VIA ELECTRONIC MAIL

Earl Stewart
Forest Supervisor
Federal Building
648 Mission Street
Ketchikan, Alaska 99901
comments-alaska-tongass@fs.fed.us
Re: Comments Regarding the Tongass Land Management Plan Amendment and accompanying Draft Environmental Impact Statement

February 22, 2016

Dear Mr. Stewart:

Thank you for the opportunity to comment on the 2015 Draft Tongass Land Management Plan (TLMP) Amendment and Draft Environmental Impact Statement (DEIS). For ease of navigation, we include a table of contents as follows:

Notes of Appreciation for the Plan Amendment

Audubon Alaska is pleased to have the opportunity to comment on the US Forest Service (USFS) 2015 Draft Tongass Land Management Plan (TLMP) Amendment and Draft Environmental Impact Statement (DEIS). We note that the Tongass is the last national forest where commercial scale, old-growth logging is still allowed, and we share the vision (Secretary's Memorandum 1044-009) outlined by the US Department of Agriculture's (USDA) Secretary, Tom Vilsack, directing Tongass management to transition away from old-growth timber harvesting. Mirroring some of the Significant Issues raised during USFS scoping events (Draft EIS, 1-9), we also share the sentiments that the Forest Service should promote the development of renewable energy projects to help Southeast Alaska communities reduce fossil energy dependence; that roadless areas are ecologically important and play an important role in conserving plant and animal populations and diversity; and a functioning network of old-growth conservation areas (buffers, reserves, and priority watersheds) is important to the continued health of old-growth-associated wildlife populations in Southeast Alaska. All of these Significant Issues would benefit from a rapid transition away from old-growth timber harvesting coupled with a reallocation of USFS resources currently dedicated to old-growth logging.

The Plan contains several elements that are an improvement over the 2008 TLMP. Foremost, taking old-growth areas out of the suitable base in the Audubon-TNC conservation priority and T77 watersheds is an important step toward protecting the ecological integrity of the Tongass National Forest. In addition, the preferred alternative sets aside inventoried roadless areas from the suitable timber base, reduces the maximum ASQ, and makes strides toward setting a transition in motion.

While we appreciate the new management direction embodied in this planning process, we are disappointed with the aspects of the Plan that delay ending old-growth logging, thus creating unjustified risk to the other resource values on the Tongass. We believe the USFS 2015 Draft TLMP Amendment and DEIS require substantial change in order to meet the intent of this amendment process. We thank you for this opportunity to provide you with concerns and comments on this draft. Specific comments on revisions to make to the Plan Amendment text appear in Appendix A.

Summary of Audubon's concerns, followed by detailed comments

The principle reason behind the proposed Plan Amendment is to transition to sustainability in the Tongass. To meet this goal, the Forest Service should include ecological and social sustainability together with economic sustainability in the purpose and need statement, and expand the range of alternatives that the DEIS considers.

The forest transition must achieve an end to old-growth clearcut logging. The Plan should institute a faster timeline to meet this objective. Audubon proposes a 5 year deadline to ending old-growth clearcut logging, as part of the overall forest transition.

The Forest Service should not open beach fringe, riparian management areas, or old-growth reserves (OGRs) to cutting; there is no ecological justification for patch clearcut logging in these areas.

Audubon also stresses the critical importance of refraining from logging young growth in the T77 and Audubon/TNC Conservation Areas.

Along with ending old-growth clearcut logging within 5 years of the amended Plan's implementation, the Forest Service should employ a phased approach to young-growth logging, similar to the approach used in the 2008 Plan. The Forest Service should designate Audubon/TNC restoration watersheds in a Phase 2 category, and place these areas off-limits until an end to old-growth clearcut logging is fully realized.

Finally, the Amendment should address road density, especially in critical areas in the Prince of Wales Island complex. Some areas require no net gain in road mileage. Other areas require immediate road closure or decommissioning.

1. Background

The Tongass National Forest is widely considered the "crown jewel" of the National Forest system, both by the public at large and by the Forest Service itself (USDA Forest Service Alaska Region 2011, USDA Forest Service 2013, Meridian Institute 2014). On a global scale, the Tongass National Forest represents a large proportion of a rare ecosystem – coastal temperate rainforest – and is of paramount conservation importance (Olson and Dinerstein 1998). As part of our mission to conserve birds, other wildlife, and the ecosystems on which they depend, Audubon Alaska has long held a leading role in developing and sharing the best available science for the Tongass.

We work closely with Southeast Alaska scientists and researchers, and we inform the public on Tongass issues through our publications, community events, and social media outreach. Audubon Alaska collaborated over a five-year period with The Nature Conservancy and other scientists to catalogue, describe, and analyze biological resources in Southeast Alaska. This exhaustive effort culminated in a publicly available Conservation Assessment (Schoen and Dovichin 2007) that included the identification of conservation priority watersheds and restoration priority watersheds (Albert and Schoen 2007). The T77 are watersheds that are key to maintaining the viability of the greater Tongass ecosystem, as identified by scientists with Audubon Alaska, Trout Unlimited, and The Nature Conservancy, and by community members and fishermen. These watersheds (originally 77 but reduced to 73 due to protections and revisions) contain the highest value unprotected salmon and trout riparian habitat in Southeast Alaska. Protecting these watersheds would represent a major contribution to the conservation and ecological integrity of the entire region. (Generally, the T77 watersheds are a subset of the original Audubon-TNC most relevant to salmon conservation, with additional watersheds added through scientific research and local knowledge.) The Forest Service recognized a portion of the Audubon-TNC and T77 conservation priority watersheds in the 2008 TLMP phased approach to timber areas, and the Service now references these watersheds in the Preferred Alternative of the current amendment.

In addition to these products, Audubon Alaska worked with The Nature Conservancy (TNC) to organize a peer review of Tongass conservation in 2008 and the Juneau Tongass Science Conference in 2009, where we gathered leading scientists to review conservation elements in the northern

temperate rainforest ecosystem. This effort culminated in the publication of the book *North Pacific Temperate Rainforests* (Orians et al. 2013). Through these and other efforts, Audubon Alaska endeavors to provide the best available science on the Tongass National Forest, including the forthcoming Ecological Atlas of Southeast Alaska.

Decades of scientific study have revealed the central role of anadromous fish (particularly Pacific salmon, *Oncorhynchus* spp.) in the Tongass. Audubon believes that a successful perspective for management of the Tongass is viewing this ecosystem as a "salmon forest" and therefore recognizing and supporting the fundamental role of salmon in the ecology of coastal, freshwater, and terrestrial systems, instead of clearcutting these important habitats. Salmon are a cornerstone of Southeast Alaska's economy, with an estimated combined economic impact of $986 million in 2007 (USDA Forest Service Alaska Region 2015).

Salmon are keystone species because they transfer marine-derived nutrients into the terrestrial and freshwater ecosystems, and many ecological processes are inextricably connected to salmon (Willson and Halupka 1995). Salmon hatch in freshwater systems but mature in the ocean, where they gain 99% of their body mass (Janetski et al. 2009). When these fish return to inland streams, rivers, and lakes to spawn and die, they provide massive nutrient subsidies to terrestrial ecosystems, thereby shaping riparian vegetation communities and feeding terrestrial predators (Willson and Halupka 1995). A single run of migrating salmon can deliver millions of kilograms of biomass, hundreds of thousands of kilograms of nitrogen and calcium, and tens of thousands of kilograms of phosphorous through consumption, decomposition, and excretion (Gende et al. 2002), attracting a diverse assemble of animals such as birds, bears, insects, and wolves. Over 90% of the forested area in the Tongass is within 5 km of a salmon stream (Gende et al. 2002), making the Tongass truly a salmon forest - ecologically, economically, and geographically.

2. Purpose and Need

The purpose and need section in the DEIS fails to articulate all of the reasons for the Plan Amendment. The reasons for the Amendment come from Secretary Tom Vilsack's 2013 memo (Memorandum 1044-009) in which he promoted as a high priority transitioning the Tongass "to a more ecologically, socially, and economically sustainable forest management . . ." The DEIS purports to analyze the intended transition, but the purpose and need statement only references the economic aspects of the transition, while failing to cite the ecological and social components identified in the Secretary's memo.

The DEIS focuses too narrowly on the economic viability of the timber industry. The "purpose" section identifies timber management but does not explore other economic opportunities; nor does it mention social or ecological factors. The "need" section describes the importance of using the transition to maintain a "viable timber industry," but fails to describe social and ecological factors, except in a single notation that the Secretary's memo included these two considerations along with economic concerns. Ecological and social factors are inextricable parts of the envisioned forest transition, and should be given equal weight with the economic considerations. Further, the 2012

Planning Rule requires plans to "provide for social, economic, and ecological sustainability." (36 C.F.R. 219.8). USFS should add social and ecological concepts to the purpose section, briefly explain social and ecological needs in the need section, and modify proposed actions accordingly.

3. The Range of Alternatives

The overly narrow purpose and need statement subsequently prevented a full consideration of potential alternatives. By not integrating ecological and social factors in the Purpose and Need section, the resulting DEIS prematurely dismissed alternatives, and did not incorporate credible alternatives meeting social and ecological needs not related to timber into its range of alternatives. The alternatives analysis is central to the NEPA process (40 C.F.R. 1502.14), and the USFS is legally required to propose and consider a reasonable range of alternatives.

To develop alternatives for this amendment, the Forest Service relied on the recommendations of a Tongass Advisory Committee (TAC) representing the timber industry, Alaska Native Corporations, conservationists (3 NGOs), state and local government, and commercial users (a commercial fisherman and a tourism operator). The TAC did not include professional wildlife or fisheries biologists or forest ecologists. The TAC's official charter was to "provide advice and recommendations for developing an ecologically, socially, and economically sustainable forest management program on the Tongass National Forest." In practice, the TAC's charter was narrower: to identify sufficient timber volume to transition the current timber industry from its current dependence on old growth to an industry that is primarily dependent on young growth by the end of the planning period. The TAC did not consider options for sustaining or increasing jobs in other sectors (guiding, recreation, tourism, fishing, and manufacturing), instead narrowly focusing on facilitating the timber industry transition. The committee had a significant influence on the amendment process. The committee's "underlying principles, general approach, and recommendations" were the basis for the preferred alternative (DEIS Abstract).

The alternatives, focusing specifically on 2, 3, 4, and 5, are all confined to a narrow band of options that lack meaningful differences. The alternatives all have similar timelines for ending old-growth logging. Nor do the alternatives vary widely in their planned old-growth harvest (30,017 – 43,167 acres after 100 years) and their projected job increases (ranging from 189 to 234 job increases). None of the alternatives consider the fishing industry and tourism industry as economic supports to replace the few added timber jobs. None of the alternatives offer strong ecological restoration components. Limiting the range to similar alternatives precludes a meaningful analysis and fails to fulfill the purpose and need, namely to transition the forest to greater economic, social, and ecological sustainability.

The described alternatives do not substantially differ in their timelines for transition away from old-growth logging. The DEIS eliminated two alternatives (an Immediate End to Old-growth Logging and a Transition to Limited Young-growth Logging in Five Years) from further consideration, reasoning that the Vilsack memo identified a 10 to 15 year transition period for the forest industry to adapt. But the two eliminated alternatives only suggest ending *old-growth logging* on an expedited

time frame, which is but one milestone, albeit an important one, within the overall forest transition toward greater sustainability. Other facets of the Southeast economy that are dependent on the forest include fishing, tourism, subsistence, recreation, and the ecosystem services provided by natural processes (e.g. carbon storage). The Forest Service should analyze alternatives with different, and definitive, old-growth logging deadlines. None of the alternatives contain a firm deadline for ending old-growth clearcutting, a glaring omission in the goal to transition toward sustainability.

The Five Year Transition alternative was also eliminated because it purportedly did not meet the stated purpose and need. As discussed above, the purpose and need statement did not accurately reflect the underlying impetus to transition the Tongass to greater ecological, social, and economic sustainability. A five-year transition away from old-growth logging would address a purpose and need to transition toward ecological and social sustainability, and would go a long way toward meeting the economic transition goals as well. The Forest Service should consider how fishing and tourism could enhance the forest's economic sustainability under a five-year transition to ending old-growth clearcutting.

In addition to displaying a narrow range of timelines, the range of alternatives does not vary substantially in the quantity of old growth slated for harvest over the Plan's time period. The DEIS analyzes only minor differences between, for example the 30,017 acres proposed in Alternative 2 and the 43,167 acres proposed under Alternative 5. The preferred alternative schedules more acres of old-growth for logging in the next ten than was logged in the past ten years. The DEIS fails to consider a truly diverse spectrum of ways to fulfill the Plan's purpose and need. Further, even though the preferred alternative does not differ greatly from the other alternatives, it still schedules more acres of OG harvest and more miles of road than any other action alternative. It is important to recognize that the Tongass National Forest is the only US national forest where old growth is still being clearcut on an industrial scale. This practice is unsustainable and should have been addressed in this amendment and presented in an appropriate alternative. The preferred alternative is presently inconsistent with the ostensible purpose of the Plan Amendment, to protect more old-growth and move away from old-growth clearcut logging entirely.

The range of alternatives also lacks an option that focuses on restoring the forest to natural processes. Economic considerations could reallocate the old-growth timber budget toward restoration, supporting the fishing and tourism industries, as well as selective logging for high-end specialty lumber operations. A viable restoration option could preserve remaining old-growth and allow young-growth forests set aside for conservation purposes to mature naturally and eventually develop increased wildlife habitat value. A restoration alternative could also actively decommission roads to increase wildlife refugia, and fund restoration of fish passage. Terrestrial and aquatic species will especially benefit from a restoration alternative that allows the riparian forests to naturally develop and regain structural diversity, such as snags and deadwood on the forest floor (Pollock and Beechie 2014). The budget could be used for research and development of young-growth restoration practices that enhance wildlife habitat and encourage a faster return to old-growth

uneven-aged structure. The currently proposed 10-acre clearcuts in young-growth do not qualify as ecological restoration.

The EIS should analyze the economic and social value of moving away from even-flow timber harvest. Even-flow logging, which demands a steady output, puts pressure on the forest to meet fixed annual quotas, even when doing so would be ecologically damaging. The purpose of the Plan Amendment is to transition to greater sustainability and end old-growth clearcutting; part of that transition may involve fluctuation in timber harvest. The USFS should at least explain why retaining an even-flow approach to logging in the Tongass over the transition period serves economic, social, and ecological objectives.

Audubon's objective is to point out these shortcomings in the NEPA process to encourage USFS to use this opportunity to fill in the conspicuous gaps in the purpose and need, and to expand the range of alternatives given serious consideration. The agency should incorporate ecological and social interests into all of its alternatives, especially in its preferred alternative. Embracing the suggestions offered in the preceding paragraphs will strengthen the final preferred alternative and bring it into alignment with the original purpose and need as outlined in the Secretary's memo, to make Tongass forest management sustainable – economically, socially, and ecologically.

4. End to Old Growth Clearcutting

Old-growth forests are a rare and diminishing resource throughout the world. The nation's remaining old-growth forests—only about 5–10% of the original forests (excluding Alaska's taiga)—provide the country with many irreplaceable ecological benefits. These include clean water for millions of Americans; carbon storage; outdoor recreation; key habitat for salmon and other important fish, wildlife, fungi, and plant species; and the representation of our collective ecological heritage.

Restoration after logging is expensive and cannot restore all the elements of old growth habitats. It takes centuries for forests to develop fully, and the ecological characteristics of old growth habitats are essentially lost forever if clearcutting is followed by harvest rotations of less than 300 years. Old-growth forests, which store vast quantities of carbon, also play a role in reducing the effects of global climate change. In recognition of the relative scarcity, ecological value, and irreplaceability of old growth, all national forests, except the Tongass, have stopped clearcutting old-growth forests. It is time for the Tongass to join them.

At 16.8 million acres, the Tongass is the nation's largest national forest. It is also one of the world's last relatively intact temperate rainforests (DellaSala 2011). The Tongass supports critical spawning and rearing habitat for six species of Pacific salmonids and provides one of the Pacific's most significant salmon fisheries. The Tongass' 5.4 million acres of productive old-growth forest provides habitat for important species like Sitka black-tailed deer and some of the highest-density populations of brown and black bears, bald eagles, northern goshawks, and marbled murrelets remaining in North America. Recent research within the Alexander Archipelago has also identified an increasing number of endemic species, subspecies, and populations of mammals, birds, arthropods, and other

organisms, including the Alexander Archipelago wolf (*C. lupus ligoni*), which was considered for listing by the US Fish and Wildlife Service (Cook and MacDonald 2013).

Substantial old-growth forest still exists on the Tongass. But 60 years of industrial logging has targeted the rarest stands of large-tree old growth, thus reducing the highest-volume contiguous old growth by 66 percent forest-wide (Albert and Schoen 2013). These large-tree old-growth stands, which cover less than five percent of the Tongass, are among the most valuable habitats for many plants and animals. Clearcutting these areas jeopardizes wildlife and fish species that are closely associated with old-growth forests, and which are vital to the subsistence, tourism, and fisheries-based economies of the region (Crone and Mehrkens 2013). Already these economic sectors provide more local jobs than does timber harvesting. Past clearcutting has also reduced large woody debris in streams—key salmon habitat—and future clearcutting of old growth increases risks of erosion in streams.

For several decades, scientists reviewing the iterations of the TLMP have urged the Forest Service to stop high-grading the rare and valuable large-tree old-growth stands. In August of 2003, two former Chiefs of the USFS (Jack Ward Thomas and Mike Dombeck, both scientists) strongly recommended that "…harvest of old growth from the national forests should come to an end…" (Dombeck and Thomas 2003). In May 2010, Secretary of Agriculture Vilsack called for transitioning quickly away from harvesting in old growth on the Tongass. Many of the nation's imminent scientists from academic institutions and a variety of natural resource agencies have recently encouraged the Forest Service to end the clearcutting of the nation's remaining old-growth forests, including the Tongass.[1] In January 2015, 7 of North America's prestigious scientific societies (representing a combined membership of over 30,000 scientists and professional natural resource professionals) called for an end to clearcut logging of old growth on the Tongass.[2] These societies recommended a rapid transition out of old-growth and into young-growth logging within the next three years. Overwhelming support exists to justify ending old-growth logging in the Tongass.

The Tongass National Forest has the greatest amount of old growth remaining in the nation and it represents about 30 percent of old-growth coastal temperate rainforest on Earth. Managing old-growth forests of the Tongass for its carbon stores, and fish and wildlife populations, is the responsible approach to forest management of the nation's largest national forest and the only national forest where clearcutting old growth is still a standard management practice. Conserving the nation's old growth would set a powerful example for other nations across the globe that the United States has a commitment to climate change remediation as well as assure that the Tongass Forest will continue to

---

[1] Letter to the President by 78 North American Scientists (lead signatories were Jack Ward Thomas and Mike Dombeck [former Chiefs of the Forest Service]) calling for a national old growth policy to protect the remaining old growth on national forest lands throughout the US (June 25, 2014); Letter to Secretary Vilsack from 200+ North American Scientists urging a quick transition out of old –growth logging on the Tongass National Forest (October 15, 2014).

[2] Joint Society letter to Secretary Vilsack from American Fisheries Society (AK Chapter), American Ornithologist's Union, American Society of Mammalogists, Ecological Society of America, Pacific Seabird Group, Society for Conservation Biology, The Wildlife Society (January 20, 2015).

maintain a diverse forest ecosystem with abundant natural resources for future generations. Ending old-growth clearcutting will bring the Tongass dramatically closer to the socially, economically, and ecologically sustainable future envisioned in Secretary Vilsack's 2013 memo.

For these reasons, we strong urge the Forest Service to end clearcut logging of old-growth forests during the Plan Amendment's 15-year lifespan, and preferably within 5 years of the Plan's implementation. Unfortunately, the preferred alternative in the DEIS allows continued clearcutting of old growth for the next 15 years and contains no definitive deadline for ending old-growth clearcutting. An approach that contains no firm deadline for ending old-growth clearcutting is fundamentally at odds with the expressly stated sustainability goals. Such an approach will significantly reduce forest diversity, jeopardize ecosystem integrity of the Tongass National Forest, and increase conservation risks to many populations of fish and wildlife in this globally important temperate rainforest.

5. Importance of Maintaining Conservation Areas

The Tongass is composed of many islands which have unique patterns of vertebrate species and subspecies distributions and it is naturally fragmented. Because of this natural fragmentation, maintaining viable vertebrate populations while harvesting large tracts of old-growth forests is especially challenging. In the early 1990s, the Tongass Forest began working on a forest plan revision. As part of that effort, an interagency committee of biologists coalesced to develop a strategy for conserving vertebrates that are associated with old-growth forests in Southeast Alaska. Charged with developing a Tongass conservation strategy, this interagency Viable Population Committee (VPOP) included biologists from the Forest Service, Fish and Wildlife Service, and Alaska Department of Fish and Game (ADFG).This was, in part, a process designed to bring the Tongass National Forest into compliance with regulations of the National Forest Management Act of 1976, which required maintaining viable and well distributed populations of native vertebrate species across the national forests.

In 1993, the VPOP Team completed their draft report, *A Proposed Strategy for Maintaining Well-distributed Populations of Wildlife Associated with Old-growth Forests in Southeast Alaska.* The strategy entailed selecting a small subset of vertebrate species that are associated with old growth but that exhibit viability or distribution concerns in Southeast Alaska. These species were the Queen Charlotte goshawk, Alexander Archipelago wolf, brown bear, marten, and northern flying squirrel, among others. To maintain sufficient habitat for these species, the committee proposed a network of small, medium, and large Habitat Conservation Areas distributed across the forest. This reserve network would encompass tracts of relatively undisturbed old-growth forests, spaced across the landscape, and include representation on major islands of the archipelago. Habitat Conservation Areas, beach fringe buffers, and riparian management areas established throughout the managed forest would complement the Old Growth Reserves (OGRs), in order to provide contiguous habitat for many old-growth associated species.

In the spring of 1994, an independent committee of 21 scientists (with appropriate expertise from across North America) reviewed the VPOP strategy. Ross Kiester and Carol Eckarhardt of the

Forest Service's Pacific Northwest Research Station coordinated the review. The peer reviewers gave the strategy high marks, but also suggested that none of the planning alternatives were adequate to ensure viability of all species. One of their major concerns was to "…exercise extreme caution in choosing a minimum viable population as a management target." The peer reviewers made several notable recommendations to the Forest Service planning process:

- Recognize the global significance of the Tongass National Forest.
- Understand the implications of insularity and topography for natural fragmentation (i.e., consider the island character of the forest).
- Evaluate and synthesize additional landscape approaches to the Habitat Conservation Area including the inverse of the Habitat Conservation Area and large reserves. Alternatively, utilize a mirror image of the wildlife reserves. For example, rather than segregating "reserves" for protecting wildlife, instead protect the forest for wildlife and set aside smaller, scattered reserves for logging.
- Keep landscape options open; do not further fragment existing large blocks of high-volume old growth and do not differentially cut low altitude, high-volume old growth.

The interagency VPOP Team responded to the peer reviewers, agreeing with many of their recommendations, and revising and submitting their final plan to the Forest Service in 1994. Among their conclusions in the final report, they stated:

> Although a relatively small percentage of the overall landscape may be affected by timber harvest, historically a much greater proportion of the high-value forest habitat has been harvested. The resulting effects of that harvesting are disproportionately concentrated in certain ecological provinces.

Acknowledgement of the Old-Growth Habitat Conservation Strategy appeared in Appendix D of the Final EIS for the 2008 TLMP Amendment:

> The old-growth strategy has two basic components. The first is a forest-wide reserve network that protects the integrity of the old-growth forest by retaining blocks of intact, largely undisturbed habitat. The OGRs include a system of large, medium, and small Habitat Conservation Areas (HCAs) allocated to the Old-growth Habitat LUD…The second component of the old-growth habitat conservation strategy is management of the matrix, e.g., the lands with LUD allocations where commercial timber harvest may occur. Within the matrix, components of the old-growth ecosystem are maintained by standards and guidelines to protect important areas and provide old-growth forest habitat connectivity…Reserves should be connected, either through specific corridors (such as beach fringe or riparian areas) or though maintaining habitat characteristics similar to the reserves on the lands between them.

Appendix D of the 2008 TLMP also provided the following supporting details regarding beach and estuary fringe and riparian habitats, which are especially important wildlife areas on the Tongass.

> Beach and estuary fringe, and riparian habitats, have special importance as components of old-growth forests, serving as wildlife travel corridors, providing unique wildlife habitats, and providing a forest interface with marine or riverine influences that may distinguish them as separate ecosystems within the larger old-growth forest ecosystem…In conjunction with riparian areas, which provide connectivity within watersheds, the beach fringe is thought to be a component of the major travel corridor system used by many resident wildlife species…Accordingly, the Forest Plan establishes a Beach and Estuary Fringe Forest-wide Standard and Guideline that prevents timber harvest within 1,000 feet inland from mean high tide…Together, the beach and riparian habitat management features and the mapping of small reserves represented a substantial response to the landscape linkage element of conservation planning and significantly contributed to management of the overall matrix among habitat reserves.

<u>i. The scientific community's views on the 1997 TLMP conservation strategy</u>

Under the current Forest Plan (originally developed as a science-based conservation strategy in 1997 and again incorporated in 2008), key habitats important for wildlife, and habitat connectivity, were placed off limits to logging. They are an important component of TLMP conservation strategy—a strategy that has been cited in the past to deny petitions to list wildlife species, like the Queen Charlotte Goshawk, under the Endangered Species Act (ESA). The Tongass Conservation Strategy was a significant advance in wildlife conservation on the forest. However, many scientists considered it inadequate to ensure the conservation of those species that may be at risk because of their dependency on old growth, or because logging and road construction would dangerously increase their naturally fragmented distribution. As an example, 11 members of the Peer Review Committee of scientists (established in 1993 by the Pacific Northwest Research Station of the Forest Service to evaluate the conservation actions appearing in the Tongass Plan revision) issued a joint statement in September 1997 concerning the inadequacy of conservation measures in the new Forest Plan. The scientists cautioned that the new plan relies "…on an inadequate reserve system" and "ignores the adverse consequences of fragmenting habitat." They also emphasized that "…large blocks of habitat must be preserved to ensure overall species viability." Additional criticisms of the revised TLMP by the Peer Review Committee are excerpted below.

- Perhaps the greatest concern is the failure to protect the Forest's remaining pristine watersheds. We concluded in our 1996 Joint Statement that continued road building and logging in these watersheds could not be reconciled with the Forest Service's obligation to ensure the viability of all native vertebrate species…The 1994 Peer Review concluded that, to keep important landscape options open, the Tongass should "not further fragment existing large blocks of high volume Old Growth."

- In general, the more desirable timber classes correspond to habitat of high value to wildlife. The high "volume classes"…have been, almost exclusively, the target of past logging in Southeast Alaska…the Forest Service must preserve future management options to ensure the future viability of wildlife populations… Because volume classes 6 and 7 are not separately tracked any longer, it is not possible to predict their fate from reading the FEIS.

- The final Land Management Plan for the Tongass National forest does not incorporate the recommendations of the Peer Review or other scientific input in fundamental ways. Consequently, we do not believe that this Plan will protect viable, well distributed populations of vertebrate species on the Tongass National Forest.

These arguments mean that while the TLMP conservation strategy is incomplete and not adequate to protect the ecological integrity of the Forest by itself, the areas it does recognize are highly important to Tongass wildlife and people and should remain in long-term conservation status.

ii. The 2015 Plan Amendment contravenes the original 1997 TLMP conservation strategy, which was set up to protect apex predators

The current Forest Plan Amendment has significantly pushed back the original sideboards of the TLMP conservation strategy. This is most dramatically evident on Prince of Wales Island (POW), where 94 percent of the contiguous large-tree old-growth stands have been eliminated since 1954 (Albert and Schoen 2013). As a result, we can expect significant declines in Sitka black-tailed deer populations. The decline in deer numbers (the primary prey of the Alexander Archipelago wolf) in combination with the high road density on the island will result in significant declines in wolf numbers from lack of prey and increased human-caused mortality associated with road access (Person and Brinkman 2013). We discuss road impacts on wildlife, particularly wolves, in a section below on Road Management.

The US Fish and Wildlife Service recently considered the Alexander Archipelago wolf (*Canis lupus ligoni*) for listing under the Endangered Species Act. The agency ultimately found that listing was not warranted, but did acknowledge that there was reasonable risk that wolves could be significantly reduced, or perhaps even extirpated, from a portion of their range in the POW complex as a result of declining prey abundance and increasing density of roads and subsequent human-induced mortality risk to wolves (see Audubon's Wolf Report, attached as Appendix C, for more information). Many mammalian taxonomists consider the wolves of the POW complex to be a subspecies or at least a distinct population segment of the larger population of continental gray wolves. Even if the wolves of the POW complex are not legally considered a listable entity under the Endangered Species Act, these wolves represent important components of genetic biodiversity, in addition to playing a vital role as an apex predator.

Scientific research over the last several decades has clearly documented that apex predators profoundly affect terrestrial, aquatic, and marine ecosystems and play important roles in maintaining biological diversity (Terborgh and Estes 2010). Significantly reducing wolf populations in the

southern islands of the Alexander Archipelago or running the risk of extirpation of wolves from portions of their historic range on the Tongass Forest poses serious risks to the ecological integrity of that part of the Tongass National Forest. The preferred alternative in the Tongass Plan Amendment will erode the original Tongass Conservation Strategy, increase risks to the Archipelago wolf, and is contrary to the provisions in the 2012 planning rule on ecological integrity and ecosystem diversity (36 C.F.R. 219.8(a), 219.9(a)).

iii. Cutting young-growth forest in buffers and reserves does not promote restoration

The Tongass Advisory Committee (TAC) recommended significant changes to the Tongass Conservation Strategy. Specifically, the Plan Amendment's preferred alternative calls for logging of young-growth stands in OGRs, Beach/Estuary Fringe Buffers, and Riparian Management Areas. This violates the intent of the original VPOP Strategy which was found by many scientists to be a minimal conservation strategy at best (see previous comments on development of the strategy). For nearly 60 years, the Forest has high-graded the best, most productive large-tree old-growth stands on the Forest at both regional and watershed scales. Now, under the proposed amendment, this high-grading would continue on the oldest and most productive young-growth on the forest.

That this young growth would be targeted in critical OGRs, Beach-Estuary Fringe, and Riparian Management Areas is of particular concern. Raptors such as the Queen Charlotte goshawk and bald eagles nest in the beach fringe. Marbled murrelets nest on moss-covered platforms deep in the old-growth forest. Landbird species richness and density is greater in riparian than non-riparian forests. Riparian species include American Dipper, Western Screech Owl, Western Wood-Pewee, and Hammond's Flycatcher. We agree that protection of 100 acres surrounding known Northern Goshawk nests should also apply for young-growth stands, as outlined in the preferred alternative. However, simply protecting a nest stand is not adequate to sustain goshawks, as they require extensive foraging areas. Iverson et al. (1996) estimated that radio-tagged goshawks each used areas of about 10,000 acres on the Tongass during the breeding season. We recommend adopting guidelines for conservation within projected foraging territories surrounding nests. The DEIS states that "Continued inventories and monitoring of established nest protection buffers will help to inform future decisions," but there are no specifics on how this monitoring will be accomplished and what measures will be used to gauge continued success of the goshawk in heavily managed timber production areas.

Allowing new clearcuts, of whatever size, in these important areas will reduce populations of these and other forest-dwelling birds. These areas were set aside as reserves because they were considered critical to the long-term viability of many wildlife species across the forest. Limiting the clearcutting of these reserves to blocks less than 10 acres, as proposed in the Alternative, will not help the conservation of those species. A 10-acre clearcut is still a clearcut and it will set back the ecological structure and function of old-growth for more than a century, putting at risk wildlife and bird populations (e.g., northern goshawk, bald eagle, brown creeper, varied thrush, Townsend's warbler, and many others).

The TAC recommendations are not scientifically peer-reviewed. A group of 10 independent scientists with significant Tongass experience (including 6 former Forest Service scientists) sent a letter to Mr. Jason Anderson, Deputy Forest Supervisor, on May 12, 2015, expressing concerns over the TAC recommendations. The letter (attached herein as Appendix B) stated that "…key assumptions (or hopes) expressed by the advisory committee are not grounded in sound science." An additional notable excerpt from this letter follows:

> To access more volume, and improve timber sale economics, the advisory committee would have the Forest Service authorize clearcutting in ≤ 10 acre units in ecologically sensitive areas that are currently off limits to logging. These include Old Growth Reserves, Beach Fringe Buffers, and Riparian Management Areas. These are some of the most productive lands on the Tongass NF, and include reserves that were part of the wildlife conservation strategy in the 1997 Land and Resource Management Plan (carried forward in the 2008 TLMP amendment). Allowing commercial logging in these sensitive areas risks the integrity of that strategy… we find no empirical data to support the contention that one can log 60-80 year old young growth in ways that are economically viable and achieve desired wildlife benefits. Until there is, the advisory committee should not advertise this as the expected outcome (i.e., their "co-intent")…The final document produced by the TAC suggests logging in non-suitable lands (including beach fringes, riparian management areas, and old-growth reserves) will <u>not</u> be implemented unless doing so is "likely to facilitate a more rapid recovery of late-successional forest characteristics." Based on the current science, the prospects of achieving old-growth forest characteristics by placing small clearcuts in mature young-growth stands is extremely low.

<u>iv. Implement a phased approach to young-growth logging</u>

The Forest Service should leave intact beach- and estuarine-fringe forests, riparian management areas, and OGRs. These areas are critically important for ensuring the viability of many wildlife species on the forest, which is why these areas were set aside in the 1997 and 2008 Plan Amendments. There is no scientific justification for entering these sensitive reserves.

In addition, the Forest Service should not cut young-growth in the conservation priority watersheds set aside in the Audubon-TNC and T77 proposals. Both proposals are based on a whole watershed conservation approach which is not compatible with partial logging. These lands should be returned to old-growth characteristics through natural regeneration.

Finally, the Forest Service should set up a phased approach to young-growth logging. The approach would create two phases, similar to the approach used in the 2008 Plan. Audubon-TNC restoration priority watersheds (high-quality "hammered gems" identified alongside the conservation priority watersheds) should be set aside into a Phase 2 for young-growth logging. All other young-growth lands would be in Phase 1, immediately available for harvest. Table 5-1 summarizes the young-growth suitable base with the closures and phased approach.

Table 5-1. Adjusted suitable young-growth timber base for the Preferred Alternative 5.

Preferred Alternative 5 suitable YG timber base	**332,964 ac**	**100%**
YG to remove from suitable base	**27,251 ac**	**8%**
• Buffers (Beach and RMAs)	4,428	1%
• OGRs	1,796	<1%
• Audubon-TNC conservation priority + T77 watersheds	21,027	6%
Phase 1 suitable YG timber base	**136,486 ac**	**41%**
Phase 2 suitable YG timber base	**169,227 ac**	**51%**
• Aud-TNC restoration watersheds	169,227	51%
Phase 1 + Phase 2 suitable YG timber base	**305,713 ac**	**92%**

*Acreages are approximate based on planning documents and GIS analysis.

6. Road management

i. Roads in the Tongass have serious implications for wildlife

Roads have a tremendous impact on the ecological dynamics of any region, and are a major aspect of Tongass National Forest management and regional ecology (Terborgh and Estes 2010). Roads fragment populations of animal and plants, kill animals via vehicle-wildlife collisions, increase mortality due to increased human access, introduce invasive species, deposit chemical pollutants, and create habitat loss, with a range of consequences from an overall shift in community structure to species extinction (Hanley et al. 2005).

Within Southeast Alaska, roads are linked to increased deer and wolf mortality (Hanley et al. 2005, Person & Russel 2008) as well as bear mortality (Schoen et al. 1994). Species such as grizzly bears (McLellan and Shackleton 1988) and bald eagles (e.g. nest location); adjust their behavior to avoid roads (Anthony and Isaacs 1989). The USFS has linked increased disturbance from the timber harvest road network to decreased productivity and declines in goshawk populations (Iverson et al. 1996), supporting other Forest Service management recommendations to minimize road density in order to maintain goshawk populations (Reynolds et al. 1992). For salmon populations, roads act both directly, as a barrier to migration, and indirectly, through increased sedimentation and erosion (Hicks et al. 1991).

One of the most serious impacts of logging roads in the Tongass is the increase of quick and easy access points for hunting. Habitats that lack roads provide important refuge areas for wildlife species like deer, bear, marten, and wolves. As these refugia become more and more bisected by roads, wildlife is increasingly subject to harvest, both legal and illegal, putting undue pressure on those species. The US Fish and Wildlife Service recently acknowledged this dilemma, pointing to logging roads as a primary driver of wolf population decline in the POW Island Complex (also known as Game Management Unit 2, or GMU 2):

> [I]n our review of the best available information, we found that high rates of unreported harvest are resulting in unsustainable total harvest of Alexander Archipelago wolves in GMU 2 and that *roads constructed largely to support the timber industry are facilitating unsustainable rates of total wolf harvest* (US Fish and Wildlife Service 2016, emphasis added).

Therefore, simply setting low hunting rates is unlikely to reduce mortality rates of wolf and wildlife populations in areas with high road density. The real power instead rests in reducing access to wildlife populations. The Forest Service should address problematic road access in the Tongass, by preventing a net increase in road building in some areas, and eliminating existing road access in areas where densities are already too high. These recommendations reiterate two points made in our report entitled *Prince of Wales Wolves: The long-term impacts of logging and roads push a Tongass wolf population toward extinction* (attached as Appendix C). First, wolf harvest must stop until there is evidence the population as recovered. Second, the USFS should end old-growth clearcut logging and actively reduce road densities to reduce human access to wolves.

ii. The Plan Amendment does not sufficiently address road density issues in wildlife habitat

The preferred alternative would prohibit logging and road building in Inventoried Roadless Areas (IRAs). This is a positive step toward maintaining scenic and wild places in the Tongass. But unfortunately, adherence to the roadless rule does not adequately address the integrity of wildlife populations. Much of the important wildlife habitat in the Tongass occurs in large-tree old-growth forest, but most of the land in IRAs is non-forest or low-productivity forest, rather than large-tree old-growth forest. The Plan Amendment proposes young-growth logging in OGRs, which exhibit exceptional habitat value, and presently have few open roads. Logging in these areas will necessarily involve building or re-opening roads, which will negatively impact wolf populations and could diminish ecological function and biodiversity overall.

The Forest Service manages National Forest lands in trust for the American public for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes" under the Multiple Use-Sustained Yield Act of 1960. The National Forest Management Act of 1976 (and its planning regulations of 2012) requires forest plans to provide for "ecological sustainability" and "ecosystem integrity," including provisions "to maintain or restore ecosystem structure, function, composition, and connectivity." 36 C.F.R. 219.8(a). Forest plans also "must provide for the diversity of plant and animal communities." 16 U.S.C. 1604(g)(3)(B). The DEIS does not provide for ecological sustainability on Prince of Wales and at the WAA scale; nor does it maintain or restore ecosystems.

The Forest Service has yet to fulfill goals stated in the 2008 Plan for alleviating road density effects on wildlife. The Plan Amendment reiterates these goals, but projected road densities remain a threat to wildlife in general and wolves in particular. The 2008 Plan originally intended to stabilize the Alexander Archipelago wolf population by analyzing hunting pressure at a local scale, and identified road closure and road densities as an important component:

> Implement a Forest-wide program, in cooperation with ADF&G and USFWS, to assist in maintaining long-term sustainable wolf populations. . . . To assist in managing legal and illegal wolf mortality rates to within sustainable levels, integrate the Wolf Habitat Management Program (including road access management) with season and harvest limit proposals submitted to federal and state boards. . . . Where wolf population data suggest that mortality exceeds sustainable levels, work with ADF&G and USFWS to identify

> probable sources of mortality. Examine the relationship among wolf mortality, human access, and hunter/trapper harvest. Conduct analyses for smaller islands (e.g., Mitkof Island), portions of larger islands, or among multiple wildlife analysis areas (WAAs). . . . Where road access and associated human-caused mortality has been determined, through an interagency analysis, to be a significant contributing factor to locally unsustainable wolf mortality**,** incorporate this information into Travel Management planning and hunting/trapping regulatory planning. The objective is to reduce mortality risk and a range of options to reduce this risk should be considered. In these landscapes, both open and total road density should be considered. Total road densities of 0.7 to 1.0 mile per square mile or less may be necessary. Options shall likely include a combination of Travel Management regulations, establishing road closures, and promulgating hunting and trapping regulations to ensure locally viable wolf populations. Local knowledge of habitat conditions, spatial locations of roads, and other factors need to be considered by the interagency analysis rather than solely relying upon road densities. (See 2008 Plan at 4-95, emphasis added).

But even after 8 years of implementing the 2008 Plan, road densities in 32 out of 190 WAAs presently exceed 0.7 mi/mi^2, as indicated in the attached map (Appendix D) entitled "Tongass Road Density". Within GMU 2, 19 out of 31 WAAs (61%) exceed 0.7 mi/mi^2. The USFS has not followed through on the standards and guidelines stated in the 2008 plan.

The Amendment retains the 2008 language calling for the Service to analyze and maintain road density below 0.7 mi/mi^2 for wolf conservation purposes (Plan Amendment at 4-95). But unfortunately, the Amendment and preferred alternative do not analyze road density on a scale that is meaningful for wildlife. The agency instead asserts in its DEIS that road density across the Tongass will not increase much:

> "Average total road density across WAAs (NFS lands only) under all alternatives would be approximately 0.2 miles per square mile, an increase of 0.03 to 0.04 above existing levels. Average open road density across WAAs (NFS lands only) would be approximately 0.1 miles per square mile, an increase of 0.01 under all alternatives. Approximately 82 percent of WAAs would have open road densities of 0.7 miles per square mile or less under the action alternatives. Therefore, any potential increase in hunter access or risk of overharvest for wildlife species would be minor and localized, and would not be measurable at the forest-wide scale under any of the alternatives." DEIS at 2-40 – 2-41.

Analyzing road densities at the scale of the entire Tongass is not a meaningful metric for wildlife population sustainability, especially in a naturally fragmented island archipelago. Most road impacts are expressed at much smaller scales. The Forest Service needs to evaluate the impacts of roads at the scale at which they genuinely influence wildlife populations.

The Forest Service is charged with sustaining wolf and wildlife populations at scales smaller than the entire forest. The 2012 planning rule requires plans to maintain and restore ecosystem function on the watershed level:

> [T]he plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore their structure, function, composition, and connectivity. 2012 Planning rule §219.9(a)(1) (emphasis added).

The Plan Amendment itself calls for analysis of road density and wolf mortality at the scale of "smaller islands," "portions of smaller islands," or among WAAs (Plan Amendment at 4-95). The Plan also calls for preserving biodiversity (Plan at 2-4, 2-7, 3-10, 3-67), and defines the term as "the variety and abundance" of organisms, including the varying categories of biodiversity that occur at the genetic, species, community, ecosystem, and regional levels (Plan Amendment at 7-7).

Although the US Fish and Wildlife Service recently ruled that a petition to list the Alexander Archipelago wolf under the Endangered Species Act was unwarranted, they stated that the wolf "currently forms an ecological and genetic unit worthy of analysis" and that "the Alexander Archipelago wolf (*C. l. ligoni*) is a valid subspecies of gray wolf" (US Fish and Wildlife Service 2016). Furthermore, individual populations of wolves have substantial genetic differentiation (Weckworth et al. 2005; Weckworth et al. 2010), including those on Prince of Wales Island: "the GMU 2 population of the Alexander Archipelago wolf is markedly separated as a consequence of physical (geographic) features and due to genetic divergence from other populations of the taxon" (US Fish and Wildlife Service 2016). As the Plan Amendment highlights preservation of genetic biodiversity, management efforts should protect not only the Alexander Archipelago wolf at the forest scale but should also conserve the smaller populations that comprise this taxon's genetic diversity.

The Amendment and the DEIS do not adequately explain intended road density increases. As stated above, the Service errs in using the entire Tongass as the lens for analyzing road density, thus conveniently misapplying the scale at which road densities affect wildlife conservation. In doing so, the Amendment and DEIS do not identify those areas with problematic road densities. Because the Plan Amendment does not explain how and where road densities may increase, the planning procedure does not offer the public a meaningful opportunity to comment on particular problem areas. The road density map by WAA in Appendix D represents a more meaningful analysis of this issue.

The Plan Amendment should also bring greater clarity to the road density issue by defining the various terms for Tongass road closures. The Plan Amendment does not presently define "open road," "closed road," and "decommissioned road." (See Plan Amendment Glossary at 7-1 – 7-107 for lack of definitions for these terms; although "open road mileage" is defined, "open road" is not). It is difficult to tell whether a "closed" road is physically barred or merely has a posted sign indicating closure. Closing spur roads, rather than arterial roads, may add up to significant mileage on paper, but has little tangible impact on limiting poachers' access to an imperiled wolf population. Closed roads may still offer access to ORVs, and effectively remain open to poachers. Hunters are also willing to walk about 2.4 km (1.5 mi) along a closed road (Brinkman 2007), making some mileage on "closed" roads effectively open. Finally, it is not clear whether the Service

"decommissions" roads by recontouring the road bed and fully restoring the area, or whether decommissioning means something less than restoration such as barring vehicle access.

iii. The Plan Amendment should add standards and guidelines to address transportation issues

The road density map in Appendix D highlights WAAs that exceed the Forest standard. The Plan Amendment should include a standard and guideline for road density's impact on wildlife. The USFS should pay special attention to road management in high-density areas, ensuring that the Plan is properly implemented by closing or decommissioning roads. The Amendment focuses on "maintain[ing] wildlife habitat corridors" between habitat types (Plan Amendment at p. 5-13 – 5-15). Habitat connectivity is important, but the Amendment should also account for the link between road density and poaching.

We suggest the Service add a standard and guideline for transportation projects to maintain Tongass WAAs at a threshold of 0.7 mi/mi^2. We suggest a 0.7 threshold because the Plan Amendment itself uses this number (Plan Amendment at 3-225; DEIS at 2-44). A threshold of 1.0 mi/mi^2 is too high, given that the mean road density in GMU 2 is 1.00 mi/mi^2 (U.S. Fish and Wildlife Service 2016), where precipitous wolf population decline has recently occurred. Certainly a road density threshold of 1.45 mi/mi^2, the figure associated with potential wolf population instability, is too high for any given WAA to exhibit (Person and Russell 2008, p. 1548; US Fish and Wildlife Service 2016, at 448).

WAAs that presently exceed the TLMP 0.7 mi/mi^2 threshold should have no net gain in roads (new road additions should be countered by road closures/decommissioning). WAAs that exceed 1.0 mi/mi^2 should receive priority efforts to reduce road densities. As our attached map illustrates, the POW Island Complex (GMU 2) requires urgent agency attention. The Forest Service should add a standard and guideline in its Transportation System Corridors Direction to account for these road density concerns (see Appendix A).

Audubon also suggests adding definitions to the Plan Amendment's Glossary for the different categories of roads: "closed roads" are roads inaccessible to all vehicles, including ORVs, and only including the mileage on these closed roads that are beyond 2.4 km (1.5 mi) of an open road; "open" roads are those accessible to any vehicle, as well as the mileage of technically closed roads that lie within 2.4 km of an open road; "decommissioned" roads are destroyed to the point at which a new road in the same site would require new road building. The Forest Service should at least clarify its road terminology so that accurate account of road densities may occur.

The Plan Amendment should also reinstate the transportation LUD overlay that appeared in the 2008 Plan. The 2008 Plan contained a LUD overlay that deterred road building in Wilderness (and certain other designations; see Appendix A to this comment), by requiring transportation projects to first consider feasible alternatives. The Plan Amendment removes the transportation LUD overlay and does not adequately replace it in the "Transportation Systems Corridors Direction" (Plan Amendment at pp. 5-13 – 5-15). The Forest Service should either reinstate the overlay, or add a standard and guideline for completing a transportation avoidance analysis in the same LUDs that the overlay once protected.

7. Climate considerations

Over the past 50 years, world temperatures have soared. Alaska temperatures have increased by an average of 3°F with winter measurements rising by an average of 6°F, twice the national average over that same period of time.[3] Climate impacts on Alaska's public infrastructure are projected to add $3.6–$6.1 billion to future costs over the next 20 years (Larsen et al. 2008). To counter the effects of global warming, the world is looking for ways to sequester carbon[4]. At the recent Paris climate talks, the nations of the world agreed to maintain global carbon sinks; yet, in the Tongass, operations continue to target the biggest trees and the landscapes with the highest potential to sequester carbon (Hoover et al. 2012, Stephenson et al. 2014). Instead of subsidizing harmful timber practices such as road building, we encourage the Forest Service leverage those taxpayer dollars to help local communities complete their transitions from old-growth logging, while also contributing to carbon storage.

Concluding remarks

We commend the overarching movement away from old-growth logging that is implied in the Plan Amendment. Audubon supports the long-term vision to sustain the rich tapestry of ecological, social, and economic factors that make up the Tongass. Transitioning Southeast Alaska's economy toward sustainable industries, while holding onto the remaining pristine old-growth areas will bring greater resiliency and vibrancy to this region. Refraining from logging and road-building in IRAs, quickly ending old-growth clearcutting as part of the overall forest transition, reducing the 2008 Plan's ASQ, and recognizing that wildlife and biodiversity are critical components of the Tongass' future are all beneficial components of the Plan Amendment. We also strongly support the preferred alternative component that would set aside old growth in the Audubon-TNC and T77 conservation priority watersheds.

But the conservation details remain vital, even as the big picture transition goes forward. The Tongass has already lost much of its large-tree old-growth forest. There must be enough of the original large Tongass trees left at the end of the transition to serve as a perpetual legacy for wildlife, salmon, and sustainable human interests. The Amendment and DEIS simply do not reflect the ecological and social sustainability that have important roles alongside economic sustainability. The Plan must contain a firm deadline for ending old-growth clearcut logging, but not at the expense of conservation areas originally set aside for wildlife and conservation. To this end, Audubon recommends implementing a phased approach to young-growth logging in certain areas, similar to the phased approach in the 2008 Plan, in line with achievement of the targeted end to old-growth clearcut logging. Finally, the Plan must address imperiled wildlife areas like GMU 2 by reducing road densities. To facilitate incorporation of these comments into the final Amendment, we include Appendix A, a detailed citation describing where the USFS should reinstate language that was

[3] http://www3.epa.gov/climatechange/impacts/alaska.html
[4] http://pubs.usgs.gov/fs/2008/3097/pdf/CarbonFS.pdf

removed from Chapters 3 and 4, and where the USFS should modify new language appearing in Chapter 5.

The simple truth is that the Plan Amendment goes to extraordinary lengths to promote about 200 timber jobs in lieu of putting greater efforts into the successful fishing and tourism industries that support thousands of jobs. The Forest Service should take a hard look at this allocation of taxpayer dollars and consider the bigger picture, in which old-growth forests offer carbon sequestration; wildlife provide prospects for world-renowned tourism and subsistence hunting; and an incredibly rich salmon forest supports a wealth of opportunity for local communities. It is time to leave publically subsidized, old-growth, clearcut logging in the past, and recognize that there is significant monetary and societal value in wilderness, birds and wildlife, and salmon thriving among giant old trees.

Thank you for your hard work and your careful consideration of our comments.

Sincerely,

Nils Warnock, Ph.D.
Executive Director
Audubon Alaska

Appendix A:
Specific Comments on Revisions to the Plan

2008 Plan Elements to Retain in the 2016 Plan

The Tongass National Forest (TNF) should reinstate the following deleted Management Prescriptions in Chapter 3 and Forest-wide Standards and Guidelines in Chapter 4 of the Plan Amendment. Note that page numbers refer to the track changes version of the Plan.

Pg 3-20, Wilderness LUD, Lands, Special Use Administration (non-recreation)

I. Wilderness is a Transportation and Utility System (TUS) "Avoidance Area." Transportation and utility sites and corridor systems may be located in the Wilderness only after an analysis of potential TUS opportunities has been completed and no feasible alternatives exist outside the Wilderness. Refer to the Transportation and Utility section for direction. (see ANILCA Title XI). ANILCA (Section 506) includes specific exceptions for Admiralty Island National Monument Wilderness regarding the right to develop hydroelectric resources and public access and use.

Similarly, TNF should include the language below under the following LUDs, as was set forth in the 2008 plan.

Non-Wilderness National Monuments, pg 3-35
Research Natural Area, pg 3-43
Special Interest Area, pg 3-50
Remote Recreation, pg 3-56
Municipal Watershed, pg 3-63
Old-growth Habitat, pg 3-70
LUD II, pg 3-85
Scenic River, pg 3-100
Recreational River, pg 3-108

This LUD represents a Transportation and Utility System (TUS) "Avoidance Area."

Transportation and Utility sites and corridors may be located within this LUD only after an analysis of potential TUS corridors has been completed and no feasible alternatives exist outside the LUD. Refer to the Transportation and Utility section for direction.

Pg 4-5, Beach and Estuary Management, Management

A.6. Areas within the beach and estuary fringe are classified as unsuitable for timber harvest. Timber harvest that counts toward the Allowable Sale Quantity is not allowed; however, timber harvest that does not count toward the Allowable Sale Quantity could be allowed. Reasons for timber harvest that does not count toward the Allowable Sale Quantity include timber sold as part of a salvage sale (see 7. below), for specialty wood products, as products of habitat restoration treatment, for customary and traditional uses, and for landings, roads, or timber

harvest necessary to access timber in adjacent suitable areas where there are not feasible alternatives in project design.

a) Timber harvest necessary to access timber in adjacent areas allocated for timber production, where there are no feasible alternatives in project design (e.g., landings for logical yarding settings), will be considered only on the landward edges of the fringe.

b) Silvicultural prescriptions for any harvest must address beach fringe management objectives.

A.7. Allow salvage of dead standing and/or down material if the salvage activity is consistent with long-term beach and estuary management objectives. This salvage will not contribute to the Allowable Sale Quantity. Small amounts of standing green timber may be harvested during salvage operations for safety and operational considerations.

Pg 4-25, Karst Resources, Young-Growth Management on Karst

A. On lands underlain by carbonate substrate, where either pre-commercial or commercial thinning is proposed, a karst resource inventory shall be conducted as described above.

B. The openness of the underlying karst system, that system's vulnerability to surface disturbance, and the likelihood of additional sediment production or runoff by thinning the young-growth timber shall be determined.

C. Pre-commercial thinning is appropriate on all karst lands when the karst management objectives can be met.

D. No slash or debris may fall or be placed in identified high vulnerability karst features.

E. If any introduced slash or debris finds its way into karst features or losing streams, it must be removed by hand.

F. Commercial thinning is appropriate on low to moderate vulnerability karst lands when the karst management objectives can be met.

G. Generally, no thinning shall be permitted on lands determined to be of high vulnerability, such as within 100 feet of a cave entrance, a karst feature accepting surface flow, or on the edge of a sinking or losing stream within 0.25 mile upstream of their swallow hole or loss point. A zone equal to one tree height should be left untreated to ensure that no material will be placed in these features.

Pg 4-71, Timber Sale Preparation, Regeneration Methods

A.1. Consider silvicultural systems other than clearcutting to meet other resource objectives at the project level. As part of the project NEPA process, analyze current scientific information related to the applicability of alternative timber harvest methods.

Pg 4-74, Timber Sale Preparation, Utilization Standards

A. Industrial wood products on the Tongass National Forest will be managed for quality sawtimber material and other merchantable wood products.

1. Require utilization and optimum feasible use of wood material. Promote the use of wood for its highest value product commensurate with present and anticipated supply and demand.

Pg 4-74, Timber Sale Preparation, Windthrow

A. Special consideration will be required in the design of harvest units adjacent to LUDs or other areas that limit or prohibit timber harvest activities. Where the chance of windthrow in adjacent stands is increased by timber harvest, measures will be taken to contain the windthrow within the LUD where timber harvest is allowed. (Also see the Riparian Standards and Guidelines.)

Pg 4-83, Road and Bridge Reconstruction, Location and Design

A.10. Promptly rehabilitate temporary roads in accordance with erosion control and stabilization measures prescribed in the project plan. Establish vegetation on roadbeds of temporary roads within 10 years following termination of use.

AUDUBON'S CHANGES TO CHAPTER 5 OF THE PLAN

The TNF should change the following Desired Conditions (DC), Objectives (O), Suitability (SUIT), Standards (S), and Goals (G) in Chapter 5 of the Plan. Page numbers refer to the track changes version of the Plan. We excerpt the text at issue and offer detailed commentary in italics.

Pg 5-6, Desired Conditions, Young Growth Direction

DC-YG-04: Harvesting of young-growth stands in Riparian Management Areas (RMAs) and Beach Fringe provides opportunities to improve or maintain fish and wildlife habitat by accelerating old-growth characteristics.

Comment: TNF should not enter RMAs and Beach Fringe for young-growth harvest. The ability to accelerate old-growth characteristics through harvest has not been scientifically demonstrated. The proposed 10-acre clearcuts

are not similar to natural disturbance patterns. Imposing 10-acre clearcuts will set back decades of progress toward mature, uneven-aged stand structure and further fragment the older young growth that now exists. Furthermore, these sites were once some of the most productive sites on the forest and this second harvest will be another example of highgrading the best young-growth stands. RMAs and Beach Fringe reserves should remain as reserves. Breaching these reserves will significantly erode the Tongass Conservation Strategy crafted by an interagency group of scientists.

SUIT-YG-01: Lands within Old-growth Habitat, Scenic Viewshed, Modified Landscape, and Timber Production LUDs are suitable for young-growth timber production if they meet the other suitability requirements such as Tongass Timber Reform Act (TTRA), high vulnerability karst, and Inventoried Roadless Areas. Timber management within these LUDs is compatible with desired conditions for young-growth management.

Comment: Old-growth Habitat LUDs should not be entered for young-growth timber management. There is no scientific justification for doing this (see substantive comments above regarding RMAs and Beach Fringe young-growth harvest).

O-YG-01: During the 15 years after plan approval, the amount of young-growth offered would gradually increase to exceed 50 percent of the timber offered annually.

Comment: Audubon believes the deadline for ending old-growth clearcutting should be complete in no more than five years.

O-YG-02: During the 15 years after plan approval, offer increasing annual volumes of economically viable young-growth timber. Old-growth timber harvest would gradually be reduced to an average of 5 million board feet (MMBF) annually, to support local mills and investments in re-tooling, depending on markets and demand.

Comment: Consistent with the above comment, the Forest Service should put an end to old-growth clearcut timber harvest before the end of the Amended Plan's lifespan, and preferably within five years, as one milestone within the overall 15 year transition.

Pg 5-11, Desired Conditions, Wildlife

DC-YG-WILD-01: Active management of young-growth stands within the Old-growth Habitat LUD supports the integrated consideration of social, economic and ecological needs of regional and local communities. Young-growth stands within the Old-growth Habitat LUD maintain habitat and connectivity for wildlife and opportunities for accelerating development of old-growth characteristics while also providing commercial timber byproducts.

Comment: Old-growth Habitat LUDs were set aside for ecological reasons and infringing onto those areas is not consistent with meeting social and economic needs. These LUDs are a crucial component of the TLMP Old-Growth Conservation Strategy and should not be entered for timber management. To enter these reserves would erode the effectiveness of the conservation strategy and place undue risk on particular wildlife populations.

DC-YG-WILD-02: In the Old-growth Habitat LUD, treated young-growth emulates the natural scale and distribution of disturbance patterns (for example, windthrown timber that creates gaps and patches; landslides that create corridors and gaps; and mortality that naturally thins stands).

Comment: 10-acre clearcuts do not emulate natural disturbance patterns. This treatment recommendation is not scientifically demonstrated, as clearly stated in the 5-12-15 letter to Jason Anderson by ten scientists with significant Tongass experience. There may be restoration treatment methods that would increase habitat value in second-growth forests, e.g. removing 1-3 trees in widely spaced gaps. Ultimately, it is the agency's burden to explain the research and evidence used to justify any such proposed forest restoration methods.

O-YG-WILD-01: During the 15 years after plan approval, treat about 1,800 acres of young-growth in the Old-growth Habitat LUD to promote the development of old-growth characteristics while also providing commercial byproducts.

Comment: Old-growth Habitat LUDs should not be entered for young-growth timber management. See above comments.

S-YG-WILD-01: The maximum size of any created opening must not exceed 10 acres and a maximum removal of up to 35 percent of the acres of the original harvested stand is allowed. Commercial thinning is limited to 35 percent of the stand's original basal area. A combination of the two treatments may be used, with no more than 35 percent of the total stand removed in either basal area and/or acres. TTRA and other administratively withdrawn areas do not count towards the stand's total acreage.

Comment: Old-growth Habitat LUDs should not be entered for young-growth timber management.

S-YG-WILD-02: Commercial young-growth harvest within the Old-growth Habitat LUD is limited to a one-time only entry and to the first 15 years unless best available scientific information shows that additional entries are: a) warranted, and b) meet the LUD objectives.

Comment: Old-growth Habitat LUDs should not be entered for young-growth timber management.

G-YG-WILD-01: Road construction should be kept to the minimum necessary for the removal of young-growth timber within the Old-growth Habitat LUD. The intent is that determinations of prescriptions and opening sizes consider spatial and temporal conditions of adjacent landscapes. The intent is that treatment prescriptions in the Old-growth Habitat LUD would

facilitate a more rapid recovery of the late successional forest characteristics, while creating commercial timber byproducts.

Comment: No new roads should be built in Old-growth Habitat LUDs. Furthermore, Old-growth Habitat LUDs should not be entered for young-growth timber management.

Pg 5-14, Transportation Systems Corridors Direction

O-TSC-01: Cooperate with other agencies in developing 35 miles of transportation corridors on NFS lands during the 15 years after plan approval.

Comment: TNF should manage for fewer roads in areas with high road density. This objective should focus on improvements to existing travel corridors rather than new roads. This is a particularly acute issue in areas on POW Island where wolf mortality has increased in proportion to road density (see Appendix D).

Pg. 5-15, Transportation System Corridors Direction

[Add] S-TSC-WILD-02: Maintain road densities within Wildlife Analysis Areas (WAAs) at less than 0.7 mi/mi^2.

[Add] G-TSC-WILD-01: The ability for wildlife to withstand illegal hunting pressure should be maintained and depends on limiting WAAs to road densities of less than 0.7 mi/mi^2.

Comment: In WAAs that approach or meet the 0.7 mi/mi^2 threshold, the Service should aim for no net gain in roads. In other words, if a new road goes into a particular WAA, the Service should close or decommission the equivalent road mileage within the same WAA. In WAAs that already exceed the 0.7 mi/mi^2 threshold, the Service should actively close and decommission roads in order to alleviate the hunting access pressure in those areas, paying special attention to GMU 2.

Pg 5-16, Forest-wide Multiple-Use Goals and Objectives, Timber

O-TIM-01: Seeking to accelerate a transition to primarily young-growth harvest, offer an average of 46 MMBF annually in a combination of old growth and young growth. When young-growth offered is less than 41 MMBF, provide old growth to make up the difference and achieve the annual market demand of 46 MMBF. Offer an average of 5 MMBF of old growth annually to support local mills and investments in re-tooling, depending on markets and demand.

Comment: TNF should articulate a schedule for decreasing old-growth timber to ensure an end to old-growth clearcut logging before the end of the Plan, and preferably within 5 years of the Plan's implementation. We recommend that any post-transition harvest of old growth be accomplished by single or small group tree selection rather than clearcutting. The overall forest transition may require moving away from even-flow timber harvest, allowing greater flexibility in annual harvest quotas.

O-TIM-02: Seek to provide an economic timber supply sufficient to meet the annual market demand for Tongass National Forest timber, and the market demand for the planning cycle. The projected timber sale quantity (PTSQ) is 460 MMBF in the first decade, of which approximately 92 MMBF would be from young growth. The PTSQ in years 11-15 would be about 230 MMBF, of which about 125 MMBF would be young growth.

Comment: TNF should articulate a schedule for ending old-growth clearcut logging before the end of the Plan, and preferably within 5 years of the Plan's implementation.

LANGUAGE ON SUITABLE TIMBER LANDS

The TNF should make the following clarifications to the language in the Amendment's Appendix A. We excerpt the text at issue and offer comments in italics.

Appendix A, Step 2 – Lands Suited and Not Suited for Timber Production Based on Compatibility with Desired Conditions and Objectives

Timber production is compatible with the desired conditions and objectives of the following LUDs, including specific areas (e.g., beach fringe, riparian management areas) with these LUDs:

Comment: Timber production should not be considered compatible with beach fringe and RMA.

1. Non-Development LUDs except for the Old-growth Habitat LUD

Comment: Timber production should not be considered compatible with Old-growth Habitat LUDs.

A. Forest land in non-development LUDs are identified as **not suited** for timber production, except for young-growth stands in the Old-growth Habitat LUD.

Comment: Timber production should not be considered compatible with Old-growth Habitat LUDs.

2. Old-growth Habitat LUD (specific areas)

A. Forest land that meets all the other suitable criteria in the Old-growth Habitat LUD is identified as suitable for young-growth timber production. See Chapter 5, Young Growth Direction in the wildlife (WILD) section.

Comment: Timber production should not be considered compatible with Old-growth Habitat LUDs.

B. Forest land in the beach buffer is identified as suitable for young growth timber production except for 200 feet from the mean high tide line. See Chapter 5, Young-growth Direction in the Beach and Estuary Fringe (BEACH) section.

Comment: Timber production should not be considered compatible in BEACH areas.

C. Forest land in riparian management areas (RMAs) outside of Tongass Timber Reform Act (TTRA) buffers are considered suitable for commercial young growth timber production. See Chapter 5, Young Growth Direction in the Riparian (RIP) section.

Comment: Timber production should not be considered compatible with RMAs.

3.A. Forest lands that meet all the other suitable criteria in the Development LUDs (Scenic Viewshed LUD, Modified Landscape LUD, and Timber Production LUD) are identified as suitable for timber production (with the exception described in item B).

Within Development LUDs, old-growth stands in Phases 2 and 3 of the 2008 Forest Plan Timber Sale Program Adaptive Management objectives for Strategy, in the Trout Unlimited TU77 watersheds, and in The Nature Conservancy/Audubon Priority Conservation Areas (as shown on maps in the planning record) are identified as NOT suitable for timber production except for small sales after the transition is complete. Young-growth stands in all of these areas are identified as suitable for timber production.

Comment: Clarify above language to conform to the corresponding language in the TAC recommendation, which ensures that all of the following are protected: old-growth stands in Phases 2 and 3 of the 2008 Forest Plan, the Trout Unlimited T77 watersheds, and The Nature Conservancy/Audubon priority conservation areas.

Comment: Place the young-growth that is slated for harvest in the above areas (Phases 2 and 3 of the 2008 Forest Plan, the T77 watersheds, and Audubon-TNC Conservation Priority Watersheds), as well as beach fringe buffers, RMAs, and OGRs, off limits to harvest.

Comment: Ensure that the above areas are correctly removed from the suitable base in spatial representations.

Comment: Audubon defines priority conservation areas as those watersheds identified in our 2007 Conservation Assessment as green "conservation priority" as well as orange "restoration" watersheds. Together, and along with TLMP riparian and beach buffers and OGRs, they ensure ecological protection for the Forest. In addition to removing the areas discussed above from the suitable timber base, also place the restoration watersheds into a Phase 2 designation for young-growth cutting. The Forest Service should not enter the Phase 2 category until after achieving an end to old-growth clearcut logging.

Table D-1. Adjusted suitable young-growth timber base for the Preferred Alternative 5.

Preferred Alternative 5 suitable YG timber base	**332,964 ac**	**100%**
YG to remove from suitable base	**27,251 ac**	**8%**
• Buffers (Beach and RMAs)	4,428	1%
• OGRs	1,796	<1%
• Audubon-TNC conservation priority + T77 watersheds	21,027	6%
Phase 1 suitable YG timber base	**136,486 ac**	**41%**
Phase 2 suitable YG timber base	**169,227 ac**	**51%**
• Aud-TNC restoration watersheds	169,227	51%
Phase 1 + Phase 2 suitable YG timber base	**305,713 ac**	**92%**

*Acreages are approximate based on planning documents and GIS analysis.

Appendix B:

Scientist letter to Mr. Jason Anderson, Deputy Forest Supervisor, on May 12, 2015, expressing concerns over the TAC recommendations

May 12, 2015

Mr. Jason Anderson
Deputy Forest Supervisor
Petersburg Ranger District
P.O. 1328
Petersburg, AK 99833-1328

Dear Mr. Anderson,

We wish to formally comment on the final recommendations of the Tongass Advisory Committee (dated 5/11/2015) as they relate to our experience in wildlife and forest ecology on the Tongass National Forest. Please make these a part of the record, and distribute to the members of the advisory committee for their future consideration.

As you know, the scientific community has previously expressed concerns about continued logging of old growth on National Forest lands. These concerns are voiced by seven professional scientific societies, and scores of eminent scientists, including many with significant experience in wildlife and forest ecology in Southeast Alaska (letters dated 6/25/2014 and 10/15/2014).

The Tongass is the last National Forest in the Nation still clearcutting old-growth forests. The signers of those letters believe it is past time that this practice ended. That recommendation is echoed by Forest Service leaders, including two former Chiefs of the Forest Service and a former Director of Wildlife and Fisheries for the Alaska Region.

We appreciate the Forest Service's efforts to transition out of old-growth logging as soon as possible, but we find certain key assumptions (or hopes) expressed by the advisory committee are not grounded in sound science.

To access more volume, and improve timber sale economics, the advisory committee would have the Forest Service authorize clearcutting in ≤ 10 acre units in ecologically sensitive areas that are currently off limits to logging. These include Old Growth Reserves, Beach Fringe Buffers, and Riparian Management Areas. These are some of the most productive lands on the Tongass NF, and include reserves that were part of the wildlife conservation strategy in the 1997 Land and Resource Management Plan (carried forward in the 2008 TLMP amendment). Allowing commercial logging in these sensitive areas risks the integrity of that strategy.

There has been very little research and experience involving silvicultural treatments in older (>30 years) young-growth stands in Southeast Alaska. Most interest has centered on pre-commercial thinning of younger stands. Although Experiment IV of the Tongass-Wide Young Growth Studies (TWYGS) involves stands > 35 years old, and the McClellan-Tongass study of "commercial thinning" are currently ongoing, only the first 5-10 years of responses are available (and the only data analyzed and reported are from the first 5 years of TWYGS – Hanley et al. 2013). Neither of those studies includes treatments anything like clearcutting of up to 10 acres as suggested by the advisory committee.

Other very limited results (only 4 stands) from the Tongass' 1980s "Second-growth Management Area Demonstration Project" involving thinning of stands 43-94 years old showed some qualified promise after 12 years for the "individual tree selection" treatment (Zaborske et al. 2002, Hanley 2005); but the more open "strip thinning treatment" was overwhelmingly dominated by hemlock seedlings, a result consistent with Alaback and Tappenier's (1991) report of response following windthrow. Moreover, there has been no empirical research on secondary succession following clearcutting of young-growth forests in Southeast Alaska, and there is no theoretical reason to assume that it might be better for wildlife habitat than clearcutting of old-growth forest.

Recent work suggests that artificial canopy gaps (≤ 1 ac) created in older (54 year old) young growth may create a light environment more favorable to *Vaccinium* than hemlock (unpublished data, S. Harris and colleagues, Sitka). These treatments are ecologically distinct from the strip cuts and clearcuts associated with commercially-viable sales. Even with a positive *Vaccinium* response at this fine scale, however, the value to deer and other wildlife will vary depending on site characteristics, scale, and context. Thinned stands may show little increased use by wildlife (e.g. DellaSala et al. 1996, Matsuoka et al. 2012), or if use increases, it may be misleading (VanHorne 1983). These studies need to be carefully designed and conducted before committing to management actions that have centuries-long implications for wildlife.

In summary, we find no empirical data to support the contention that one can log 60-80 year old young growth in ways that are economically viable *and* achieve desired wildlife benefits. Until there is, the advisory committee should not advertise this as the expected outcome (i.e., their "co-intent").

The final document produced by the TAC suggests logging in non-suitable lands (including beach fringes, riparian management areas, and old-growth reserves) will not be implemented unless doing so is "likely to facilitate a more rapid recovery of late-successional forest characteristics." Based on the current science, the prospects of achieving old-growth forest characteristics by placing small clearcuts in mature young-growth stands is extremely low. We anticipate these ecologically important areas will be deferred from logging until that science changes.

Thank you for considering our comments and recommendations.

Sincerely (in alphabetical order).

Paul Alaback PhD.
Natalie Dawson PhD.
Tom Hanley PhD.
Wini Kessler PhD.
Matt Kirchhoff MSc.
David Person PhD.
John Schoen PhD.
Winston Smith PhD.
Lowell Suring MSc.
Mary Willson, PhD.

Cc: Tom Vilsack, Secretary of Agriculture
Robert Bonnie, USDA Undersecretary for Natural Resources and Environment,
Tomas Tidwell, Chief, US Forest Service
Beth Pendleton, Regional Forester, Alaska Region
Earl Stewart, Forest Supervisor, Tongass National Forest

Literature cited:

Alaback, P.B. and J.C. Tappeiner II. 1991. Response of western hemlock (*Tsuga heterophylla*) and early huckleberry (*Vaccinium ovalifolium*) seedlings to forest windthrow. *Can. J. For. Res.* 21, 534-539.

DellaSala, D.A., J.C. Hagar, K.A. Engel, W.C. McComb, R.L. Fairbanks, and E.G. Campbell. 1996. Effects of silvicultural modifications of temperate rainforest on breeding and wintering bird communities, Prince of Wales Island, southeast Alaska. *Condor 98:706-721*.

Hanley, T.A. 2005. Potential management of young-growth stands for understory vegetation and wildlife habitat in southeastern Alaska. *Landscape and Urban Planning* 72:95-112.

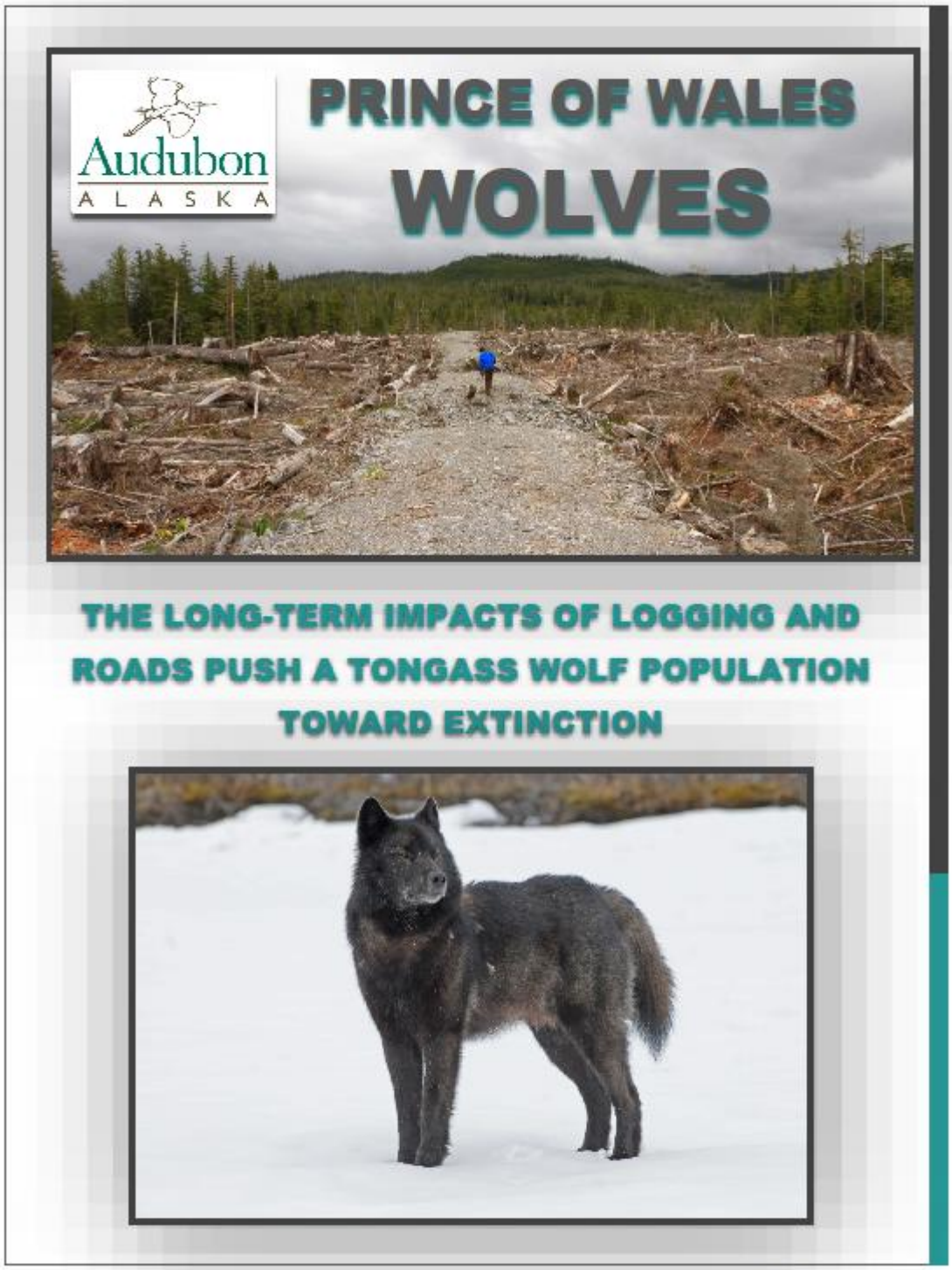
Hanley, T.A., M.H. McClellan, J.C. Barnard, and M.A. Friberg. 2013. Precommercial thinning: Implications of early results from the Tongass-Wide Young-Growth Studies experiments for deer habitat in southeast Alaska. Res. Pap. PNW-RP-593. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 64 p.

Matsuoka, S., J.A. Johnson, and D.A. DellaSala. 2012. Succession of bird communities in young temperate rainforests following thinning. *J. Wildlife Management* 76(5):919-931.

Van Horne, B. (1983). Density as a misleading indicator of habitat quality. *The Journal of Wildlife Management*, 893-901.

Zaborske, R.R and M.H. McClellan 2002. Understory vegetation development following commercial thinning in Southeast Alaska: preliminary results from the second-growth management area demonstration project. Pages 74-82 in: S Parker (ed). Beyond 2001: silvicultural odyssey to sustaining terrestrial and aquatic ecosystems. Proceedings of a workshop in 2001 in Hood River, OR. *USDS Forest Service, Gen. Tech. Rep.* PNW-GTR-546.

Appendix C:
Wolf Report


Audubon
ALASKA
PRINCE OF WALES
WOLVES
THE LONG-TERM IMPACTS OF LOGGING AND ROADS PUSH A TONGASS WOLF POPULATION TOWARD EXTINCTION
Images: J. Cannon, B. Armstrong

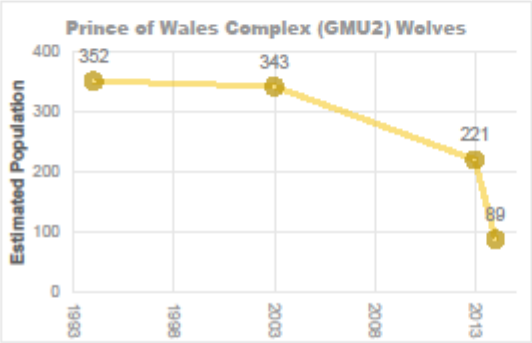
PRINCE OF WALES WOLVES

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 km²	Fall 1994	352
ADFG (2009)	38 wolves per 1000 km²	Fall 2003	343
ADFG (2015)	24.5 wolves per 1000 km²	Fall 2013	221
ADFG (2015)	9.9 wolves per 1000 km²	Fall 2014	89

[1] Wolf density estimates were applied across the Game Management Unit 2 (GMU2) extrapolation area (9025 km²). Note that the 2003 ADFG estimate was expressed as 326 wolves on POW and surrounding islands (~8615 km²) 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

2

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

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

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.

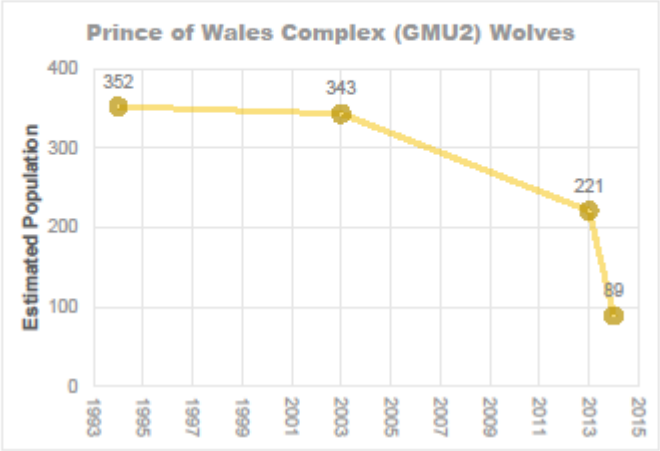
Prince of Wales and the associated complex of islands, including Kosciusko, Dall, and Outside islands, (hereafter referred to as the Prince of Wales Complex) is three times larger than the state of Rhode Island and is the most ecologically productive bioregion of the Tongass National Forest. In addition 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
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

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.

5

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.


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

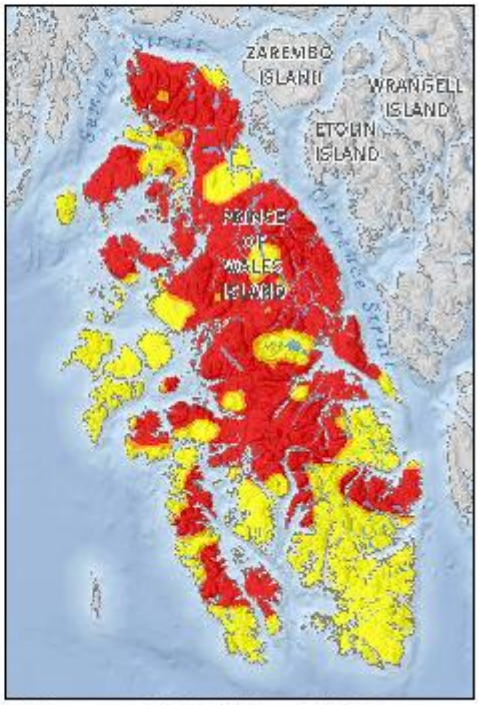
Take Facilitated by Logging Roads

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

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/km² after which population instability ensues. Road density averages 0.5 km/km² across GMU2, 0.6 km/km² across Prince of Wales Island, and 0.7 km/km² for the North Prince of Wales Province[3]. With many areas exceeding the 0.9 km/km² 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.

7

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.

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

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.

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).

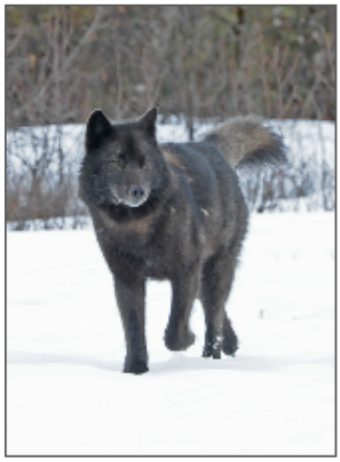
The impacts of logging are not evenly dispersed. The timber industry has targeted the largest, highest-value tree stands, which are generally the areas that are also most ecologically important to the forest and wildlife that live there (Albert and Schoen 2013). As discussed above, Prince of Wales Island

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.

REFERENCES

Alaska Board of Game. 2015. Region 1 GMU 2 Wolf Staff Report. Juneau, AK.

Alaska Department of Fish and Game. 2009. Wolf Management Report of Survey and Inventory Activities, 1 July 2005-30 June 2008. Alaska Department of Fish and Game.

_____. 2012. Wolf Management Report of Survey-Inventory Activities, 1 July 2008-30 June 2011.

_____. 2015. Memorandum: GMU 2 Wolf Population Estimate Update, Fall 2014. State of Alaska, Ketchikan, AK.

Albert, D. M., and J. W. Schoen, 2007. A conservation assessment for the coastal forests and mountains ecoregion of southeastern Alaska and the Tongass National Forest, *In A Conservation Assessment and Resource Synthesis for the Coastal Forests & Mountains Ecoregion in Southeastern Alaska and the Tongass National Forest*. eds J. W. Schoen, and E. Dovichin. Audubon Alaska and The Nature Conservancy, Anchorage, AK.

_____. 2013. Use of historical logging patterns to identify disproportionately logged ecosystems within temperate rainforests of southeastern Alaska. *Conservation Biology* 27:774–784.

American Society of Mammalogists. 2015. ASM Position Letter on the Alexander Archipelago Wolf. American Society of Mammologists, Berkeley, CA.

Brinkman, T. J., T. Chapin, G. Kofinas, and D. K. Person. 2009. Linking hunter knowledge with forest change to understand changing deer harvest opportunities in intensively logged landscapes. *Ecology and Society* 14.

Cook, J., and S. MacDonald. 2007. *Mammals and Amphibians of Southeast Alaska*. University of New Mexico, Albuquerque, NM.

Cronin, M. A., A. Cánovas, D. L. Bannasch, A. M. Oberbauer, and J. F. Medrano. 2015a. Single nucleotide polymorphism (SNP) variation of wolves (*Canis lupus*) in Southeast Alaska and comparison with wolves, dogs, and coyotes in North America. *Journal of Heredity* 106:26-36.

_____. 2015b. Wolf subspecies: Reply to Weckworth et al. and Fredrickson et al. *Journal of Heredity*.

Dawson, N. G., S. O. MacDonald, J. A. Cook, and A. R. Wallace, 2007. Endemic mammals of the Alexander Archipelago, *In A Conservation Assessment and Resource Synthesis for the Coastal Forests & Mountains Ecoregion in Southeastern Alaska and the Tongass National Forest*. eds J. Schoen, and E. Dovichin. Audubon Alaska and The Nature Conservancy, Anchorage, Alaska.

Dickerman, R. W., and J. Gustafson. 1996. The Prince of Wales spruce grouse: A new subspecies from Southeastern Alaska. *Western Birds* 27:41-47.

Fuller, T. K., L. D. Mech, and J. F. Cochrane. 2003. Wolf population dynamics. *Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago*:161-191.

Goldman, E. A., 1944. Classification of wolves, *In The Wolves of North America. 2 parts*. eds S. P. Young, and E. A. Goldman. Dover Publications, New York, NY.

Iverson, G. C., G. Hayward, K. Titus, E. DeGayner, R. Lowell, D. Crocker-Bedford, P. Schempf, and J. Lindell. 1996. Conservation Assessment for the Northern Goshawk in Southeast Alaska. USDA Forest Service. General Technical Report PNW-GTR-387. Pacific Northwest Research Station, Juneau, AK.

Mlot, C. 2015. Inbred wolf population on Isle Royale collapses. *Science* 348:383.

Person, D. K. 2001. Alexander Archipelago Wolves: Ecology and Population Viability in a Disturbed, Insular Landscape. PhD thesis, University of Alaska, Fairbanks, AK.

_____. 2013. Statement of David K. Person, Regarding the Big Thorne Project, Prince of Wales Island (submitted to ADFG, on file at Audubon Alaska). Vermont, US.

Person, D. K., and T. J. Brinkman, 2013. Succession debt and roads: Short- and long-term effects of timber harvest on a large-mammal predator-prey community in Southeast Alaska, *In North Pacific Temperate Rainforests: Ecology and Conservation*. eds G. H. Orians, and J. W. Schoen, pp. 143-167. University of Washington Press, Seattle, WA.

Person, D. K., M. D. Kirchhoff, V. Van Ballenberghe, G. C. Iverson, and E. Grossman. 1996. The Alexander Archipelago Wolf: A Conservation Assessment. General Tech. Report PNW-GTR-384. US Forest Service, Juneau, AK.

Person, D. K., and A. L. Russell. 2008. Correlates of Mortality in an Exploited Wolf Population. *Journal of Wildlife Management* 72:1540-1549.

Schoen, J. W., and D. K. Person, 2007. Alexander Archipelago wolf, *In A Conservation Assessment and Resource Synthesis for the Coastal Forests & Mountains Ecoregion in Southeastern Alaska and the Tongass National Forest*. eds J. W. Schoen, and E. Dovichin. The Nature Conservancy and Audubon Alaska, Juneau, AK.

Smith, W. P. 2013. Spatially explicit analysis of contributions of a regional conservation strategy toward sustaining northern goshawk habitat. *Wildlife Society Bulletin* 37:649-658.

Tongass National Forest. 2008. Record of Decision: Land and Resource Management Plan Amendment. USDA, Washington, D.C.

Weckworth, B. V., N. G. Dawson, S. L. Talbot, and J. A. Cook. 2015. Genetic Distinctiveness of Alexander Archipelago Wolves (*Canis lupus ligoni*): Reply to Cronin et al.(2015). *Journal of Heredity*.

Weckworth, B. V., S. Talbot, G. K. Sage, D. K. Person, and J. Cook. 2005. A signal for independent coastal and continental histories among North American wolves. *Molecular Ecology* 14:917-931.

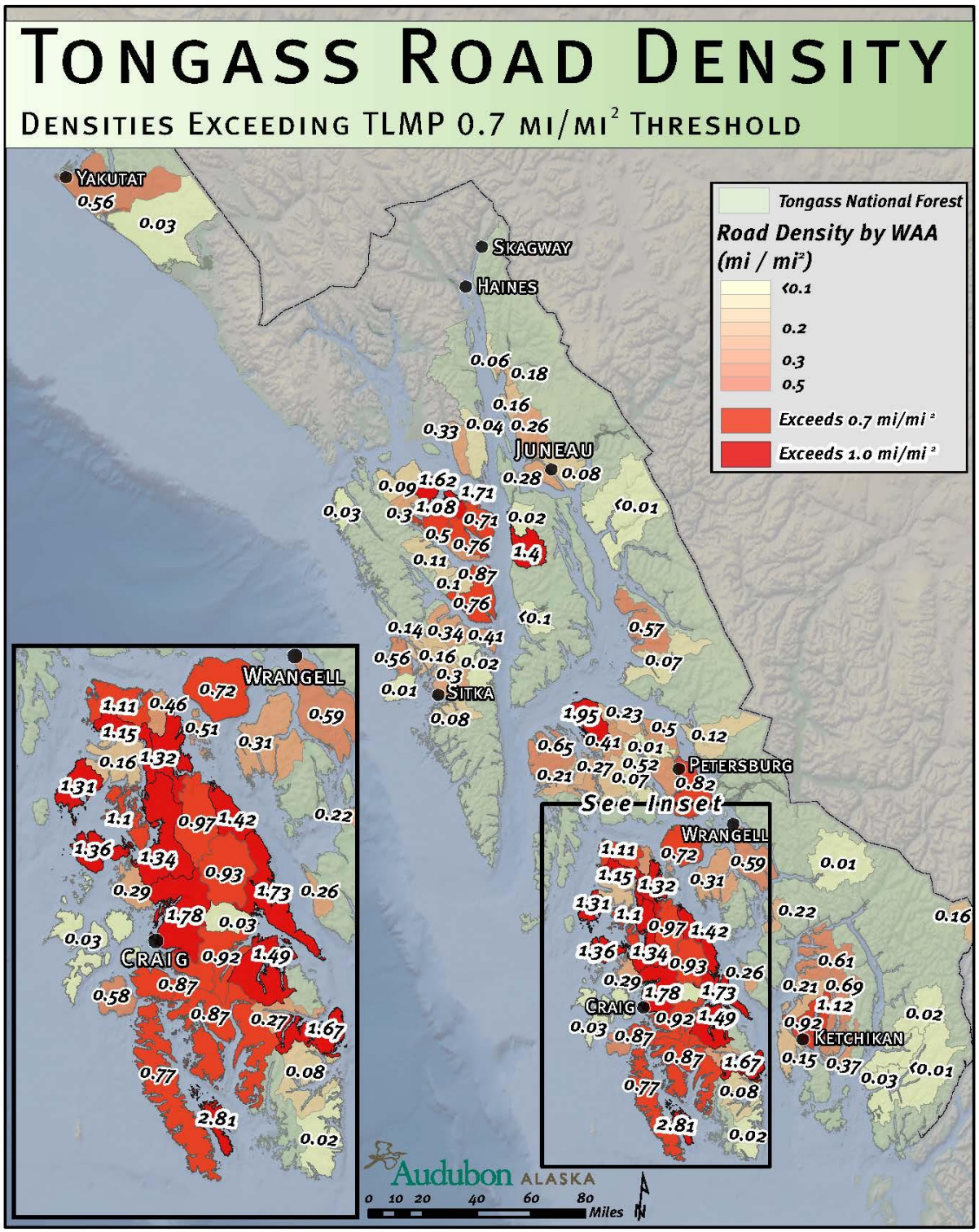
Weckworth, B. V., S. L. Talbot, and J. A. Cook. 2010. Phylogeography of wolves (*Canis lupus*) in the Pacific Northwest. *Journal of Mammalogy* 91:363-375.

Woodford, R. 2014. Deer Hunting Forecast and "State of the Deer". Alaska Department of Fish and Game, Juneau, AK. Accessed online Aug 25 2015 at http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=672.

Audubon ALASKA

13

Appendix D:
Road Density Map


TONGASS ROAD DENSITY
DENSITIES EXCEEDING TLMP 0.7 MI/MI² THRESHOLD
Tongass National Forest
Road Density by WAA (mi / mi²)
<0.1
0.2
0.3
0.5
Exceeds 0.7 mi/mi²
Exceeds 1.0 mi/mi²
YAKUTAT
SKAGWAY
HAINES
JUNEAU
SITKA
PETERSBURG
WRANGELL
CRAIG
KETCHIKAN
See Inset
Audubon ALASKA
0 10 20 40 60 80 Miles
N

References

Anthony, R.G., and F.B. Isaacs. 1989. Characteristics of bald eagle nest sites in Oregon. *J. Wildl. Manage.* 53:148-159.

Albert, D. M., and J. W. Schoen. 2007. A conservation assessment for the coastal forests and mountains ecoregion of southeastern Alaska and the Tongass National Forest, *In A Conservation Assessment and Resource Synthesis for the Coastal Forests & Mountains Ecoregion in Southeastern Alaska and the Tongass National Forest*. eds J. W. Schoen, and E. Dovichin. Audubon Alaska and The Nature Conservancy, Anchorage, AK.

_____. 2013. Use of historical logging patterns to identify disproportionately logged ecosystems within temperate rainforests of southeastern Alaska. *Conservation Biology* 27:774–784.

Cook, J. A., and S. O. MacDonald. 2013. Island life: Coming to grips with the insular nature of Southeast Alaska and adjoining coastal British Columbia, *In North Pacific Temperate Rainforests: Ecology and Conservation*. eds G. H. Orians, andJ. W. Schoen, pp. 19-42. University of Washington Press, Seattle, WA.

Crone, L. K., and J. R. Mehrkens. 2013. Indigenous and Commercial Uses of the Natural Resources in the North Pacific Rainforest with a Focus on Southeast Alaska and Haidi Gwaii, *In North Pacific Temperate Rainforests: Ecology and Conservation*. eds J. W. Schoen, andG. H. Orians, pp. 73–88. University of Washington Press, Seattle, WA.

DellaSala, D. A. 2011. *Temperate and Boreal Rainforests of the World: Ecology and Conservation*. Island Press, Washington, DC.

Dombeck, M., and J. W. Thomas. 2003. P-I Focus: Declare harvest of old-growth forests off-limits and move on.

Gende, S. M., R. T. Edwards, M. F. Willson, and M. S. Wipfli. 2002. Pacific salmon in aquatic and terrestrial ecosystems. *BioScience* 52:917-928.

Hanley, T. A., W. P. Smith, and S. M. Gende. 2005. Maintaining wildlife habitat in southeastern Alaska: implications of new knowledge for forest management and research. *Landscape and Urban Planning* 72:113-133.

Hicks, B. J., J. D. Hall, P. A. Bisson and J. R. Sedell. 1991. Response of salmonid populations to habitat changes caused by timber harvest. pp. 438-518, In: W. R. Meehan (ed.). Influence of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Hoover, C.M., Leak, W.B. and Keel, B.G. 2012. Benchmark carbon stocks from old-growth forests in northern New England, USA. *Forest Ecology and Management*. 266:108-114.

Iverson, G. C., G. Hayward, K. Titus, E. DeGayner, R. Lowell, D. Crocker-Bedford, P. Schempf, and J. Lindell. 1996. Conservation Assessment for the Northern Goshawk in Southeast Alaska. USDA Forest Service. General Technical Report PNW-GTR-387. Pacific Northwest Research Station, Juneau, AK.

Janetski, D. J., D. T. Chaloner, S. D. Tiegs, and G. A. Lamberti. 2009. Pacific salmon effects on stream ecosystems: a quantitative synthesis. *Oecologia* 159:583-595.

Larsen, P.H., Goldsmith, S., Smith, O., Wilson, M.L., Strzepek, K., Chinowsky, P. and B. Saylor, B. 2008. Estimating future costs for Alaska public infrastructure at risk from climate change. *Global Environmental Change*. 18:442-457.

McLellan, B. N., and D. M. Shackleton. 1989. Immediate reactions of grizzly bears to human activities. Wildlife Society Bulletin 17:269-274.

Meridian Institute. 2014. Tongass Advisory Committee Meeting Summary. November 19-21, 2014. Available online at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3826730.pdf.

Olson, D. M., and E. Dinerstein. 1998. The global 200: A representative approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12:502-515.

Orians, G. H., J. W. Schoen, J. F. Franklin, and A. MacKinnon. 2013. Introduction, *In North Pacific Temperate Rainforests: Ecology and Conservation*. eds G. H. Orians, andJ. W. Schoen, pp. 3-18. University of Washington Press, Seattle, WA.

Person, D. K., and T. J. Brinkman. 2013. Succession debt and roads: Short- and long-term effects of timber harvest on a large-mammal predator-prey community in Southeast Alaska, *In North Pacific Temperate Rainforests: Ecology and Conservation*. eds G. H. Orians, andJ. W. Schoen, pp. 143-167. University of Washington Press, Seattle, WA.

Person, D. K., and A. L. Russell. 2008. Correlates of Mortality in an Exploited Wolf Population. *Journal of Wildlife Management* 72:1540-1549.

Pollock, M. M., and T. J. Beechie. 2014. Does riparian forest restoration thinning enhance biodiversity? The ecological importance of large wood. *JAWRA Journal of the American Water Resources Association,* 50:543-559.

Reynolds, R.T., R.R. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. Rocky Mountain Forest and Range Experiment Station and Southwestern Region Forest Service, U.S. Department of Agriculture. Available online at http://www.fs.fed.us/rm/pubs_rm/rm_gtr217.pdf

Stephenson, Nathan L., A. J. Das, R. Condit, S. E. Russo, P. J. Baker, N. G. Beckman, D. A. Coomes et al. 2014. Rate of tree carbon accumulation increases continuously with tree size. *Nature* 507:90-93.

Schoen, J., and E. Dovichin. 2007. The Coastal Forests and Mountains Ecoregion of Southeastern Alaska and the Tongass National Forest: A Conservation Assessment and Resource Synthesis. Audubon Alaska and The Nature Conservancy, Anchorage, AK.

Schoen, J. W., R. W. Flynn, L. H. Suring, K. Titus, and L. R. Beier. 1994. Habitat-capability model for brown bear in Southeast Alaska, *In Bears: Their Biology and Management*. Missoula, Montana.

Terborgh, J., and J. A. Estes. 2010. *Trophic Cascades: Predators, Prey, and the Changing Dynamics of Nature*. Island Press, Washington.

U.S. Fish and Wildlife Service. 2016. 12-Month Finding on a Petition to List the Alexander Archipelago Wolf as an Endangered or Threatened Species; codified at 50 C.F.R. Part 17. *Federal Register* 81.

USDA Forest Service. 2013. TNF 5-Year Forest Plan Review Public Outreach & Comment Analysis. Available online at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5443864.pdf.

USDA Forest Service Alaska Region. 2011. Biography: Jon R. Martin. Feb 17, 2011. Available online at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5275416.pdf.thesis.

Weckworth, B. V., S. L. Talbot, and J. A. Cook. 2010. Phylogeography of wolves (Canis lupus) in the Pacific Northwest. *Journal of Mammalogy* 91:363-375.

Weckworth, B. V., S. Talbot, G. K. Sage, D. K. Person, and J. Cook. 2005. A signal for independent coastal and continental histories among North American wolves. *Molecular Ecology* 14:917-931.

Willson, M. F., and K. C. Halupka. 1995. Anadromous fish as keystone species in vertebrate communities. *Conservation Biology* 9:489-497.