trip (HIA files). Regulations promulgated by the U.S. Fish and Wildlife Service from 2004-2009 allowed for the harvest of glaucous-winged gull eggs by the permanent residents of Hoonah in Cross Sound and Icy Strait, but reiterated that harvest was not permitted within Glacier Bay National Park. Although no data is available regarding the level of harvest in these years, anecdotal evidence suggests that harvest was extremely limited due to difficulty in accessing the island in rough seas and the increase in the number of Steller sea lions utilizing the island as a haul out.

Cultural Significance of Gull Egg Harvesting

Within the larger context of the *atxaayi* life way, the collection and consumption of gull eggs holds significance for a variety of reasons. The harvesting of eggs signaled the start of a new year; provided opportunities for families to bond; served as a context in which Tlingit values, morals and ethics could be passed down to youth; tied the Huna Tlingit to their beloved homeland of Glacier Bay; and served as a unique element in the Huna tribes’ identity.

Spring Food, Diet Change and Seasonal Connectivity: The first spring harvests of gull eggs, herring eggs, seaweed, and fresh greens marked the transition from a season of confinement, scarcity, and reliance on stored foods to a season of activity, abundance, fresh foods, and good travel weather. The period from mid-May to mid-June was called ‘Going to Get Eggs Moon’ in the Huna Tlingit calendar, signifying the importance of this activity to all during the late spring.

After a long winter of dried foods, the Tlingit looked forward to a change in diet. As Henry Katasse noted (Newton and Moss 2005) “Seagull eggs provided a welcome change in diet and men were usually willing to travel quite a distance to get a supply of seagull eggs.” Respondents likened the spring egg harvest time to Easter and noted it was a joyous occasion for all in the family (Hunn et al. 2002). Gull eggs also have particularly high fat contents, important after a long winter of dried foods.

Family Bonding: Gull egg harvests also had special social significance as an activity that typically involved the whole family working together. It was a unique opportunity for children to learn from their parents, grandparents and extended family - in the context of an actual harvest activity - both practical and moral lessons with respect to how Tlingits should relate to their natural environment.

Such trips may have been the first opportunity Tlingit children had to experience the self-esteem that came from successfully gathering foodstuffs. Egg gathering was relatively safe and the probability of finding eggs was high; hence, it served as one means by which children too young to hunt or fish could actively and successfully engage in harvest practices.

Because gull eggs were typically shared upon return to the community, children were able to sense the responsibility of, and pride engendered by, providing for their families and the community as a whole. Perhaps because gull eggs are comparatively scarce, they continue to be shared widely and freely in the community today. Egg harvest is thus one means of inculcating the traditionally-held Tlingit value of sharing in children at an early age.

Transmitting Harvest, Moral and Cultural Lessons: Gull egg harvest trips provided an opportunity for intergenerational learning – not only about traditional harvest practices associated with the eggs themselves – but also about other Tlingit beliefs. Following the adoption of a western economy, Tlingit families spent much less time together than in previous eras. Families who once spent months together gathering and preserving foods are now divided by regular employment at canneries, months at sea during commercial fishing season, and a 9-month period of schooling. Thus, the spring egg harvest served as an ideal opportunity for the entire family to join in a communal activity and for elders to transmit stories and myths as well as practical information about harvesting techniques.

Under the close supervision of older relatives, young children were allowed to harvest gull eggs. Children were carefully instructed in harvest methods. In the course of these outings, children were taught the Tlingit perspective of the natural world. They learned that all things have a spirit and that respect is due all things in the natural world. In particular, young people were taught that their sacred homeland, Glacier Bay, should be treated respectfully. Importantly, the sheer cliffs, uneven terrain, and occasionally rough water at gull egg harvest sites may have provided a

real-world lesson regarding the need to harvest with care and walk carefully on the land during harvest activities.

Many consultants recalled that egg-gatherers performed private ceremonial acts before, during, and/or after the taking of gull eggs. Some said these rituals were ongoing throughout the gathering, while others indicated that they occurred at specific times. Two Huna elders said that before they took the eggs, people asked the gulls' permission and explained that they needed to use them.

Connection to Homeland: Most consultants in Hunn et al. (2002) emphasized that traveling to Glacier Bay to pick gull eggs was more than just a food gathering activity; it was a return to the ancestral homeland. People were happy and joyous, but for many there was a spiritual component to the trip. Returning to the land in which their ancestors lived and harvested is viewed as vital to the perpetuation of the Huna Tlingit identity and performing harvest activities in locations where ancestors harvested as well connects living tribal members to the past and future through *haa shagoon*. A young Huna woman described her first experience in Glacier Bay:

I felt it. I felt everything ... the spirits were so strong. I was just so alive. I just felt it through my whole body. My dad was born here. My dad told me stories. I couldn't tell anyone how I felt. It was just like a big shining light.

Another consultant (Hunn et al. 2002) speaks to the point that gathering gull eggs in Glacier Bay was more than just obtaining food.

And the difference between an egg inside Glacier Bay and an egg outside Glacier Bay is Glacier Bay is our traditional homeland. That's where our heart and soul is. That's what ties us to our land. Our food that comes out of there is directly responsible for our strength, our knowledge, our inner peace, as compared to anything that's outside of the traditional homeland is food.

A male elder enlarged on Glacier Bay's spiritual significance for the Tlingit:

Glacier Bay is [the] sacred ancestral homeland for us, the Huna Tlingit, who are a spiritual people. Every living being has a spirit including the flora and fauna. By the act of God we were pushed out of Glacier Bay due to the advancement of the glacier. And now we are not allowed to return because Glacier Bay was made a National Monument.

Another consultant explains why the Marble Islands and Glacier Bay are favorite places to gather eggs:

The reason is because it's the home country of the Huna Tlingit people ... spiritually and because we have a lot of stories that come out of Glacier Bay [that are] important to our people. And you know that the food that we gathered there is part of the spiritual part of the Bay. So going to Glacier Bay is more important than going out into the other areas like Inian Islands or in that area where we also get eggs.

Speaking especially about Glacier Bay's spiritual importance, a Huna matriarch says:

We were taught [that] the place where we get our food was always sacred, and the food we ate, everything had spirit in it that we respected.... Everything we got from up there was sacred because when people were living up there ... it was just like the Garden of Eden.... Everything they touch[ed] was beautiful. People were happy. That was the second thing to the Garden of Eden.

Referring to gathering food in Glacier Bay and Excursion Inlet, one consultant explains its significance in more cultural, as opposed to spiritual, terms:

And this is how we have come to love our country the way our fathers and uncles did. We also felt that we were part of somebody and somebody special when our families took us on these trips. We were taught this is who we are and that this is how it's going to be.

Gull Eggs Define the Huna Tlingit: Although Tlingit tribes throughout Southeast Alaska gathered much the same resources, each community had its specialties as well as specific means of preparing and storing foods. Even today, individual Tlingit communities are known for – and looked to for – resources that are limited or patchy in nature. The environs of Sitka are renowned for herring eggs, other Tlingit communities look to Haines for hooligan and hooligan oil, Kake is honored for its dog salmon harvest, and Hoonah is synonymous with gull eggs.

Hoonah's association with gull eggs is likely due to the fact that the many small islands dotting Glacier Bay's recently deglaciated lower reaches provide ideal nesting habitat for cliff and ground nesting birds which typically prefer rocky, barren or sparsely vegetated islands. Importantly, these islands were readily accessible to people living only miles away and the protected waters of the Bay made spring access comparatively safe.

The Huna Tlingits' association with sea gull eggs is likely strengthened through the T'akdeintaan clan's claim to the kittiwake, "sea pigeon," or "sea gull" as their crest. They derive this crest – with its associated story, emblem, and distinctive song or cry, from a kittiwake breeding area near Boussole Head called *Ghaanaxhaa*. Swanton (1909) recounts the story of a young Tlingit woman who briefly lived with the puffins and kittiwakes at *Ghannaxhaa*, but later returned to her family. Oral history describes how the kittiwakes at *Ghannaxhaa* greet visitors; each visitor is welcomed with a gull cry that resounds with his or her own name. Female members of the T'akdeintaan clan give the "seagull gal's" cry at potlatches and gatherings even today.

Gull Egg Harvest as an Ethnographic Resource

Park ethnographic resources are the cultural and natural features of a park that are significant to traditionally associated peoples – those whose interests in the park's resources began prior to the park's establishment. Hunn et al. (2002) clearly document that the traditional practice of gull egg harvest is significant to the Huna Tlingit whose relationship with Glacier Bay long predates establishment of the monument and park. The natural features of the park that support this practice – the evolving landscape which includes recently de-glaciated, sparsely vegetated islands suitable for nesting gulls – is embodied in the Tlingit place name *K'wát' Aaní* or "Land

of the Seagull Eggs.” This moniker was traditionally applied to the highly productive cluster of islands in the mid-Bay with South Marble Island at its center. However, the name is more appropriately understood conceptually as any land in which “seagulls” nest and eggs can be harvested; that is, any land that “belongs to the seagulls” and provides food for the people. It is likely that additional areas in Glacier Bay would have also been referred to as *K’wát’ Aaní* over time as gull distribution changed just as numerous locations throughout Huna territory are named *Gaatheeni* or Sockeye Creek. The way in which the Huna Tlingit interacted with gull eggs forms the basis for a cultural landscape that morphs over time as nesting colonies are established, become productive, and eventually senesce. This cultural landscape is given meaning – and maintained - through an ongoing relationship between the landscape and the Huna Tlingit’s perceptions, beliefs, stories, experiences and practices.

Harvest Strategy

Consultants in Hunn et al. (2002) described gull egg harvest strategies that they or their families had used in previous years. They outlined egg harvest sites, timing of egg harvest, number of eggs taken, and preparation methods.

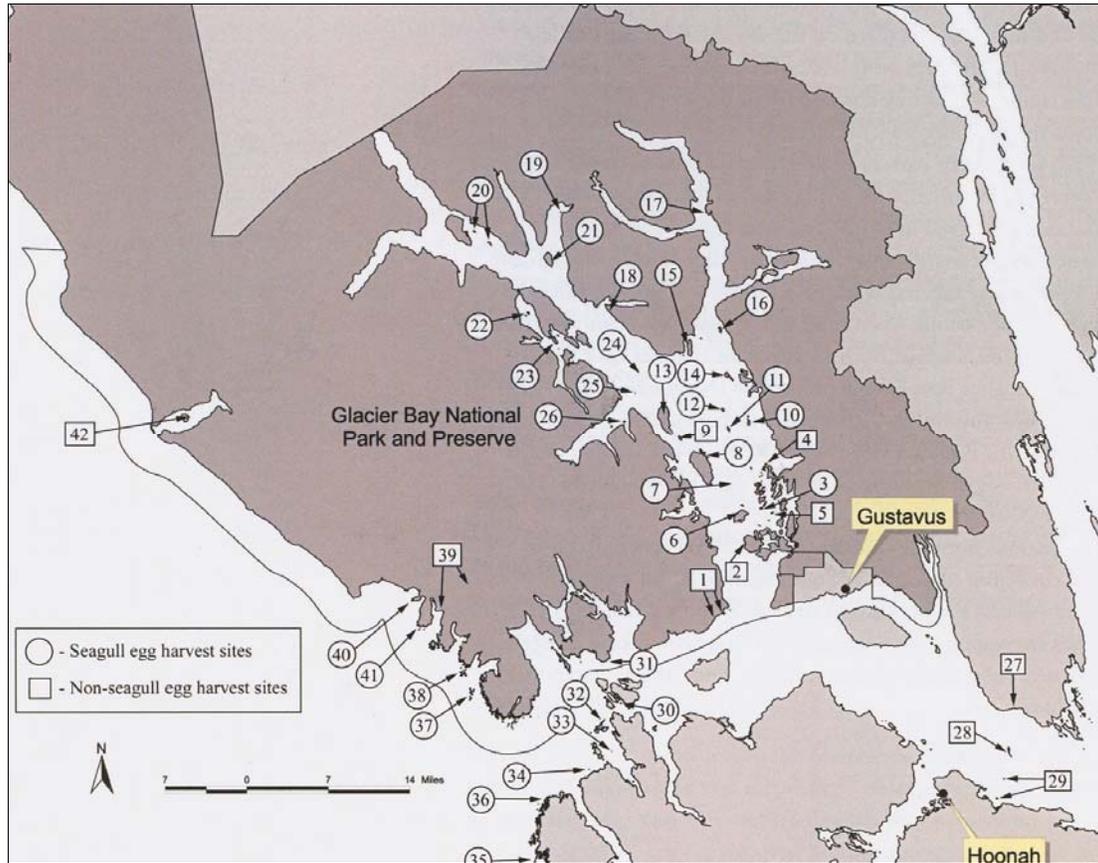
Ownership of Egg Sites: Although Glacier Bay as a whole was claimed by the Chookaneidi clan, members of other Huna clans were never excluded, nor were they required to obtain explicit permission from Chookaneidi leaders to harvest eggs there.

The right to harvest eggs in Glacier Bay appears to be essentially a “tribal” right with the possible exception of Boussole Head on the outer coast, an area claimed by the T’ak̄deintaan clan. This likely occurred because the gull egg resource in Glacier Bay (and particularly on South Marble Island) was viewed as sufficiently abundant to allow all Huna clans to harvest there. A similar situation occurs at Haenke Island in Yakutat Bay (see de Laguna 1972:395) where a single, concentrated, high-quality resource site located close to the village was used by all of the villagers. Certain other islands in Sitka Sound also served as a communal source of eggs for all clans dwelling in Sitka, even though the surrounding body of water was claimed by one clan (T. Thornton, pers. comm.).

When visitors (usually relatives) came from outside Huna Tlingit territory (e.g., Angoon, Juneau, Haines) to gather gull eggs, they first asked permission which was usually granted. They were most often accompanied by a Huna Tlingit, normally a relative, when they harvested the eggs. Tlingits from more distant villages fishing in the Glacier Bay area occasionally harvested eggs from within the park (O. James, pers. comm.).

Egg Gathering Sites: Consultants in Hunn et al. (2002) identified 31 sites where glaucous-winged gull eggs were harvested by the Huna Tlingit; 25 of these are within the boundaries of Glacier Bay National Park (Figure 3-2).

Site Selection: The Marble islands, and especially South Marble Island, were particularly popular for their accessible, abundant and early eggs. The overwhelming majority (70%) of egg harvesting sites identified by consultants in Hunn et al. (2002) like those identified in earlier



1	Point Carolus	15	Sebree Island	29	Pulizzi Island (Spasski Bay)
2	Young Island	16	Garforth Island	30	Middle Passage Rock
3	Beardslee Islands	17	Sealers Island	31	Greentop
4	Flapjack Island	18	Tidal Inlet (islands?)	32	George Islands
5	Goose Island (Eider Island)	19	Triangle Island	33	Table Rock
6	Strawberry Island	20	Russell Island rocks	34	Pt. Lucan Column Pt. rock
7	Boulder Island	21	Composite Island	35	Surge Bay rocks
8	Willoughby Island	22	Skidmore Bay Islands	36	Yakobi Rock
9	Francis Island	23	Hugh Miller Inlet islands	37	Graves Rocks: Egg Island
10	Leland Island	24	Lone Island	38	Libby Island, rocks inside
11	South Marble Island	25	Geikie Rock	39	Dixon Harbor: lake
12	North Marble Island	26	Shag Cove Rock	40	Boussole Arch
13	Drake Island	27	Grouse Fort	41	Astrolabe Pt.
14	Sturgess Island	28	Sister's Island	42	Cenotaph Island

Adapted from Hunn et al. 2002 with updated information from Arimitsu et al. 2007.

Active sites (in bold text) are those at which birds are documented as nesting in the previous 10 years. Historic sites (in regular text) are those which are no longer active

Figure 3-2. Egg harvest sites within Huna Tlingit traditional territory.

studies (Goldschmidt and Haas 1998; Schroeder and Kookesh 1990), lie within Glacier Bay National Park and especially within Glacier Bay proper (62%).

All consultants in Hunn et al. (2002) either remembered harvesting eggs on South Marble Island or, if they were too young to have participated, hearing stories about those harvests. Less than half of the consultants mentioned any other site, with Middle Passage Rock in the Inian Islands (outside of park boundaries) the next most frequently mentioned. There appear to be a variety of biological, logistical, and cultural reasons for why certain eggging sites are preferred over others. The most important of these factors are discussed below.

Site Productivity: Sites that consistently produced many eggs were preferred. Glacier Bay – in particular the Marble islands - is recognized as being highly productive in terms of egg numbers. One group estimated harvesting as many as 600 eggs from a trip to these locales around 1970 (Hunn et al. 2002). Many of the smaller islands in Glacier Bay, due to size, plant growth and other variables, were not as productive.

Site Accessibility and Safety: Egg harvesters considered proximity to Hoonah and sites of associated activities (e.g., fishing), shelter for landing and anchorage, and traditional and modern land rights when selecting harvest sites. Sites in the protected inner waters of Glacier Bay were preferred over those in exposed “outside” waters. South Marble Island, for example, is considered among the closest and safest egg-gathering sites. Informants frequently contrasted its easy access with that of sites on “the outside,” such as Middle Pass Rock in the Inian Islands which is subject to ocean swells. This latter location is not accessible by elders or young children.

Accessibility of Eggs: Although a particular site may have an abundance of eggs and be accessible from the water, the eggs themselves may be dispersed, obscured by overgrowth, or beyond reach on cliffs or precipices. Competition from other predators, including bears, mink, otters, eagles, ravens, and crows is also a consideration.

Quality of Eggs: Some consultants suggested that the quality of the eggs was influenced by the local habitat. For example, some Tlingits believe that gull eggs can be “polluted” by a “garbage” diet (Hunn et al. 2002). Glacier Bay eggs, as well as other foods harvested in Glacier Bay, are esteemed as rich and pure.

Attachment to Site: Other things aside, the Huna Tlingit simply prefer to hunt and gather in their traditional homeland – the landscape that their ancestors moved through and inhabit still today. The importance of place and attachment to place among the Tlingit in general and Huna Tlingit in particular has been explored in detail by Thornton (1995, 1997a, 1997b, 2000, 2002). This literature shows the power of place in individual and collective identity and how cultural constructions of place not only reflect human perceptions of, interactions with, and feelings towards specific landscapes but also influence them. The act of egg gathering and consumption is a symbolic connection to ancestors who sustained their bodies in the same way with identical food from this sacred place.

Timing of Egg Laying: Because bird eggs were among the first fruits of the year, and thus eagerly anticipated and craved, sites that yielded eggs early were favored. “Inside” sites (i.e., those in bays, etc. protected from the Pacific coast weather including Glacier Bay) consistently yielded eggs one to two weeks earlier than those on the outer coast. The Marble islands were said to be the earliest due to the “incubating” effects of the heat-retaining rock (Hunn et al. 2002). Egg harvest might also be tied in with other activities including commercial fishing, gathering low tide foods (such as clams, cockles, seaweed), and hunting.

Accessing the Site: Access to the South Marble Island gull colony itself was by way of shallow gullies leading up from the gentle southern shoreline just above a beach suitable for landing. Eggs were gathered from nests that were on flat or gently sloping areas. Care was taken to stay back from cliff edges, especially when children were present. Occasionally men used ropes or halibut lines to hang off the edges of cliffs to retrieve eggs that were otherwise inaccessible.

Rituals During Egg Harvest: Besides offering prayers, some people used the first egg they found to ritualistically aid them in finding more eggs.

Egg Harvesting Strategy: Harvest strategies were designed to maximize the number of fresh, undeveloped eggs collected as well as to ensure that gulls would relay. Although Hunn et al. (2002) reported that some Huna elders enjoyed eating eggs that had been incubated and contained developing chicks, the majority of consultants indicated that fresh eggs were preferred.

Most consultants who specified a gull egg harvest strategy noted that they had been taught that they should harvest eggs only from nests with one or two eggs present (24 of 39 consultants, 64%, see Table 3-4). The most common strategy reported by far was to collect only from nests with up to two eggs and to take them all (16 consultants, 41%).

Restrictions on Egg Gathering: None of the consultants in Hunn et al. (2002) described any limits being placed on the number of people that gathered eggs at a particular site or on the number of trips to a particular site in a given year. It is possible that informal communication within the Hoonah community limited the number of trips – or when trips would occur – within a given year. For example, if a party returned to Hoonah with eggs, it is likely that other harvesters would not visit that site right away. Likewise, information about the prevalence of eggs with developed embryos or the number of eggs in the nests at a particular colony may also have circulated throughout the community. Because eggs were shared, it is possible that only a few trips to a particular site were viewed as “necessary” to provide adequate eggs in the community.

Hunn et al. (2002) pose a number of other mechanisms by which the Huna Tlingit regulated egg harvest. First, the Tlingit were knowledgeable about gull reproductive biology and understood that relaying was limited. Second, most people preferred fresh eggs, that is, eggs that did not contain developing embryos. Third, and related to the first hypothesis, the Huna Tlingit recognized the narrow time-frame for easily gathering large numbers of fresh eggs and the importance of timing the harvest accordingly. Fourth, people were acutely aware of the fact that their harvest activities, if not conducted properly and “with respect,” could be destructive. Fifth, gull eggs, although symbolically important, were never a major portion of the Huna diet gathering. Huna egg gathering was valued more for its intangible benefits and rewards than its necessity as an individual or community food supply. Given the above circumstances and

Table 3-4. Egg harvest strategies used by the Huna Tlingit.

Strategy	Number	Percentage
Nests with 1 Egg		
Only take from nests with 1 egg	5	12.8
Nests with up to 2 Eggs		
Take all eggs from nests with 1 or 2 eggs	16 ^a	40.9
Take 1 egg from 1 or 2 egg nests	2	5.1
Take 1 egg from nests with 2 eggs (none from 1 egg nests)	2	5.1
Nests with up to 3 Eggs		
Take all eggs from nests with up to 3 eggs	2	5.1
Take 1 egg from nests with up to 3 eggs	2 ^b	5.1
Take all eggs from 1 or 2 egg nests, take 2 eggs from 3 egg nests	3 ^c	7.7
Take eggs from 2 or 3 egg nests, but always leave 1 egg	1	2.6
Take 2 eggs from 3 egg nests (none from 1 or 2 egg nests)	1 ^d	2.6
Nests with more than 3 Eggs		
Take all eggs from nests with up to 4 eggs	1	2.6
Take eggs from nests with 2 to 4 eggs, but always leave 1 egg	1	2.6
Take two eggs from nests with 4 or 5 eggs (none from 1, 2, or 3 egg nests)	1	2.6
Leave one egg		
	1	2.6
Throw out eggs / mark nests / return and take all eggs		
	1	2.6
Total specifying strategy	39	100.0

From Hunn et al. 2002.

^a One consultant indicated that later in the season all eggs were checked to see if they floated (i.e., had a chick developing).

^b Consultant indicated that eggs from nests with 2 or 3 eggs were checked to see if they floated.

^c Consultant indicated that eggs from nests with 3 eggs were checked to see if they floated.

^d Consultant indicated that all eggs were checked to see if they floated.

conditions, the number of individuals actually harvesting eggs at the Marble islands in any given year was probably limited. Not all families gathered eggs every year.

Distribution Among Community Members: Eggs were typically shared with relatives, especially elders. Individuals whose relatives did not gather eggs in a particular year usually still received eggs. Elders were given priority when eggs and other food was distributed. Eggs were apparently also traded to people outside the village for other products of nutritional importance.