CANDIDATE AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Brachyramphus brevirostris*

COMMON NAME: Kittlitz's murrelet

LEAD REGION: 7

INFORMATION CURRENT AS OF: September 2002

STATUS/ACTION (Check all that apply):
_x__ New candidate
___ Continuing candidate
___ Non-petitioned
__x_ Petitioned - Date petition received: __May 9, 2001_____
__ 90-day positive - FR date: _____
__ 12-month warranted but precluded - FR date: _____
__ Is the petition requesting a reclassification of a listed species?
___ Listing priority change
Former LP: ___
New LP: ___
Latest Date species first became a Candidate: _____
___ Candidate removal: Former LP: ___ (Check only one reason)
___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___ F - Range is no longer a U.S. territory.
___ M - Taxon mistakenly included in past notice of review.
___ N - Taxon may not meet the Act's definition of "species."
___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Alcidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:

CURRENT STATES/ COUNTIES (optional)/TERRITORIES/COUNTRIES OF OCCURRENCE: Alaska, Russian Far East

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LEAD FIELD OFFICE CONTACT: Ecological Services, Anchorage Field Office, Greg Balogh, (907) 271-2778

BIOLOGICAL INFORMATION:

Distribution. The Kittlitz's murrelet (*Brachyramphus brevirostris*) (Vigors) (AOU 1983) is a small diving seabird that inhabits Alaskan coastal waters discontinuously from Point Lay south to northern portions of Southeast Alaska (Fig. 1). It is an uncommon and secretive breeder; only about 2 dozen nest records exist (Day et al. 1999). All of the North American and most of the world population of Kittlitz's murrelets breed, molt, and winter in Alaska; a small proportion of the world population breeds in the Russian Far East from Okhotk Sea to Chukchi Sea (Day et al. 1999). Winter range of this species outside the Americas is largely unknown, but has been reported from Kamchatka Peninsula and the Kuril Islands (Flint et al 1984). See Day et al. (1999) for detailed account of distribution and nesting records.

During the breeding season, this species' distribution is highly clumped within the extent of its geographic range (Isleib and Kessel 1973), with habitat preferences resulting in birds congregating near tidewater glaciers, and to a lesser extent, offshore of remnant high-elevation glaciers and deglaciated coastal mountains (Figs. 1 and 2) (Day et al. 1999, Day and Nigro 1999).

The winter range of the Kittlitz's murrelet is not well known, but is probably pelagic (Day et al. 1999). There are records of occasional winter sightings in southeast and western Alaska, and locally common sightings in a few locations in Southcoastal Alaska (Kendall and Agler 1998, Day et al. 1999). Kittlitz's murrelets also occur during winter in the mid-shelf regions of the northern Gulf of Alaska (Day and Prichard 2001).

Demography. Age at first breeding is probably 2-4, interval between breeding is unknown. Lifespan and survivorship are also unknown (Day et al. 1999).

Habitat. General habitat associations for Kittlitz's murrelets are fairly well known for summer months, but specific breeding habitat requirements are less well known and additional investigation is needed. Available information indicates this species nests in unvegetated scree fields, coastal cliffs, barren ground, rock ledges, and talus above timberline in coastal mountains, generally in the vicinity of glaciers, cirques near glaciers, or recently glaciated areas, primarily from the Alaska Peninsula to Glacier Bay (Day et al. 1999, Day et al. 1983, Day 1995, Piatt et al. 1999).

During the breeding season, this species, when it occurs within the range of tidewater glaciers, is associated with waters containing icebergs and brash ice, but avoids areas that contain heavy ice cover (Day et al. 1999, Day and Nigro 1999). In four bays of Prince William Sound, Day et al. (2000) found that Kittlitz's murrelets preferred shoreline segments with ice cover of 0.5 - 15% and avoided segments with no ice or with more than 50% ice cover. Elsewhere, Kittlitz's murrelets can be found along coasts where waters are influenced by glacial outwash, such as the Malaspina Forelands, where the Malaspina glacial runoff seeps across miles of exposed coast (Kozie 1993). In general, this species is more highly associated with glacially-influenced waters than the closely related, but genetically very distinct (Pacheco et al. 2002) *Brachyramphus* species, the marbled murrelet (*B. marmoratus*) (Day et al 1999).

During the breeding-season, Kittlitz's murrelets appear to favor waters >200m from shore.

Surveys of both shoreline (within 200 m of shore) and offshore (> 200 m from shore) waters, show higher densities of Kittlitz's murrelets offshore. An early report from Glacier Bay (Walker 1922, cited in Kendall and Agler 1998) noted that Kittlitz's murrelets were found in the "tide rips" near the middle of the bay. In June of 1999 and 2000, the density of Kittlitz's murrelets in Glacier Bay was 60% higher in waters greater than 200 m from shore, relative to shoreline transects (Piatt, unpubl. data). Similarly, in Prince William Sound (Kuletz, USFWS, unpubl. data) and in Icy Bay (Kissling and Kuletz, USFWS, unpubl. data), densities were two to three times higher in mid-bay waters than within 200 m of shore.

During the non-breeding season, the marine distribution of Kittlitz's murrelets is farther offshore. In the northern Gulf of Alaska (GOA) during winter and spring, Kittlitz's murrelets prefer the Alaska Coastal Current and mid-shelf regions, and avoid the shelf-break front and Alaska Stream (Day and Prichard 2001). In these offshore regions of the GOA, Kittlitz's murrelets were most abundant in March and April, but were always relatively rare, with mean densities of 0.01 - 0.2 birds/km^2 (Day and Prichard 2001). In winter, few Kittlitz's murrelets occur in the protected waters of Prince William Sound, Kenai Fjords, Kachemak Bay, and Sitka Sound (Kendall and Agler 1998, Day et al. 1999).

Diet. −Our knowledge of the diet of Kittlitz's murrelets is based on few samples, with little information on regional or seasonal variability. Prey consists of fish (Pacific sand lance (*Ammodytes hexapterus)*, Pacific herring (*Clupea pallasi*), capelin (*Mallotus villosus*) Pacific sandfish (*Trichodon trichodon*)), euphasiids, amphipods and small crustacea (Sanger 1987, Vermeer et al. 1987, Day et al. 1999). Stomach analyses suggest regional differences in the proportions of fish and invertebrates in the diet of Kittlitz's murrelets, but there has been insufficient sampling in winter to determine if there are seasonal changes as well (Day et al. 1999).

Current population estimates. − Precise and accurate population estimates for this species do not exist in most areas of its range. At three important summer population centers for Kittlitz's murrelets, (Lower Cook Inlet, Prince William Sound, and Southeast Alaska), population estimates were obtained via marine surveys conducted between 1993 and 2000 (Kendall and Agler 1998, Stephensen et al. 2001) (Table 1). These surveys covered shoreline and offshore waters using shoreline and offshore strata, with random selection of transects and standard U.S. Fish and Wildlife Service (Service) Seabird survey protocol (Klosiewski and Laing 1994). Additionally, Yakutat Bay/Russell fjord waters were surveyed in 2000 using Service protocol, but with continuous shoreline counts and systematically placed offshore transects (Stephensen and Andres 2001). The combined population estimate resulting from these four surveys was 10,776 $\pm$ 7,372 (Table 1). The random selection of transects over the larger geographic areas used for general seabird surveys was ill-suited for deriving precise estimates for an uncommon bird with clumped distribution, such as the Kittlitz's murrelet, hence the wide confidence intervals around the point estimate.

Table 1. Recent statistically valid population estimates for Kittlitz's murrelets in Alaska.

Area	Population estimate N ± 95% CI	Year(s) of survey	Source or responsible agency
Glacier Bay, Southeast AK	2,265 ± 916	1999-2000	Robards et al. 2002; USGS
Yakutat Bay	927 ± 233	2000	Stephenson and Anders 2001; MBM/USFWS
Russell/Nunatak Fjords	55 ± 43	2000	Stephenson and Anders 2001; MBM/USFWS
Malaspina Forelands	1,058 ± 1100	2002	SEES/USFWS, unpubl. data
Icy Bay, Southcentral AK	2,212 ± 721	2002	SEES/USFWS, unpubl. data
Prince William Sound	2,290 ± 1258	2001	MBM/USFWS, unpubl. data
All of Southeast Alaska Including Glacier Bay[1]	5,408 ± 7,039	1994	Kendall and Agler 1995; MBM/USFWS
Lower Cook Inlet[1]	3,353 ± 1,718	1993	Kendall and Agler 1995; MBM/USFWS

[1] Less recent estimates for important population centers

In July 2002, two additional areas were targeted for surveys, based on previous reports of aggregations of Kittlitz's murrelets. In Icy Bay, about 80 km northwest of Yakutat Bay, a Service crew (following standard survey protocols) conducted continuous shoreline and systematic offshore transects, and estimated 2,212 ± 721 Kittlitz's murrelets (Kissling and Kuletz, USFWS, unpubl. data). The high density and dispersed distribution of the birds within Icy Bay contributed to the (for this species) unusually narrow confidence intervals. The waters along the Malaspina Forelands were also surveyed, including up to 5 km offshore of Manby Pt. Preliminary analysis suggests up to 1000 Kittlitz's murrelets may occur in this area (USFWS, unpubl. data). Further refinement of this estimate is expected by early 2003.

Large numbers of Kittlitz's murrelets (1,000-5,000) observed by G. Divokey along the Lisburne Peninsula during the early 70's (Day et al. 1999, John Piatt, USGS, Alaska, pers. comm. 2002) suggest that notable numbers of birds occurred in the Chukchi Sea at that time. However, because these birds were observed along the ice edge during late summer and fall, it is unclear whether birds observed along the Lisburne Peninsula bred there or gathered there during the post-breeding season (John Piatt, USGS, pers. comm. 2002). Scientists have not surveyed this area since the 1970's. Sampling methods used, and ice conditions present, during this early 70's observation prevent us from deriving a population estimate for that area based on these data.

In addition to the population estimates above, approximately 700 birds have been counted at other sites between 1977 - 1994, primarily along the Kenai Fjords (Tetreau, National Park USFWS, unpubl. data), Aleutian Islands (Balch, Attours, Inc., Anchorage, Alaska, pers. comm., V. Byrd, Alaska Maritime National Wildlife Refuge, Homer, Alaska, pers. comm., Meehan 1996) and Bering Strait (Piatt et al. 1992). Based on these counts and 'best-guess' estimates compiled from

wildlife biologists familiar with areas used by Kittlitz's murrelets, van Vliet (1993) suggested that there may potentially be an additional 5,000 birds along the Kenai Fjords, Alaska Peninsula, Kodiak, Aleutian Islands, western Alaska and the Chukchi Sea.

If we take the lowest and highest estimates for each area randomly or systematically surveyed throughout the main arc of Kittlitz's murrelet distribution (Cook Inlet to Southeast Alaska), and add the potential for 5,000 birds in other areas (van Vliet 1993), the current Alaska Kittlitz's murrelet population could be anywhere between about 9,000 and 25,000 birds. Unfortunately, the statistically valid and anecdotal estimates used in developing this total population estimate were often taken from information obtained prior to apparent recent declines in Kittlitz's murrelet populations. This is especially true for the more remote portions of the species range. Thus we consider this crude population estimate to be somewhat speculative and dated, with the upper bound of the estimate almost certainly overestimating the current population. For the main population center (Cook Inlet to Southeast Alaska), we note that there is a statistically valid and relatively recent point estimate of about 14,000 Kittlitz's murrelets (Table 1), at least half of which are in Glacier Bay, Icy Bay, and Prince William Sound.

Primary population centers. In Glacier Bay, U.S. Geological Survey (USGS) surveys in 1999 and 2000 yielded a population estimate of 2,265 $\pm$ 916 Kittlitz's murrelets. The 2001 survey of Prince William Sound resulted in an estimate of 2,290 $\pm$ 1,258 birds (Kuletz, USFWS, unpubl. data). We note that confidence intervals for both sites are fairly large. Nevertheless, the magnitude of the point estimates in Prince William Sound and Glacier Bay highlight the importance of these two water bodies to the Kittlitz's murrelet population in North America (i.e. a large proportion of the world's Kittlitz's murrelets are in these two places). The 2002 survey of the Malaspina Forelands and Icy Bay indicates that this heavily glacially-influenced area is equally important to the Alaska and world Kittlitz's murrelet population. Population estimates from a July 2002 survey of the Kenai Fjords are not yet available, but preliminary examination of the data did not indicate large numbers of Kittlitz's murrelets. Another notable population center, lower Cook Inlet, has not been systematically surveyed since 1993. Data from pelagic surveys conducted in the 1970's and early 1980's suggest notable numbers of birds around the Lisburne Peninsula, Kodiak Island and Cold Bay. The Lisburne peninsula has not been surveyed since that time, and no meaningful population estimate can be derived from the data that we have. Recent surveys around Kodiak Island indicate that Kittlitz's murrelets do not use the waters around that island to any great extent. Whether the original assertion that Kittlitz's murrelets concentrated there represents a case of mistaken identity, or is documenting an instance of near extirpation is unknown. Observations of notable numbers of Kittlitz's murrelets continue to be made in the Cold Bay area, but data that would allow us to derive an estimate of birds using the area do not exist.

Estimating population size for a clumped species. In Prince William Sound, two surveys have been conducted specifically for Kittlitz's murrelets, and both of these compare relatively well to the Service general seabird survey. Between 1996 and 1998, Day and Nigro (1999) conducted summer surveys of the entire shoreline and portions of the offshore waters of four fjords known to harbor a large portion of the Kittlitz's murrelets in Prince William Sound. Using their highest counts for each site, they estimated 1,275 $\pm$ 1,100 Kittlitz's murrelets in these bays. A 2001 survey by Service found that about 85% of the Kittlitz's murrelets in the Sound were in these

four fjords, which we believe helps to explain why Day's survey of just four bays closely approximates the estimates from the Service general seabird surveys between 1996 and 2000 (see Appendix, Table 2). The 2001 Service survey dedicated to deriving a Kittlitz's murrelet population estimate targeted 17 bays with previous records of Kittlitz's murrelets or with suitable marine habitat, using continuous shoreline and systematically spaced offshore transects within each bay. From this survey, the Service estimated 2,290 $\pm$ 1,258 birds, primarily in the northwestern portion of the Sound (Kuletz, USFWS, unpubl. data). As might be expected with an intensive survey targeting Kittlitz's murrelets, the point estimate is higher, but also overlaps the estimate from the 2000 Service general seabird survey (1,033 $\pm$ 1,339; Stephensen et al. 2001).

The Service's general seabird survey has been criticized as a tool for estimating abundance and monitoring population trends for the clumped and relatively rare Kittlitz's murrelets. This is a valid concern. Our general seabird survey is most appropriate for obtaining population estimates for species that are common and widespread (e.g. marbled murrelets). Wide confidence limits can hinder the ability of a survey to detect a trend. Nonetheless, the stratified, random selection of transects provides an unbiased, though imprecise, estimate of the Kittlitz's murrelet population. Further, the same sampling design, protocol, and platforms used in Prince William Sound have been consistent since 1989. Under these conditions, trends derived from the estimates, however imprecise, are valid and relevant. The ability of this survey design to detect a trend in the murrelet population depends on the time frame, the number of survey years, and how extreme the trend is over time (Caughley 1977; B. Manly, West, Inc., pers. comm.; M. Udevitz, USFWS, Anchorage, Alaska, pers. comm.). We recognize the need to exercise caution in deriving conclusions based on these general seabird surveys. Further, we have exercised caution in comparing population estimates and trends obtained from surveys using different study designs or protocol.

The largest drawback of using the Service survey as a population estimator or index actually has less to do with its design and more to do with the relative levels of experience of the surveyors. Observers were instructed to record murrelets as 'unidentified *Brachyramphus'* if they were not certain of species identification. Thus, over time, as observers changed, the proportion of unidentified *Brachyramphus* murrelets in the sample changed markedly, because some observers were much better at discerning between marbled and Kittlitz's murrelets than others. The changing proportion of unknown murrelets relative to the proportion of Kittlitz's murrelets in the sample makes population estimation from these data problematic. We were able, however, to incorporate unidentified *Brachyramphus* murrelets into our analysis of population trends by using a model developed for this situation (see *Trends*, below).

It is possible that the general seabird surveys may under-report the abundance of Kittlitz's murrelets for two reasons. First, identification of murrelets to species is a problem for many observers, and can introduce bias into population estimates. We believe that we have successfully accounted for this sampling problem in a model developed specifically to address this situation (see *Trends*, below). A second factor that may result in under-reporting Kittlitz's murrelets results from survey boats being prevented by heavy ice from approaching close enough to observe Kittlitz's murrelets near the faces of tidewater glaciers. Service survey boats are sometimes precluded from approaching tidewater glacier faces because of heavy ice, but the 25

ft. Boston whalers that we used for most of our surveys were more mobile than larger vessels in the ice, and were able to maneuver through ice of at least 50% coverage. Our surveys are conducted in July, when ice conditions are less severe at the heads of fjords. In 2001, survey crews made concerted attempts to get into any open water beyond floating ice, and often ventured into ice of up to 80% coverage. However, few Kittlitz's murrelets were observed in these areas (Kuletz unpubl. data), and they are not often found in waters with ice cover greater than 50% (Day and Nigro 2001, Day et al. 2000). Day et al. (2000) also concluded that even open waters near glacier faces that are hemmed in by heavy ice were rarely occupied by Kittlitz's murrelets. Thus, although preclusion of our survey vessels from important Kittlitz's murrelet areas by ice has been suggested as a problem, we do not believe that floating ice has notably affected our overall population estimates.

The raw survey data used in these population estimates are not presented in this assessment. Survey methodologies and levels of effort varied greatly, and raw numbers should be examined in the context of effort. We believe presentation of population and density estimates with estimates of variance or confidence limits is the most effective means of conveying the available information for the purposes of this candidate assessment. Raw data from each survey will be presented in a future determination concerning whether listing is warranted.

Population trends. – The most extensive data on Kittlitz's murrelet population trends exists for Prince William Sound and Glacier Bay, and to a lesser extent, the Malaspina Forelands and the Kenai Fjords. Whether we can consider population trends from these locations to be indicative of population trends for the species elsewhere is uncertain. If factors unique to Prince William Sound, Glacier Bay, and Kenai Fjords are driving those populations down (e.g., boat traffic and other forms of human disturbance) then we may expect population decline to be limited to those locations. However, if the factors that are driving down populations of this bird are of a global nature (i.e., glacial retreat; possibly as a consequence of global warming), then we would expect to see population declines throughout the species range as its habitat degrades. Negative population trends observed in areas such as the Malaspina forelands that are relatively free of human disturbance lead us to believe that the populations may be driven downwards more by climatological and geological phenomena than by anthropogenic factors. Nevertheless, human activities may be exacerbating the declines within portions of the species range.

<u>Considerations in Population Trend Data Analysis</u>

Prince William Sound. – Following the*Exxon Valdez* oil spill, seabird populations in Prince William Sound were surveyed in March and July using a design based on randomly selected transects in two strata; shoreline segments (within 200 m of shore) and offshore blocks. The same transects were surveyed in 7 of the last 14 years, and population estimates were derived using a ratio estimator (Cochran 1977; details in Klosiewski and Laing 1994 and Stephensen et al. 2001). We examined the trend in the Prince William Sound population two ways. First, we used population estimates based solely upon positively identified Kittlitz's murrelets. The annual estimates and their standard errors were then log-transformed and the slope of the change over time was tested for significant deviation from zero, at alpha 0.1. Second, we used the population estimates and error rates to model the population trend for both Kittlitz's and marbled murrelets with an iterative process that allowed the inclusion of the unidentified *Brachyramphus* murrelets in the analysis (see Appendix for details).

Glacier Bay. – Seabird surveys conducted in Glacier Bay during 1991 (Piatt and Springer, unpubl. data) were used to compare with the 1999 and 2000 Glacier Bay surveys. We examined the trend in Kittlitz's murrelet density (birds/km^2) in nearshore waters only (< 200 m from shore), because the 1991 surveys did not include enough pelagic transects to derive population estimates for comparison to later years. Such a comparison assumes that: 1) survey techniques are comparable through time; 2) observer experience is comparable between years; and 3) murrelets did not become more or less pelagic in their habitat preferences during the intervening decade. In making our comparisons using data from Glacier Bay, we took care to compare data only from portions of surveys that were comparable. While we believe that assumption 2 is valid for this particular survey, we have no information to suggest whether assumption 3 is also valid. Some believe that Kittlitz's murrelets have indeed become more pelagic in recent years, but we are unaware of data supporting or refuting this assumption. In our analysis, we assumed no change in habitat preferences over the intervening decade.

For Glacier Bay, we presented the observed densities of murrelets, which we also standardized to the maximum density, transformed using natural logarithms, and tested the slope for deviation from zero. We also used the densities to examine the population trend with the unidentified murrelets incorporated into the densities, using the model in the Appendix.

Malaspina Forelands. – This site is unique in that the survey area is a single 80 km stretch of very exposed coastal waters, with the vessel traveling 1 to 1.5 km offshore, due to a large shallow shelf that stretches out from the coast abutting the massive Malaspina glacier. In July 1992, the Service surveyed for murrelets using standard protocol while traveling between Yakutat and Icy Bay, and recorded high numbers of both species of murrelets (Kozie 1993). The Service repeated the survey in July 2002. Two observers counted birds from both sides of the 20 m vessel. The survey line was run on each of 2 days, as was done in 1992 (note: on one day, technical problems resulted in data loss from one observer; on this day we applied the proportion of murrelets observed from the one technically operational observer to both sides). We present the total numbers of birds, and the log-transferred numbers to examine change over time.

Kenai Fjords. –Seabird surveys were conducted in the Kenai Fjords National Park and adjacent coastline by the Service and U.S. National Park Service in July of 1976, 1986, 1989, 1990, and 2002. Surveys were conducted in nearshore waters only, with the shoreline divided into segments in 1986 and in subsequent survey years. In 1989, only 25% of the shoreline segments were randomly selected for survey. Those segments were surveyed again in 2002. Thus, counts can be compared for the entire shoreline for 1976, 1986, and 1990. To incorporate 2002 data, we conducted an analysis that considered birds present on the 36 shoreline segments surveyed during that year that were also surveyed during 1986, 1989, 1990, and 2002. Counts of murrelets were transformed using natural logarithms, and graphed to determine the trend.

Results of Population Trend Data Analysis

Prince William Sound. – For Prince William Sound, survey results using the population estimates for identified Kittlitz's murrelets (Fig. 3A) show a population decline of about 18% per year, from 6,436 $\pm$ 3,151 birds in 1989 to 1,033 $\pm$ 1,339 birds in 2000 (Fig. 3B); an 84% decline in the

point estimate over 11 years. Even with the large half width of the confidence intervals, the slope of the trend from 1989 to 2000 (slope = -0.1995, SE of slope = 0.0714) is significantly different from zero (T-test = -2.79, p = 0.038). If this decline is linear and remains constant, the log number of birds crosses 0 (or 1 bird) at 2032, predicting extirpation of Kittlitz's murrelets in Prince William Sound in approximately 30 years (Fig. 3C).

A cautionary approach is advised when one compares estimates from surveys of notably different survey designs. Such is the case when comparing Kittlitz's murrelet estimates derived from a July, 1972, Service survey of Prince William Sound (single stage random selection of townships in which complete counts of birds were made along shorelines and within bays) to estimates made subsequent to that date using a notably different sampling design (Klosiewski and Laing 1994). This 1972 survey resulted in a Kittlitz's murrelet population estimate of 63,229 $\pm$ 80,122 (Klosiewski and Laing 1994). Because the methodology used in this study was different from subsequent surveys, direct comparison of the data was impossible. However, the magnitude of the change in the point estimate certainly suggests a decline in Kittlitz's murrelets since 1972. Within the Kittlitz's murrelet scientific community, there are differences of opinion as to the statistical validity of this 1972 estimate. Nevertheless, both the 1972 and the post-1989 surveys were designed around randomly selected sample units, with similar survey protocol, and both produced statistically valid estimates. It is intriguing that the1972 point estimate fits so well with the linear regression line derived from the1989-2000 data (Fig. 3C), suggesting that a substantial decline may have been underway for this species for at least the past 30 years. We note that, while the 1972 data supports the premise of a long-term decline in this species, our basis for concern over the welfare of this species does not rely upon this 1972 data set.

Incorporating Unidentified Murrelets into our Population Analysis for Prince William Sound.- In Prince William Sound, the model that accounts for unidentified murrelets yielded predicted populations that fit well with the actual population estimates (Appendix, Figs.1- 4). The first run of the model (for July estimates from 1972-2001), indicated a Kittlitz's murrelet decline of 18% per year, and a predicted Prince William Sound population of less than 2 birds by 2025 (Appendix, Table 9). Because the 1972 population estimate and its standard error were unusually large, and because the number of unidentified birds was unusually large in 1993, these more problematic data were omitted in two subsequent runs of the model. Whether we exclude only 1972 (Appendix, Fig. 3), or both 1972 and 1993 data (Appendix, Fig. 4), trends were similar; in both cases, the annual rate of decline was approximately 31%, with a predicted population of less than 2 birds by 2012. In other words, incorporating the unidentified murrelets, or omitting the problematic 1972 data, actually increased the predicted rate of decline and resulted in an earlier date of predicted extirpation.

Glacier Bay.

A comparison of density estimates derived from Glacier Bay shoreline transects surveyed in 1991, and comparable surveys run in 1999 and 2000, indicate that Kittlitz's murrelets have undergone a statistically significant decline (Table 2) (Robards et al. 2002). Interestingly, Kittlitz's and marbled murrelets were the only seabird species to have undergone significant declines in Glacier Bay during the past decade. Gulls (black-legged kittiwakes, glaucous-winged gulls, and mew gulls), arctic terns and pelagic cormorants all increased in density while Pigeon Guillemot densities were stable (Robards et al. 2002, Gary Drew, USGS, Anchorage, Alaska,

pers. Comm. 2002).

We note that one of the assumptions necessary to make the Glacier Bay survey a good population index may have been violated; specifically, that of comparable observer experience. The proportion of murrelets that were recorded as unidentified murrelets in this survey was not comparable across years (33% in 1991, 36% in 1999, and 61% in 2000) (Table 2). However, this issue is addressed by the model in the Appendix. The densities predicted from the model for Glacier Bay fit well with observed densities, both of which show a steep decline between 1991 and 1999-2000 (Appendix, Fig. 5). The model predicted a decline of the Glacier Bay population to less than 1% of the 2000 density by about 2026, and less than 0.1% of the 2000 density by 2039. Thus, while the Glacier Bay population of Kittlitz=s murrelets may have a slower rate of decline than that exhibited by the Prince William Sound population, it also faces local extirpation if recent trends continue.

Malaspina Forelands

Counts of murrelets along the Forelands showed a reversal in the relative proportion of Kittlitz's to marbled murrelets; in 1992, 59% of identified murrelets were Kittlitz's murrelets, whereas in 2002, only 18% were Kittlitz's murrelets. Between 1992 and 2002, there was a 75% decline in identified Kittlitz's murrelets (an annual decline of 13%) (Fig. 4A). However, the number of identified marbled murrelets increased by 40% during this time, and as a result, the total number of ***Brachyramphus*** **murrelets (including all identified and unidentified murrelets) decreased about 38%, (annual rate of decline of about 5%). Thus, at a minimum Kittlitz's murrelet numbers declined by 38%, but it is more likely that the decline approached 75%.**

Table 2. Densities and point estimate confidence intervals of Marbled, Kittlitz's, and unknown Brachyramphus murrelets from coastal transects within Glacier Bay for 1991, 1999, and 2000 (in birds/km^2), with sampling effort.

	Kittlitz's Murrelet		Marbled Murrelet		Unknown Murrelet		
Year	Density	95% CI	Density	95% CI	Density	95% CI	
1991	5.04	1.91	31.17	7.76	19.74	6.92	651
1999	1.01	0.55	13.01	3.69	5.54	1.80	772
2000	0.99	0.60	3.44	1.28	5.08	1.38	779

Kenai Fjords

For the entire coast of the Kenai Fjords, identified Kittlitz's murrelets declined by 47% between 1976 and 1986, with a slight (5%) increase in 1990. For the 36 shoreline segments surveyed between 1986 and 2002, numbers of Kittlitz's murrelets were low (31 birds in 1986 declining to 9 birds in 2000), suggesting a 70% decline, at a rate of about 8% per year (Appendix Fig. 3B).

To summarize, all treatments of the data for the Prince William Sound and Glacier Bay populations of Kittlitz's murrelets indicate declining populations in both locations. The best available information also suggests declining populations in the Malaspina Forelands and the Kenai Fjords. Through modeling efforts, we have determined that in Prince William Sound, population estimates of identified Kittlitz's murrelets show an annual decline of 18% between 1989 and 2000, with a predicted date of local extirpation around the year 2032. Models that incorporate unidentified murrelets indicate an annual decline of 31% and date of extirpation around the year 2012. Models incorporating data from Glacier Bay indicate that Kittlitz's murrelet density in 2026 is predicted to be less than 1% the density in 2000, and less than 0.1% of the 2000 density by 2039. The 1992-2002 decline in Kittlitz's murrelets along the Malaspina Forelands is at least 38%, and could be as high as 75% if we include in our analysis only those murrelets positively identified as Kittlitz's murrelets. In the Kenai Fjords, complete shoreline counts conducted between 1976 and 1990 indicate at least a 44% decline during those 14 years. A survey of randomly selected shoreline transects in the same region indicate a 70% decline in the past 16 years (1986-2002).

There is a concern among some scientists that the observed decline in Kittlitz's murrelets may be an artifact of differing abilities among observers to differentiate marbled from Kittlitz's murrelets. If this is the case, then perhaps some of the Kittlitz's murrelet decline could be attributed to Kittlitz's murrelets being misidentified and recorded as marbled murrelets. However, we do not believe that this can explain away the observed decline in Kittlitz's murrelets in any of their population centers, and we believe that our modeling efforts have adequately allowed for such instances of misidentification. Indeed, the model supports the observation of drastically declining Kittlitz's murrelet populations, despite changes in the proportion of unidentified birds and uncertainty in the annual population estimates (large confidence limits). Most of the model runs using July data showed a decline in *both* marbled and Kittlitz's murrelet populations.

Estimates from Winter Surveys

The March population estimates of identified Kittlitz's murrelets suggest a downward trend (Appendix, Table 1). However, most Kittlitz's murrelets are thought to winter offshore in the Gulf of Alaska. Therefore, we believe that detecting population trends based upon March surveys of Prince William Sound is of little value. Modeling the March population estimates was problematic due to zeros (years in which no Kittlitz's murrelets were observed in Prince William Sound), thus our analysis includes only those years in which more than a few Kittlitz's murrelets were observed. Because the excluded years had very low (or zero) Kittlitz's or unidentified murrelets, the projected trend is conservative but negative (Appendix, Fig. 1).

Records of Opportunistic One-time Estimates

Population estimates and records for other areas are less reliable or only occurred once, disallowing any inferences regarding population trend in each of these locations.

Older estimates and the world population. Kittlitz's murrelet population estimates outside of the areas mentioned above are little more than estimated based upon best professional judgement. For the North Gulf Coast alone, Isleib and Kessel (1973) estimates "probably a few 100,000's" based on their experience prior to the 1970s. These authors also note that in several Prince William Sound fjords and waters near the Malaspina-Bering icefields, Kittlitz's murrelets "outnumber all other alcids in these waters" - which, except for Icy Bay, is no longer the case.

In the Russian Far East, at least 600 Kittlitz's murrelets have been recorded during surveys between 1985 - 1992 (Konykhov 1992, as cited in Day et al. 1999). Overall, the Russian population is thought to be in the hundreds to low thousands (Day et al. 1999).

G. Divokey (in Day et al. 1999) reports 1,000-5,000 Kittlitz's murrelets using the Chukchi Sea during the late 1970's and early 1980's. These birds may have been staging or feeding post-breeders that were concentrated along the edge of newly forming pack ice (John Piatt, USGS, Anchorage, Alaska, pers. comm. 2002). Kittlitz's murrelets observed along the Lisburne Peninsula on OCSEAP surveys conducted between 1975-1983 were seen from Sept. 17th-Oct. 8th (Gary Drew, USGS, Anchorage, Alaska, pers. comm. 2002). The highest count on these transects during any single year was 26 birds in 1981. Because these transects were mostly pelagic, and overlapped with coastal Kittlitz's murrelet habitat very little, it is difficult to derive population estimates for this area from these data. Therefore, the size of the Kittlitz's murrelet breeding population in the Lisburne Peninsula area remains uncertain, and scientists have not searched the area for Kittlitz's murrelets since 1983 (Gary Drew, USGS, Anchorage, Alaska, pers. comm. 2002).

Recent surveys do not support the notion that large numbers of Kittlitz's murrelets breed on Kodiak Island, and, although we continue to receive sighting reports from the Cold Bay area, we have not yet been able to determine the number of birds that may occur there, or whether the birds seen there represent breeding birds.

Ewins et al. (1993) suggested a global population of 25,000 - 100,000 Kittlitz's murrelets, while during the same year, van Vliet (1993) suggested that there were fewer than 19,000 Kittlitz's murrelets worldwide. We note that no data exists to support the upper range of the estimate put forth by Ewins et al. (1993) (Day et al. 1999). Taking into consideration all unsubstantiated and

one-time estimates with estimates from surveys of key breeding areas prior to 1998, Day et al. (1999) concluded that the world population of Kittlitz's murrelets during the late 90's was likely in the thousands or very low tens of thousands. A summation of all population estimates derived from systematic surveys fall in the lower end of this range. Given the population information presented here and the anecdotal records from the past, we believe that there is little doubt that there used to be many more Kittlitz's murrelets than there are now. Furthermore, in the portions of this species range where we have trend data, it is in rapid decline.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Glacial retreat, possibly due to global warming, seems to be affecting Kittlitz's murrelet populations in a rather direct manner. As noted earlier, this species is associated with glacially influenced habitats. The species has even been called the "glacier murrelet" (Van Vliet 1993). It evolved just prior to, or during the early Pleistocene, about 1.6 - 2.7 million years ago (Pitocchelli et al. 1995, Friesen et al. 1996), and is apparently well adapted for glacially affected areas (Isleib and Kessel 1973, Day et al. 1999, Day and Nigro 2000). Day et al. (2000) found that Kittlitz's murrelets occupying nearshore waters (< 200m offshore) preferred 'glacially affected' areas (waters ≤ 200 m from a tidewater glacier) or 'glacial-stream-affected' areas (> 200 m from a tidewater glacier, but with an area affected by at least one glacial meltwater stream). Loss or pronounced retreat of glaciers due to global warming is likely to have a negative impact on glacially-dependant species such as the Kittlitz's murrelet.

Most glaciers in Alaska, including those surrounding Glacier Bay and Prince William Sound, have been receding since the turn of the century (Lethcoe 1987, Molnia 2001). To what extent this retreat is due to a long term climatic cycle or to global warming is unknown. The Service conducted Kittlitz's murrelet surveys in Prince William Sound during 2001 in which we targeted sites with suitable habitat or historical records of Kittlitz's murrelets. We found that 99% of the observed individuals were within only five fjords, four of which contained 91% of the Kittlitz's murrelets. These Fjords are primarily in the northwestern portion of the Sound and contained what were considered to be stable or advancing glaciers in 1987(Lethcoe 1987). The remaining 1% of the observed Kittlitz's murrelets were spread amongst 12 sites with receding glaciers or no glaciers (Kuletz, unpubl. data). Some sites that had previously contained Kittlitz's murrelets contained none in 2001. More recent studies suggest that many of the glaciers in the northwestern Sound that were considered advancing or stable are now beginning a slow retreat as well (B. Molnia, USGS, Reston, Virginia, pers. comm.), which could further degrade value of this habitat to Kittlitz's murrelets. The reason(s) why Kittlitz's murrelets seem to prefer areas near stable or advancing tidewater glacier faces may have to do with the higher primary productivity in these areas, compared to the siltier, less saline fjords with receding glaciers (Hegseth et al. 1995, Weslawski et al. 1995). The ecological mechanisms linking Kittlitz's murrelets to their preferred habitats remains a topic for further research.

The ecology and behavior of Kittlitz's murrelets seem to predispose them to being vulnerable to oil pollution. A 1979 study comparing vulnerability of 176 species of birds to oil spills concluded that Kittlitz's murrelets were the most vulnerable of all non-endangered birds in the North Pacific. This conclusion was based on the species' body size, diving behavior, and tendency to cluster in nearshore waters (King and Sanger 1979). The species' restricted

distribution and low productivity were also noted as factors that enhanced the species' vulnerability to petroleum pollution.

Prince William Sound is prime Kittlitz's murrelet habitat. It is also famous as the terminus of the Trans-Alaska pipeline and the start of the Alaska crude oil shipping corridor. In 1989, the commercial oil tanker *Exxon Valdez* spilled nearly 11 million gallons of heavy Alaska crude oil into Prince William Sound, eventually contaminating approximately 30,000 km^2 of coastal and offshore waters that served as habitat for approximately one million marine birds (Piatt et al. 1990). Estimates for direct mortality of Kittlitz's murrelets from this spill range from approximately 500 (Kuletz 1996) to over 1,000 (van Vleit and McAllister 1994), in either case, a notable portion of the Prince William Sound population (perhaps 7-15%) was lost. The proportion of resident Kittlitz's murrelets lost in this oil spill exceeds that of all other species impacted by this spill.

The Exxon Valdez oil spill (EVOS) is certainly the most noteworthy spill to have occurred within the range of Kittlitz's murrelets. However, smaller spills within the species range frequently occur. During the past 10 years, of the 3,069 reported oil spills that have occurred within Alaska waters, at least 982 have been reported within the known range of Kittlitz's murrelets (Table 3) (U.S. Coast Guard National Response Center website: (www.nrc.uscg.mil/foia.htm). We also note that fuel spills originating from recreational boaters go largely unreported, and recreational boaters frequent waters used by Kittlitz's murrelets in Prince William Sound and Glacier Bay.

Though we have little evidence of take of Kittlitz's murrelets from smaller spills, we believe that if it occurs, it would probably go unobserved in Alaska's vast and remote waters. We do have one record of a non-EVOS-related oil-murrelet interaction. In summer 2001, the F\V Windy Bay sank and spilled a large but unknown volume of fuel (between 11,000 and 35,000 gallons) into northern Prince William Sound near areas used by Kittlitz's murrelets. The resulting diesel slick covered 104 km^2 of marine waters, within which at least one Kittlitz's murrelet was observed (Kuletz 2001). The ultimate fate of this and other birds in the contaminated area is unknown.

As is often the case in remote Alaska, the lack of observations of interactions (in this case, between murrelets and oil) is not necessarily evidence of a lack of such interaction. Rather, the lack of observations is a consequence of the vastness of the landscape and the low human density within it. The number of spills affecting Kittlitz's murrelets can be expected to increase if recreational and commercial boating traffic (including tour boats) increases within this species' range.

Table 3: Minimum number of oil spills (regardless of spill volume) that have occurred within Kittlitz's murrelet range since May 21st, 1992.

Geographic Area	No. Reported Spills	Geographic Area	No. Reported Spills
Valdez	442	Sand Point	26
Kodiak	144	Nome	8
Homer	106	Yakutat	7
Seward	96	Seldovia	4

Juneau	62	Point Hope	2
Whittier	43	Prince William Sound	2
Cordova	32	Kachemak Bay	1
King Cove	27		

Cruise ship and recreational boating traffic in Glacier Bay is increasing (Glacier Bay, unpubl. data). In particular, cruise ships and recreational boating activity is increasing in glaciated fjords within Glacier Bay, the very habitats that are most important to Kittlitz's murrelets (Day et al. 1999). As vessel traffic increases, so does the threat of petroleum contamination from accidental spills and vessel exhaust. Vessel mishaps within the Glacier Bay area do occur. In 1999, a tour boat went aground within Park boundaries, in a bay near the entrance to Glacier Bay. Petroleum contamination of marine waters is inevitable wherever vessel traffic occurs with regularity. The magnitude of the threat to Kittlitz's murrelets due to petroleum contamination from commercial and private vessel traffic in Glacier Bay is unknown. A similar increase in tourism has occurred in the Kenai Fjords National Park, particularly those fjords near Seward, such as Aialik Bay. Aialik Bay and other Kenai Peninsula fjords with glacial input have resident summer populations of Kittlitz's murrelets (Day et al. 1999; J. Piatt, USGS, Anchorage, Alaska, pers. comm.).

The trend among recreational boaters away from using 2- cycle outboard motors towards the less-polluting 4-cycle outboard motors is likely a positive development for marine-dependent species. Four-cycle outboards are about 30% more fuel efficient than comparable 2-cycle outboards and they do not leave an oily exhaust slick in their wake as do 2- cycle outboards. This 2-cycle outboard exhaust slick introduces heavy and persistent petroleum products into marine ecosystems. The less polluting 4-cycle outboard motors will help reduce the amount of petroleum products present on the surface of the water in the wake of most class 1 vessels. However, 2-cycle outboards remain common, and petroleum pollution from them continues.

B. Overutilization for commercial, recreational, scientific, or educational purposes. The Kittlitz's murrelet does not appear to be threatened by overutilization for scientific or educational purposes. However, recreational and commercial tourism has increased substantially in many of its breeding areas, especially Glacier Bay, Prince William Sound, Kenai Fjords, and lower Cook Inlet/Kachemak Bay. Although this small cryptic-colored seabird is not often sought out by tour boat operators, the species'tidewater glacier habitat (Day et al. 1999) is spectacular, and is the ultimate destination for many recreational and commercial tour boats throughout the region (Murphy et al. 1999). From April 1999 to June 2002, at least 3,132 commercial tour vessels plied the waters of Kenai Fjords (Brooke Conner, NPS, Seward, AK pers. comm. 2002). Undoubtedly, many additional private vessels also traveled through this Kittlitz's murrelet habitat. Furthermore, in Prince William Sound and Kenai Fjords, peak activity for vessels of all kinds occurred in June and July (Murphy et al. 1999; Brooke Conner, NPS, Seward, AK pers. comm. 2002); a time when Kittlitz's murrelets face intense energetic requirements to complete chick-rearing, and when new fledglings first enter marine waters and must quickly learn to forage on their own. Unfortunately for Kittlitz's murrelets, most of this human use in Prince William Sound is concentrated in the northwestern part of the Sound, and in central mainland fjords with tidewater glaciers; the same areas favored by the murrelets (Murphy et al. 1999).

The issue of numbers of tour boats permitted in the Glacier Bay area is currently being litigated. The number of cruise ships (n=139) allowed into the bay has increased 30% since 1985, while smaller charter boats (n=312) and private boats (n=468) have increased 8% and 15%, respectively. Mid-sized tour boat traffic (n=276) has remained stable (Glacier Bay National Park, unpubl. data). The cumulative impact of vessel traffic on Kittlitz's murrelets during their breeding season is unknown, but warrants concern. Tourist helicopter flights and landings over inland glacial areas may result in additional unknown take of Kittlitz's murrelet eggs and nestlings through human-induced nest abandonment. Helicopter traffic in the area is not expected to decrease with time.

Among all Kittlitz's murrelet population strongholds, Icy Bay alone remains relatively free of tourist traffic and commercial fishing. Interestingly, this is the only location in which Kittlitz's murrelets still outnumber all other alcids. The importance of Icy Bay to the survival of this species may increase as anthropogenic disturbances within other portions of the species range increase. Although logging occurs near the entrance to Icy Bay and oil and gas development has been proposed just west of the area (Kozie 1993), the upper portions of Icy Bay are surrounded by the Wrangle-St. Elias National Park.

Commercial gillnet fisheries take an unknown number of Kittlitz's murrelets. In Prince William Sound, salmon gillnet fisheries occur each summer in or near Kittlitz's murrelet habitat. Kittlitz's murrelets represented 5% and 30% of murrelet bycatch in gillnets during 1990 and 1991, respectively (in the early 1990s**,** only 7% of all *Brachyramphus* murrelets in Prince William Sound were Kittlitz's murrelets) (Agler et al. 1998, Day et al. 1999, Wynne et al. 1992). Impact from gillnet fisheries may be very localized, a result of the patchy distribution of this species. In 1999 and 2000, a similar study by the National Marine Fisheries Service (NMFS) in lower Cook Inlet recorded no take of Kittlitz's murrelets (B. Fadely, NMFS, Seattle, Washington, pers. comm.). There are anecdotal reports and opportunistic observations of both Brachyramphus species being taken in gillnet fisheries in other areas of southcentral and southeast Alaska (Kathy Kuletz, USFWS, Anchorage, Alaska, pers. comm.). Studies on the effects of gillnet fisheries on murrelet species (Carter et al. 1995) strongly suggest that such fisheries are of potentially significant conservation concern for Kittlitz's murrelets. As the National Marine Fisheries Service (NMFS) conducts its annual gillnet bycatch study throughout different geographic regions of Alaska, the effects of these fisheries on this species should become increasingly clear. Future NMFS gillnet bycatch studies are planned for Kodiak (2002-2003), Southeast Alaska (approximately 2004-2005), and the Yakutat area (approximately 2006).

C. Disease or predation. There is almost nothing known about diseases of, and predation upon, Kittlitz's murrelets. Their eggs and chicks are depredated by corvids (Nelson 1997). Although eagles and falcons may prey upon Kittlitz's murrelets once they reach water, the high-elevation nesting habitat of this species probably results in a lower rate of nest depredation compared to forest-nesting marbled murrelets (Day et al. 1999, Piatt et al. 1999).

D. The inadequacy of existing regulatory mechanisms. The Migratory Bird Treaty Act (MBTA) has no provision to allow for incidental take of any migratory birds, (including Kittlitz's murrelets), however such take does occur in commercial fisheries in Alaska (Stehn et al. 2001). The NMFS monitors seabird bycatch in the fisheries over which they have regulatory jurisdiction. Their fishery observer data indicate that murrelets do not appear to be taken by longliners,

trawlers, or within pot fisheries (Stehn et al. 2001). However, murrelets are often taken in near shore gillnet fisheries (Carter et al. 1995, Wynne et al. 1992). Gillnet fisheries in Alaska generally occur within State territorial waters, within the undisputed regulatory jurisdiction of the MBTA and within fisheries managed by the State. Melvin et al. (1999) report on gear types and fishing methods that reduce such bycatch, but regulations requiring the use of such bycatch reduction techniques are not in place. The Kittlitz's murrelet could benefit from cooperation between government agencies and fishermen, such as has occurred in the Alaska longline fishery. Seabird bycatch in the Alaska longline fishery has been drastically reduced due to: 1) the development and distribution of seabird deterrent devices; 2) outreach and education efforts explaining to fishermen how to catch fewer seabirds and why catching fewer seabirds is desirable, and; 3) promulgation and enforcement of regulations requiring the use of seabird avoidance techniques and deterrent devices (Greg Balogh, USFWS, Anchorage, Alaska, pers. comm.). Kittlitz's murrelets would probably benefit from further research into bycatch reduction techniques in the gillnet fishery, subsequent education and outreach efforts, and, if indicated by research, by promulgation of regulations that would minimize take of birds in this fishery.

E. Other natural or manmade factors affecting its continued existence. Poor recruitment may be a factor hindering this species' ability to survive and recover. During a three year study in Prince William Sound (1996-1998), Day and Nigro (1999) found only a single juvenile Kittlitz's murrelet on the water. They suggested the lack of Kittlitz's murrelet juveniles was an indication of low recruitment in the Sound. It is possible that the very low numbers of adult Kittlitz's murrelets, coupled with our lack of knowledge about their post-fledging behavior, make at-sea counts of juveniles an unreliable method for estimating recruitment in this species. However, if low recruitment is occurring and is persistent, a population decline is inevitable. The reasons for the observed low recruitment rate in this species remain unknown. Indeed, it remains unknown whether Kittlitz's murrelet recruitment rates are low.

Kittlitz's murrelet populations are currently small and disjunct. Genetic information suggests very low rates of immigration and emigration between birds of the western Aleutian Islands and Kachemak Bay on the Kenai Peninsula (Friesen et al. 1996). Like most alcids, Kittlitz's murrelets are probably highly philopatric to their natal site. If so, this creates a situation in which small isolated populations may become extirpated and may not be replaced through immigration, especially if habitat quality in those locations is waning due to glacial recession. In addition, small disjunct populations in decline are at increased risk of extirpation due to stochastic events.

The marine climate regime shift that occurred in 1976-77 has been hypothesized as perhaps being at least partially responsible for the decline in Kittlitz's murrelets (van Vleit 1993, Day et al. 1999), and other piscivorous birds in Alaska (Agler et al. 1999). The suspected mechanism linking marine climate regime shifts to population declines is thus: during a cold to warm water regime shift in the North Pacific, warmer waters flow into the Gulf of Alaska, and this results in a reduction in certain species of fish that prefer cooler waters, species of fish that are also important prey items for Kittlitz's murrelets (capelin, herring and sandfish). If warmer waters result in less food, it could result in reduced productivity of, and/or increased mortality of Kittlitz's murrelets. Increased mortality of breeding adults generally has greater population level effects in long-lived species with delayed maturity and low rates of reproduction (k-selected species) such as seabirds, than it does for more r-selected species such as many geese and ducks.

BRIEF SUMMARY OF REASONS FOR REMOVAL OR LISTING PRIORITY CHANGE:

The Kittlitz's murrelet is a relatively rare seabird. Most recent population estimates indicate that it has the smallest population of any seabird considered a regular breeder in Alaska (9,000 to 25,000 birds). The entire North American population, and most of the world population of Kittlitz's murrelet, occurs in Alaska waters. This species is known to have undergone population declines in three of its core population centers; Prince William Sound, Malaspina Forelands and Glacier Bay. If current population trends continue, we expect extirpation from Prince William Sound within 30 years and from Glacier Bay within 40 years. Data for Malaspina Forelands do not allow us to reliably predict date of extirpation from that location, but the declines there are alarming (probably about a 75% decline in the past decade). Kenai Fjords, while not a population center, also appears to have a declining murrelet population. We have no trend data from other portions of the species' range, although anecdotal information suggests population declines are occurring in at least some of these other areas. If the projected extirpation from Glacier Bay and Prince William Sound occurs, and if the population decline in Malaspina Forelands continues, then we can expect a significant reduction in the range of this species in the foreseeable future. Elsewhere, as populations become smaller, they will become increasingly vulnerable to stochastic events that may result in extirpation.

Causes for the declines remain speculative, but may include: habitat loss or degradation (due to oceanic regime shifts and to glacial retreat), increased adult and juvenile mortality (due to take in fisheries and by petroleum contamination); and low recruitment (for reasons unknown). Glacial retreat and oceanic regime shifts have occurred throughout the species range (with perhaps the exception of the Lisburne Peninsula population). We believe that glacial retreat and oceanic regime shifts are the factors that are most likely causing population-level declines in this species. Existing regulatory mechanisms appear inadequate to stop or reverse population declines or to reduce the threats to this species.

We believe that listing this species as a candidate throughout its range is warranted because: 1) important population centers for which we have trend data are undergoing such dramatic negative population trends that at least two major population centers for this species may become extirpated in less than 40 years; 2) our best available information suggests that declines are occurring elsewhere in the species range; and 3) threats that we believe are having the greatest impact upon this species (glacial retreat and oceanic regime shifts) continue to affect this species and will remain as threats to the species for the foreseeable future.

FOR PETITIONED SPECIES:

a. Is listing warranted? Y

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Y

c. Is a proposal to list the species as threatened or endangered in preparation? Y

d. If the answer to c. above is no, provide an explanation of why the action is precluded:

Since publication of the 2002 CNOR, the publication of a proposed rule to list this species has been precluded by other higher priority listing actions, and based on work scheduled we expect that will remain the case for the remainder of Fiscal Year 2004. Almost the entire national listing budget has been consumed by work on various listing actions taken to comply with court orders and court-approved

settlement agreements, emergency listing, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of the Kittlitz's murrelet as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

LAND OWNERSHIP:

Offshore, Kittlitz's murrelets occur primarily in Alaska state waters (0-3 miles offshore). Murrelets that occur in waters greater than 3 miles offshore are within the U.S. Exclusive Economic Zone. Onshore, this species is found on lands managed by the U.S. Forest Service, U.S. Fish and Wildlife Service, National Park Service, the State of Alaska, Native lands, and perhaps on some Department of Defense lands. It remains unknown what proportion of the population nests on each of these landholders' lands.

PRELISTING:

No conservation agreements are known to exist. The Service and USGS have conducted population surveys in areas used by Kittlitz's murrelets, but the only consistent long-term data collected for this species is in Prince William Sound, where we have obtained population estimates on eight occasions between 1972 and 2000 (Stephensen et al. 2001). No future surveys are currently scheduled or funded for Prince William Sound. In 2001, a survey specific for Kittlitz's murrelets was conducted in Prince William Sound by Migratory Bird Management (Service), with funding from the Anchorage, Alaska Fish and Wildlife Service Field Office, due to concerns over the impact of increased boat traffic on sensitive species.

Our population estimate may increase somewhat after we have an opportunity to better survey the waters between Glacier Bay and Prince William Sound, especially in areas where there is a lot of glacial input into the marine coastal waters. Our population trend data will improve when we can conduct additional murrelet surveys in Lower Cook Inlet and Icy Bay. These are the two known important population concentration areas for which we have no trend data. What little recruitment information we have for this species is alarmingly low, therefore we believe it is important to develop a productivity monitoring index in which we search specifically for juvenile birds on the water in Icy Bay, Glacier Bay and/or Prince William Sound.

Future research and survey plans for Kittlitz's murrelets for 2003-2005 include collaborative efforts on the part of the Service, USGS, and NPS. These efforts include: 1) a reanalysis of Lower Cook Inlet survey data; 2) A continuation of Kittlitz's murrelet population, ecology, an human disturbance studies in Glacier Bay; and 3) obtaining population estimates where our current population data is weakest, specifically, Kenai Fjords, the Alaska Peninsula, the Malaspina Forelands, the Aleutian Islands, Icy Bay, Shelikof Strait, the Lisburne Peninsula, and from Yakutat south to Cape Spencer.

To better assess factors that pose risks to this species, we hope to conduct collaborative studies with the Alaska Department of Fish and Game, USGS, the National Park Service, and NMFS to address: 1) gillnet mortality rates throughout the species' range; 2) effects of large vessel traffic in fjords on murrelets; and 3) effects of large vessel traffic in fjords on murrelet habitat.

The Alaska Department of Fish and Game stresses the importance of initiating, as soon as possible, studies that identify the distribution and abundance of the species throughout their range and throughout their life cycle, especially outside of Prince William Sound, Glacier Bay, and the Yakutat/Icy Bay area. In addition, they state that population trends and productivity should be monitored in these outlying areas. They suggest the implementation of studies to address threats to Kittlitz's murrelet, and to address the effects of oceanic regime shifts on their foraging and prey availability. The State suggests that the impacts of gillnet fisheries on this species could be assessed by monitoring bycatch in coordination with existing marine mammal studies. Finally, the Alaska Department of Fish and Game suggests investigating the effects of tour boats (of all sizes) on Kittlitz's murrelet behavior, their foraging efforts, productivity, and the effects of these vessels upon Kittlitz's murrelet habitat and the distribution and behavior of their prey.

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LISTING PRIORITY (place * after number)

THREAT

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5*
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Available information indicates the Kittlitz'**s murrelet has declined in most, if not all, of its range in Alaska. Population trend data shows that this species has sharply declined in three of its core population centers (Prince William Sound, Malaspina Forelands, Glacier Bay). While Kenai Fjords is not a population center, trend data indicates that the species has declined here as well. Additionally, although there is no trend data from other portions of the species range, anecdotal information suggests population declines are occurring in at least some of these areas.**

***Imminence*: If current population trends continue in core population centers, we expect extirpation from Prince William Sound within 30 years and from Glacier Bay within 40 years. We do not have data enabling us to estimate a timeline for extirpation of the Malaspina Forelands population, but the population's 75% decline in the last decade is a cause for concern.**

Taxonomy: Kittlitz's murrelet is a monotypic species whose entire North American population, and most of the world's population, occurs in Alaska waters.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: David Allen February 19, 2003
Regional Director, Fish and Wildlife Service Date

Concur: Steve Williams April 5, 2004
Director, Fish and Wildlife Service Date

Do not concur:_____ _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review:_____
Conducted by:_____

Comments:

-

-

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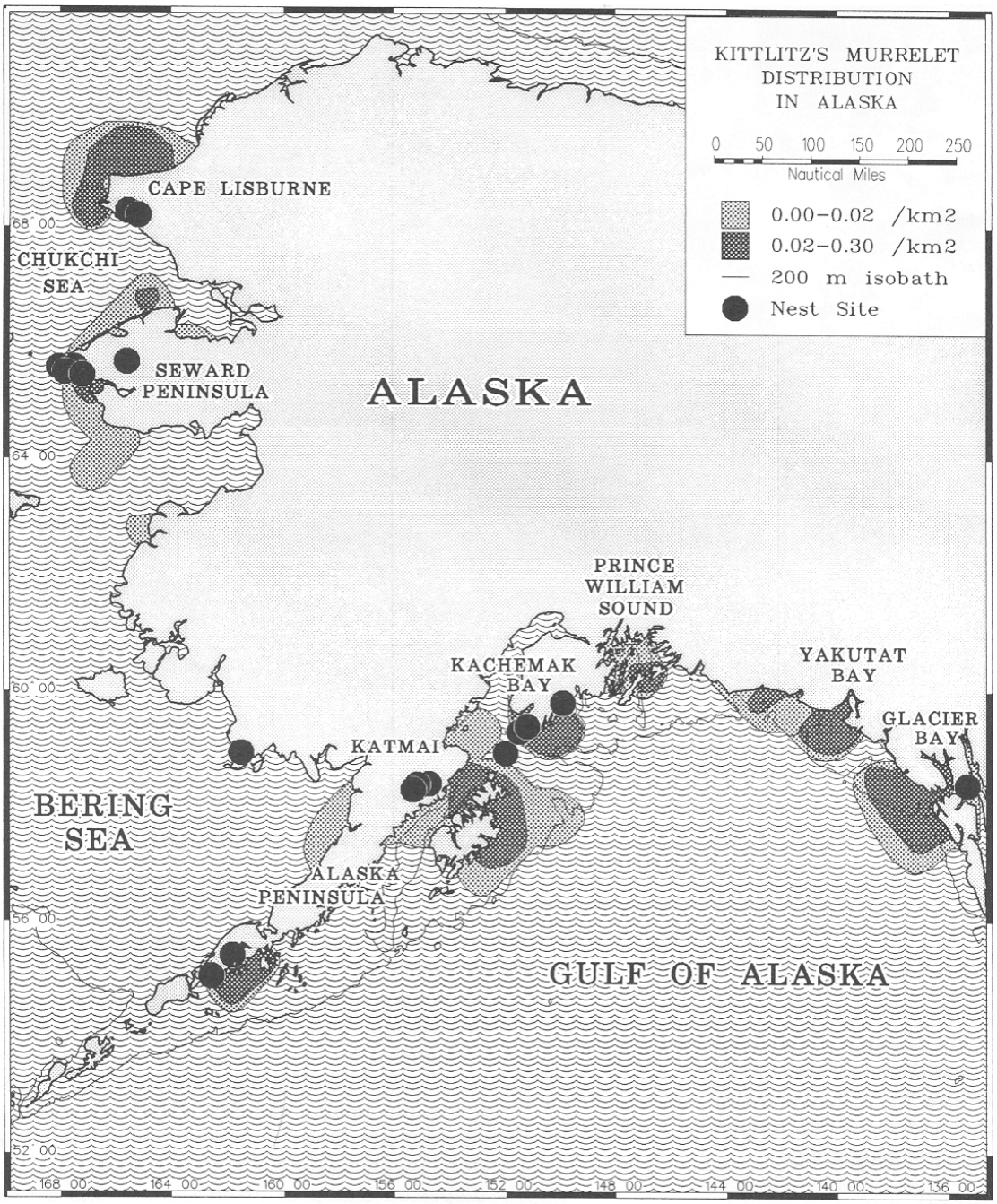

Fig.1. Density and distribution of Kittlitz's murrelets at sea and known nest sites in Alaska. Maritime distribution is from USFWS archives (see Piatt and Ford 1993). Nest site data are from Day et al. (1983) and Day (1995). One nest found on Atka Island in the Aleutians is not shown. Map reprinted with author's permission (Piatt et al. 1999).

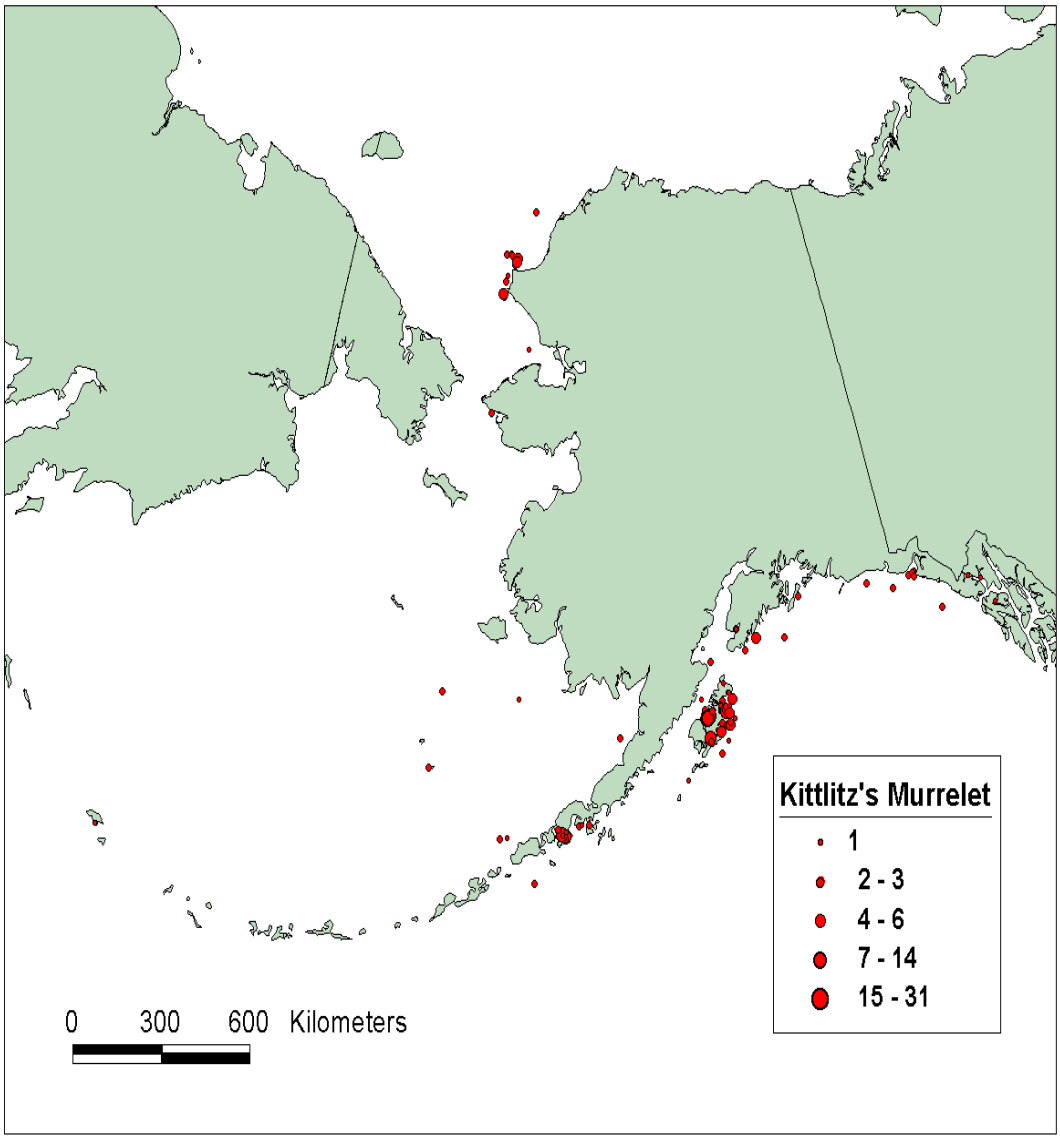

Fig. 2. Observations of Kittlitz's murrelets from the North Pacific Pelagic Seabird Database. Observations were recorded as part of the OCSEAP surveys conducted during the 1970's and 1980's. Map provided courtesy of Gary Drew, USGS, Anchorage, Alaska.

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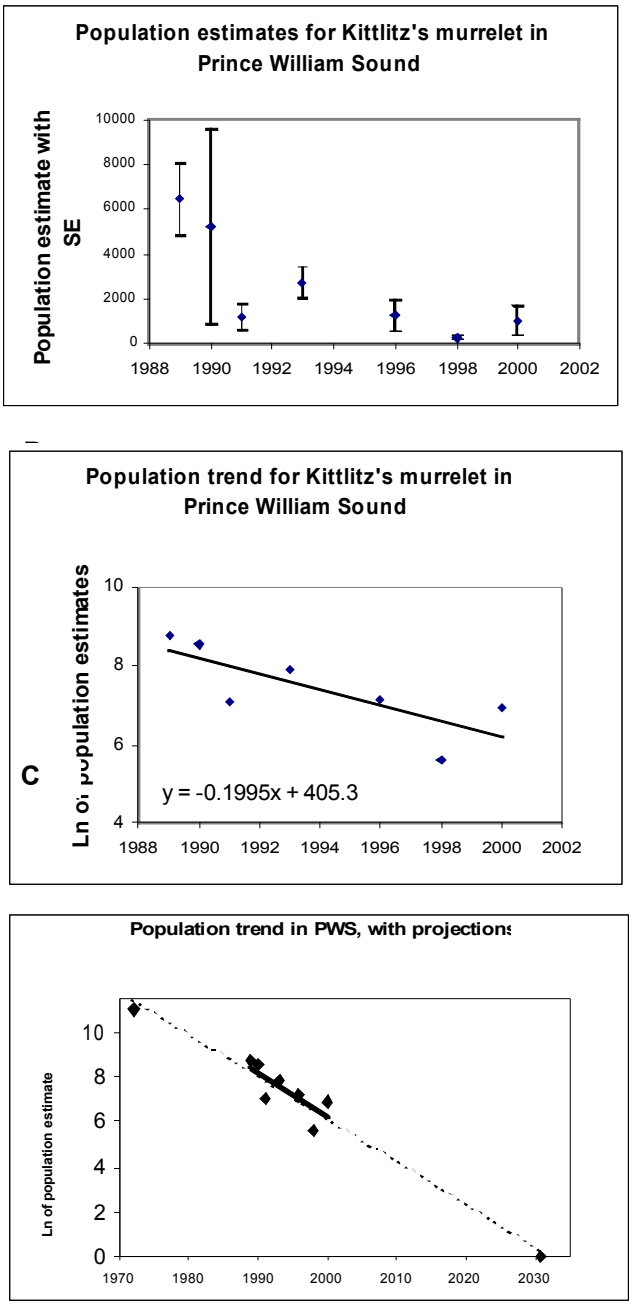

Fig. 3. Population estimates (A) and trends (B) for Kittlitz's murrelet in Prince William Sound, Alaska, 1989 - 2000. The estimates were obtained by the U. S. Fish and Wildlife Service during

general seabird surveys, using 287 randomly selected transects. In figure C, the 1972 estimate for Kittlitz's murrelets is shown, as well as the projected trend line based on the 1989 - 2000 data. The calculated trend is shown by the solid black line, and the projected trends by the dashed lines.

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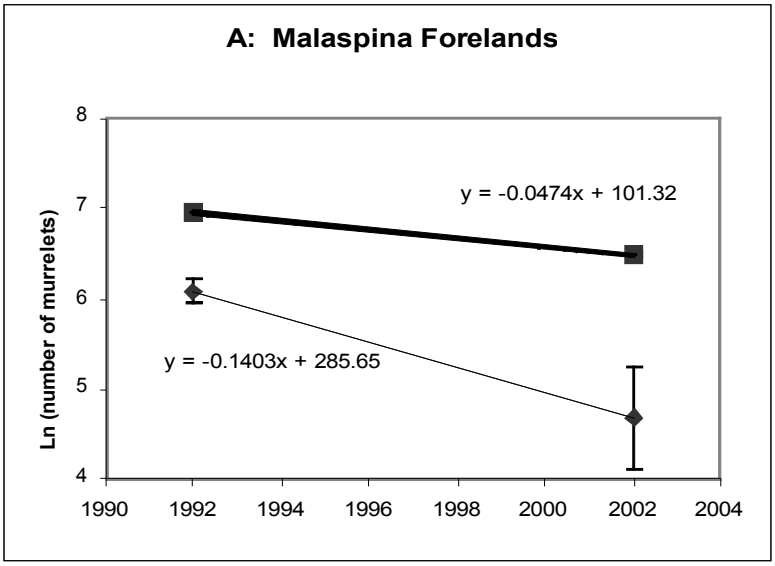

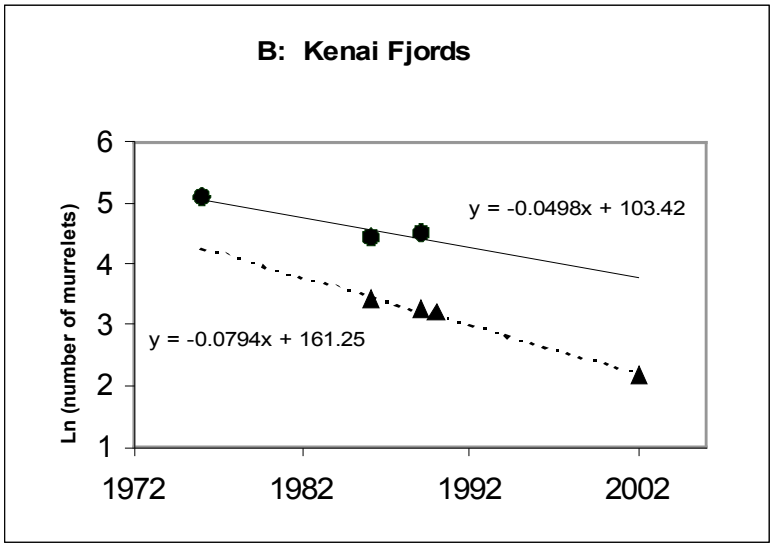

Fig. 4. Numbers of Kittlitz's murrelets (log transformed) at two locations: (A) Malaspina Forelands, July 1992 and July 2002, where the total number of Brachyramphus murrelets (squares, heavy line) declined by 38% whereas the number of identified Kittlitz's murrelets (diamonds, light line) declined by 75%. (B) the Kenai Fjords, where July shoreline counts along the entire shoreline (circles, solid line) declined by 47% between 1976 and 1986, and for counts on randomly selected transects (triangles, dashed line), where Kittlitz's murrelets declined by 70% between 1986 and 2002.