FEASIBILITY ASSESSMENT FOR INCREASING SUSTAINABLE HARVEST OF SITKA BLACK-TAILED DEER IN A PORTION OF GAME MANAGEMENT UNIT 3

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Background: Sitka black-tailed deer inhabit most Game Management Unit (Unit) 3 islands. Deer populations on these islands were high during the 1950s and 1960s after extensive wolf control, but have remained at relatively low levels in most of the Unit since a series of severe winters in the early 1970s. By the late 1990s, deer had recovered to moderate levels in some portions of the Unit but again declined to low levels throughout the Unit following the severe winters of 2006-2009. Predation, in combination with severe winter weather, seems to be the overriding factor that affects deer numbers in Unit 3. Available evidence from Unit 3 and comparisons of case histories from adjacent areas with and without wolves (e.g. Units 1, 2, and 4) indicate that predation by wolves (probably in combination with bear predation on fawns) is responsible for keeping deer in Unit 3 at low levels, particularly after severe winters. Clear-cut logging has and will continue to reduce winter carrying capacity for deer in some areas, however, the role habitat loss has played with regard to the most recent decline in deer numbers remains unclear. Unit 3 deer are at such low density that populations are not currently limited by the availability of winter habitat. On the other hand, it is also possible that reductions in the amount of winter habitat exacerbated the effects of the severe winters experienced in Unit 3 during 2006-2009 thereby causing deer numbers to decline further than they might have had the habitat remained intact. For comparison, on northeast Chichagof Island (part of Unit 4) where there has been extensive clear-cut logging and winters are even more severe than in Unit 3, but where wolves are absent, deer numbers have remained at much higher numbers than in Unit 3 and have recovered quickly following severe winters.

During the 1960s deer numbers in Unit 3 appeared to be relatively stable. At that time, the deer season in this area spanned August 1-December 15, with a bag limit of four deer. However, in the late 1960s and early 1970s, deer in Unit 3 experienced a series of severe winters that resulted in a significant population decline and led to the adoption of more restrictive seasons and bag limits. Beginning in 1970 Unit 3 was subdivided into two hunt areas (Mitkof Island and the remainder of Unit 3), with the bag limit on Mitkof reduced to 2 antlered deer. Further changes were made in the convening years, and by 1973 the season in Unit 3 was reduced to two months with a bag limit of just one antlered deer. Unit 3 was then closed to deer hunting from 1975 through 1979. The area south of Sumner Strait had a limit of 1 antlered deer from 1980 to 1987. The Alaska Board of Game (Board) increased this limit to 2 antlered deer in 1988. In 1991 a registration permit hunt with a 15–31 October season and a 1 antlered deer bag limit was opened on parts of Mitkof, Kupreanof, Woewodski, and Butterworth islands, where the deer season had been closed since 1975. The registration permit was replaced with a harvest ticket requirement in 1995. Since that time Unit 3 has been managed with seasons ranging from 2 weeks to 4 months, with a bag limit of 1-2 antlered deer. In spite of this male-only harvest, the deer population has remained relatively low when compared to neighboring islands, including Prince of Wales, Admiralty, Baranof, and Chichagof islands.

Beginning with the 1993 season, the only part of Unit 3 closed to deer hunting was the area within the Petersburg and Kupreanof city limits. The board abolished that prohibition in fall 2000. At the fall 2002 meeting, in response to increased pellet-group densities, the board extended the season length and increased the bag limit for deer on the Lindenberg Peninsula, aligning the deer regulations on all of Kupreanof Island with the majority of Unit 3. However, due to continued low deer numbers and a concern for additional habitat loss due to logging practices, the department has submitted a proposal for the January 2013 board meeting to shorten

the deer season on the Lindenberg Peninsula to two weeks (from 4 months) and reduce the bag limit from 2 to 1 antlered deer.

Most of Unit 3 is federal land managed by the USDA. Forest Service (USFS). This area has experienced a substantial amount of logging activity over the years. Initial access to most hunting areas is by water. However, in many areas, once hunters arrive, extensive networks of logging roads are used for additional access to hunting areas. The communities of Petersburg, Wrangell and Kake are located in the unit and some hunters use local road systems to access hunting areas.

Seasons and bag limits for deer on Mitkof Island and Unit 3 in general are more restrictive compared to other island-dominated management units in the region. For example, in Unit 3 the seasonal bag limit is one or two bucks depending on the area, while in Unit 2, hunters can currently take up to 4 bucks, and in nearby Unit 4 hunters can take 4 deer of either sex. Additionally, federally-qualified hunters may harvest a doe in Unit 2. Between 1994 and 2005, the estimated Unit 3 deer harvest ranged from 603 to 1,119, and the number of hunters varied from 891 to 1,220. In 2005, the estimated unit-wide harvest began decreasing, a trend that continued until 2009. The estimated unit-wide harvest of 333 deer in 2008 was the lowest reported harvest since 1990 and well below the preceding 10-year average of 816 deer. In 2009 the estimated harvest increased to 594, and then increased again to 656 in 2010 (Lowell 2011).

With the possible exception of a few smaller islands, Unit 3 deer have existed largely at levels well below carrying capacity since the 1960s. From 2006-2009, the central Alaska panhandle, including Unit 3, experienced 3 consecutive winters with well above average snowfall. During the winter of 2006–2007, the Petersburg and Wrangell areas broke all-time records for snowfall (229.7 inches for Petersburg and 148.5 inches for Wrangell) (NOAA 2010). The winter of 2008–2009 also resulted in above average snowpack though not as severe as the 2 preceding winters. As noted earlier, winter weather is one of the main factors influencing deer numbers in Southeast Alaska. We believe the observed declines in both pellet-group densities and estimated hunter harvest reflect actual declines in deer numbers. Factors potentially contributing to the decline in the Unit 3 deer population and harvest in recent years include 3 consecutive deep snow winters, predation by wolves, and reductions in deer carrying capacity resulting from the harvest of productive old growth stands important for overwinter survival. Additionally, second growth forest stands entering stem exclusion further reduce carrying capacity for deer.

For the purposes of implementing AS 16.05.255(e) – (g), the board established the deer population and harvest objectives for Unit 3 at 15,000 and 900 respectively (5 AAC 92.108). Although we do not have a reliable way to estimate deer numbers in Unit 3, our deer pellet trends suggest we are at a much lower level than 15,000, while our harvest estimates are well below the 900 deer threshold. New mandatory harvest reporting should improve harvest estimates in the future.

Overall assessment of potential to increase harvest *Low, Moderate, High*[1]:**Low to Moderate.**

[1] Component factors are discussed in Section II.

As identified in the intensive management law, the options available to increase deer numbers in Unit 3 are: 1) restricting hunting seasons and bag limits, 2) evaluating and improving habitat, and 3) liberalizing harvest of predators. If these options do not produce the desired effects of increasing deer numbers and scientific studies indicate significant predation by bears and/or wolves, then the board may direct the department to undertake predator control.

Restricting hunting seasons and bag limits: Restricting hunting season and bag limits is not expected to result in increased deer numbers because hunting in Unit 3 is already restricted to bucks only. Furthermore, hunting in the area that is accessible from the Petersburg road system and those areas nearest to the proposed wolf control area (residents of Petersburg) has been restricted to just a two week season (the last two weeks of October), before the onset of the rut when bucks are not vulnerable to harvest.

Evaluating and improving habitat: There is little that can be done to improve deer habitat in Southeast Alaska, especially during the winter period that tends to be most limiting for deer. The most economically feasible and widespread man-caused influence that affects habitat in Southeast Alaska is clear-cut logging, and it is thought to have both positive and negative influences on deer. Although clear-cut logging can initially improve spring, summer, and fall food supplies, during severe winters, deer will concentrate in remaining old growth stands and along beaches adjacent to old growth. If deer numbers are high, the reduction in preferred winter range caused by logging could result in food competition among the remaining deer. In addition, the more concentrated deer could also be more vulnerable to predation by wolves. As a practical matter, in Unit 3, deer numbers are now so low that the influence of habitat on deer numbers is likely to be of very little import for many years. There are large areas of the Unit that have adequate remaining old growth winter range, and deer numbers are also low in these areas. The Department does not believe that evaluating or improving habitat, or protecting more areas of old growth for deer can help restore deer numbers and harvest in Unit 3 in the short-term. However, maintaining adequate reserves of old growth will be important for maintaining deer numbers at higher levels once recovery of the deer population has occurred.

Liberalizing harvest of predators: Liberalizing harvest of wolves appears to be the only potentially feasible means of improving deer numbers and harvest in Unit 3. Hunting and trapping of wolves has already been greatly increased and wolf harvest in the Unit is at record levels (~90 wolves taken in 2011-2012). Our assessment of a “moderate” potential of increasing the deer harvest through wolf removal stems from our uncertainty about whether wolf numbers can be effectively reduced to the point where deer will respond. In addition, we don’t know the importance of black bear predation on deer fawns, or the impacts of severe winter weather or habitat loss on these deer populations. Unit 3 contains a multiple predator system that includes both black bears and wolves. Both are known to prey on deer, however, the respective role each plays in holding Unit 3 deer populations at low levels remains unknown. Data from an ongoing fawn mortality study in neighboring Unit 2 indicates that black bears represent an important source of mortality for deer fawns, though their impacts on deer appear to be largely limited to the fawn age class. In Unit 4, where brown bears are present but wolves and black bears are absent, deer have recovered quickly after severe winters. Because there is no reason to suspect that brown bears are less predatory than black bears, we suspect that black bear predation alone

would not prevent recovery of deer in Unit 3 if wolves can be effectively removed from the proposed wolf control area.

There remains some uncertainty about whether or not 1-2 hired trappers can reduce wolf numbers sufficiently, and maintain their numbers at low enough levels long enough to achieve the desired increase in deer numbers. Control of wolves is rarely effective with normal harvest methods (hunting and trapping). In areas of Interior Alaska and the Yukon, wolf numbers have had to be reduced by at least 55% for several years to effect measurable improvement in moose calf survival (National Research Council 1997: 184). Regulation (i.e., maintaining wolf populations at lower than natural levels) typically requires annual harvests of at least 30% (e.g., Adams et al. 2008). Regulation to less than control levels may not produce rapid or measurable increases in intended prey abundance over the short-term, but it might maintain increased ungulate survival following control programs or eventually allow ungulate populations to increase if other mortality factors remain constant.

It is also important to note that the portion of Unit 3 proposed for experimental wolf reduction does not represent a "closed system". Wolves from adjacent non-treatment areas (western Kupreanof Island and the Unit 1B mainland) could easily move in and replace those removed by lethal removal.

Variations in winter weather conditions from year to year can have a profound influence on wolf trapping effort and success. If a decision is made to proceed with the considered IM action, our ability to achieve and maintain the desired level of wolf reduction will similarly be affected by winter weather conditions and whether or not those conditions prove favorable or unfavorable to wolf trapping success.

Information needs:

Deer: Because the focus of the proposed IM program is to increase the deer population and harvest in a portion of Unit 3, our most critical information needs include the ability to measure changes in both deer numbers and hunter harvest. Such information will be critical to our ability to evaluate the reasons for the success or failure of the program.

There are three potentially feasible methods of estimating deer numbers or relative abundance traditional and/or DNA-based pellet group transects, aerial surveys of deer in alpine areas, and numbers of bucks harvested. None of these methods are likely to yield accurate estimates, especially over the short-term.. The pellet-group surveys we have employed in the past are not appropriate for detecting fine-scale changes in deer abundance. They are instead designed only to obtain general trends in deer numbers over longer periods of time (years). Surveys of deer in alpine areas yield highly variable results but may provide a relative measure of abundance and may be helpful in assessing the success of wolf control over a period of several years. Deer harvest, especially if estimates of hunter effort are included, may be as good a measure of deer abundance as anything else, and would be particularly useful because improved deer harvest is the main goal of the predator control program. Mainly for this reason, we propose to allow a limited season on bucks to continue in the wolf control area and comparison areas.

We are also currently experimenting with a new DNA-based method for estimating deer numbers. This technique involves extracting deer DNA collected from fresh pellets and using those results to develop a mark-recapture estimate of deer abundance and density. This methodology is still being developed, but has promise as a tool for measuring deer densities at smaller geographic scales. We are currently awaiting analyses of samples collected from within the considered treatment area in Unit 3 during spring 2012. We expect to obtain the results of this analysis, and complete an evaluation of the method's potential for estimating low density deer populations sometime in late 2012. However, it may require a few more years of development and testing before we can determine its utility in estimating deer numbers over large areas.

Biologists would also benefit from a better understanding of deer mortality factors. We currently lack a good understanding of the respective roles wolves and black bears play with regard to limiting deer numbers in Unit 3. To assess the mortality factors influencing deer populations would require radio-marking a sample of deer so that their survival could be monitored and any mortalities investigated in a timely manner. This would require live capturing deer, fitting them with radiocollars equipped with mortality sensors, and having staff available to investigate mortalities as they occur. A fawn mortality study would also be helpful, although it would be expensive, and deer numbers are now so low that it may not be possible to capture enough fawns to yield statistically meaningful results.

Wolves: The primary focus of the considered IM program would be to experimentally reduce wolf numbers in a select portion of Unit 3, so it is important that we have some understanding of how many wolves there are in both the removal and experimental areas prior to embarking on wolf removal. It is currently only possible to develop crude population estimates for Unit 3 wolves based on average home range and pack sizes derived from extensive radio-telemetry studies conducted on Prince of Whales Island during the 1990s (Person 2001). Wolf numbers would have to be monitored for the life of the IM action to help evaluate the failure or success of the program to meet the specified objectives. Determining wolf numbers and monitoring them over a period of several years would only be feasible through the marking of animals with radio collars. This, in turn, would require the capture and handling of wolves within both the treatment and comparison areas. GPS radio collars with remote download capabilities would provide the best means of gathering data and assess home ranges and travel corridors, which would be important to effectively direct removal efforts. Additionally, radiocollared wolves could then be radio tracked and observations made regarding pack sizes. This, along with home range information, would provide biologists with site-specific data for use in estimating Unit 3 wolf numbers.

Benefit of the above information toward the IM program: These data would benefit the IM program in at least two ways. First, the public expects the department to operate using the best available scientific methods, Second, if we hope to have any understanding of the success or failure of an IM effort, we need to be able to detect at least relative changes in deer and wolf numbers. This information is critical for evaluating progress toward meeting IM objectives.

Endangered Species Petition: In 1993, the Biodiversity Legal Foundation (Boulder, CO) and an independent biologist from Haines, Alaska filed a petition with the U. S. Fish and Wildlife

Service (FWS) requesting that wolves in Southeast Alaska be listed as a threatened subspecies under to the Endangered Species Act (ESA). The FWS ruled that a listing was not warranted at that time.

More recently, in August 2011, Greenpeace and the Center for Biological Diversity collectively petitioned the FWS to list the Alexander Archipelago wolf (*Canis lupus ligoni*) as a threatened or endangered subspecies throughout its range, and also petitioned FWS to declare wolves on Prince of Wales Island as a threatened or endangered Distinct Population Segment (DPS). They also requested that the FWS designate critical habitat to ensure survival and recovery of the subspecies and the DPS.

Although the portion of Unit 3 being proposed for wolf removal is within the range of the wolves covered by part of the petition for listing under the ESA, the department does not have conservation concerns for wolves in southeast Alaska. There are however, some local areas on Prince of Wales Island where harvest of wolves may need to be reduced by the Federal Subsistence Board to meet mutually agreed wolf management objectives.

Department recommendation: _____

I. FEASIBILITY ASSESSMENT[2]

A. *Definitions*

1. Define the relevant geographic area for assessing abundance of prey and predators (Appendix A, part 1).

   - The area being considered for this experimental wolf reduction plan encompasses approximately 1,680 km^2 (648 mi^2) or approximately 22% of the land area in Unit 3. The proposed treatment area includes Woewodski Island, Mitkof Island, and the Lindenberg Peninsula on eastern Kupreanof Island. The community of Petersburg (population 3,000) is located on Mitkof Island and is within the proposed treatment area. Lindenberg Peninsula and Mitkof Island are separated by a narrow body of water (Wrangell Narrows) and because of their proximity to one another, established road systems and ease of access, both locations are important deer hunting areas for Petersburg residents. In order to evaluate whether or not treatment effects are working, and to ensure that any desired results are not simply an artifact of non-treatment effects, an approximately 1,200 km^2 (475 mi^2) non-treatment or "comparison area" would be established on western Kupreanof Island for comparison to the area to be treated under the IM program (Figure 1).

2. Recommend a time period for evaluation of the proposed program that matches the regional Alaska Board of Game (BOG) cycle: 6-years[3].

[2] The purpose of the feasibility assessment and process are described in *Intensive Management Protocol*.

[3] Six years is the recommended time period for evaluating progress toward objectives because it fits either a 2-year or 3-year regional BOG cycle and should provide adequate time to assess whether a program is causing improvement in ungulate abundance or harvest in the defined area.

3. Note if the feasibility assessment is for intensive management (IM; legal requirements in Appendix A and the *Intensive Management Protocol*) or another purpose; Yes, this is an IM action.

B. *Review Management Objectives and Current Abundance and Harvest*

1. List the population and harvest objectives for prey species and current estimates of each; objectives may be in regulation for IM (Appendix A, part 2) or in survey and inventory reports otherwise.

DEER

- Population Objective: For the purposes of implementing AS 16.05.255(e) –(g), the Alaska Board of Game established the unit-wide deer population objective for Unit 3 at 15,000 (5 AAC 92.108) There is no area-specific population objective for the relatively small portion of Unit 3 for which this experimental wolf reduction effort is being considered.
- Harvest Objective: For the purposes of implementing AS 16.05.255(e) –(g), the Alaska Board of Game established the unit-wide deer harvest objective for Unit 3 at 900 (5 AAC 92.108). There is no area-specific harvest objective for the relatively small portion of Unit 3 for which this experimental wolf reduction effort is being considered.
- Management Goal in S&I deer management report:
  - As established by the board during its fall 2000 meeting in response to the intensive management of game law [AS 16.05.255 (i)(4)], the management goal is to manage the Unit 3 deer population to achieve and maintain a population of 15,000 deer while maintaining an annual harvest of 900 deer.
- Management Objectives in S&I deer management report:
  - Increase deer populations on winter range (below 1500 ft elevation) to 32 deer/mi^2, measured by a mean pellet density of 1.0 pellet-group/20m^2 plot.
  - Monitor deer densities using pellet-group surveys.
  - Monitor deer harvest using mailed questionnaires [now deer harvest ticket reports].

MOOSE

- Moose are a relative newcomer to Unit 3 having only recently immigrated from the Unit 1B Mainland during the past several decades. We are unable to estimate the Unit 3 population by aerial surveys because of the difficulty of seeing moose in a heavily forested landscape. The desire to rebuild deer populations on the Unit 3 islands may be counter to goals of establishing moose on these same islands because habitat alterations like clear-cut logging that benefit moose during the early seral stages leads to competition with deer. Additionally, moose provide

wolves with an alternative prey source, which may allow wolf numbers to remain at higher levels despite low deer numbers.

- Nonetheless, we established the following goals for Unit 3 moose. These goals have been met in recent years with the exception of "post hunt moose numbers," which we are unable to determine.
    - Post-hunt numbers: 400
    - Annual hunter kill: 40
    - Number of hunters: 470
    - Hunter-days of effort: 2300
    - Hunter success: 10%
- These goals are based on a crude estimate of population size, limited knowledge of habitat utilization and moose movements, and anecdotal information from people in the field (Lowell 2010).

2. Briefly review biological rationale of IM objectives (Appendix A, part 2) or other objectives for prey species:

- The current population objective (15,000) and harvest objective (900) for Unit 3 were established by the board in fall 2000. The population objective was estimated using a USFS habitat capability model for deer combined with a qualitative estimate of deer numbers by ADF&G biologists based on deer pellet counts and general range condition. The harvest objectives were based on the average annual harvest during 1994-1999. These objectives were set based on peak harvest years with mild winters.
- In the absence of practical techniques for developing precise population estimates for deer in Southeast Alaska, we conduct spring pellet-group surveys in select watersheds to identify deer population trends over time. Such surveys provide only a very general measure of deer population trends over a period of several years for specific watersheds. However, during the past 3 summers, Region I staff have been experimenting with a new DNA-based technique in which deer pellets are collected and analyzed and the results used to develop a mark-recapture estimate of deer numbers. This allows us to identify individuals and thus use a mark-recapture model to estimate deer numbers. This method is currently being tested to determine if it can be successfully applied in areas where deer exist at low density. Prior to 2012, we also used a regional questionnaire mailed randomly to 33% of deer harvest ticket holders to estimate annual harvest. That questionnaire has now been replaced with a harvest ticket report that all hunters receive when they acquire their deer harvest tickets. All hunters are asked to submit this report at the end of the season.
- Factors influencing deer populations in Southeast Alaska include severe winter weather, predation by wolves and bears, continued reductions in deer carrying capacity resulting from the harvest of productive old growth stands important for overwinter survival, and second growth stands entering stem exclusion.

- The most recent decline in the Unit 3 deer population and harvest resulted from 3 consecutive deep snow winters (2006–2007, 2007–2008, and 2008–2009). While deer populations throughout the region were similarly impacted, Unit 3 deer have failed to rebound. In Unit 4, where wolves are absent, deer have quickly rebounded. This rapid recovery may be related to the absence of wolves, but could also be a function of differing habitat modification from logging in Unit 4 relative to Unit 3.

3. List the population and harvest objectives for predator species in survey and inventory reports.

- Wolf management objective for Unit 3 is to maintain a sustainable population in all areas of historical wolf range.

- Black bear management objectives for Unit 3 are to maintain an average spring skull size and an average annual male skull size of at least 18.5 inches, and maintain a male to female harvest ratio of 3:1.

C. *Recommended Management Strategy.*

1. Briefly describe the proposed management strategy for the ungulate population (actions to be taken on habitat, predation, harvest, access, or other factors) [*This section could include PredPrey or other population modeling to forecast response in prey during proposed treatment period under scenarios of no action (continue current situation) and under the proposed action (active management); include brief statement of modeling assumptions*].

- This considered IM action would involve hiring 1 or 2 experienced wolf trappers to remove wolves (during the established wolf trapping season) from a relatively small portion of Unit 3 in an attempt to increase the deer population and reallocate harvest from wolves to humans. This reallocation will occur in proximity to the community of Petersburg, where deer populations are currently low. The reallocation of harvest will be restricted to bucks (thereby allowing the population to grow by protecting does).

2. Propose measures of progress toward population or harvest objectives to be evaluated, identifying if additional data collection beyond survey and inventory program is necessary.

- Since the mid 1980s, the department has monitored trends in Sitka black-tailed deer populations in Southeast Alaska using a systematic survey of fecal pellet groups. Counts of pellet groups are made along straight-line transects, ideally located within deer winter range from sea level to 1,500 feet elevation. Transects are established throughout the region and surveys are conducted during the spring to estimate activity of deer over the winter. However, fecal counts are confounded by seasonal and weather-related variability that influences the persistence of pellets in the environment, defecation rates, and detectability of pellets at different elevations and within different habitat types. Moreover, deer activity within winter range is strongly influenced by winter weather and snow conditions. Therefore, there is a great deal of "noise" in the data that is unrelated to numbers

or density of deer. It is also difficult to use pellet group counts to estimate population abundance or density because scaling factors used to convert pellet counts to numbers of deer are based on few empirical data and rarely evaluated over time. As a result, population estimates based on pellet counts are typically imprecise and unreliable.

- A number of long-established traditional deer pellet-group transects are located throughout Unit 3, including the considered "treatment" and "comparison" areas on Mitkof and Kupreanof islands. If deemed necessary, additional pellet-group transects could be established within the treatment area to monitor changes in deer pellet-group density. Although this method has to this point provided our only means of estimating deer population trends, information gained from traditional pellet group surveys cannot be used to derive precise measures of deer abundance. The ability of this technique to detect real changes in deer numbers is generally limited to large changes over many years and, therefore, cannot be relied upon as the only source of estimating deer population size. There are a number of variables that affect pellet densities, besides changes in deer numbers, which need to be considered. These include the effects of winter weather on deer distribution, the presence of snow that may cover deer pellets, persistence of pellets over time, and pellet detection rates.
- We will also initiate aerial surveys of deer in alpine areas of Mitkoff, Kupreanoff, and Kuiu islands as an additional indicator of deer presence and relative abundance before wolf control occurs and after wolf control begins. These surveys are relatively inexpensive, have been conducted in some of these areas previously, and should serve as an additional indicator of the relative success of the wolf control program.
- Harvest statistics derived from the recently-implemented deer harvest report cards (including days hunted per deer harvested) will be an important additional measure of deer abundance and be useful for evaluating progress toward the program's objectives. Although hunters are required to submit a report summarizing their deer hunting activities we anticipate some level of noncompliance with the reporting requirement. Nonetheless, we expect with internet reporting that we will get approximately 70-80% returns. If necessary, we can follow up with reminder letters to those who fail to report, as an attempt to achieve a high reporting rate from the IM area. This process could be enhanced with the requirement of a registration permit for all hunters if we find that the harvest ticket reporting is not sufficient. A registration permit would allow us to acquire data from all hunters given the stricter reporting requirements than that of harvest ticket reports.
- DNA deer pellet transects: Brinkman et al. (2010) developed and tested a protocol to efficiently locate and sample fecal pellets deposited by Sitka black-tailed deer, extract and sequence DNA from those pellets, and use the resulting genotypes to estimate deer abundance. They developed a method that was reliable, flexible to local environmental conditions, and that could be useful at varying temporal and spatial scales. They tested several DNA protocols suitable

for extracting and amplifying DNA from fecal pellets, and identified a suite of polymorphic loci useful for distinguishing between individual deer. They also developed a pellet sampling design and procedures that maximize sampling efficiency and simultaneously minimized the degrading effects of weather on the epithelial-cell DNA adhering to pellets. And finally, they adapted accepted methods of mark-recapture analysis to the sampling design and genetic data.

The department is currently evaluating this new DNA-based technique for estimating deer density and/or population size. This technique shows promise with providing us real time data on deer density, and may be essential if we are to use deer pellets as a means of measuring changes in deer numbers. This method includes collecting fresh deer pellets and extracting DNA in order to identity individual deer. In so doing, we can conduct a mark-recapture experiment and determine deer density and/or population size, depending on sampling intensity. During the past 3 years we have implemented this technique on a portion of Northeast Chichagof Island (2010 and 2011) and on Mitkof and Kupreanof islands in 2012. At this point, we are uncertain whether or not the DNA-based approach to estimating deer numbers will work in areas such as Unit 3, where deer occur at low density. Data analysis is still ongoing to determine the utility of this method in measuring deer population size, which is necessary to measure changes should we implement wolf removal through IM.

3. Provide a brief explanation for collecting or evaluating data from untreated areas for comparison to areas treated under the management program as evidence in a scientific study design that the treatment effects are working as intended and not simply an artifact of nontreatment effects (e.g., widespread improvement in calf survival because of mild winter across region, not because of predation control in a specific area).

   - We have a number of long-established traditional deer pellet-group transects located within both the considered “comparison” and “treatment” areas on Kupreanof, Mitkof and Woewodski islands. However, as previously noted, traditional pellet-group data alone may not be sensitive to anything short of broad and marked changes in deer abundance. Information obtained from traditional pellet-group surveys and deer hunt reports will be used as surrogates for other more direct measures of changes in deer density to determine if the considered treatment has effectively increased deer abundance and harvest.
   - The department will recommend that deer hunting remain open for bucks-only within both the treatment and comparison areas. The harvest of a few bucks is not expected to cause a further decline in deer numbers or prevent recovery of deer. Harvest statistics derived from the recently-implemented deer harvest report cards (including days hunted per deer harvested) will be an important measure of deer abundance that will be useful for evaluating progress towards achieving the program’s objectives.
   - Surveys of deer in untreated alpine areas of Mitkof, Kupreanof, and Kuiu islands

as an additional indicator of deer presence and relative abundance before wolf control occurs and after wolf control begins.

4. Provide an estimated cost of implementation (operations and field staff salary) for the proposed program over the evaluation time period.

   - Five-year cost of the predator control program.

     - Hire trappers: this would entail hiring 2 trappers for 4-5 months/year at a FW Tech III level, plus provisions such as food, fuel, and other miscellaneous supplies and equipment. This is expected to cost about $60-70K/year. We would want to continue the trapping effort for a minimum of 5 years in an attempt to achieve and maintain the desired reduction in wolf numbers. The cost for 5 years would be $300K-350K.

     - Traditional deer pellet transects: these transects have been conducted for decades, albeit at irregular intervals, in both the experimental and the comparison areas, giving us long-term population trend information. Although recognizing the limitations of this technique for detecting short term changes in the population, we may continue sampling these transects to add to long-term trend assessments. The cost of completing these transects would be $3-5K/year, and $15-25K over the 5 years of the study.

     - DNA deer pellet surveys: this technique is still in the development phase but has shown promise for estimating deer numbers on Prince of Wales (Unit 2) and NE Chichagof Island (Unit 4), and in spring of 2010 was implemented "experimentally" in that portion of Unit 3 being proposed for treatment. Until the data collected in Unit 3 this spring has been thoroughly analyzed, we will not know if this new technique will be useful for estimating deer abundance in areas where deer exist at low density. If this new technique can be successfully applied in such areas, it will allow us to identify real time changes in deer density which will aid in evaluating the effectiveness of the IM action being considered. Ideally, we would sample both the treatment and comparison areas during the first year of implementation. This would require a team of 4-6 people for approximately five weeks during the spring. Depending on the accessibility of the sampling plots, we would likely need some level of helicopter support, 2 highway vehicles, and food and housing for field crews. We estimate the first year cost at $75K. Only after running the analysis on the spring 2012 data will we be able to evaluate the effectiveness of this technique and develop an appropriate sampling strategy for future years.

     - Aerial surveys of alpine areas in August: these areas are small and easily surveyed during the time of year when many deer prefer alpine areas and weather is good. We estimate the annual cost of surveys will be about $6K.

     - Other sampling methods: we have not considered other methods at this time.

II. Potential to Achieve Ungulate Population and Harvest Objectives[4]

A. Population increase in ungulates required to reach population objective (may be represented as comparable density). *Insert number.*

- The treatment area represents only a portion of Unit 3 (22%), so anticipated increases in deer abundance from this IM program is not expected to provide enough deer to meet the IM harvest objective on a unit-wide basis. It may; however, allow for a few deer to be reallocated from wolf predation to hunter harvest, which would provide local residents with additional harvest opportunity. The program will be treated as a management experiment to determine if wolf numbers can be reduced sufficiently by trapping to improve deer harvest, and to see if the results can be measured. If successful, this program could provide a blueprint for expanding the program to other parts of Unit 3 to further increase deer numbers and possibly meet the unit-wide population and harvest objectives.
- Because precise population estimates are not currently available for Unit 3 deer, changes in deer pellet-group densities and deer numbers from surveys of alpine areas will be used in lieu of other more direct measures of population change to evaluate progress towards IM objectives. Deer harvest will be the primary direct measure of the success of the program and progress toward IM objectives. Harvest estimates will also serve as an indirect measure of deer abundance.

B. Increase in average estimated harvest (last three regulatory years [RY]; RY = 1 July–30 June) to reach harvest objective [*if applicable, clarify for IM areas at low density how many prey are needed to meet local needs as an initial means of contributing toward IM objective for that unit]*. *Insert number.*

- The average annual extrapolated harvest during the past 3 RYs has been 542 deer, or 358 deer below the IM harvest objective of 900.

C. Potential to mitigate biological limitations in proposed IM area (Appendix B.I). *Low/Moderate/High.*

- Low: Continued or periodically severe winter weather could negate or confound recovery of deer, and if deer numbers are low enough, predation on deer fawns by black bears could also prevent deer recovery. Severe weather can not be effectively mitigated. Black bear predation could be mitigated to some degree by removing black bears at a higher rate, but at present, we are not proposing this as part of this IM measure.
    - Periodically severe winters in Southeast Alaska are a function of the Pacific Decal Oscillation and occur primarily when ocean temperature is relatively cold during "La Nina" weather events. Maintenance of old growth forest has the potential to keep carrying capacity of deer winter range high and perhaps to mitigate the effects of severe winters, especially when deer numbers are high. However, based on deer pellet data and hunter harvest, deer appear to be so far

[4] The background data used in evaluating potential are found in Appendices B and C.

below carrying capacity in Unit 3 that habitat is unlikely to be limiting deer numbers at this time. In addition, the majority of the land area in Southeast Alaska, and in Unit 3, is under federal ownership and managed by the USFS. While the effects of winter weather might otherwise be partially mitigated by retaining as much old growth forest as possible to function as deer winter range, the department has very little influence over forest management activities occurring on federal lands. In short, while the State manages the wildlife, the USFS manages the habitat.

Predation by black bears on deer fawns has been shown to be an important mortality factor on Prince of Wales Island where black bears are abundant. Black bears are also abundant in all of Unit 3, except perhaps on Zarembo Island. However, reducing black bear numbers enough to reduce mortality of deer fawns is likely not prefered because of their economic importance.

D. Potential to reduce or moderate hunting conflicts (Appendix B.II). *Low, Moderate, High.*

- High. Few, if any, hunting conflicts currently exist, nor are they anticipated as a result of the IM activity under consideration.

E. Anticipated public participation based on expense and other factors (Appendix B.III). *Low/ Moderate/High .*

- Moderate. While there are a number of wolf trappers operating within portions of the considered treatment area, high fuel prices and low pelt prices tend to limit most wolf trapping activity to a few individuals operating relatively few wolf sets at low to moderate intensities. This may, however, work to our advantage as it is preferable to have 1 or 2 experienced and dedicated trappers intensively working an area than several less experienced trappers who may only "educate" wolves to the dangers of approaching trap sets.

F. Data availability for designing an effective management plan [Appendix C]. *Low/Moderate/High.*

- Low/Moderate. Precise population estimates are not available for deer or wolves in the unit, although we have long-term data from pellet-group surveys that provide us with general population trend information and long-term deer harvest estimates. If we are able to successfully implement the DNA-based methodology for estimating deer density then we will substantially improve our ability to detect changes in deer numbers, which will be important for an effective management plan. The addition of surveys of alpine areas may also improve data on deer presence/absence and relative abundance.

G. Potential to measure or demonstrate progress in ungulate population recovery or an increase harvest within a defined time period (Appendices B.I.E. and Appendix C). *Low/Moderate/High.*

- Low/moderate. As explained above, our present deer pellet-group counts are meant only to provide general long-term trends in deer numbers, not precise density or population estimates. However, if the DNA method proves feasible, our

ability to detect changes in the deer population over time is expected to be greatly enhanced.

- Beginning with the 2011 season, all deer hunters are required to submit hunt reports indicating the locations they hunted, number of days hunted, and the number of deer harvested. . We believe deer hunt reports will improve our ability to detect changes in harvest and catch per unit effort. Consequently, these metrics of harvest may be our best means of detecting increases in deer numbers as a result of IM efforts.
- Proposed deer surveys in alpine areas will also help indicate deer presence or continued absence and perhaps also relative abundance.

H. Potential to document reasons for success or failure in population recovery or harvest increase (Appendix B.I.E). *Low/Moderate/High*

- Low/Moderate. Our ability to measure or demonstrate progress toward deer population recovery will depend on four factors, 1) measuring harvest and thereby detecting increases that occur, and 2) our ability to successfully apply the deer population estimation technique which uses DNA extracted from fecal pellets to measure changes in deer density and/or population size in selected areas, 3) comparing measures of pellet group abundance with previous data, and 4) conducting surveys of deer in alpine areas before and after wolf control. We believe the harvest monitoring we have in place will be sufficient to measure changes in hunter success, while having the ability to estimating relative abundance of deer over large areas is still something we are working towards. If we can accomplish these two goals, we should be able to compare changes in deer numbers both within and between the experimental and comparison areas.

APPENDIX A. Legal elements and criteria for intensive management objectives and a feasibility assessment.

Department staff should review and ensure the following four elements have been met [*Brief listing of information by bullet may be useful for Sections 1, 2, and 3 this appendix*]:

1. Definition of populations:
   - The relevant area for defining an ungulate population under intensive management (IM) is that defined as a positive determination in Title 5, Alaska Administrative Code, Chapter 92, Section 108 (5 AAC 92.108).
     - Game Management Unit 3 (3,000 square miles).
   - "Game population" is defined in AS 16.05.940(20) as a "group of game animals of a single species or subgroup manageable as a unit." Clarify the purpose of ungulate or predator management zones proposed to be smaller than areas under 5 AAC 92.108.
     - The area being considered for this experimental wolf reduction plan encompasses approximately 1,680 km^2 (648 mi^2) or approximately 22% of the land area in Unit 3. The considered treatment area includes Woewodski Island, Mitkof Island, and the Lindenberg Peninsula on eastern Kupreanof Island. The community of Petersburg (population 3,000) is located on Mitkof Island and is within the considered proposed treatment area. Lindenberg Peninsula and Mitkof Island are separated by a narrow body of water (Wrangell Narrows) and because of their proximity to one another, established road systems and ease of access, both locations are important deer hunting areas for Petersburg residents. In order to evaluate whether or not treatment effects are working, and to ensure that any desired results are not simply an artifact of nontreatment effects, an approximately 1,200 km^2 (475 mi^2) non-treatment or "comparison area" will be established on western Kupreanof Island for comparison to the area to be treated under the management program (Figure 1).
   - Consider whether a population with a positive determination for IM (5 AAC 92.108) should match or differ from amounts necessary for subsistence (5 AAC 99.025) for the same geographic area.
     - The ANS for deer in Unit 3 is 150-175, well below the harvest objective of 900 or the population objective of 15,000.
2. The Alaska Board of Game (board) has established population and harvest objectives for IM of identified ungulate populations for a high level of harvest by humans:
   - Positive determination made for species and herd (caribou) or unit/subunit (moose, deer) per 5 AAC 92.106(1) by considering the following factors:
     - Historic harvest that meets or exceeds defined levels (caribou: 100, deer: 500, moose: 100); the highest three consecutive years and three most recent years are provided by department.

        - Unit wide deer harvest
            - Highest 3 years: RY 1998-2000 = 1041/yr.
            - Most recent 3 years: RY 2008-2010 = 542/yr.

    - Accessibility (roads, rivers, trails, landing strips).
        - The considered treatment area is highly accessible using either highway vehicles, boats, ATV's, snow machines, float planes or a combination of these means of transportation.
    - Use of harvest primarily for meat.
        - Deer harvest is primarily for meat. Although nonresidents are allowed to hunt deer in Unit 3, hunting is so poor that participation is low. Although the nonresident harvest is low, eliminating nonresident hunting is being considered, but doing so could potentially influence measures of relative deer abundance based on harvest and thus partially compromise the experimental design.
    - Hunter demand (reported hunting effort– RY2010).
        - During RY 2008-2010 an annual average of 653 hunters hunted deer in Unit 3.

- Population and harvest objectives established in 5 AAC 92.108 based on these criteria in 5 AAC 92.106(2):
    - Effects of weather, habitat capability, diseases, and parasites.
        - Weather: Severe winter weather has perhaps the greatest impact on Unit 3 deer populations, often resulting in high levels of mortality. Severe winters generally occur in cycles and appear to be associated with the Pacific Decadal Oscillation. Usually two or three bad winters are followed by seven to ten mild winters.
        - Habitat capability: Past, present and anticipated future reductions in important deer winter range (productive old growth forest) remain a management issue as it affects the ability of the landscape to support deer. On this larger scale, the ability of the habitat in Unit 3 to support deer will decline, but deer numbers are so low in the unit that carrying capacity issues are unlikely to be a concern at the present time.
        - There is no evidence to suggest that disease or parasites are responsible for the observed decline in the deer population.
    - Maintenance of viable predator populations (see definition in *Intensive Management Protocol*).
        - Wolf surveys are not feasible in the unit; however, the unit-wide wolf harvest has remained relatively stable at approximately 50 wolves per year over the last 2 decades. Wolves in the treatment area are part of a much larger wolf population that interchanges freely with wolves from nearby islands and the mainland. Therefore, even with a high rate of wolf removal from within the treatment area, the wolf population over the broader area will continue to be managed at sustainable levels.

- Maintenance of habitat conditions suitable for other species in the area.
  - Habitat in the unit, including the proposed treatment and comparison areas, consists of a diverse mixture of productive and nonproductive old growth forest stands, managed second-growth stands, muskeg, and subalpine habitats. The proposed IM program will not affect habitat.
- Effects on subsistence users.
  - Low deer numbers in Unit 3 have greatly reduced harvest opportunity for all hunters, including state and federally qualified subsistence hunters.. Local users are being forced to either forego deer meat, or travel substantial distances to neighboring units (Unit 2 and 4) with more abundant deer populations. Given the large open-water crossings involved, travel to neighboring units in search of deer can substantially increase hunting expenses and expose hunters to greater risks. There have been several documented drownings and near-drownings of hunters attempting to travel to Admiralty Island in Unit 4 where deer are more abundant.
- Cost, feasibility and potential effectiveness of possible management actions.
  - Cost: The cost of this program would include hiring 2 trappers for a period of 4-5 months, at a FW Tech III pay grade. Additional costs would include fuel and other supplies. However, the trappers would be using their own boats, and/or vehicles to access trapping sites. Anticipated staff time associated with hiring one or more trappers would be moderate and related mostly to keeping the trappers operating, and collecting biological samples from wolves that are taken.
  - Feasibility and effectiveness of management actions: The proposed wolf reduction plan is an experiment that we believe can be successful in increasing deer numbers. Barring severe winters, we expect even a modest increase in adult deer survival due to decreased wolf predation can result in up to a 25% annual population increase (Lou Bender, personal communication). Removal of wolves would be conducted by 1-2 experienced trappers who, contingent upon favorable weather conditions, should be able to harvest wolves at a relatively high rate. These trappers have spent years perfecting their techniques, and all indications are that with department support (particularly with covering fuel costs) trapping by experienced local trappers would be the most feasible method of reducing the wolf population within the considered treatment area.
- Land ownership patterns within range of population.
  - Most of the unit is comprised of Federal lands (National Forest) with small State, Tribal and private in-holdings. Nonetheless, the proposed wolf trapping activities will be confined to State tidelands bordering Federal lands.
- Accessibility to harvest.
  - The area is comprised primarily of public lands that are readily accessible using highway vehicles, boats, ATV's, snow machines, floatplanes or combinations thereof.

- Other factors considered relevant by the board.

3. Depletion of the ungulate population (abundance or harvest below objectives) or reduction of the "productivity" (recruitment) of the population has occurred and may result in a "significant" reduction in the allowable harvest per Alaska Statute, Title 16, Chapter 5 (AS 16.05.255[e]).

    - Yes. The unit-wide deer harvest is well below the IM harvest objective. Although a precise population estimate is not available for the unit, the deer population is also believed to be well below the IM population objective. The allowable harvest for deer hunting in this unit is currently restricted to 1-2 bucks in most areas, with seasons ranging from 2 weeks to 4 months. The department is proposing to reduce deer seasons and bag limits to 15-31 October (one buck) throughout the proposed IM "treatment" area.

4. Enhancement of abundance or productivity of the big game prey population is feasibly achievable utilizing recognized and prudent management techniques (AS 16.05.255[e][3]).

    - Moderate chance of success. Trapping is widely recognized to be a prudent predator management technique. Although trapping by the public has seldom been shown to significantly reduce wolf numbers in Alaska, by hiring 1 or 2 experienced wolf trappers who will work full time within the considered treatment area, the department believes there is at least a moderate likelihood that wolf numbers may be reduced given the experience these trappers have. However, whether they can consistently maintain the wolf population at or below 55% of pretreatment levels long enough to measurably improve deer survival and harvest remains uncertain.

5. The BOG is not required to adopt regulations to provide for an IM program per AS 16.05.255(f)(1) if a proposed IM program is:

    - Ineffective based on scientific information. Although there are unknowns in this situation, we believe that a preponderance of available scientific information indicates that the program has the potential to be effective. The primary unknown is whether trapping can be effective enough at reducing wolf numbers and the only way to determine this is to try it.

    - Inappropriate due to landownership pattern. The land ownership in this area is mostly federal (USFS), but the trapping activities would be conducted on State lands below mean high tide. Therefore, land ownership patterns are not expected to hinder an effective control program. While stopping short of providing a definitive answer, US Forest Service staff has indicated that the agency has no policy that specifically prohibits predator control or intensive management activities on Forest Service lands. Furthermore, if the activities were consistent with hunting and trapping regulations, the agency would have no basis to prohibit such activities since the agency supports the sustainable use of fish and wildlife (Deputy Forest Supervisor Patricia O'Connor, pers comm. via email Sept. 11, 2012).

- Against the best interest of subsistence uses. Subsistence users throughout the unit would benefit from any increase in the availability of deer, and most would support the department's efforts to increase deer numbers.

6. The BOG may forego a feasibility assessment if per AS 16.05.255(f)(2) it declares that a biological emergency exists and takes immediate action to protect or maintain the big game prey population in conjunction with the scheduling for adoption of those regulations that are necessary to implement section (e).

APPENDIX B. Elements of a feasibility assessment for an area (deer, moose) or herd (caribou).

[*The assessment identifies factors that have the potential to hinder or prevent progress toward maintaining or elevating ungulate harvest (ultimate goal of intensive management [IM] and common to other management programs). Two general situations are high and low density of prey. For ungulate populations already at high density, managers typically seek to maintain or improve nutritional condition of the animals by reducing the browsing or grazing on forage plants, by increasing forage production, or both. Thus, a strategy at high density may seek to purposefully reduce ungulate populations (often accomplished by increasing harvest) or enhancing habitat. In contrast, for populations at low density where nutritional condition is generally good and predation is the primary limiting factor, strategies will often include predation control where the initial focus is to increase the ungulate population by improving recruitment of young into the breeding population. Predation control (particularly for wolves in areas of deep snow) may also improve survival of older age classes to allow population growth. Alternatively, predation control might be applied, particularly in focused geographic areas, in an attempt to initially reallocate part of the predation mortality to harvest without expecting a substantial increase in population.*

There may be situations where dramatic change in habitat has reduced carrying capacity, resulting in reduced density. For example, during several decades following coastal timber harvest there may be lack of canopy interception of snow by mature conifers that hinders deer access to upland browse, followed by a period of dense regeneration where canopy hinders understory forage development by blocking sunlight.

In all situations, hunting conflicts can limit harvest potential and should be identified (along with strategies to reduce conflict) before drafting an operational plan and implementing a management program to increase the population (see Intensive Management Protocol). The primary (but not exclusive) forum for defining acceptable hunting practices, discussing access conflicts, or recommending evaluation parameters is the local Fish and Game advisory committee. For example, greater hunter success per unit of effort (i.e., fewer days required to harvest an animal) may be considered an acceptable outcome of management because of fuel savings, even if the harvest objective is not achieved. Where appropriate, based on factors assessed, an area smaller than the IM subunit or herd range may be identified for implementing and assessing results of IM programs as a means to make progress toward achieving the population and harvest objectives for the game management unit (deer, moose) or herd range (caribou) or as specified in regulation.]

I. BIOLOGICAL FACTORS

Biological factors are the basis for evaluating potential to achieve population or harvest objectives. Information may be yes/no, numeric, categorical, or not applicable depending on species or area. Brief explanations may be warranted along with local data where available. In most instances professional judgment by department staff will be required to put numbers in context in the recommended management strategy (Section I:Feasibility Assessment, p. 1).

A. *Nonpredation and Nonhunting Mortality of Prey*

1. How frequently is there markedly reduced survival due to annual weather (snow depth, especially associated with complicating factors, such as severe cold; ice on

snow events; flooding; drought)? [*Expected primarily to affect young, but not exclusively. General examples of thresholds include snow ≥36 inches deep for moose or ≥20 inches for deer, or prolonged wind chill <0°F for deer in shrub-dominated coastal areas. Other empirical values may pertain in specific areas*.]

- Severe winter weather has the potential to confound or prevent recovery of the deer population, even if wolves are successfully reduced in the treatment area. However, severe winters generally occur in cycles and appear to be associated with the Pacific Decadal Oscillation. Usually two or three bad winters are followed by seven to ten mild winters. Separating the effects of severe winter weather and wolf predation is difficult because these two factors are strongly linked. For example, during periods of heavy winter snowfall, deer tend to use low-elevation portions of their home ranges that are typically closer to shorelines. As a result, wolves typically frequent these same areas in search of prey, where they can more efficiently locate and kill deer.

- 2. How extensive is vehicle mortality along road and rail systems that reduce harvestable surplus in the population (estimated number killed annually or as a percentage of total kill by humans that includes harvest and defense of life or property)?

    - The community of Petersburg is located on Mitkof Island, and where deer have become habituated to human activity and motor vehicle traffic, vehicle mortality is considered problematic from a public safety standpoint. However, because such mortality typically involves habituated deer that inhabit relatively urban areas, these animals do not typically provide recruitment for the island-wide deer population. Illegal harvest of deer is known to occur along the Mitkof Highway; however, its contribution to the recent deer decline in Unit 3 is likely small given that deer in remote areas without poaching have also declined. Illegal harvest is not expected to affect recovery of deer.

B. *Productivity of Prey Population and Habitat* (may include prey density effects).

1. Evidence of inherent habitat limitation (e.g., nutrient deficiency) manifested in low reproduction, body weight, or survival? *Yes/No.*

    - Unknown. We do not have any information on deer condition, pregnancy rates, fecundity, recruitment, mortality or survival. However, we have no evidence indicating that deer are nutritionally stressed in this area. Although we do not have quantitative measures of body condition for deer in Unit 3, hunters report that deer are in excellent condition with large reserves of body fat during the hunting season in October. At present this is the best measure we have for insight into the fitness of deer in Unit 3.

2. How strong a negative effect from the local prevalence of diseases or parasites? *Low/Moderate/High.*

    - Low. There is no evidence to suggest that disease or parasites are responsible for the observed decline in the deer population.

3. Evidence of longer term weather trend changing forage production or other habitat requirements (e.g., markedly increased area in recent burns or noticeably less frequent flooding) and its consequence for the ungulate in question *Yes/No.* Note trend in habitat capability. *Positive/Negative.*

    - No. There is currently no evidence that climate change will result in lower deer numbers in this portion of Southeast Alaska.

    - Negative. The current trend in deer habitat capability, irrespective of climate change, is negative as a result of reductions in important deer winter range due to logging of productive old growth forest stands and second growth stands entering stem exclusion. However, deer numbers are now so low that carrying capacity is unlikely to be an important issue for many years.

4. Evidence of high or excessive levels of forage use (excessive means evidence of plant mortality from inability to rejuvenate after persistent grazing or browsing at some proportional level of biomass removal). *Yes/No.*

    - Unknown. As mentioned earlier, anecdotal information from hunters suggests harvested deer are in excellent condition with large reserves of body fat. We have not conducted any formal studies to evaluate browsing intensity but based on observations by staff deer browsing intensity appears to be very light on Mitkof and Kupreanof islands where the proposed IM program will occur, except within the Petersburg city limits. One concern is the interspecific competition for browse species between deer, elk and moose in some areas of unit 3.

5. Has the combination of natural and human-caused disturbance produced an extent and mixture of vegetative seral stages capable of maintaining the present productivity if the population changes due to management treatment at a moderate level of increase? *Yes/No*. At a substantial level of increase? *Yes/No.*

    - Yes and Yes. Habitat will continue to support deer numbers now and into the future even if the IM program is far more successful than we anticipate. Deer are likely well below carrying capacity of the available productive habitats. Nutrition is not expected to be a limiting factor even if deer numbers increase substantially, unless bad winters occur. Although continued reductions in deer habitat capability associated with past, present, and future timber harvest will likely reduce the unit's ability to support *high* deer numbers, deer numbers are not expected to reach high levels even if the IM program is successful. This is because the IM program will initially be restricted to a small portion (22%) of the Unit, and because reductions in wolf numbers are not expected to be nearly as great as they were during the previous predator control programs of the 1950s, when poison was used.

C. *Potential Effectiveness of Proposed Predator Control* (based on number of predator species and seasonal prey location).

1. Is effect of predation by individual predator species known for the ungulate species of interest in the proposed area? *Yes/No* [*by predator species*].

- To some extent. While little area-specific information is available regarding predation on deer in Unit 3, research conducted on deer, wolves, and black bears in neighboring Unit 2 (Prince of Wales Island) provides useful information on the predator/prey relationship of these species in a similar environment. For example, for wolves and Sitka black-tailed deer in Southeast Alaska, the estimated predation rate is 26 deer per wolf per year (Person et al. 1996). Black bear predation on deer also occurs, and although we have no data from Unit 3, we are able to draw some inferences from an ongoing study from neighboring Unit 2. In that study, deer fawns are subject to fairly intensive predation by black bears. It stands to reason that similar predation patterns on fawns may occur in Unit 3. 2. Is predation control being proposed for one or multiple predator species? *One/Multiple*; One.
    - Only wolves.

3. Are there concentrated calving and/or young rearing areas of ungulates for focused bear or wolf control? *Yes/No* [*define which predator(s)*].
    - No. Based on deer studies on nearby Prince of Wales Island, we suspect that deer are widely distributed throughout the habitat during the fawning period.
4. Are there concentrated winter ranges of ungulates suitable for focused wolf control? *Yes/No/Unknown.*
    - Yes. During winter, deer tend to use low-elevation portions of their home ranges that are typically closer to shorelines. As a result, wolves typically frequent these same areas in search of prey. For this reason we believe focusing trapping efforts along state-tidelands during the winter months has the highest likelihood of effectively reducing wolf numbers.

D. Potential Effectiveness of Public Participation in Predator Control (under permit) or Predator Harvest (see also III.A and III.B this appendix).

1. Number of licensed hunters and trappers within or near proposed management area (size of potential participant group) and the proportion of these hunters and trappers actively harvesting predators.
    - Over the last 2 decades, trappers and hunters have harvested an average of approximately 50 wolves annually in Unit 3 (Figure 7). Trappers account for most of the annual harvest (60%), with incidental shooting accounting for 40%.
2. Estimated wolf harvest rate (percentage of estimated fall population, average of three most recent regulatory years).
    - Based on estimates of average pack and home range sizes derived from extensive wolf radio-telemetry studies on Prince of Wales Island in neighboring Unit 2, our best estimate for wolf numbers in Unit 3 is approximately 250 (range from 125-385) of which approximately 50 (19%) are harvested by hunters and trappers annually (data from 2000-2010). However, for management purposes, the wolves on Etolin Island, Wrangell Island, and Zarembo Island should be considered as separate populations from the wolves that inhabit Kuiu, Kupreanof, Woewodski,

and Mitkof Islands. There are approximately 180 wolves within the Kuiu, Kupreanof, Woewodski, and Mitkof Island complex, of which about 33 (18%) are harvested annually (data from 2000-2010). If the considered Intensive Management Program is implemented, approximately 32% of the land area within this 4 island complex (or 1,680 km^2) would be established as a treatment area (Lindenberg Peninsula of Kupreanof Island, Mitkof Island, and Woewodski Island). In the treatment area, as close to 80% of the wolves as possible (about 50 wolves in 5-6 packs) would be removed. If the proposed trapping program is successful, and the approximately 50 wolves are removed from the treatment area, and harvest on the remaining portion of the four islands continues at average historic levels, approximately 45% of the population of wolves within the 4-island complex would be removed. Normal harvest outside the treatment area is therefore not expected to reduce the overall wolf population within the 4-island complex to unsustainable levels. Previous research, for example Adams, et al. (2008) has shown that harvests of less than 29% of a wolf population do not result in reduced population size.

3. Estimated black bear harvest rate (percentage of estimated spring population, average of three most recent regulatory years).

    - Precise population estimates are not currently available for black bears in the unit, however, we estimated bear density, population size and harvest rates during Board of Game preparations in 2010. For all of Unit 3, our estimated densities ranged from 0.5-2.5 bears/$mile^2$, our estimated population size ranged from about 2,500-4,500, and our estimated harvest rate ranged from about 2.3-13%. These density estimates were derived from subjective assessments from area biologists by comparing each area to Kuiu Island (where bear density estimates have been derived using scientific data and findings), along with habitat capability models. Harvest records and anecdotal evidence from big game guides, hunters, and agency biologists appears to indicate that black bear populations may have declined over the last decade.

4. Estimated grizzly/brown bear harvest rate (percentage of estimated spring population, average of three most recent regulatory years).

    - While brown bears are known to occur occasionally on those Unit 3 islands separated from the mainland by only short water crossings, their numbers are believed to be very low. Therefore, brown bears are not believed to be a significant contributing factor to low deer numbers.

5. Historical effectiveness of a predator control program in this area (where applicable).

    - Wolves were controlled in Unit 3 during the 1950s using poison, trapping, and the bounty system. The wolf control program was apparently effective, because by the late 1950s deer numbers were high and biologists worked hard to convince hunters to shoot more female deer (Dave Klein, personal communication). During the late 1960s, in response to severe winter weather and reduced deer numbers, the State Legislature appropriated $13,400 for wolf control in Unit 3 and animal control agents and biologists with ADF&G used traps and strychnine poison to

reduce wolf numbers around Petersburg and Wrangell (McKnight 1973). This program was not continued after 1968, and in the early 1970s, several consecutive severe winters reduced the reportedly moderate deer numbers to low levels. Although the bounty ($50) on wolves in Southeast Alaska remained in place after statehood, the Legislature did not fund it after 1967 and it was eliminated in 1977. No formal wolf control program has been conducted in Unit 3 since 1968, and despite long seasons, public trapping has been ineffective for significantly reducing wolf numbers or predation on deer. In November 2010, the board extended the wolf hunting season until the end of May to provide more opportunity for black bear hunters to take wolves. This action, however, contributed little to the Unit 3 harvest (just 2 wolves were harvested during May 2011).

6. Number of competing predator control programs in the region and the anticipated impact of adding an additional program (potential dilution of participation by skilled members of the public).

    - There are no other predator control programs in the Region. An experimental predator control effort is similarly being considered for a small portion of Unit 1A near Ketchikan. With the exception of the bounty system that was funded until 1967, there has been no recent state sponsored IM activity in the Region.

E. *Ability to Confirm Treatment Response* (e.g., predator control, habitat enhancement, selective harvest) in treatment areas with data from nearby and comparable untreated areas through assessment of biological parameters using existing techniques. Low sample size for survey data may limit applicability in low density situations. Describe whether the following criteria for evaluating response to treatment are possible or recommended (*Yes/No* answers): Possibly.

1. Established periodic survey for abundance?

    - Deer pellet group transects: A number of long-established deer pellet-group transects are located on Mitkof, Kupreanof and Kuiu islands, including transects within proposed “treatment” and “comparison” areas on Mitkof and Kupreanof islands. If deemed necessary, additional pellet group counts will be established in treatment and comparison areas to help evaluate the success or failure of the proposed trapping effort. However, the deer pellet-group methodology is not designed to detect precise changes in deer numbers, but is instead used to assess general trends in deer population fluctuations (i.e., increasing, stable or decreasing?). Interpretation of pellet-group results can be confounded by a number of factors (snowfall, snow persistence, pellet persistence) independent of whether there is any change in actual deer numbers. While the pellet group data is one tool we use to measure long-term trends in deer numbers, it is not well suited to measuring short-term changes in deer population size.

    - DNA deer pellet transects: The department is currently experimenting with a new pellet-group methodology that, if successful, should allow us to more accurately estimate deer density and/or population size. This method involves collecting fresh deer pellets and extracting DNA to determine the identity of individual deer.

In so doing, it may be possible to conduct a mark-recapture estimate of deer density and/or population size depending on the level of effort we are able to undertake. We are currently planning on conducting some level of analysis using this methodology in the Unit 3 IM area to measure deer density pre-control. We would then continue this effort during the control period to measure changes in deer density/population size.

- Deer catch per unit effort: Despite low deer numbers on Mitkof, Kupreanof, and Woewodski islands, the department will recommend that deer hunting remain open for bucks only. Harvest of a few bucks is not expected to cause a further decline in deer numbers or prevent recovery of deer, and harvest statistics (including days hunted per deer harvested) will be an important measure of deer abundance that will be useful for evaluating progress toward achieving the program's objectives.

- Annual August surveys of deer in alpine areas of Mitkoff, Kupreanoff, and other islands in Unit 3 before, during, and after wolf control: These aerial surveys of alpine areas in August are expected to contribute to evaluating whether deer abundance has changed during the wolf control program. Although surveys of deer in alpine areas have largely been abandoned in Southeast Alaska, the Department believes they may be useful indicators of relative deer abundance, presence/absence, and relative fawn survival.

2. Fall composition surveys for young to adult female ratio as index to survival? [*e.g., bear predation during prior summer where wolf predation on young is comparatively low*].

   - Possibly. Usually not feasible due to sightability challenges associated with dense vegetation and rugged terrain. However, surveys of deer in open alpine areas may contribute some indication of fawn survival.

3. Fall composition surveys for yearling to adult female ratio as index to survival [*e.g., wolf predation during year since prior fall survey where bear predation on young is comparatively low*].

   - Not feasible.

4. Radio telemetry for survival of specific age cohorts.

   - Possibly, pending available funding. However, given the low density of deer in this area, capturing a sufficient sample size of deer could be difficult.

5. Total prey harvest and age-sex composition of harvest among local residents, state residents, and nonresidents (where applicable).

   - Yes. Historic deer harvest survey information is available and recently-implemented deer harvest report cards will provide additional data.

6. Harvest per unit effort, particularly in focused program areas where the initial intent is reallocation of mortality from predators to harvest to first meet local harvest needs.

   - Yes. Historic deer harvest survey information is available and recently-

implemented deer harvest report cards will provide additional data.

II. SOCIETAL FACTORS

Societal factors associated with hunting conflicts (e.g., constraints to access, acceptable methods, and harvest expectations), hunter access, and public tolerance for intensive management practices.

A. *Public expectation for predator control and increased ungulate harvest* must be understood prior to initiating programs to increase ungulate populations. Public conflicts over ungulate harvest methods can reduce options for controlling population growth. Failure to limit growth can reduce the condition of habitat and ungulates to the extent of reduced productivity. Critical components of conflict mitigation are identifying acceptable predation control methods as well as the potential for additional ungulate harvest opportunities that are acceptable to the hunting and nonhunting public. Defining the benefits of increased harvest is complex because hunter motivation may include economic factors (cost of meat replacement) and intangible measures of satisfaction (continuation of hunting culture, time spent in the field with family or friends, etc.).

1. Has the public defined an acceptable quantity and sex/age structure of ungulate harvest? *Yes/No.*

   - Yes. Residents of Unit 3 have cited the scarcity of locally available deer and have requested measures to enhance deer populations and harvest. Public outside of Unit 3 have yet to be involved in this process. There are no apparent objections to harvest of does if the population recovers sufficiently to allow such harvests.

2. Does the level of unreported or unknown harvest hinder the ability of the department to evaluate response to management treatments? *Yes/No.*

   - To a small extent. The fall 2011 implementation of harvest tickets and accompanying hunt report is intended to provide more accurate assessments of hunter harvest, and effort (days per deer).

3. Has the department informed constituents about ecological and biological constraints (nutrition, forage condition) relative to setting upper limits for population densities of managed ungulates? *Yes/No.*

   - No. High deer numbers have not been an issue since the early 1960s in Unit 3. The department anticipates that hunters will easily be able to limit growth of deer numbers in the treatment area because of both high road densities and ease of access from the shoreline. Since the 1960s, there have been no objections to harvest of does. Does are widely harvest in areas of Southeast Alaska where wolves are not present.

4. If possible from historic data, characterize hunter density where significant conflicts occur between hunters: *Low, Moderate, High* and between hunters and nonhunters: *Low, Moderate, High.*

- Low. The area proposed for treatment is comprised mainly of public lands and conflicts between hunters are rare.
- Low. Conflicts between hunters and nonhunters are extremely rare.

5. If possible from historic data, what is potential for conflict in rural areas between local hunters and nonlocal hunters? *Low, Moderate, High.*
   - Low. Unit 3 deer populations are very low compared to other neighboring units (i.e. Units 2 and 4), therefore, relatively few nonlocal residents participate in the local deer hunt and few conflicts occur.
6. Conflicts or problems associated with access, such as existing access constraints. *Few, Some, Many.*
   - Due to the large percentage of public land available, few, if any, conflicts occur with regard to access.
7. Accepta*ble strategies to s*pread out hunters and minimize trespass on private lands. *Few, Some, Many.*
   - Not applicable.
8. *Accepta*ble strategies to minimize unacceptable levels of trail *damage on public* lands. *Few, Some, Many.*
   - Not applicable.
9. Acceptance of restricted methods or means for *harvest, partic*ularly *near communitie*s (e.g., archery or muzzleloader). *Yes/No.*
   - Yes. The Community of Petersburg currently has a well accepted archery-only management area located within city limits (Petersburg Management Area).
10. Anticipated increase in vehicle mortality with ungulate population growth (poses a public safety risk). *Low, Moderate, High.*
    - Kupreanof: Low to nonexistent.
    - Mitkof: Moderate.
11. Anticipation of strongly adverse public reaction to a management tool (e.g., predation control, prescribed fire, selective harvest), geographic area, or other facet of the proposed program. *Low, Moderate, High.*
    - Low among the local public.
    - Possibly high among nonlocal public, especially in light of the petition for listing the Alexander Archipelago Wolf under the endangered species act. Although the department does not have a conservation concern for wolves anywhere in Alaska, the petition for listing wolves in this area may result in opposition to this IM program.
12. Potential for predator control to have indirect negative effects on alternate prey, such as increase in medium predators that can prey on ungulate young, particularly in

species of high interest to hunters (e.g., increased coyote abundance following extended periods of wolf control to benefit moose or caribou could increase predation on Dall sheep lambs during peak abundance of hares, with implications on number of legal rams in future years). *Low, Moderate, High.*

- Low. However, wolf predation on black bears is suspected to be at least partially responsible for recent decreases in black bear abundance within the unit, particularly on Kuiu Island. Reducing wolf numbers, and decreasing wolf predation on black bears, could result in increased black bear numbers and an associated increase in bear predation on deer fawns. There is currently no evidence that predation by black bears has prevented recovery of deer. Reducing wolf numbers could also result in increased moose density and potentially increase interspecific competition for browse between deer and moose. If so, such interspecific competition could be mitigated by increasing the allowable harvest of moose (i.e. liberalize or eliminate moose antler restrictions, allow a limited cow harvest, etc.).

13. Coordination among hunters and trappers about control methods and allocation among ground-based trappers, aerial gunners by permit, and departme*nt use of helicopters. Low, Moderate, High.*

- High. We anticipate a high level of cooperation among hunters and trappers with regard to reducing wolf numbers as a means of increasing deer populations. There are approximately 10-15 trappers per year who actively trap wolves at varying intensities in Unit 3. The communities of Wrangell and Petersburg are small (about 3,000 residents each) and trappers know each other and support the proposed IM program.

B. *Landownership* may influence or restrict access for predator control or ungulate harvest. Proximity of restrictive status to communities or areas where management treatments would be most effective is the important context (see discussion of management strategy, Section I: Feasibility Assessment, p. 1). If the objective is to increase harvest in a local area as progress toward a larger area objective, a program to reallocate mortality from predation to harvest without a substantial increase in ungulate abundance may be feasible with harvest coordination (see Section III.A.3).

1. Percentage of national park or preserve and national wildlife refuge (where predator control may be restricted) in game management unit or subunit or caribou herd range.

- Not applicable.

2. Percentage of area in federally designated wilderness or wilderness study areas where habitat or wildlife management may be subject to more extensive public process.

- The Petersburg Creek-Duncan Salt Chuck Wilderness is located on Lindenburg Peninsula and consists of approximately 44,000 acres (69 mi^2), or approximately 11 percent of the proposed treatment area. The presence of Wilderness within the treatment area is not expected to significantly impact our ability to implement IM activities because trapping efforts will take place on State tidelands outside of Wilderness.

3. Percentage of Alaska Native corporation land.

    - The Organized Village of Kake (Population 700) is located on the northeastern tip of Kupreanof Island. The village and surrounding Native lands encompass approximately 76 sq. mi^2, representing approximately 7 percent of the land area on Kupreanof Island, however, these lands are located outside the proposed treatment area. Nonetheless, we anticipate a high level of Alaska Native support for efforts to increase deer numbers on Kupreanof and Mitkof islands as deer are an important food source for the village.

4. Access for predator control or ungulate hunting allowed on Alaska Native corporation lands? *Yes/No.*

    - Not applicable. While the geographic area being considered for initial IM efforts does not encompass any Native lands, we anticipate a high level of Alaska Native support for efforts to increase deer numbers. While ungulate harvest on Kake Tribal and Sealaska Lands in Unit 3 is currently restricted to Native shareholders, we expect that these landowners would welcome IM efforts on their lands.

C. *Access for Predator Reduction and Ungulate Harvest* (see also Sections II.A.6 and II.A.7).

1. What is the extent of all-season roads?

    - Kupreanof: limited.
    - Mitkof: moderate.

2. What is the extent of ATV trails?

    - Kupreanof: moderate.
    - Mitkof: limited.

3. What is the extent of navigable rivers?

    - Kupreanof: limited.
    - Mitkof: none.

4. What is the feasibility of landing fixed-wing aircraft in winter for predator removal?

    - Kupreanof: high.
    - Mitkof: moderate.
    - Floatplane only, but most IM efforts will be conducted using boats.

5. What is the feasibility of landing fixed-wing aircraft in fall for ungulate hunting?

    - Kupreanof: high.
    - Mitkof: moderate.
    - Floatplane only, but most hunters use boats, highway vehicles or ATVs to access their hunt areas.

6. What is the feasibility of ocean shoreline access for hunting or predator removal? *Low/Moderate/ High.*

   - Very High. There are approximately 223 miles (359 km) of shoreline associated with the 640 mi^2 (1,680 km^2) treatment area under consideration.

7. Is use of helicopters by the public (under permit) allowed for trapping or retrieval of carcasses from aerial shooting? *Yes/No.*

   - Not applicable.

8. Are there controlled use areas that prohibit aircraft access for ungulate harvest? *Yes/No.*

   - No.

III. ECONOMIC FACTORS

Economic factors: define estimated costs of management programs and expectations for public participation in predator control programs for comparison to perceived benefits by the BOG and the public.

A. *Cost of Participation* (in prey harvest or predation control by the public)

1. Price (dollars/gallon) of unleaded gasoline (average among communities).

Fuel prices in Petersburg, the only location where fuel is available within the proposed treatment area.

- Unleaded gasoline for highway use; currently $4.33/gal.
- Unleaded gasoline for boat (non-highway) use; currently $3.67/gal.

2. Price (dollars/gallon) of 100 octane low lead aviation fuel (average among communities).

   - Currently $6.68/gal.

3. Cost to hunters per prey animal harvested from alternative area (e.g., transportation cost to hunt in adjacent areas with harvestable surplus of ungulates).

   - Difficult to quantify; depends on method of travel and final destinations. When compared to hunting locally (within the considered treatment area) the cost to hunt in adjacent Units 2 and 4 is considerably higher in terms of both transportation costs and risks to personal safety.

4. Value of predator hides or other parts legal to sell.

   - Low. Green hides = $100 ea. Tanned hides = $200-$300 ea.

B. *Potential for Participation* (in predator control or harvest by public).

1. Would creating a new predation control program hinder ability to maintain public involvement in existing predation control programs in the region?

   - No.

2. Will a predation control program, habitat enhancement project, or ungulate harvest strategy conflict with existing harvest of predators by reducing opportunity for local hunters or trappers?

    - To some extent. There is some potential for conflict with local trappers, particularly within Wrangell Narrows. However, we feel that through discussions with local trappers we could either work around existing private traplines or encourage intensified public efforts to harvest wolves.

3. Potential to conduct department-sponsored control programs if public participation is lower than expected. *Low/Moderate/High.*

    - High. The proposed wolf control program will not rely on public participation to meet program objectives. The program will rely on trappers hired by the department. Public participation in wolf trapping and the intensity of these efforts are low in Unit 3 because of high fuel prices and frequently inclement winter weather conditions. Low public participation in trapping will actually benefit the proposed program because inexperienced public trappers tend to "educate" wolves and make trapping more difficult for professional trappers. In spring and fall, hunters take wolves opportunistically while hunting for black bears, deer, and moose. This harvest will continue and will contribute to reducing wolf numbers in the treatment area.

C. *Potential for Cost Sharing* (in habitat enhancement) (see also Section II.B).

    - Low. Deer are currently believed to be far enough below carrying capacity that nutrition is not believed to be a contributing factor to the recent population decline. Deer numbers have declined to low levels in all habitats. Precommercial thinning of the dense second-growth stands that have resulting from clear-cut logging provides the only real opportunity to improve habitat conditions for deer. However, most of the unit is comprised of Federal lands (National Forest) and it is not within the State's authority to undertake such activities. Even if it were feasible, because deer in the unit do not appear to be food-limited, we would not expect such efforts to significantly improve deer numbers over the near-term.

1. Potential to collaborate on prescribed fire where hazardous fuel reduction is the primary goal. *Low/Moderate/High.*

    - Not applicable.

2. Potential to collaborate on forest management or mechanical vegetation treatments to produce wood products or reduce hazardous fuels. *Low/Moderate/High/.*

    - Not applicable. Deer are currently far enough below carrying capacity that nutrition is not believed to be a contributing factor to keeping deer at the observed low levels.

APPENDIX C. Availability of population and harvest information.

Data include status of predators, ungulate species, and habitat for modeling predator removal rates and **time until i**ncrease in harvest of ungulates is feasible [*/No/Unknown/Not applicable*].

- Unknown.

- Ungulate population status:
  - Abundance survey within last 2 years. Yes, standard deer pellet transects.
  - Abundance surveys on set schedule to estimate trend. Yes.
  - Composition survey within last 2 years. Not feasible.
  - Estimate of parturition rate within last 5 years. For Unit 2, but not Unit 3.
  - Young survival estimate with mortality causes identified. For Unit 2, but not Unit 3.

- Harvest of prey:
  - Trends in reported harvest by residents and "local" (game management unit) residents among general season, drawing permit, registration permit, and Tier II categories over last 10 years? Yes.
  - Where unreported harvest occurs, public perception of trend? To some extent.
  - Estimate of unreported harvest from telemetry, Division of Subsistence, or other sources.
    - To a limited extent (Doer et al. 2005).
  - Department estimate of current sustainable harvest. No.
  - Amount necessary for subsistence (specify date of determination or updates, whether specific to proposed intensive management (IM) area or larger area, and number relative compared to IM objective).
    - The Amount Necessary for Subsistence in Unit 3 (unit-wide) was set by the board at 150-175 deer per year in 2000. The ANS has been consistently achieved. Information from the recently established Deer Harvest Ticket and associated Hunt Report Card should provide better information on whether or not the ANS is being met.
  - Historical harvest by nonresidents? *Yes/No* Yes, but minimal.
  - Present harvest by nonresidents? *Yes/No* Yes, but minimal.

- Status and harvest of predators:
  - Survey/census of wolf density within last 5 years. No.
  - Survey/census black bear density within last 5 years. No.
  - Survey/census grizzly/brown bear density within last 5 years. NA.
  - Predator-prey ratio estimated. No.
  - Survey of alternative prey adequate to aid predator recovery.
    - Not feasible. Moose are present at low density but sightability issues prevent population census.
  - Most wolf harvest accounted for by sealing data.
    - Most, but not all.
  - Most black bear harvest accounted for by sealing data.
    - Most, but not all.
  - Department estimate of black bear harvest where sealing does not occur. NA.
  - Most grizzly/brown bear harvest accounted for by sealing data. NA.

- Habitat condition (methods may be specific to region or species):
  - Proportional removal of browse biomass in previous 5 years with no large population change or widespread disturbance (e.g., fire) since browse survey. No.
  - Proportion of browse species with broomed growth structure (history of browsing).
    - Generally low, although some brooming in areas occupied by moose.
  - Proportion of area burned in last 10 years (potential browse availability). NA.
  - Proportion of area in appropriate habitat type based on vegetative classification (define as forage, cover, etc.). NA.
  - [*Other metrics? Describe*].

- Ungulate nutritional condition (representative of environmental conditions experienced during the most recent population census or estimate; may be specific to area/region or herd) [*options currently being discussed*]:
  - Percentage of productive 3-year-old female caribou (cohorts are radio marked for calf weights and monitored for photo census coverage). NA.
  - Weight of 4- or 10-month-old females (*caribou, deer, moose*). None.
  - Weight of adult (5–6 year old) female caribou (herd specific; requires baseline). NA.
  - Yearling female mandible length. None.
  - Ratio of femur to hind foot length. For Unit 2 but not Unit 3.
  - Two estimates of moose twinning rate in previous 5 years with no large population change. NA.
  - [*Other metrics? Describe*].

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Figure1. Treatment and comparison areas being considered within Unit 3.

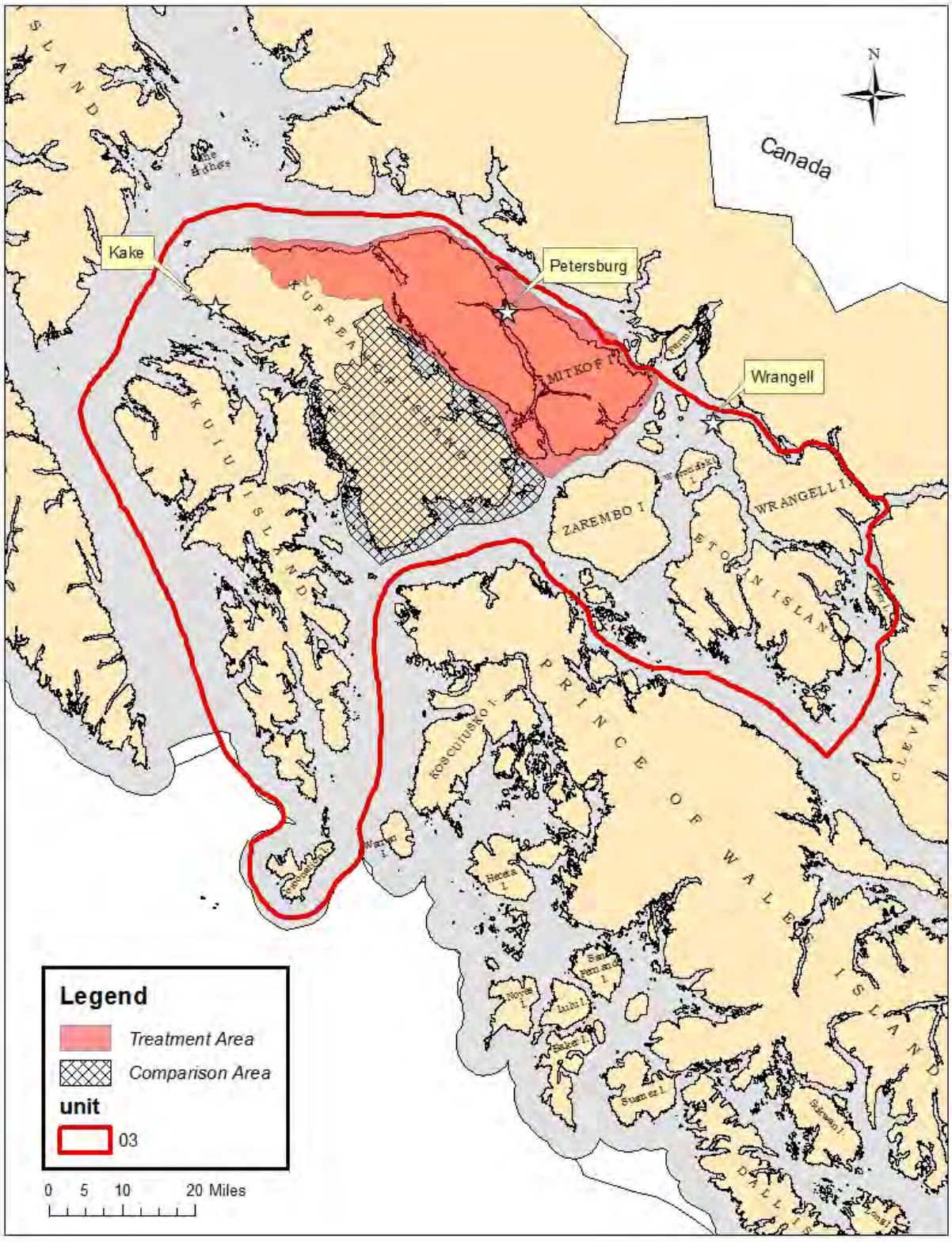

Figure 2. Size of treatment and comparison areas being considered in Unit 3.

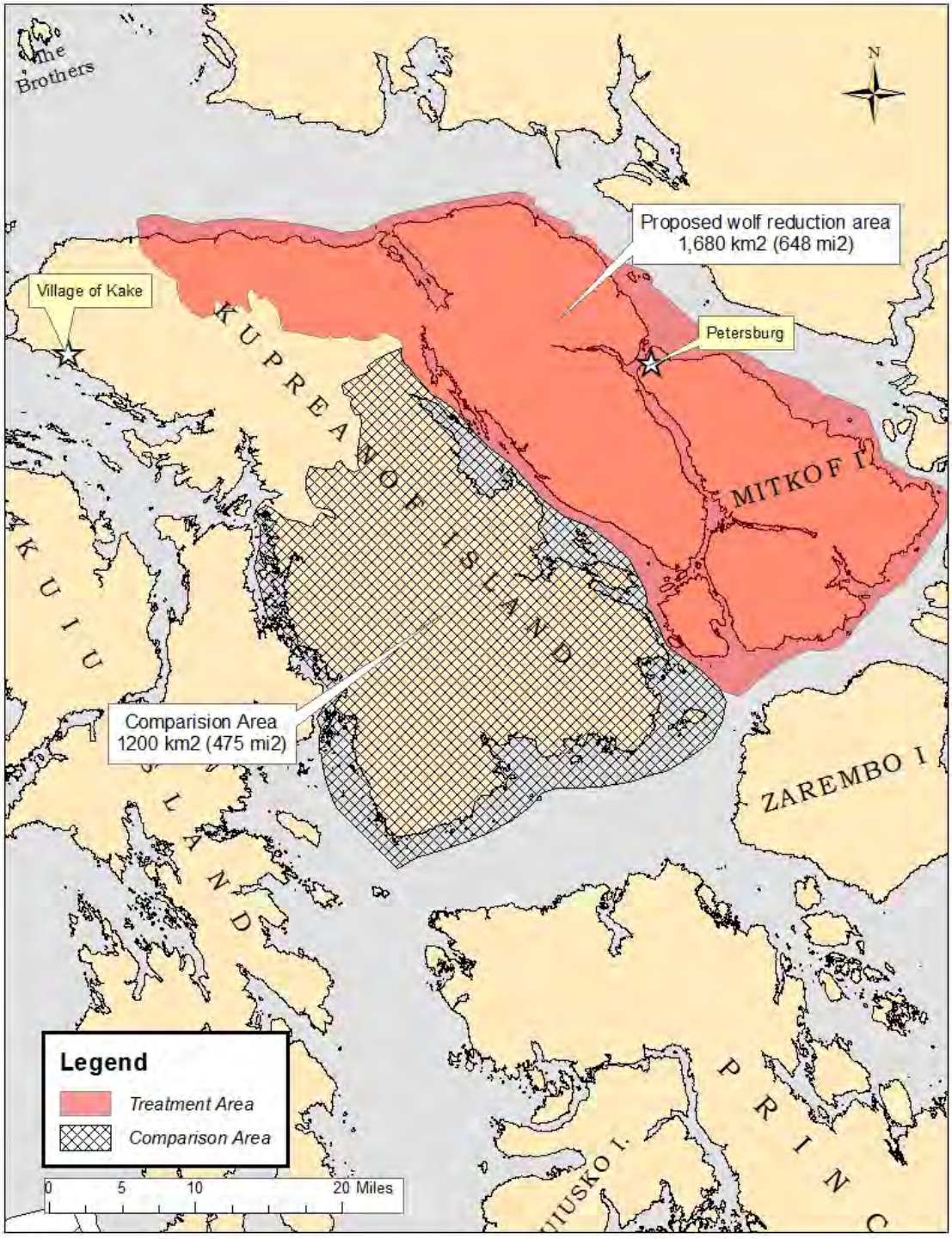

Figure 3. Mitkof Island deer pellet group counts, 1984-2010.

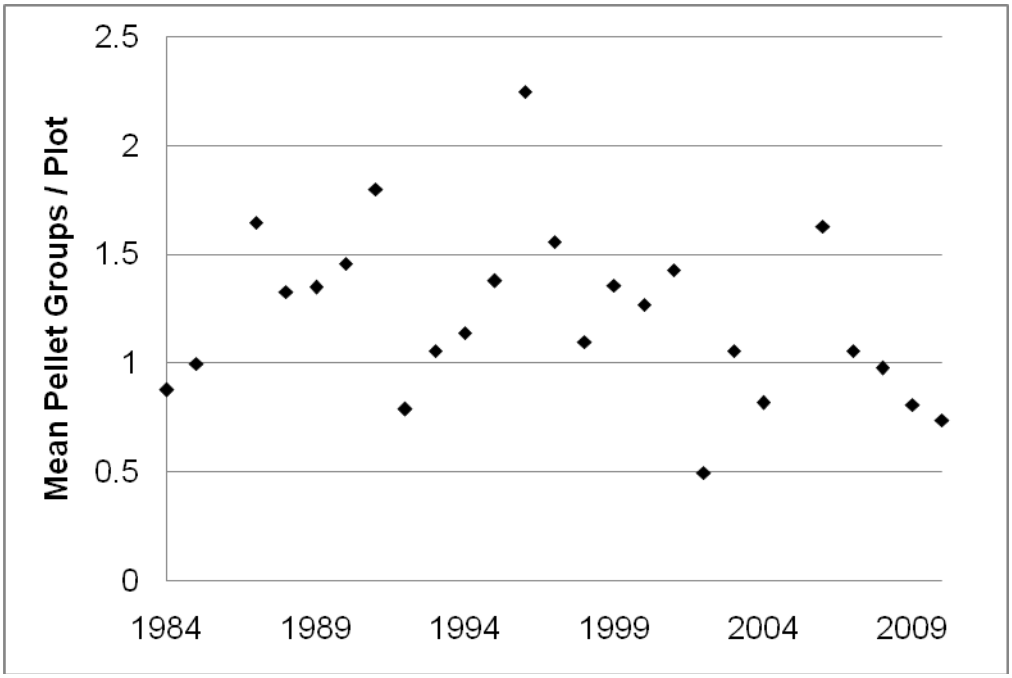

Figure 4. E. Duncan Canal deer pellet group counts, 1989-2010.

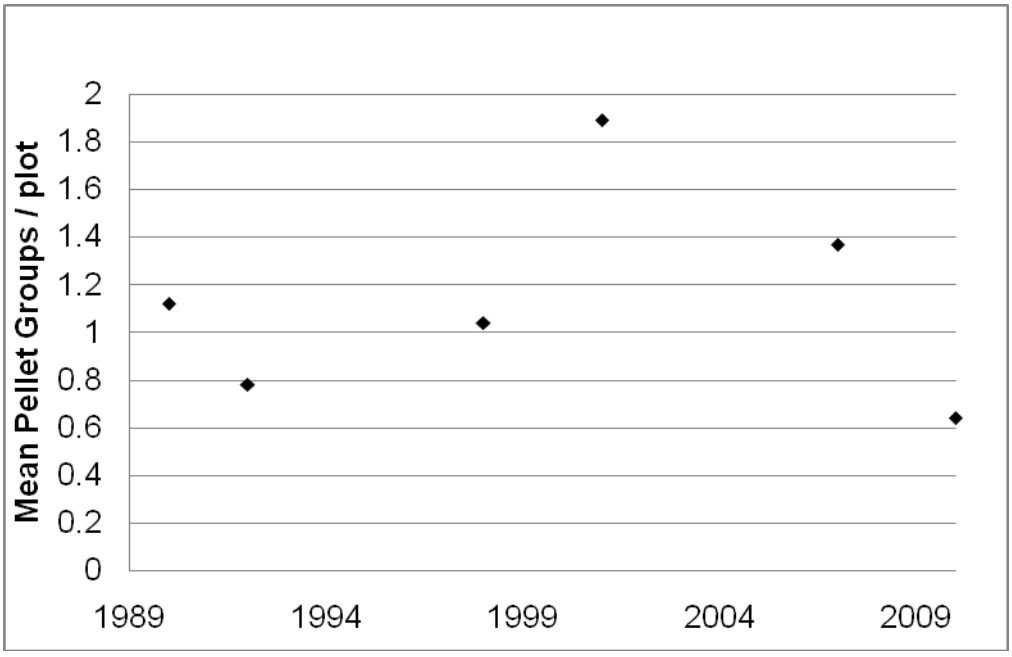

Figure 5. Castle River deer pellet group counts, 1983-2008.

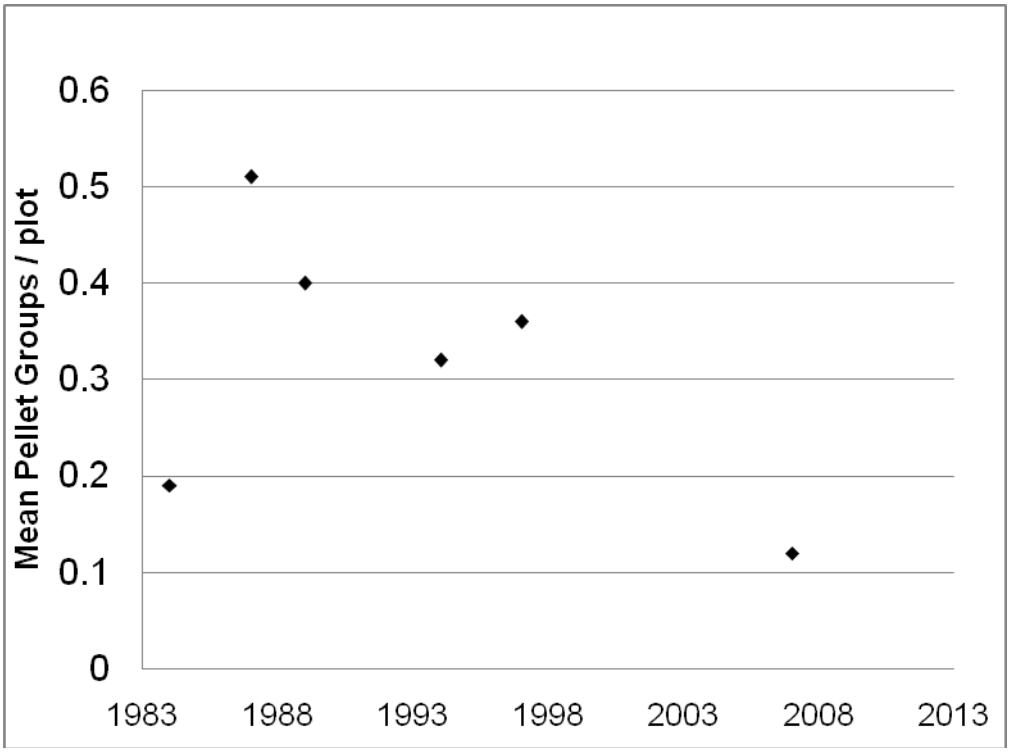

Figure 6. Estimated Mitkof Island deer harvest, 1997-2010.

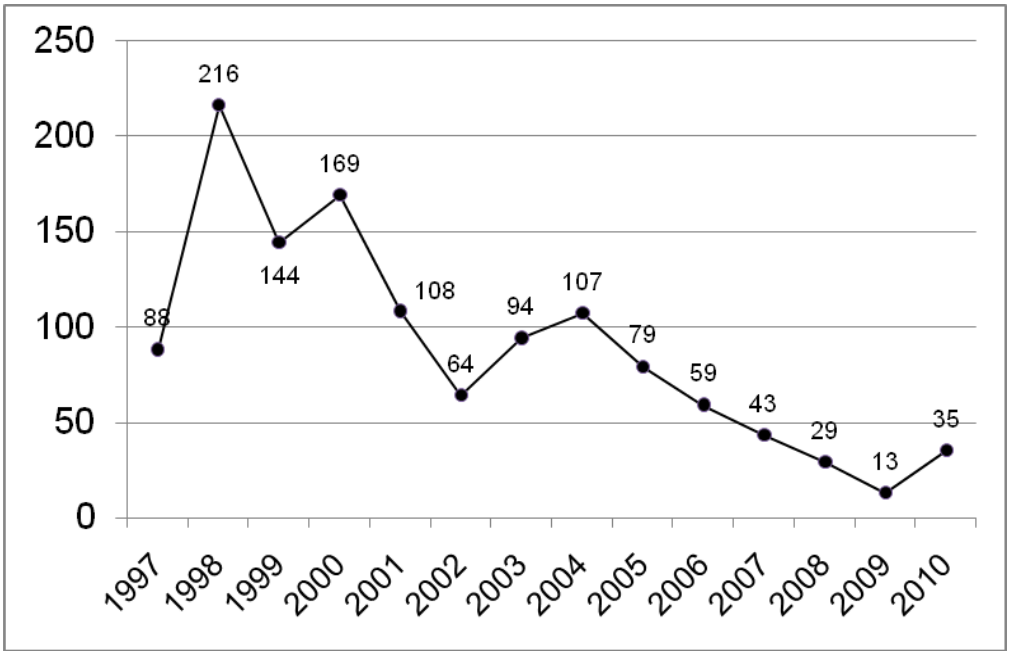

Figure 7. Estimated Kupreanof Island deer harvest, 1997-2010.

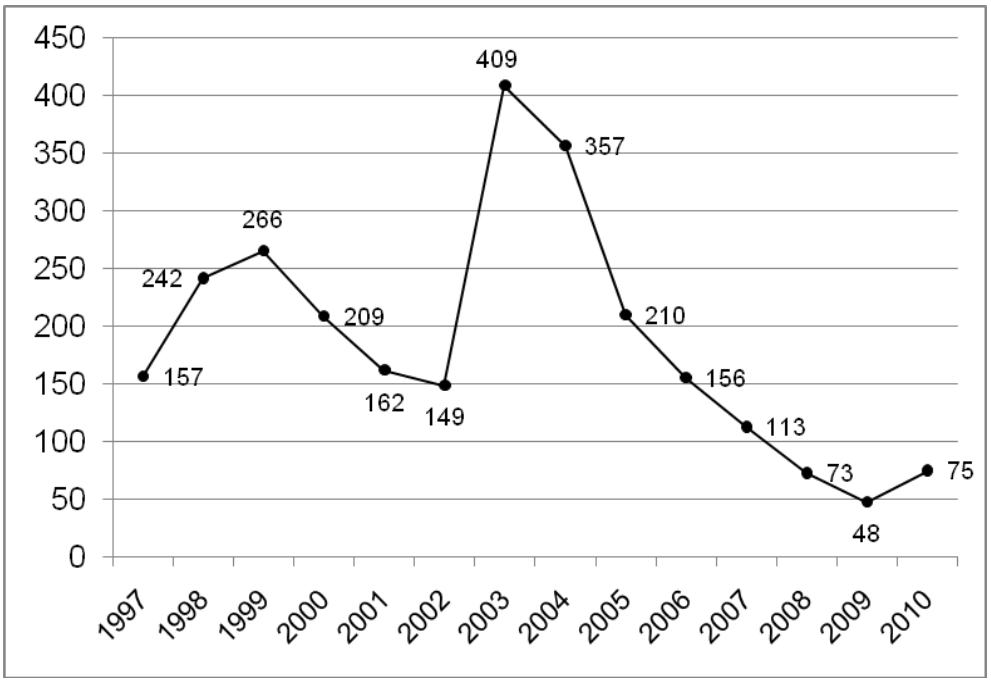

Figure 8. Estimated Unit 3 deer harvest, 1982-2010.

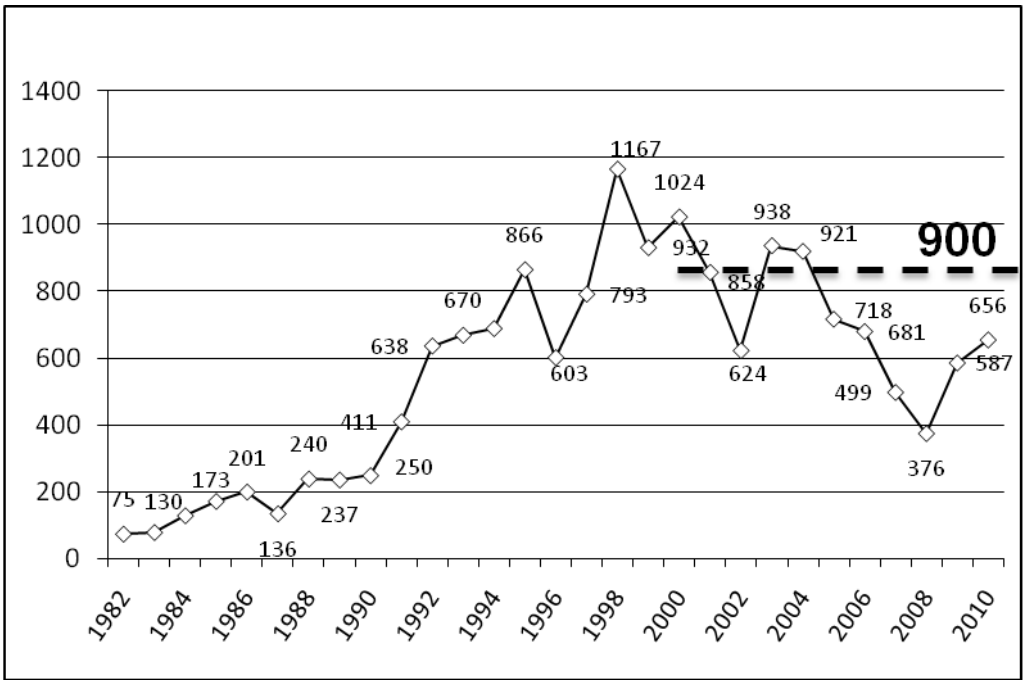

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Figure 9. Unit 3 wolf harvest, 1979-2010.

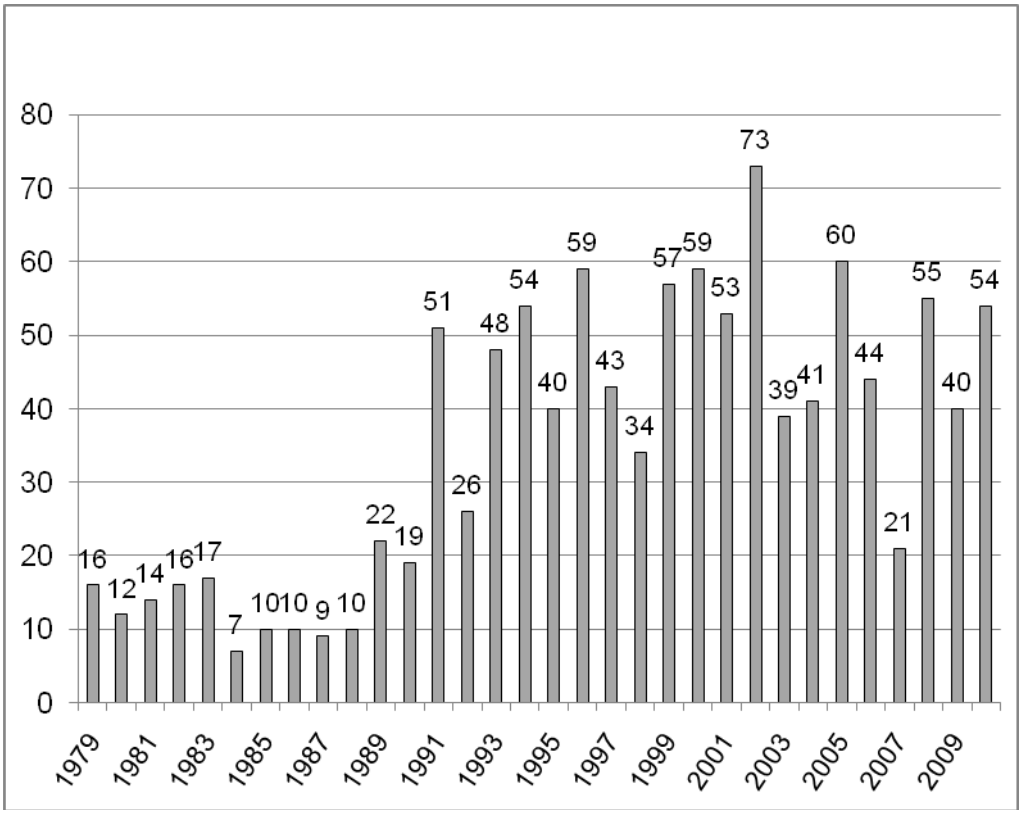

Table 1. Unit 3 Deer Pellet-Group Survey Results, 1981-2010.

VCU	Name	Acres	CFL%	Year	# Plots	Mean	95% C.I
400	**Security Bay**	28,040	79%	1984	360	0.02	0.01-0.04
				1989	304	0.25	0.16-0.34
				1995	268	0.22	0.15-0.29
				2000	200	0.09	0.05-0.14
403	**Pillar Bay**	28,227	65%	1988	337	0.16	0.10-0.22
				2000	265	0.18	0.13-0.23
408	**Malmesbury**	18,151	68%	1990	206	0.11	0.05-0.18
				2000	254	0.06	0.03-0.09
417	**Conclusion Island**	12,561	99%	1987	207	2.66	2.32-3.01
				1989	200	0.95	0.72-1.18
				1991	200	0.71	0.53-0.88
				1996	191	1.45	1.19-1.70
427	**Big John Bay**	32,711	29%	1994	300	0.38	0.29-0.48
428	**Rocky Pass**	49,403	35%	1989	298	0.40	0.27-0.53
431	**Point Barrie**	22,187	27%	1988	357	0.23	0.17-0.29
				1993	375	0.77	0.64-0.90
434a	**Big Level Island**	727	61%	1981	399	1.54	1.45-1.63
				1983	336	1.56	
				1986	382	1.66	1.41-1.90
				1989	227	1.07	
				1991	456	2.16	1.90-2.41
				1999	427	2.00	1.74-2.26
434b	**Little Level Island**	263	92%	1981	114	2.48	2.02-2.94
				1983	136	2.34	
				1986	122	1.39	1.07-1.70
				1989	137	1.52	
				1991	132	3.59	3.07-4.11
				1999	123	2.84	2.28-3.40
435	**Castle River**	32,724	36%	1984	312	0.19	0.12-0.26
				1987	305	0.51	0.37-0.65
				1989	312	0.40	0.25-0.56
				1994	310	0.32	0.24-0.40
				1998	281	0.36	0.28-0.44
				2008	275	0.12	0.07-0.17
437	**E. Duncan**	23,744	55%	1990	227	1.12	0.92-1.32
				1992	213	0.78	0.63-0.94
				1998	153	1.04	0.77-1.30
				2002	254	1.89	1.59-2.19
				2008	262	1.37	1.10-1.65
				2011	289	0.64	0.51-0.57

Table 1 (cont.)

GMU 3 Deer Pellet-Group Survey Results, 1981-2010.

VCU	Name	Acres	CFL%	Year	# Plots	Mean	95% C.I
442	**Portage Bay**	11,269	49%	1993	282	0.43	0.31-0.56
				1995	277	0.43	0.33-0.53
				1998	285	0.39	0.29-0.49
448	**Woewodski (Mitkof)**	20,931	53%	1984	295	0.88	0.69-1.08
				1985	209	1.00	0.82-1.19
				1987	195	1.65	1.85-2.61
				1988	433	1.33	1.16-1.51
				1989	417	1.35	1.24-1.73
				1990	355	1.46	1.28-1.64
				1991	316	1.80	1.52-2.07
				1992	248	0.79	0.62-0.97
				1993	230	1.06	0.85-1.27
				1994	152	1.14	0.82-1.46
				1995	157	1.38	1.08-1.67
				1996	243	2.25	1.95-2.55
				1997	282	1.56	1.27-1.84
				1998	282	1.10	0.91-1.29
				1999	196	1.36	1.11-1.60
				2000	226	1.27	1.05-1.50
				2002	220	1.43	1.17-1.68
				2003	216	0.50	0.36-0.64
				2004	250	1.06	0.87-1.25
				2005	279	0.82	0.65-0.98
				2007	180	1.63	1.26-2.00
				2008	235	1.06	0.83-1.28
				2009	162	0.98	0.74-1.22
				2010	234	0.81	0.63-0.98
				2011	232	0.74	0.58-0.89
448a	**Woewodski Island**	20,931	53%	1991	461	1.86	1.66-2.05
				1994	510	1.30	1.15-1.46
449	**Frederick**	6,835	70%	1981	945	0.08	0.06-0.11
				1990	180	0.55	0.36-0.74
				1992	227	0.54	0.42-0.65
452	**Blind Slough**	30,655	55%	1990	324	1.35	1.15-1.56
				1992	114	1.04	0.77-1.30
				1993	265	1.28	1.04-1.51
				1997	245	1.61	1.34-1.88

Table 1 (cont.)

GMU 3 Deer Pellet-Group Survey Results, 1981-2010.

VCU	Name	Acres	CFL%	Year	# Plots	Mean	95% C.I
454	**Dry**	11,033	74%	1981	91	0.92	0.56-1.28
				1993	210	1.44	1.17-1.72
				1997	188	1.26	0.88-1.39
455	**Vank**	8,437	99%				
	a) Sokolof			1981	900	1.73	1.61-1.85
				1999	360	0.92	0.76-1.08
	b) Rynda			1981	281	0.25	0.18-0.32
				1999	280	0.27	0.18-0.36
	c) Greys			1981	284	0.25	0.18-0.32
456	**Baht**	16,972	69%	2002	109	2.75	2.10-3.41
				2004	108	1.80	1.45-2.15
				2005	101	2.12	1.73-2.51
				2007	108	1.51	1.14-1.88
				2009	125	1.19	0.86-1.52
457	**St. John**	26,112	53%	2002	220	1.65	1.38-1.93
				2004	229	1.17	0.96-1.38
				2005	213	1.75	1.44-2.03
				2007	211	1.98	1.65-2.31
				2009	225	0.99	0.81-1.17
458	**Snow Passage**	31,572	46%	1994	345	0.58	0.45-0.70
				1997	315	0.98	0.80-1.16
				2002	280	1.50	1.28-1.72
				2004	306	1.02	0.84-1.20
				2005	262	1.08	0.89-1.27
				2007	289	1.52	1.26-1.78
459	**Meter**	42,438	46%	2002	180	0.87	0.64-1.10
				2004	180	0.89	0.68-1.10
				2005	155	1.41	1.75-1.07
				2009	80	2.29	1.33-3.24

Table 1 (cont.)

GMU 3 Deer Pellet-Group Survey Results, 1981-2010.

VCU	Name	Acres	CFL%	Year	# Plots	Mean	95% C.I
461	**Woronkofski (All Transects)**	14,500	63%	1985	646	1.63	1.45-1.81
461	**Woronkofski (Trans. 10,11,12)**			1985	218	2.01	1.62-2.39
				1987	201	2.23	1.85-2.61
				1989	223	2.52	2.18-2.85
				1991	203	1.59	1.32-1.85
				1993	225	0.22	0.13-0.31
				1994	224	0.26	0.18-0.34
				1999	216	0.11	0.06-0.17
				2004	227	0.08	0.03-0.13
467	**Mosman**	25,573	54%	1993	304	0.07	0.03-0.11
473	**Onslow**	28,947	55%	1984	321	0.37	0.28-0.46
				1985	334	0.59	0.48-0.70
				1986	347	0.72	0.59-0.84
				1987	336	0.42	0.31-0.55
				1988	329	0.44	0.32-0.55
				1991	322	0.66	0.51-0.80
				1993	341	0.68	0.55-0.82
				1994	340	0.88	0.74-1.02
				1997	346	0.73	0.59-0.86
				2002	332	0.97	0.81-1.13
				2006	363	0.60	0.48-0.71
				2008	339	1.33	1.13-1.53
				2010	366	0.96	0.81-1.10
474	**Fisherman's Cove (Canoe)**			2001	228	0.11	0.06-0.17
564	**Coronation**	19,107	69%	1983	696	1.20	1.04-1.36
				1985	228	2.34	
				1988	408	1.41	1.17-1.66
				1989	293	1.63	1.28-1.98
				1997	289	0.44	0.34-0.55
				2001	336	0.85	0.67-1.03

Table 2. Deer seasons and bag limits in Unit 3, 1954–2011.

Location	RY	Season	Bag limit	Restrictions
Units 1-5	1954	Aug. 20 - Nov. 22	3-bucks	3" antlers or longer
Units 1-5	1957-1958	Aug. 20 - Nov. 30	3-bucks	
Units 1-5	1959	Aug. 20 - Nov. 30	4-bucks, or 3 bucks and 1 doe	Doe may only be taken only during Oct. 15 - Nov. 30
Units 1-5	1960	Aug. 20 - Dec. 15	4-bucks, or 3 bucks and 1 doe, or 2 bucks and 2 does	Doe may only be taken only during Oct. 1 - Dec. 15
Units 1-5	1961	Aug. 1 - Nov. 15	4 deer	including 2 antlerless between Sept 15 - Nov. 30
Units 1-6	1962	Aug. 15 - Dec. 15	4 deer	antlerless may be taken between Oct. 15 - Dec. 31
Units 1-5	1963-1968	Aug. 1 - Dec. 31	4 deer	antlerless may be taken between Sept. 15 - Dec. 31
Unit 3 - remainder	1969-1970	Aug. 1 - Dec. 15	4 deer	antlerless may be taken between Nov. 1 - Nov. 30
Mitkof			2 antlered deer	
Unit 3 - remainder	1971	Aug. 1 - Nov. 30	3 deer	antlerless may be taken between Oct. 1 - Oct. 31
Mitkof, Wrangell, Etolin and Woronkofski Is.			2 antlered deer	
Unit 3 and 1B	1972	Aug. 1 - Nov. 30	2 antlered deer	
Unit 3 and 1B	1973-1974	Sept. 1 - Nov. 30	1 antlered deer	
Unit 3	1975-1979	no open season		
Level, Vank, Sokolof, Rynda, and Kadin Is.	1980-1982	Aug. 1 - Nov. 30	1 antlered deer	
Unit 3 - remainder		no open season		
Level, Vank, Sokolof, Rynda, Kadin and Conclusion Is.	1983-1984	Aug. 1 - Nov. 30	1 antlered deer	
Unit 3 – remainder		no open season		

Location	RY	Season	Bag limit	Restrictions
Level, Vank, Sokolof, Rynda, Kadin, Coronation and Conclusion Is.	1985-1986	Aug. 1 - Nov. 30	1 antlered deer	
Unit 3 - remainder		no open season		
Level, Vank, Sokolof, Rynda, Kadin, and Conclusion Is.	1987	Aug. 1 - Nov. 30	1 antlered deer	Subsistence, Resident and Nonresident
Unit 3 - remainder		no open season		
Vank Island Group	1988-1990	Aug. 1 - Nov. 30	2 antlered deer	
Unit 3 - remainder		no open season		
Mitkof Is. South of city limits, Woewodski and Butterworth.	1991-1992	Oct. 15 - Oct. 31	1 antlered deer by registration permit	
Vank Island Group		Aug. 1 - Nov. 30	2 antlered deer	
Unit 3 - remainder		no open season		
Mitkof Is. South of city limits, Woewodski, Butterworth and Lindenberg.	1993-2000	Oct. 15 - Oct. 31	1 antlered deer by registration permit	
Petersburg City limits and Kupreanof City Limits		no open season		
Unit 3 - remainder		Aug. 1 - Nov. 30	2 antlered deer	
Mitkof, Woewodski, Butterworth and Lindenberg	2001-2002	Oct. 15 - Oct. 31	1 antlered deer by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 antlered deer	
Mitkof Island, PSG Management Area	2003	Oct. 15 - Nov 15	1 buck by archery-only	
Mitkof, Woewodski, and Butterworth		Oct. 15 - Oct. 31	1 buck by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 bucks	
Mitkof Island, PSG Management Area	2004-2005	Oct. 15 - Nov 15	1 buck by archery-only	
Mitkof, Woewodski, and Butterworth		Oct. 15 - Oct. 31	1 buck by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 bucks	

Location	RY	Season	Bag limit	Restrictions
Mitkof Island, PSG Management Area	2005-2006	Oct. 15 - Nov 15	1 buck by archery-only	
Mitkof, Woewodski, and Butterworth		Oct. 15 - Oct. 31	1 buck by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 bucks	
Mitkof Island, PSG Management Area	2007-present	Oct. 15 - Dec. 15	2 bucks by archery-only	
Mitkof, Woewodski, and Butterworth		Oct. 15 - Oct. 31	1 buck by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 bucks	
PROPOSED				
Mitkof Island, PSG Management Area	2013	Oct. 15 - Dec. 15	2 bucks by archery-only	
Mitkof, Woewodski, Butterworth Islands and Lindenberg Peninsula		Oct. 15 - Oct. 31	1 buck by harvest ticket	
Unit 3 - remainder		Aug. 1 - Nov. 30	2 bucks	