THE LONG-TERM IMPACTS OF LOGGING AND ROADS PUSH A TONGASS WOLF POPULATION TOWARD EXTINCTION

Images: J. Cannon, B. Armstrong

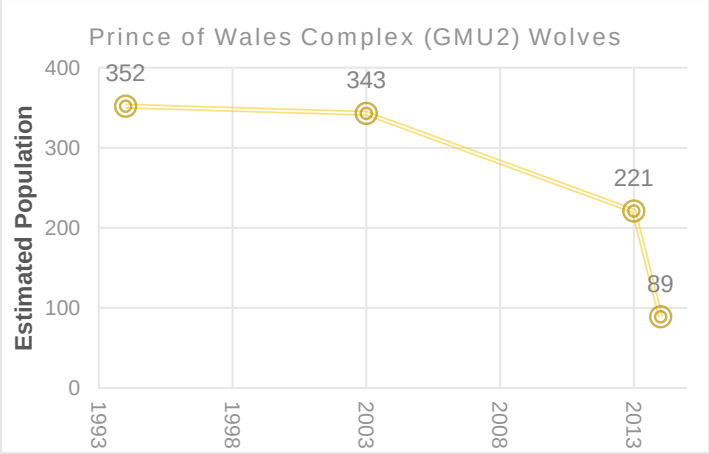
PRINCE OF WALES WOLVES

The long-term impacts of logging and roads push a Tongass wolf population toward extinction

Executive Summary

A 75% DECLINE IN 20 YEARS

Wolves are a symbol of wilderness and ecological integrity. They are important in their own right and as a key part of a functioning predator-prey system. In Southeast Alaska, wolves bring significant economic benefits to communities as part of the package that lures more than one million visitors to the Tongass National Forest every year and that contributes more than $1 billion to the Southeast Alaska economy.



Source	Estimate[1]	Year	GMU2 Total
Person et al. (1996)	39 wolves per 1000 km^2	Fall 1994	352
ADFG (2009)	38 wolves per 1000 km^2	Fall 2003	343
ADFG (2015)	24.5 wolves per 1000 km^2	Fall 2013	221
ADFG (2015)	9.9 wolves per 1000 km^2	Fall 2014	89

[1] Wolf density estimates were applied across the Game Management Unit 2 (GMU2) extrapolation area (9025 km^2). Note that the 2003 ADFG estimate was expressed as 326 wolves on POW and surrounding islands (~8615 km^2) rather than as a density.

THREE STEPS FOR CHANGE

1

Halt hunting and trapping of wolves in Game Management Unit 2 until a sustainable population is rebuilt

2

Halt clearcut old-growth logging and road-building, and close unnecessary roads

3

Protect the wolf population under the Endangered Species Act

Audubon ALASKA

In 1994, there were an estimated 352 Alexander Archipelago wolves in Game Management Unit 2 (i.e. GMU2 or Prince of Wales Complex) (Person et al. 1996). In 2014, Alaska Department of Fish and Game (ADFG) estimated there were 89 wolves remaining in GMU2 (ADFG 2015). The drop from 352 wolves to 89 represents a 75% decline in the region's wolf population. It indicates that the Prince of Wales Complex wolf population is not being managed sustainably by ADFG, the Alaska Board of Game, and the Federal Subsistence Board, which set hunting and trapping allocations, and by the Forest Service, which controls most of the wolves' habitat.

THE CAUSES OF WOLF MORTALITY

The direct take of wolves is the immediate issue facing the Prince of Wales Complex wolf population. An estimated 87% of wolf mortality is human-caused through hunting, trapping, and illegal poaching (Person and Russell 2008). Much of the human-caused mortality can ultimately be indirectly attributed to six decades of the Forest Service's aggressive old-growth clearcut logging program on Prince of Wales and surrounding islands. How?

- First, the roads that are built to support the logging effort provide easy access points for poachers to enter the forest and kill wolves. The Prince of Wales Complex has over 4,200 miles of roads.
- Second, large-scale, old-growth logging eliminates important winter habitat for deer. More than 40% of the high-quality winter deer habitat in GMU2 has been logged. The eventual result is a smaller deer population and less prey for wolves.
- Third, the reduction in deer populations leads some people to view wolves as competition for deer, leading to increased poaching and public pressure to authorize unsustainable legal limits on wolf take to drive down the wolf population. It is estimated that illegal poaching accounts for the killing of 0.5 to 1 wolf for every wolf legally harvested, which can mean a doubling of the sustainable harvest every year in the Prince of Wales Complex (Person and Russell 2008, Alaska Board of Game 2015). Prior to 2015, ADFG, the state Board of Game and the Federal Subsistence Board did not include poaching in their calculation of a sustainable take for wolves.

SOLUTIONS

In order to prevent the extinction of Prince of Wales wolves, Audubon recommends three important steps:

1. ADFG, the Alaska Board of Game, and the Federal Subsistence Board halt wolf hunting and trapping on Prince of Wales and the associated complex of islands (GMU2) until there is evidence of a sustainable, harvestable population of wolves. Following recovery, illegal take must be realistically accounted for in hunting and trapping limits to ensure sustainable management.
2. The Forest Service halts large-scale old-growth clearcut logging and road-building for the ongoing Big Thorne sale and ends future large-scale old-growth sales in the Prince of Wales Complex. The Forest Service should also aggressively close and decommission logging roads to reduce human access to wolves.
3. The US Fish and Wildlife Service lists the Alexander Archipelago wolves in the Prince of Wales Complex under the Endangered Species Act.

PRINCE OF WALES WOLVES

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An Audubon Alaska Report

INTRODUCTION

Wolves are an integral part of a functioning ecosystem in Southeast Alaska. They have been identified as a Management Indicator Species by the Forest Service (Tongass National Forest 2008) because wolves' dependence on deer, and thus on the Tongass National Forest's biggest and most productive old-growth forests, makes them a good gauge for ecosystem health.

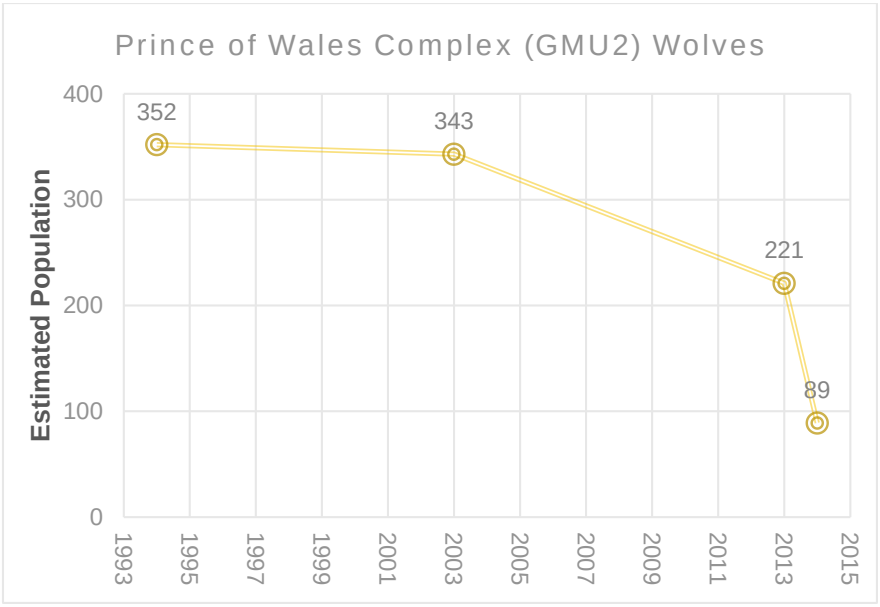
Prince of Wales and the associated complex of islands, including Kosciusko, Dall, and Outside islands, (hereafter referred to as the Prince of Wales Complex) is three times larger than the state of Rhode Island and is the most ecologically productive bioregion of the Tongass National Forest. In addition to being the home to an Alexander Archipelago subspecies of gray wolf (Weckworth et al. 2005), Prince of Wales is also home to a number of endemic species, including the Prince of Wales flying squirrel, Queen Charlotte Goshawk, Prince of Wales ermine, and Prince of Wales spruce grouse (Dickerman and Gustafson 1996, Iverson et al. 1996, Cook and MacDonald 2007, Dawson et al. 2007, American Society of Mammalogists 2015). Where fragmentation of habitat by clearcuts and logging roads impacts wolves and their prey, it is also likely to be impacting these and other species that rely on intact old-growth forest in the Prince of Wales Complex (American Society of Mammalogists 2015).

In this report, Audubon Alaska discusses the twenty-year decline in wolf populations in the Prince of Wales Complex brought on by unsustainable game and habitat management. We discuss the direct and indirect causes of the decline, and propose three steps to help the Prince of Wales Island Complex wolf population, and by extension much of the rest of the ecosystem, recover.

POPULATION STATUS OF PRINCE OF WALES WOLVES

A 75% Decline in 20 Years

In 1994, there were an estimated 352 wolves in Game Management Unit 2 (i.e. GMU2 or Prince of Wales Complex), which represented about a third of the Southeast Alaska Alexander Archipelago wolf population (Person 2001). In 2013, the population was estimated at 221 wolves, a 37% decline over 19 years. This decline caused great concern among experts, reflecting what they called the unraveling of a healthy, functioning predator-prey ecological relationship on Prince of Wales Island (Person 2013, Person and Brinkman 2013).



Source	Estimate[2]	Year	GMU2 Total
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ADFG (2015)	24.5 wolves per 1000 km^2	Fall 2013	221
ADFG (2015)	9.9 wolves per 1000 km^2	Fall 2014	89

The 2014 population estimate of 89 wolves reflects a 60% loss in a single year. It also reflects a total 75% loss over the 1994 to 2014 time period. In addition, the 2014 estimate of 89 wolves was calculated prior to last season's legal harvest of 29 wolves and an unknown but likely significant illegal harvest (Person and Russell 2008). As a result, the 2015 population estimate across this 2.3-million-acre management area is likely to be lower still. Furthermore, there is concern about the low female ratio which is a limiting factor on reproduction. The number of females in the population decreased sharply from 50% in 2013 to 25% in 2014 (ADFG 2015). A low population size combined with a small number of reproductive females can lead to a very slow recovery and increased inbreeding. These conditions can lead to extinction despite positive management efforts, such as the well-studied Isle Royale population (Mlot 2015).

Importantly, all estimates of population abundance are subject to uncertainty; yet adaptive management warrants responding quickly when the best available information indicates a change in status. The latest estimates, as well as research conducted by ADFG and US Forest Service scientists, indicate that there is a clear long-term downward trend for the Prince of Wales Complex wolf population managed within GMU2. (Note that Prince of Wales Complex and GMU2 are used synonymously in this report.)

[2] Wolf density estimates were applied across the Game Management Unit 2 (GMU2) extrapolation area (9025 km^2). Note that the 2003 ADFG estimate was expressed as 326 wolves on POW and surrounding islands (~8615 km^2) rather than as a density.

Causes of the Wolf Population Decline

Direct Take from Hunting and Trapping

The unsustainable direct take of wolves is the immediate issue facing the Prince of Wales Complex wolf population. According to a recent study, an estimated 87% of wolf mortality is human-caused through hunting, trapping, and illegal poaching (Person and Russell 2008).

There are two agencies charged with regulating legal wolf harvest in GMU2. With advice from ADFG, the Alaska Board of Game is generally responsible for establishing hunting and fishing regulations and setting game limits on wolves in Alaska. However, in GMU2, the Federal Subsistence Board has an independent wolf management scheme for wolves for subsistence hunters and trappers. If the Federal Subsistence Board allows wolf take in GMU2, all qualified subsistence users there can participate in hunting and trapping for wolves regardless of the Board of Game regulations. Because of the high number of qualified subsistence users on Prince of Wales Island, both boards must therefore act together to effectively limit the legal take of wolves in the Prince of Wales Complex. To this point, the boards have failed to act in accordance with the best available science.

Person and Russell (2008) estimated that a sustainable yearly harvest for GMU2 (including both legal hunting and poaching) is 33% or less; the authors corroborate this result with the Fuller et al. (2003) finding that annual mortality rates greater than 34% generally resulted in wolf population declines. The state and federal legal harvest must therefore be low enough to ensure that poaching, legal hunting, and trapping all account for a mortality rate of 33% or less. According to the best available research, illegal take of wolves on the Forest is common and “may at times equal the legal harvest” (Person and Brinkman 2013). Person and Russell (2008) reported in their study of radio-collared wolves in the Prince of Wales Complex that 47% of the total wolf take was from unreported illegal harvest.

Based on the findings that illegal take may equal legal take in GMU2, we suggest that the sustainable legal harvest level of a healthy wolf population in GMU2 should not exceed 17% of the population to avoid population declines. Between the years 2000 to 2015, the Board of Game and Federal Subsistence Board permitted a cumulative legal harvest of 30% of the estimated GMU2 wolf population, nearly twice that recommended level. That harvest level is not sustainable.

Take Facilitated by Logging Roads

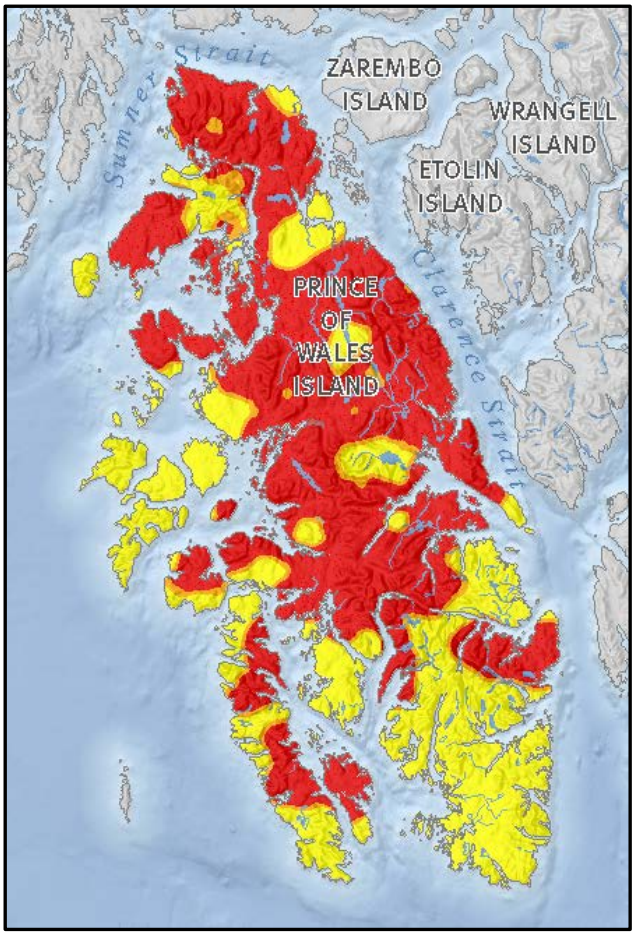
North Prince of Wales Island has been more heavily logged than any other biogeographic province in Southeast Alaska (Albert and Schoen 2007). One third of Southeast Alaska’s broad-scale, high-volume old-growth forests once occurred on North Prince of Wales. Those forest blocks have been disproportionately logged, and reduced by 94% to less than 5,000 acres remaining (Albert and Schoen 2013). To facilitate logging, 4,200 miles of roads have been built

Logging roads on Prince of Wales Island (Image: M. Smith)

in GMU2.

The roads constructed for old-growth logging facilitate legal hunting and trapping as well as illegal poaching. Not surprisingly, hunting,trapping, and poaching usually take place near roads and beaches because access is easier. Brinkman et al. (2009) found that deer hunters on Prince of Wales Island generally do not travel more than 6 miles from a road in pursuit of large game, and most often not more than 2 miles.

The farther from a beach or road a wolf or deer is, the more likely it is to survive. However, with such an extensive network of existing roads, the average distance to any road within GMU2 is 2.1 miles, and only 1.7 miles on Prince of Wales Island itself, leaving little secure habitat for wolves or deer. By another measure, Person and Russell (2008) found that Prince of Wales Complex wolf mortality rates increase with road density up to 0.9 km/km^2 after which population instability ensues. Road density averages 0.5 km/km^2 across GMU2, 0.6 km/km^2 across Prince of Wales Island, and 0.7 km/km^2 for the North Prince of Wales Province[3]. With many areas exceeding the 0.9 km/km^2 threshold, these broad landscape patterns appear to indicate regional habitat instability that is corroborated by the most recent population estimate.



Wolf source and sink habitat analysis for Game Management Unit 2; likely sink areas shown in red, potential sinks in orange, and potential sources in yellow (Image: Audubon Alaska).

Logged sites compound the survival issue for wolves by reducing hiding cover and making them more vulnerable to hunting. According to Person (2013),

"When about 40% of a pack's total home range is logged and roaded, there is a very high risk that mortality (mostly from hunting and trapping) will exceed reproduction and the pack area becomes a population sink. Indeed, even when as little as 25% of a pack's home range is logged, the ratio of reproduction to mortality is very close to one. Sinks are only maintained by immigration of wolves from other areas, which…is not likely to happen on Prince of Wales Island given the population's isolation and small numbers".

Audubon Alaska conducted a spatial analysis to identify areas meeting the 25% and 40% thresholds stated. We began with all previously logged areas, then added to this all existing roads, buffered to 1 km (the distance considered readily accessible to hunters and trappers) (Brinkman et al. 2009). We then performed a spatial analysis, creating a continuous surface that estimated the total logged and

[3] Based on a 10-km search radius, approximately equal to the average size of the Wildlife Analysis Area units used in the Person and Russell study.

roaded area within a wolf core home range[4]. Currently, most of GMU2 is a population sink for wolves, with 69% classified as likely sink habitat (>40% logged and roaded), 9% more as potential sink habitat (>25% logged and roaded), and 22% as potential source habitat (<25% logged and roaded).

Person (2001) found critical winter deer habitat to be a good measure of habitat quality for wolves. The southern portion of the island has lower habitat productivity and lower deer populations (Woodford 2014). With this in mind, it is unlikely that the large blocks of potential source habitat occurring on the southern portion of the island have a density of wolves sufficient to recruit the rest of the island's wolf population.

Indirect Take Facilitated by Clearcut Logging

Wolves of the Prince of Wales Complex rely on deer as their primary prey (Schoen and Person 2007). Old-growth timber harvest impacts important winter deer habitat by removing the large trees that intercept snow. This is a problem when snow covers the forage deer rely on in winter. In mild winters, this may not be an issue. In snowy winters, it can dramatically affect deer populations.

A comparison of historic (green plus orange) and current (green) high-quality[2] deer winter foraging habitat (Image: Audubon Alaska).

Approximately 40% of the high-quality deer habitat on Prince of Wales has been clearcut in the last 60 years[5]. Thirty years after logging, the "stem exclusion" stage of clearcut stands begins. Young trees grow tightly together causing insufficient light to reach the ground to grow understory vegetation for deer. Clearcut stands in the sapling stage that were formerly favored by deer become exclusion zones in both summer and winter, which can have population level effects on deer. Over the next twenty years, an estimated 360,000 acres of clearcut land in GMU2 will be in the stem exclusion phase, equal to about 35% of the total historic productive old growth (based on information in Albert and Schoen 2007).

Due to both habitat loss of their primary prey and an increased predator control mentality, "a significant population decline in deer will precipitate a consequent decline in the number of wolves in the region" (Schoen and Person 2007). The combined loss of winter and summer habitat is likely to decrease the deer population in the Prince of Wales Island region and increase the time needed for the population to

[4] Based on a moving window analysis with a search area equivalent to an average wolf core home range of 44 km^2 (D. Person, personal communication, March 2014).
[5] Based on a comparison of the top 40% of habitat value for historic vs. current conditions from the deer habitat suitability index models published Albert and Schoen (2007).

recover from a severe winter or disease event. As deer populations decline, people in local communities look to predator control to limit competition for prey. Illegal poaching and increased legal harvest often result. The current high rate of illegal take of wolves in the Prince of Wales Island region suggests that some members of the community may already be practicing unauthorized “wolf control” to enhance deer populations.

SOLUTIONS: THREE STEPS FOR CHANGE

1 Halt Hunting and Trapping of Prince of Wales Wolves Until the Population Rebounds

As discussed above, both legal and illegal hunting and trapping are the primary direct cause of wolf mortality in the Prince of Wales Complex. Hunting and trapping must take place at a sustainable level for the Prince of Wales Island region wolf population to survive. Currently, due to the latest population estimate of 89 wolves, hunting and trapping should cease. In August of this year, ADFG announced it would reduce the permitted state legal take to 9 wolves, 10% of the estimated population, with an adjustment for “any other human-caused mortality.” The Federal Subsistence Board followed suit.

For now, ADFG, the Alaska Board of Game, and the Federal Subsistence Board should halt all hunting and trapping of wolves in the region, and conduct scientific research to identify a harvestable population goal. The American Society of Mammologists (2015) estimate that 200 wolves are a minimum population needed for allowing further hunting and trapping in the Prince of Wales Island Complex. Once a resilient, harvestable population is identified and reached, conservative management that recognizes the high rate of illegal take of wolves and the potential challenges the region’s wolf population will face as deer populations on Prince of Wales decline is necessary. Our research suggests that a 17% take of the population is the maximum that should be allowed.

2 End Large-Scale Old-Growth Clearcut Logging in the Prince of Wales Region

The Tongass is the last national forest where large-scale old-growth clearcutting takes place for commercial purposes. Today, the Forest Service continues a more than 60-year policy of subsidizing old-growth logging on the Tongass, supporting approximately 100 private industry jobs at an average cost of $20 million/year to US taxpayers (or $200,000 per job).

“As a result of the isolated and naturally fragmented geography of Southeast, the Alexander Archipelago wolf is potentially more sensitive to human activity and habitat disturbance than elsewhere in the state.This greater sensitivity is particularly a concern in the southern archipelago where deer populations are strongly influenced by the loss and fragmentation of old-growth forest habitat” (Schoen and Person 2007).

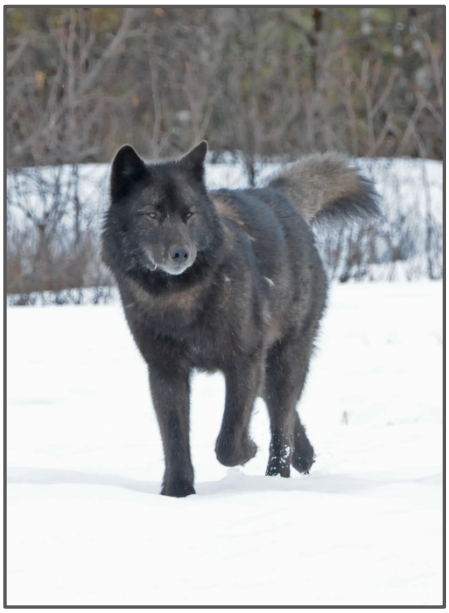
The impacts of logging are not evenly dispersed. The timber industry has targeted the largest, highest-value tree stands, which are generally the areas that are also most ecologically important to the forest and wildlife that live there (Albert and Schoen 2013). As discussed above, Prince of Wales Island

in particular has been targeted by commercial logging since 1954 with severe consequence. Despite this, in 2014, the Forest Service announced the Big Thorne timber sale on Prince of Wales, the largest old-growth timber sale on the Tongass National Forest in over a decade. Big Thorne includes 149 million board feet of old-growth timber, 46 miles of new roads, and 36 miles of reconstructed roads.

The Forest Service can take three immediate and important steps to protect Prince of Wales Island Complex wolves. First, the Forest Service can call an emergency halt to large-scale old-growth logging and road-building from the Big Thorne sale. Second, the Forest Service can close logging roads in the Prince of Wales Island Complex to create large areas of habitat that are more difficult for poachers to access. Third, the Forest Service can commit to ending large-scale old-growth logging and road-building in the Prince of Wales Island Complex in the Tongass Forest Plan amendment process currently underway.

3 Protect the Prince of Wales Wolf Population Under the Endangered Species Act

The US Fish and Wildlife Service (USFWS) is currently determining whether to list the Alexander Archipelago wolf population under the Endangered Species Act (ESA). The ESA was enacted to protect imperiled species and the ecosystems they depend on. For purposes of the act, species, subspecies, and distinct population segments are all defined by Congress to be “species.” A species is defined as “endangered” if it is in danger of extinction throughout all or a significant portion of its range. A species is “threatened” if it is likely to become endangered within the foreseeable future.



Found along the coast and islands of Southeast Alaska and northern British Columbia, Alexander Archipelago wolves tend to be smaller and darker than other wolves, and have generally been isolated from other wolf populations for approximately 10,000 years. (Image: B. Armstrong)

There is ample evidence that Prince of Wales Complex wolves are in significant danger of extinction throughout their range in GMU2. The USFWS decision to list the wolves is therefore likely to turn on the highly technical consideration of whether the Prince of Wales Complex wolves are a genetically distinct wolf population. Regardless of the outcome of that technical enquiry, the Prince of Wales Complex wolf population inhabits an area three times larger than the state of Rhode Island and has been an integral part of the area’s ecosystem for over 10,000 years. The loss of a population of wolves that numbered over 350 only twenty years ago would be a dramatic loss to Southeast Alaska and to people who value the existence of wolves and healthy ecosystems.

From a genetics perspective, the majority of scientists classify Alexander Archipelago wolves as a subspecies of gray wolf (Goldman 1944, Person 2001, Weckworth et al. 2005, Weckworth et al. 2010, Cronin et al. 2015a;b, Weckworth et al. 2015). Although there is some debate, major scientists also agree that the Prince of Wales Complex population of Alexander Archipelago wolves, which in the 1990s was estimated to make up a third of the Southeast Alaska population, is genetically isolated from mainland Alexander Archipelago wolves

by the large saltwater strait between the Prince of Wales Island region and the mainland (Weckworth et al. 2005, Weckworth et al. 2010). As recently as 2012, ADFG stated in their annual wolf management report that genetic and telemetry data strongly suggest that wolves in GMU2 are isolated. As a "markedly separate" population of Alexander Archipelago wolves whose disappearance would self-evidently leave a "significant gap" in the Alexander Archipelago wolf's range, the Prince of Wales Complex wolves qualify as a distinct population segment of the larger Alexander Archipelago wolf population and should be listed under the ESA.

Once a species or subspecies is determined to be threatened or endangered, it is illegal to "take" any member of the species without a permit from the USFWS. Federal agencies are required to use their legal authorities to promote the conservation purposes of the ESA and to consult with the USFWS to ensure that effects of actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species (16 USC 1537). Under this standard, large-scale old-growth logging and road-building in the Prince of Wales Complex, and wolf hunting and trapping, would likely be significantly constrained or ceased in the short or medium-term by an ESA listing. While it is generally in everyone's interest to avoid an ESA listing if a species can be protected as effectively in another way, to this point, neither the state nor the Forest Service has demonstrated a willingness to take the actions necessary to ensure the survival of the Prince of Wales Complex wolves. As a result, Audubon Alaska urges the USFWS to list the Prince of Wales Complex population of Alexander Archipelago wolves under the ESA.

CONCLUSION

As a first step to protect the wolf population, both Alaska and the federal government must recognize that the current combined legal and illegal harvest of Prince of Wales Complex wolves is not sustainable, and they must end GMU2 wolf hunting and trapping until evidence demonstrates that wolves there can be taken sustainably.

Large-scale, clearcut logging is one of the root causes of the wolf population crash on Prince of Wales. Logging roads built to support timber harvest provide relatively easy access to the wolf population for poachers and legal hunters and trappers. Over a longer time frame, the impacts on foraging habitat for deer will result in reduction of the deer population that in turn impact the wolf population. Without immediate policy changes on the part of the state and federal governments, the Prince of Wales Complex population appears to be on its way to extinction.

Prince of Wales Island (Image: N. Jans)

To this point, the Forest Service has disregarded the evidence of the probable impacts of its timber program on wolves and other wildlife populations on Prince of Wales such as Queen Charlotte goshawks (Smith 2013). Its focus on large-scale logging of old-growth timber in the Tongass puts forest management there 20 to 40 years behind the rest of the nation. The time has come for the Forest

Service to manage the Tongass for a host of public values that support the Southeast Alaska tourism and fishing economy of today. To do that, the Forest Service needs to aggressively close timber roads in the Prince of Wales Complex, halt logging and road-building for the Big Thorne timber sale, and end large-scale old-growth timber sales in the Prince of Wales Island region and, more generally, across the Tongass.

Third, USFWS should list the Prince of Wales Complex wolf population under the ESA. The GMU2 population historically made up one third of the total Alexander Archipelago wolf population in Southeast Alaska, and research has shown that this population is genetically isolated from mainland Alexander Archipelago wolves. A declaration of threatened or endangered status for the population is a logical step toward recovery of this ecologically important and genetically distinct predator that symbolizes the wilderness of the Tongass.

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