Audubon ALASKA

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May 15, 2008

Chief Abigail Kimbell
USDA Forest Service
Ecosystem Management Coordination
Attn: Appeals
Yates Building, 3CEN
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Washington, D.C. 20250
Email: appeals-chief@fs.fed.us

Re: Notice of Appeal

Dear Chief Kimbell:

The following is a Notice of Appeal filed pursuant to 36 CFR part 217, objecting to the Record of Decision (ROD) for the Amended Land and Resource Management Plan of the Tongass National Forest (Amended Plan), signed by Regional Forester Dennis E. Bschor on January 23, 2008. The Amended Plan is based on Alternative 6 in the Final Environmental Impact Statement (FEIS), as modified in the ROD.

***SUMMARY***

*Past timber harvest on Forest Service, state, and private lands throughout southeast Alaska focused disproportionately on the highest value timber lands and most valuable fish and wildlife habitats. The biogeographic provinces delineated on the Tongass are each ecologically unique, some supporting endemic species or subspecies. The conservation reserves in a number of these provinces are inadequate for maintaining habitat diversity and abundant populations of fish and wildlife. Although Phase 1 of the Amended Plan minimizes future impacts to many of the most ecologically productive intact watersheds, those watersheds are at risk in later phases of the plan. In addition, many of the core areas of high biological value in previously developed watersheds are scheduled for further logging in Phase 1, while most of the core areas will be developed in later phases of the plan. Thus the Amended Plan is a high-risk strategy for maintaining ecosystem integrity, habitat diversity, and abundant populations of fish and wildlife well distributed across the Tongass National Forest. An expanded system of reserves made up of intact watersheds and core areas of ecological value within developed watersheds are needed to maintain ecosystem integrity. Audubon Alaska and The Nature Conservancy have proposed a conservation area design that provides two scales of habitat protection across the most biologically productive watersheds while sustaining the local timber industry on a combination of old-growth and second-growth harvest. Audubon Alaska seeks relief through adoption of a set of recommendations for improving the Amended Plan and reducing conservation risks.*

**INTRODUCTION**

Audubon Alaska (Audubon) is the state office of the National Audubon Society with six chapters in Alaska and over 2,000 members and supporters. The National Audubon Society is a conservation organization with over 500 chapters and more than half a million members and supporters. The mission of Audubon Alaska is to conserve Alaska's natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit and enjoyment of current and future generations. Numerous National Audubon Society members have visited or plan to visit the Tongass National Forest (Tongass) and many Audubon Alaska members recreate or harvest food on the forest. Audubon has long been interested and involved in conservation and management of the Tongass and has participated fully in all the recent Tongass planning processes since 1997. Audubon Alaska provided extensive scoping comments on the Amended Plan and substantial comments on the 2007 draft environmental impact statement (DEIS). Audubon, in cooperation with The Nature Conservancy (TNC), also completed a conservation assessment (Albert and Schoen 2007a,b) and a conservation area design (Schoen and Albert 2007) for southeastern Alaska (Southeast) and the Tongass and have previously provided copies of this report (under separate cover) to the Tongass leadership.

Audubon's vision for the Tongass includes:

- Maintaining the long-term (i.e., centuries) ecological integrity and resilience of the rainforest ecosystem (including conserving abundant and well distributed populations of fish and wildlife populations and the diversity of habitats upon which they depend for the benefit of current and future generations of Alaskans and all Americans); and
- Providing an opportunity for local industry to access a sustainable timber supply to enhance economic diversity and sustainability for local communities.

The primary underpinnings of this vision are to: (1) focus conservation on intact watersheds and sub-watershed core areas (within developed watersheds) with the highest ecological and community values within each biogeographic province across the Tongass; (2) concentrate timber production within the smallest land base and with the least impact on intact (roadless) habitat values (including minimizing new roads); (3) facilitate a rapid transition from old-growth to young-growth timber harvest; and (4) restore impaired watersheds that have high ecological or community use potential.

**THE AMENDED TONGASS LAND AND RESOURCE MANAGEMENT PLAN**

**Record of Decision.** Audubon appreciates the progress the Forest Service has made toward assessing and describing (in the FEIS) the current and historical distribution of habitats and conservation issues on the Tongass Forest. We also acknowledge the creative adaptive management approach the Forest Service used in their attempt to balance timber production with other values of the Tongass. Although Alternative 1, with an annual sale quantity (ASQ) of 49 million board feet (MMBF), was the environmentally preferred alternative, Alternative 6, as amended in the ROD, was selected for the Amended Plan. The upper limit of timber harvest per decade under the Amended Plan is 2.67 billion board feet per decade and is unchanged from the 1997 Tongass Land Management Plan (TLMP). While the Amended Plan minimizes new timber harvest activities in many high-value intact watersheds in the short term, there are still serious deficiencies that must be corrected before this plan becomes operational.

Based on Audubon's review of the ROD, Amended Plan, and FEIS, we contend the Amended Plan represents a risky strategy for conserving the ecological integrity and habitat diversity of the Tongass and maintaining abundant and well distributed populations of fish and wildlife throughout the forest's biogeographic provinces. Therefore, Audubon is appealing the Amended

Plan and recommending specific adjustments to the conservation strategy and ASQ. We believe these recommended adjustments will allow for a sustainable timber industry in Southeast providing economic diversity and stability for local communities while also maintaining the ecological integrity of the forest ecosystem and providing for a diversity of other forest uses dependent on abundant and well distributed fish and wildlife populations.

**Tongass Timber Supply and Allowable Sale Quantity.** As part of the Tongass Futures Roundtable, Dave Albert of TNC developed a decision-support tool for evaluating various land allocation alternatives and timber supply on the Tongass. The TNC-Audubon Conservation Area Design was developed to optimize biodiversity and timber values on the Tongass (Albert and Schoen 2007). We applied the decision support tool to evaluate the ASQ that could be produced from the Tongass suitable timber base assuming no timber harvest within the Conservation Area Design Conservation Priority Watersheds and the Core Areas within Integrated Management Watersheds. This analysis also applied all the protections of the Amended Plan's conservation strategy including old growth reserves, beach-fringe and riparian buffers and standards and guidelines. The potential ASQ under the above scenario is equivalent to 118 MMBF/year of saw timber (including 52 MMBF of old growth and 66 MMBF of second growth). Thus, applying the TNC-Audubon Conservation Area Design to the Amended Plan could theoretically provide more volume than has been harvested on average over the last seven years and significantly reduce conservation risks associated with the cumulative effects of timber harvest and associated road construction.

Recent discussions at the Tongass Futures Roundtable regarding timber economics and ASQ suggest that the Model Implementation Reduction Factor (MIRF, also known as falldown) may have been significantly underestimated, particularly in areas with multiple previous entries for timber harvest. This includes much of the Phase 1 timber base. Indeed, in several recently planned timber sales, the quality and accessibility of remaining timber, and the volume that is economically viable to harvest is significantly lower than expected based on forest-wide estimates used in the TLMP Amendment. This represents an economic component to the MIRF that has not been adequately taken into account. Thus, the supply of economically viable timber in TLMP has been significantly overestimated, and as a consequence leads to the over-harvest of stands within the subset of forest lands that are most valuable and accessible. This is not economically or ecologically sustainable. If this is the case, most of the Core Areas within Integrated Management Watersheds (such as Staney Creek and Logjam) will be at high risk from logging during Phase 1 of the Amended Plan. This represents a significant risk to the long-term ecological integrity of those watersheds and our ability to maintain habitat diversity and abundant and well distributed populations of fish and wildlife within the province. If the MIRF has been underestimated, then we have serious concerns over the estimated timber supply across the Tongass. This issue is exacerbated by the long history of highgrading the most valuable timber stands across all land management jurisdictions in Southeast.

Audubon contends the ASQ of 267 MMBF/year is unsustainable and much too high to maintain habitat diversity and abundant populations of fish and wildlife needed to sustain quality recreation and subsistence uses on the Tongass. Alternative 1—with an ASQ 49 MMBF/year—is much more in line with the average annual harvest of timber from the Tongass over the last seven years. We believe that an ASQ in the range of 45 to 65 MMBF/year, with an accelerated transition from old growth to young growth, is much more realistic in terms of sustainability and protection of other resource values across the Tongass. This ASQ could theoretically support the current mills now operating in Southeast. As the transition from old growth to second growth is

completed, the higher volume second-growth stands could ultimately lead to an ASQ over 100 MMBF/year.

**ECOLOGICAL CONCERNS ASSOCIATED WITH THE AMENDED PLAN**

The Tongass National Forest overlays an archipelago of over 5,000 islands (> 1 acre) and a narrow mainland coast along rugged mountains and glacial fiords. The insular geography and glacial history of this region has resulted in a naturally fragmented terrestrial ecosystem. Within this region, 20% of known mammal taxa have been described as endemic species or subspecies (MacDonald and Cook 1996). Although island endemics are highly vulnerable to extinction (Soule 1983), a comprehensive plan for conserving Tongass endemics has not yet been developed (Dawson et al. 2007), thereby increasing conservation risks to endemic taxa. The natural fragmentation of the Tongass compounded by past timber harvest targeting the most productive forest lands (Albert and Schoen 2007a, b, Tongass FEIS 2008) also increases the risks of maintaining habitat diversity and abundant and well distributed populations of fish and wildlife.

Citing Franklin (1993), the Tongass FEIS states that maintaining a full representation of ecosystem types is an accepted strategy for conserving biodiversity in landscapes managed for forestry, and Audubon believes this is essential for sustaining abundant populations of fish and wildlife well distributed across the Tongass. Citing Wells et al. (2003), the Tongass FEIS also states that most species, especially those for which knowledge is sparse or absent (e.g., most species on the Tongass), are best sustained by ensuring that an adequate portion of each ecosystem type is represented in a relatively unmanaged state. Increased habitat fragmentation and loss of habitat diversity in the most productive provinces of the Tongass and adjacent private lands have significantly increased risks of maintaining abundant and well distributed fish and wildlife populations. Audubon contends that the Amended Plan failed to modify the Tongass conservation strategy to minimize conservation risks. In fact, the FEIS (p. 3-175) acknowledges the uncertainty of its conservation strategy in citing Powell et al. (1997) that "…the effectiveness of the reserves and buffers in relation to their size, landscape pattern, and geographic distribution has yet to be scientifically tested."

**Habitat for Viable Versus Abundant Populations.** The ROD cites National Forest Management Act (NFMA) regulations that state:

> Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area.

Based on the overall abundance of productive old-growth forest (POG) on the Tongass (the FEIS estimates that 92% of the original POG still remains today) and the amount remaining over the 15 year life of the plan (89% of POG), the ROD states: "Accordingly, I am as certain as I can be that this decision ensures the maintenance of viable wildlife populations as required by NFMA."

Unfortunately, this "certainty" is not demonstrated by any quantitative population viability analyses, particularly for endemic species that may be at risk because of their naturally small, isolated populations. Nor does the ROD or FEIS explicitly address the uncertainty of the Tongass conservation strategy as expressed by Powell et al. (1997). But there is also a significant difference between "viable" and "abundant" or usable populations, and providing for viability does not provide people the opportunity of using fish and wildlife populations that are well

distributed across the Tongass. Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) requires that the needs of rural residents be given priority when managing wildlife and fisheries in Alaska. The Sitka black-tailed deer is the most important big game species in Southeast. Maintaining merely viable populations of deer will not meet the demands for deer by local subsistence or sport hunters who require much higher population levels for successful hunting. If deer numbers decline sufficiently, rural preferences required under ANILCA will kick in, causing conflicts between rural and urban deer hunters.

Regarding population abundance, the FEIS (p. 3-253) states: "…another important purpose of the Tongass Forest Plan is to manage wildlife resources in such a way that, in addition to ensuring that viable populations are sustained, consumptive (hunting) and non-consumptive (wildlife viewing) opportunities are maintained." Audubon agrees that the Forest Service has a responsibility to maintain habitat that allows for the natural abundance of populations that will provide opportunity for people to use those populations for both consumptive and non-consumptive purposes. However, the primary focus of the FEIS and ROD are on viable populations rather than abundant (or useable) populations. This is a serious flaw of the Amended Plan. There is no quantitative analysis of the cumulative effects of the Amended Plan, over the long-term, on maintaining abundant populations of fish and wildlife. In addition, the NFMA regulations require that habitat must be "well distributed." As we will demonstrate below, forest management on the Tongass and adjacent private lands have significantly altered the distribution of specific rare forest habitat types throughout Southeast and the Amended Plan will further reduce and fragment those rare and important fish and wildlife habitats. In fact, deer hunters on Prince of Wales Island are already facing reduced deer hunting opportunities in localized areas in part as habitat transitions into closed canopy second growth, which provides little forage for deer.

**Estimating changes in habitat abundance and distribution.** Audubon appreciates that the Tongass Plan FEIS has used the size-density model to estimate the abundance and distribution of various types of forest habitat across the Tongass and throughout Southeast. This also provides an opportunity for estimating past harvest of specific forest types, including the rare large-tree (SD67) old-growth stands. The FEIS analysis basically used the same approach that Albert and Schoen (2007a) used for calculating a coefficient of selectivity for large-tree old growth, based on timber harvest after 1986. For example, in the TNC-Audubon analysis, areas that were logged after 1986 consisted of approximately 29% of large-tree forest types, 65% of medium-tree types, and 6% of small-tree productive old-growth types (Albert and Schoen 2007a). In comparison with the total abundance of these forest types, this results in a selectivity ratio of 2.89 for large-tree, 0.87 for medium-tree, and 0.4 for small-tree forest types. Thus, large-tree forests were logged during this period at a rate that exceeded their proportional abundance by 2.89 times, and exceeded the proportional rate of logging on medium- and small-tree forest types by 333% and 720% respectively. The FEIS, however, failed to discuss that this approach substantially underestimated the level of harvest prior to 1986 because early logging was highly selective for the most productive timber sites (Greeley 1953, Rakestraw 1981, USFS 2003). Although the FEIS did not describe the problem of <u>underestimating</u> the harvest of large-tree old growth prior to 1986, it clearly recognized the disproportionate harvest throughout Southeast. For example the FEIS states:

> Past harvest on the Tongass has disproportionately targeted the larger POG types. Early logging in particular, especially prior to the 1990s, extensively harvested the larger tree types. These types were not only the highest timber volume types but they also often grew at lower elevations in the easiest areas to access (e.g., valley bottoms and lower slopes. (FEIS 3-149).

> Disproportionate past harvest has occurred at a higher rate for large-tree POG…on non-NFS lands compared with NSF lands. (FEIS 3-151).
>
> Large-tree stands found in alluvial river bottoms and karst areas were the target of early cleacut logging throughout Southeast Alaska (especially in the 1950s through early 1970s); some clearcuts were extensive and in many cases trees were harvested to the stream banks. With growing concerns over fisheries protection and proportionality, buffer restrictions were instituted in the 1990s. (FEIS 3-152).

Furthermore, in some provinces the most productive watersheds that currently remain intact are not comparable to the productivity of those highly productive watersheds that were logged in the early years. Logging regulations and guidelines have also changed over time, further underestimating the original selectivity for large-tree forest types. For example, about 57% of the timber harvest on the Tongass occurred prior to the 1979 Tongass Land Management Plan and another 25% harvested prior to additional riparian protections or proportionality requirement of the 1990 Tongass Timber Reform Act (FEIS 2008) and was much less restrictive of logging in the most productive flood plain forests than in more recent years. Indeed, many of the harvest units from the 1950s, 60s and 70s are characterized by broad-scale clearing of flood plain forests in watersheds, such as Katlian River and Nawkasina Sound on Baranof Island and Harris River and Staney Creek on Prince of Wales Island. Forestry standards implemented with the 1997 Tongass Land Management Plan revision further restricted logging in flood plain areas, beach and estuary fringe, and other forest types.

Clearly, forest types logged after 1986 are not representative of those from earlier years, particularly related to logging in the most productive watersheds. Audubon contends that the assessment in the FEIS substantially underestimates the original distribution of these forest types. We clearly acknowledged this underestimate in the TNC-Audubon conservation assessment (Albert and Schoen 2007), but we could not find an acknowledgement of this underestimate in the FEIS. Based on the history and pattern of logging in Southeast, Audubon believes it is possible that over half of the rare large-tree old-growth stands may have been logged throughout the region, including on National Forest, state, and private lands. The permanent loss of this unique ecological community type raises a serious concern about maintaining habitat diversity well distributed across the Tongass. And, as we will show below, it is in the most productive provinces on the Tongass where the greatest impacts have occurred.

In addition to being selective at the level of watersheds or forest stands, historic logging activity in Southeast has also occurred disproportionately on the most productive landforms (Albert and Schoen 2007a). A simple comparison of the proportional abundance of productive forest lands with the proportion of logging activity that has occurred among elevation zones, landform associations, and karst landscapes reveals that logging has occurred disproportionately on karst lands and low elevation flood plain forests. Indeed, while low elevation karst lands represented only 2.7% of all productive forests in Southeast, 15.1% of all logging activity has occurred in these areas for a rate of harvest 560% above proportional abundance. As a consequence, we estimated that at least 44% (and likely more than half) of all productive old-growth forests on karst lands in Southeast have been logged since 1954 (Albert and Schoen 2007a). Likewise, logging activity occurred in low elevation flood plain forests at a harvest rate 156% above the proportional abundance of these areas. These forest tree types are among the most productive

terrestrial habitats of Southeast. Lower rates of logging are observed on other lowlands and all areas above 800 ft, with the exception of karst lands.

A comparison among provinces reveals that logging activity has also occurred disproportionately among Southeast's biogeographic provinces in comparison to the availability of productive forest lands (Albert and Schoen 2007a). For example, North Prince of Wales Island originally contained 14% of the region's POG but has been the location of 38% of all timber harvest in Southeast. As a consequence, 32% of all POG has been logged within the North Prince of Wales Island province, which historically had the most abundant large-tree forests in all of Southeast. Other provinces with high rates of logging include Dall and Long islands, Kupreanof and Mitkof islands, Etolin and Zarembo islands, and East Chichagof and Outside islands. In contrast, provinces with low rates of logging (e.g., West Chichagof Island, Misty Fjords, and the mainland provinces from Lynn Canal through Glacier Bay and Fairweather Icefield) do not contain significant areas of productive old-growth forest comparable to other provinces in the region (Admiralty being an exception).

These large-tree forests make up a small portion of Southeast (less than 3%) but represent some of the region's most valuable fish and wildlife habitats. A comparison of biological value and conservation risk reveals a significant imbalance in the Tongass conservation strategy (Albert and Schoen 2007b). For example, in Figure 1, biological value is represented along the vertical axis, with North Prince of Wales, Admiralty Island, East Chichagof, Revilla Island and Cleveland Peninsula, Stikine River, and Kupreanof/Mitkof representing the areas of highest biological value. These areas contain significant areas of large-tree forests, salmon streams, estuaries and high value habitat for deer and bear. Areas with lower value include the mainland provinces of the Fairweather Range, Glacier Bay, and Misty Fjords, as well as West Chichagof, East Baranof and Outer islands. Conservation risk or vulnerability is distributed along the horizontal axis (Fig 1), with Kupreanof/Mitkof, North Prince of Wales, Etolin/Zarembo/Wrangell, and East Chichagof representing the highest proportion of habitats designated for development. Significantly, six of the nine most productive areas are at high risk (Fig 1, upper right quadrant), while those at lowest risk (i.e., highest levels of conservation including Glacier Bay National Park, Misty Fjords National Monument, and West Chichagof Wilderness, in lower left quadrant) are also among the areas with the lowest biological value. In fact, nearly half or more of the original habitat values (of large-tree old growth) are at risk in three out of five of the most biologically productive areas of the Tongass National Forest (i.e., North Central Prince of Wales, Kupreanof/Mitkof, Rivilla/Cleveland, and East Chichagof). This imbalance reflects a high-risk strategy for the long-term protection of biodiversity and ecosystem integrity in the region. The notable exception is Admiralty Island, which is the only area that is both highly productive ecologically and also managed primarily for fish and wildlife conservation and ecosystem integrity. Clearly, additional protections and modifications to the Amended Plan are necessary in order to balance conservation and timber management throughout the Tongass.

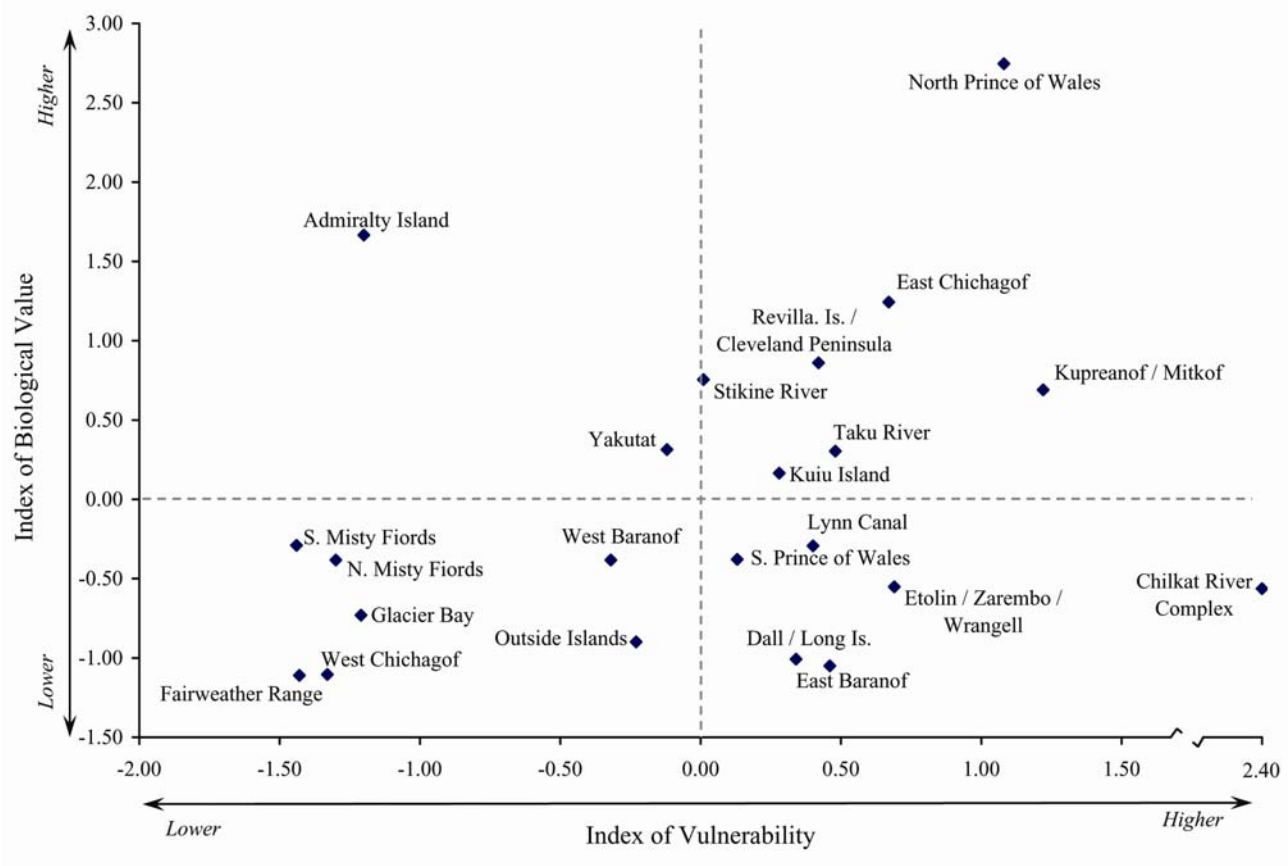


Figure 1. The index of biological value and the index of vulnerability (percent of habitat values designated within development lands) (from Albert and Schoen 2007b).

**Tongass Provinces at Risk.** The ROD and FEIS provide numerous references to forest-wide percentages of the remaining POG, high-volume POG, and large-tree POG on the Tongass. For example:

> Across the Tongass and Southeast Alaska in general, timber harvest has been concentrated in the larger tree types and the higher timber volume classes. While approximately 87 percent of all POG remains across Southeast Alaska, about 82 percent of high-volume POG remains unharvested, and about 68 percent of large-tree POG remains. (FEIS 3-152).

Although we generally concur that a small percentage (< 10%) of the POG has been harvested forest wide, this fact has little relevance to conservation at the province or watershed scale. Nor does the small percentage of habitat lost forest-wide provide assurance that abundant and useable populations of fish and wildlife can be maintained and well distributed across the Tongass. Table 3.9-22 of the FEIS clearly demonstrates our concern about the cumulative loss of rare large-tree old-growth habitat on all lands (including federal, state, and private) within specific provinces. We have summarized these data for selected provinces in Table 1 below. Note that 68% of this rare habitat currently remains forest-wide, but after 100 years at maximum harvest under the Amended Plan just over half of this rare and valuable habitat is estimated to remain on all lands in Southeast. Also we believe, as stated above, that the FEIS underestimated the proportion of large-tree old growth harvested prior to 1986 so these numbers represent conservative estimates.

When we look at the province level, the loss of the rare large-tree old growth habitat becomes even more of a concern. Using Tongass FEIS data, eight provinces, representing the most productive forest provinces in Southeast, excluding Admiralty Island (see Fig 1), have conservatively lost more than 40 percent of this rare habitat and five have lost nearly half or more. At the end of 100 years under the Amended Plan, the eight provinces will have lost half or more of this rare ecological community and the five provinces will have lost >60%. According to the FEIS (3-200):

> Past harvest activities have concentrated, and future harvest will continue to concentrate under most alternatives, primarily in three biogeographic provinces: the North Central Prince of Wales, Kupreanof/Mitkof, and Revilla/Cleveland provinces. These three provinces account for about 56 percent of the past harvest and will account for 44 to 74 percent of future harvest, depending on the alternative.

These three provinces are also among Southeast's five provinces with the highest ecological values (Fig 1). Audubon contends the Amended Plan significantly decreases habitat diversity in the most ecologically productive provinces and fails to meet NFMA regulations requiring that habitat must be "well distributed."

Table 1. Cumulative percent of original SD67 POG remaining currently and estimated to remain on all ownerships after 100+ years of maximum timber harvest under the Amended Plan within selected biogeographic provinces (from FEIS Table 3.9-22).

| Province: | % Remaining | % Remaining at 100 years |
|---|---|---|
| East Chichagof | 58 | 52 |
| East Baranof | 33 | 31 |
| West Baranof | 44 | 38 |
| Kupreanof/Mitkof | 47 | 35 |
| Etolin/Zarembo | 51 | 39 |
| North Central Prince of Wales | 55 | 43 |
| Revilla/Cleveland Peninsula | 59 | 50 |
| Dall/Long Islands | 42 | 37 |
| Total for Southeast | 68 | 57 |

The proportion of intact watersheds with representative large-tree old-growth habitat is likely much reduced from historic levels. In fact, the percentage of large watersheds that are intact on North Central Prince of Wales, Etolin Island (and vicinity), and Kupreanof/Mitkof is only 24%, 33%, and 37%, respectively (FEIS Table 3.9-19). We have summarized these data (from Table 3.9-19) on existing and future (100+ yeabs) percentage of intact watersheds for selected provinces under the Amended Plan (Table 2). Under the Amended Plan, only half of the watersheds in Southeast will remain intact and eight provinces will have less than or equal to 45% of their watersheds intact. The percentage of intact watersheds on North Central Prince of Wales (the most productive province on the Tongass) will decline to 12% and similar declines will occur in the Etolin Island vicinity (19%) and Kupreanof/Mitkof (11%) (Table 2). The North Central Prince of Wales Province is of particular interest because this province has the most productive forest lands of all of Southeast and the highest ecological values of any province in the region (Albert and Schoen 2007a). It is also the center of endemism in Southeast (Dawson et. al. 2007).

Clearly, those watersheds that were harvested had a much higher proportion of large-tree old growth than those that were left. And the habitat that is left is highly fragmented, with significantly lower amounts of old-growth core area than the habitat patches that were originally present. As an example, the Forest Service's Southeast Chichagof Landscape Analysis (Shephard et. al. 1999) reported that in 1956 there were 374 old growth patches representing 120,066 acres with an average patch size of 321 acres. In 1996, there were 688 patches representing 85,068 acres with an average patch size of 124 acres. This 2.6-fold decrease in patch size represents a significant reduction in core old growth. Thus, the structure and function of this rare ecological community has substantially changed as a result of forest management. Audubon contends this represents a significant cumulative impact on habitat diversity and the potential for maintaining abundant populations of fish and wildlife well distributed across the Tongass. These cumulative impacts have not been adequately quantified in the Tongass FEIS beyond the general overview provided in Table 2.

Table 2. Estimated percent of all large watersheds in selected biogeographic provinces defined as intact* currently and after 100+ years of forest plan implementation under the Amended Plan (Alt 6) (from FEIS Table 3.9-19).

| Province: | Existing Percentage | Percentage after 100+ years |
|---|---|---|
| East Chichagof: | 53% | 41% |
| East Baranof | 55%; | 41% |
| Kupreanof/Mitkof | 37% | 11% |
| Etolin/Zarembo | 33% | 11% |
| North Central Prince of Wales | 24% | 12% |
| Revilla/Cleveland Peninsula | 68% | 39% |
| Southern Islands | 50% | 45% |
| Dall/Long Islands | 71% | 29% |
| Forest-wide | 69% | 51% |

* Intact is defined as having < 5% original POG harvested and no major disturbances.

**Ecological thresholds.** Conceptually, an ecological threshold occurs at the point where a relatively small change in environmental conditions causes a substantial change in an ecosystem (Groffman et al. 2006). An important component of the Tongass conservation strategy should be to avoid or minimize crossing an ecological threshold beyond which the ecosystem or some element of biodiversity begins to unravel. The Tongass FEIS (3-293) briefly addressed the issue of ecological thresholds:

> Evidence from theoretical and empirical studies suggests that the likelihood of a population persisting over time is related to some threshold level of habitat loss across the landscape (Fahrig 1997, 1999, 2003; Flather et al. 2002, Andren 1994). Haufler (2006) reviewed the literature and found that, based on modeling, habitat loss and reduction of population size are linearly related, up to some threshold. Below this threshold, the additional effects of habitat fragmentation increase the rate of population reduction, and in turn, the risk of extinction…Reported threshold levels for the percentage of habitat maintained at which the rate of landscape extinction increases range from 20 percent (Fahrig 1997) to 50 percent (Soule and Sanjayan 1998), depending in part on the dispersal capability of the species under consideration.

Price et al. (2007) reviewed the literature on empirical studies of ecological thresholds and concluded that thresholds began to appear when suitable habitat declined below 60%. They concluded that maintaining 70% of the natural level of old growth in forested ecosystems on the British Columbia Coast represented a low risk to ecological integrity.

To our knowledge, there are no empirical studies of thresholds for any species in Southeast. However, based on the literature and the fact that the Tongass is a national forest overlaying a highly fragmented archipelago displaying substantial endemism, we believe a precautionary approach to forest conservation is highly appropriate. This is particularly relevant since the Tongass and adjacent private lands have undergone substantial logging activity over the last half century that further fragments this naturally fragmented ecosystem. Thus, it would be prudent to avoid reducing any discrete habitat types or forest communities (e.g., high-volume POG or large-tree POG [SD67], both in riparian flood plain areas and on karst substrates) below a minimum threshold of 50% within any given biogeographic province or watershed. Unfortunately, this threshold has already been exceeded in many watersheds and even in some provinces, including many of the most biologically productive areas of Southeast.

The FEIS (3-294) states:

> None of the alternatives would result in less than 71 percent of the original POG remaining on the Southeast Alaska Landscape after 100+ years…Likewise, on a Southeast Alaska basis, none of the alternatives would result in less than 65 percent of the original high-volume POG remaining after 100+ years…Finally, under each of the alternatives at least 52 percent of the large-tree POG would be retained over the entire landscape in Southeast Alaska after 100+ years…Therefore, based on the reported habitat loss thresholds, it is unlikely that cumulative timber harvest would result in significant viability concerns for any species of wildlife in any of the provinces…

Audubon's concerns, however, go beyond species "viability." We are concerned about <u>habitat diversity AND species abundance</u> (required to support numerous human uses) at the watershed

scale. We remain very concerned that in some provinces (e.g., North Central Prince of Wales, Kupreanof/Mitkof) loss of habitat diversity, including the rare large-tree POG, may already be approaching ecological thresholds, particularly in terms of maintaining abundant populations that people use (e.g., black-tailed deer). The Tongass may be more sensitive to ecological thresholds because the region is a naturally fragmented archipelago. Furthermore, the FIES (3-199) also states that:

> As development continues through timber harvest, associated activities such as road building, and community expansion, particularly in areas where extensive development has already occurred (i.e., POW), maintaining connectivity and roadless refugia will become increasingly important, particularly for wide-ranging species whose distribution depends on some level of connectivity across the landscape.

There is also a concern for less wide-ranging species, like the endemic Prince of Wales flying squirrel (FEIS 3-244).

**Important Bird Areas.** The FEIS (3-244) states: "…there are no recognized Important Bird Areas within Southeast Alaska…" Although this was the case during preparation of the DEIS, the current IBA list for Southeast Alaska includes:

| Site | State review | National review |
|---|---|---|
| Mendenhall Wetlands | accepted | global |
| Port Snettisham | accepted | global |
| Blacksand Spit (Yakutat) | accepted | global |
| Berners Bay | accepted | in review |
| Chilkat Bald Eagle Preserve | accepted | in review |
| Stikine River Delta | accepted | in review |
| Icy Bay | accepted | in review |
| St. Lazaria Island | accepted | in review |
| Forrester Island | accepted | in review |
| Glacier Bay | in progr. | |
| Gustavus Flats | in progr. | |
| Seymour Canal | in progr. | |
| Yakutat Bay | in progr. | |
| Keku Strait - Rocky Pass | potential | |

**CONCLUSIONS AND REQUESTED RELIEF**

The ecological integrity (and abundance of fish and wildlife populations) of the Tongass National Forest will depend on maintaining habitat diversity well distributed across the forest. A major focus of Audubon's appeal is the significant loss of large-tree old growth (SD67) habitat, especially in certain biogeographic provinces. This forest type represents a rare and unique ecological community with high habitat values for fish and wildlife. The loss and fragmentation of this forest type is not compatible with the goal of maintaining habitat diversity well distributed across the Tongass. The FEIS (3-174) states: "It can be assumed that the more an alternative changes the natural distribution and composition of old-growth ecosystems, the greater are its effects on biodiversity." Audubon contends that past high-grading of timber on the Tongass (as well as on adjacent state and private lands) and future management under the Amended Plan will have a significant cumulative impact on biodiversity and the integrity and resilience of the rainforest ecosystem on the Tongass. In 2005, the Ninth Circuit Court ruled that "…the EIS does not disclose the effect of continued high-grading of the Tongass. Moreover, it does not give detail on whether or how to lessen the cumulative impact of this practice." The ROD and FEIS still fail to quantify the cumulative effects of high-grading on the long-term ecological integrity of the Tongass.

An expanded system of intact watershed reserves and core areas of ecological value within developed watersheds will enhance the Amended Plan's conservation strategy and minimize risks to ecosystem integrity. Audubon and TNC have identified and ranked both intact and developed watersheds and established conservation priorities within each biogeographic province on the Tongass (Schoen and Albert 2007a). This Conservation Area Design was presented to the Forest Service in our formal comments on the DEIS. Although Phase 1 of the Amended Plan minimizes impacts to many of the intact watersheds identified in the Conservation Areas Design, these same watersheds are at risk in later phases of the plan. In addition, many (65%) of the core areas of biological values in the developed watersheds are scheduled for development in Phase 1 and most (95%) will be developed in later phases of the plan. As a result of logging in conservation priority watersheds and sub-watershed core areas, Audubon contends that the Amended Plan is an unacceptable risk for maintaining ecosystem integrity, habitat diversity, and abundant populations of fish and wildlife well distributed across the Tongass.

To reduce significant conservation risks to the Tongass Forest, Audubon seeks relief through the following modifications to the Amended Plan:

1. Estimate the proportion of large-tree POG that was logged prior to 1986. The FEIS recognized that early harvests significantly targeted the largest old-growth trees and most valuable timber stands but failed to assess the disproportionate harvest pre-1986 in their analysis. At minimum, we request that the Forest Service acknowledge underestimates of earlier harvest levels.

2. Establish clear biogeographic province goals for maintaining the natural range of environmental variability across the Tongass, including protection of rare habitats and forest types (e.g., large tree floodplain and karst forest and cedar stands), and establish thresholds of habitat diversity (e.g., a minimum of 50%) and watershed intactness below which timber harvest and road construction will not occur.

3. Protect Conservation Priority Watersheds throughout each biogeographic province of the Tongass. These watersheds are identified in the Conservation Area Design developed by TNC and Audubon (Appendix A, Table 1, Figure 1).

4. Protect old growth within the Core Areas of ecological values within Integrated Management Watersheds throughout each biogeographic province of the Tongass. These watersheds are identified in the Conservation Area Design developed by TNC and Audubon (Appendix A, Table 2, Figure 1).

5. Collaboratively identify local subsistence and community use areas on the Tongass and incorporate these areas into an expanded protected areas strategy.

6. Develop a clear plan for increasing research and inventory activities on forest endemics and adapt the conservation strategy to minimize risks to endemic populations.

7. Initiate research and monitoring programs to evaluate and plan second growth rotation schedules and begin rapidly transitioning timber harvest from old growth to second growth with an eventual goal of Tongass timber harvest confined to second growth.

8. Focus conservation and management priority on maintaining abundant and usable populations of fish and wildlife rather than the lower threshold of viable populations which will likely fail to meet future user demands for fish and wildlife across the Tongass.

9. Reevaluate the Model Implementation Reduction Factor (falldown) for each biogeographic province and clearly assess the available and economic timber supply across the Tongass.

10. Adjust the (ASQ) based on a more realistic assessment of market demand and timber supply and to minimize the disproportionate harvest of rare forest types, including large-tree stands, karst forest, and cedar trees. An ASQ of 45 to 65 MMBF/year represents a more reasonable range for balancing timber production (and sustaining the current mills) with other important forest resources and uses.

Thank you for considering the concerns and recommendations we have included in this appeal.

Sincerely,

Stanley E. Senner
Executive Director

John W. Schoen, Ph.D.
Senior Scientist

cc: Forest Cole, Tongass Forest Supervisor
Denny Bschor, Regional Forester
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## APPENDIX A
Conservation Priority Watersheds and Integrated Management Watersheds

**TABLE 1.** Conservation Priority Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on intact watersheds (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| East Chichagof Island | Chicken Cr | 1960 | 100.0% | 0.0% | 21,436 |
| | Poison Cove | 2790 | 13.4% | 85.9% | 7,151 |
| | Crab Bay | 2320 | 14.6% | 85.3% | 11,017 |
| | Goose Flats | 2260 | 14.2% | 85.8% | 23,111 |
| | Ushk Bay | 2810 | 15.6% | 80.3% | 21,284 |
| | Broad Island | 2460 | 17.1% | 82.8% | 16,848 |
| | Saltry Bay | 2310 | 14.2% | 85.8% | 18,353 |
| | Long Bay | 2280 | 36.4% | 63.6% | 19,178 |
| | Deep Bay | 2800 | 12.8% | 82.5% | 18,180 |
| | Seal Bay | 2290 | 20.2% | 79.8% | 21,905 |
| | Little Basket Bay | 2400 | 19.0% | 81.0% | 10,155 |
| | Whip Station | 2210 | 90.7% | 9.4% | 4,546 |
| | Neka Bay | 2010 | 22.0% | 78.1% | 39,557 |
| East Baranof Island | Saook Bay | 2940 | 13.2% | 86.8% | 23,839 |
| | Lake Eva | 2950 | 99.7% | 0.3% | 12,395 |
| | Deadman Reach | 2890 | 47.4% | 52.6% | 8,125 |
| | Kelp Bay - South Arm | 3140 | 100.0% | 0.0% | 35,118 |
| | Kelp Bay - Middle Arm | 2980 | 51.7% | 48.3% | 27,746 |
| West Baranof Island | Sitka Sound – Aleutkina Bay | 3200 | 97.2% | 2.8% | 7,627 |
| | Kruzof I. - Sea Lion Cove | 3050 | 70.2% | 29.9% | 10,960 |
| | Krestof Sound | 3090 | 90.3% | 9.7% | 8,963 |
| | Redoubt Lake | 3500 | 95.3% | 3.2% | 28,147 |
| | Deep Inlet | 3220 | 100.0% | 0.0% | 6,954 |
| | Salmon Lake | 3230 | 13.6% | 86.4% | 7,663 |
| | Fish Bay | 2870 | 96.4% | 3.6% | 41,305 |
| | Big Bear / Baby Bear | 2880 | 17.6% | 67.9% | 7,141 |
| | Kruzof I. - Mount Edgecumbe | 3080 | 92.5% | 7.5% | 53,550 |
| | Nakwasina Passage | 3000 | 57.8% | 42.2% | 19,899 |
| | Sukoi Inlet / N. Krestof | 3030 | 39.6% | 60.4% | 18,138 |
| | Big Bay | 3490 | 92.9% | 5.7% | 9,414 |
| Kuiu Island | Reid Bay | 4160 | 17.6% | 81.5% | 16,043 |
| | Kuiu - Salt Lagoon | 4180 | 38.2% | 61.7% | 9,634 |
| | Security Bay | 4000 | 43.6% | 54.6% | 28,775 |
| | Howard Cove | 4100 | 99.9% | 0.0% | 12,752 |
| | Kingsmill Point | 4010 | 100.0% | 0.0% | 13,286 |
| | Bay of Pillars | 4030 | 99.8% | 0.2% | 29,886 |
| | No Name Bay | 4170 | 38.0% | 61.9% | 10,009 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.
[b] Development lands include areas available for timber harvest under the 1997 TLMP as well as private or other lands lacking administrative protection or conservation buffers.

**TABLE 1 (cont.).** Conservation Priority Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on intact watersheds (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| Kupreanof and | Lower Castle River | 4350 | 58.6% | 41.4% | 32,318 |
| Mitkof Islands | Rocky Pass | 4280 | 92.9% | 7.1% | 48,412 |
| | Lake Kushneahin | 4310 | 19.8% | 80.2% | 22,500 |
| | Colp Lake | 4460 | 18.2% | 81.6% | 11,290 |
| | Totem Bay | 4320 | 16.4% | 83.6% | 42,544 |
| | Big John Bay | 4270 | 94.4% | 5.6% | 25,152 |
| | Upper Castle River | 4360 | 15.1% | 84.9% | 21,248 |
| | Duncan Bay | 4380 | 26.1% | 73.9% | 27,447 |
| | Lovelace Cr | 4300 | 19.7% | 80.3% | 14,563 |
| | Towers Arm | 4400 | 27.4% | 72.0% | 26,813 |
| | Irish Lakes | 4290 | 16.7% | 83.3% | 54,647 |
| | Woewodski Island | 4480 | 19.0% | 78.4% | 24,863 |
| | Blind Slough | 4510 | 83.1% | 16.9% | 9,614 |
| Etolin / | Kunk Lake | 4630 | 99.6% | 0.4% | 11,141 |
| Zarembo / | Burnett Bay | 4680 | 24.8% | 75.2% | 23,197 |
| Wrangell Is. | Woronkofski Island | 4610 | 9.4% | 90.6% | 14,532 |
| | Streets Lake | 4660 | 94.2% | 5.9% | 17,336 |
| | Thoms Lake | 4790 | 49.6% | 45.5% | 25,061 |
| | Southwest Cove | 4710 | 16.8% | 83.0% | 8,674 |
| | Chichagof Pass | 4620 | 18.7% | 81.4% | 16,290 |
| | Mosman Inlet | 4670 | 16.3% | 83.8% | 24,798 |
| Revilla Is. / | Union Bay | 7090 | 99.2% | 0.8% | 14,642 |
| Cleveland Pen. | Port Stewart | 7190 | 21.8% | 78.2% | 22,580 |
| | Helm Bay | 7160 | 98.5% | 1.5% | 17,079 |
| | West Gravina Island | 7620 | 79.8% | 20.2% | 8,792 |
| | Yes Bay | 7240 | 100.0% | 0.0% | 42,926 |
| | Moser Bay | 7430 | 19.0% | 81.0% | 14,044 |
| | Spaceous Bay | 7220 | 28.2% | 71.8% | 31,347 |
| | Bostwick Inlet | 7630 | 16.0% | 84.0% | 19,905 |
| | SW Cleveland Peninsula | 7120 | 53.1% | 46.9% | 14,584 |
| | Vixen Inlet | 7200 | 29.8% | 70.2% | 24,859 |
| | Granite Cr CP | 7170 | 38.9% | 61.1% | 10,280 |
| | Deer Island | 5250 | 28.4% | 71.7% | 9,329 |
| | Behm Narrows | 7310 | 99.9% | 0.1% | 19,765 |
| | SW Cleveland Peninsula | 7130 | 96.7% | 3.3% | 9,498 |
| | Smugglers Cove | 7150 | 98.5% | 1.6% | 13,920 |
| | Emerald Bay | 7210 | 67.1% | 32.9% | 8,011 |
| | Swan Lake | 7450 | 89.8% | 10.1% | 23,744 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.
[b] Development lands include areas available for timber harvest under the 1997 TLMP as well as private or other lands lacking administrative protection or conservation buffers.

**TABLE 1 (cont.).** Conservation Priority Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on intact watersheds (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| Revilla Is. / | Bell Arm | 7280 | 100.0% | 0.0% | 12,917 |
| Cleveland Pen. | Orchard Creek | 7340 | 91.0% | 8.9% | 32,858 |
| (continued) | Hickman Pt | 7230 | 100.0% | 0.0% | 6,850 |
| | Cannery Creek | 7100 | 17.5% | 82.5% | 5,412 |
| | California Cove | 7580 | 96.5% | 3.6% | 11,594 |
| | Betton Island | 8641 | 91.8% | 8.2% | 5,432 |
| | Duke Island | 7670 | 99.7% | 0.3% | 39,263 |
| | SE Thorne Arm | 7600 | 17.4% | 82.5% | 11,127 |
| | Reflection Lake | 7270 | 100.0% | 0.0% | 11,117 |
| | Upper Vixen | 7180 | 26.2% | 73.8% | 11,850 |
| | Sunny Bay | 5260 | 20.4% | 79.6% | 17,659 |
| North Prince | Cholmondeley Sound (West Arm) | 6740 | 20.0% | 80.0% | 19,901 |
| of Wales | Waterfall | 6310 | 58.9% | 41.1% | 16,284 |
| | Barns Lake | 5520 | 48.6% | 51.4% | 9,695 |
| | Sarkar Lakes | 5541 | 100.0% | 0.0% | 24,949 |
| | S. Honker Divide | 5750 | 68.1% | 31.9% | 18,306 |
| | Salt Lake Bay | 5920 | 95.3% | 4.7% | 14,655 |
| | NW Sukkwann Is | 6710 | 55.0% | 45.0% | 22,844 |
| | Whale Passage | 5510 | 43.6% | 56.4% | 13,312 |
| | Center Peak | 5760 | 99.6% | 0.4% | 15,292 |
| | McKenzie Inlet | 6180 | 49.5% | 50.5% | 17,365 |
| | S Sukkwan Is | 6700 | 47.8% | 52.2% | 16,850 |
| | Sweetwater Lake | 5730 | 43.2% | 56.8% | 25,939 |
| | Sunny Cove, Cholmondeley Sound | 6750 | 36.5% | 63.5% | 6,570 |
| | Lower Thorne River | 5971 | 82.5% | 17.5% | 3,455 |
| | Sukkwan Strait | 6720 | 81.4% | 18.6% | 28,633 |
| | Thorne River Falls | 5780 | 49.5% | 50.6% | 6,411 |
| | Tracodero Bay | 6250 | 27.8% | 72.2% | 31,290 |
| | Clover Bay | 6170 | 76.0% | 24.0% | 14,207 |
| | North Honker Divide | 5740 | 78.7% | 21.4% | 26,681 |
| | Cristoval Channel | 5930 | 46.3% | 53.7% | 16,237 |
| | Calder Bay | 5311 | 23.0% | 77.0% | 15,907 |
| | Port Estrella | 6300 | 12.3% | 87.7% | 17,209 |
| | Mt Francis | 5410 | 65.0% | 35.1% | 6,059 |
| | Davidson | 5470 | 18.5% | 81.5% | 3,171 |
| | Soda Bay | 6320 | 9.6% | 90.4% | 14,470 |
| | Nossuk Bay | 5910 | 13.7% | 86.3% | 8,849 |
| | Baird Peak | 5820 | 13.8% | 86.3% | 4,124 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.

[b] Development lands include areas available for timber harvest under the 1997 TLMP as well as private or other lands lacking administrative protection or conservation buffers.

**TABLE 1 (cont.).** Conservation Priority Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on intact watersheds (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| North Prince of Wales (continued) | Trollers Cove | 6150 | 24.0% | 76.0% | 10,012 |
| | Control Lake / Upper Thorne | 5960 | 76.3% | 23.7% | 12,602 |
| South Prince of Wales | S Arm Moira Sound | 6920 | 20.6% | 78.9% | 23,699 |
| | Nutkwa Inlet | 6850 | 7.7% | 92.0% | 18,158 |
| | Kassa Inlet | 6890 | 48.1% | 50.0% | 10,636 |
| | Mabel Bay | 6880 | 16.0% | 84.0% | 8,167 |
| | Hidden Bay | 6950 | 100.0% | 0.0% | 4,844 |
| | Nichols Bay | 7040 | 99.3% | 0.0% | 17,270 |
| | Stone Rock Bay | 7020 | 100.0% | 0.0% | 9,339 |
| | Ingraham Bay | 6940 | 43.5% | 56.5% | 6,200 |
| Outside Islands | Port Santa Cruz | 6340 | 28.1% | 71.9% | 11,631 |
| | San Fernando – S | 6280 | 100.0% | 0.0% | 9,960 |
| | Port Refugio | 6350 | 17.8% | 82.3% | 9,085 |
| Dall / Long Islands | Bobs Bay | 6390 | 16.8% | 83.2% | 6,081 |
| | Essoway Lake | 6590 | 97.1% | 2.9% | 14,136 |
| | Waterfall Bay | 6480 | 99.1% | 0.9% | 7,209 |
| | McLeod Bay | 6660 | 85.0% | 15.0% | 3,440 |
| | Devil Cove | 6460 | 61.9% | 38.1% | 7,120 |
| | Hook Arm | 6410 | 66.6% | 33.4% | 4,621 |
| | Port Bazan | 6560 | 32.8% | 67.2% | 14,908 |
| | Datzkoo Hbr | 6630 | 88.5% | 11.5% | 3,616 |
| | Sea Otter Hbr | 6420 | 77.6% | 22.4% | 7,105 |
| | Welcome Cove | 6470 | 100.0% | 0.0% | 3,634 |
| | Meares Passage | 6370 | 18.3% | 81.7% | 6,035 |
| | Driver Bay | 6400 | 40.5% | 59.6% | 3,079 |
| | Gold Hbr | 6510 | 95.3% | 4.7% | 5,469 |
| | Fisherman Cove | 6440 | 48.2% | 51.8% | 3,445 |
| Lynn Canal / Mainland | Cowee Creek | 230 | 10.6% | 89.4% | 26,936 |
| | Pt. Couverden | 1170 | 16.4% | 83.6% | 11,184 |
| | Earth Station | 1150 | 100.0% | 0.0% | 8,389 |
| | Eagle / Herbert River | 260 | 98.2% | 1.8% | 38,786 |
| | Lincoln / Shelter Island | 1240 | 32.8% | 56.6% | 8,084 |
| | St. James Bay | 1110 | 50.3% | 39.5% | 23,335 |
| | Nun Mountain | 1120 | 88.0% | 11.9% | 22,228 |
| | Echo Cove | 250 | 12.7% | 65.9% | 12,821 |
| | Katzehin River | 90 | 100.0% | 0.0% | 55,631 |
| | Gilkey River | 150 | 99.9% | 0.0% | 42,279 |
| | Antler River | 140 | 100.0% | 0.0% | 28,649 |
| | Sullivan Mountain | 950 | 19.9% | 80.1% | 16,303 |
| | Dayebas Creek | 80 | 100.0% | 0.0% | 10,907 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.

[b] Development lands include areas available for timber harvest under the 1997 TLMP as well as private or other lands lacking administrative protection or conservation buffers.

**TABLE 1 (cont.).** Conservation Priority Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on intact watersheds (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| Lynn Canal | Pt. Danger | 1080 | 9.0% | 91.0% | 3,633 |
| (continued) | William Henry Bay | 1070 | 61.4% | 38.0% | 7,488 |
| | West Sullivan | 970 | 17.1% | 82.9% | 6,659 |
| Taku Mainland | Taku River | 460 | 97.6% | 2.4% | 111,669 |
| | Port Houghton Salt Chuck | 790 | 27.5% | 72.5% | 42,519 |
| | Port Houghton - Robert Is. | 820 | 12.6% | 86.6% | 13,185 |
| | Sandborn Canal | 840 | 39.3% | 60.7% | 17,437 |
| | Gilbert Bay | 570 | 59.6% | 40.4% | 28,037 |
| | Slocum Inlet | 510 | 14.4% | 85.6% | 16,525 |
| | Dry Bay | 690 | 14.8% | 85.2% | 12,416 |
| | Pt. Houghton – Dalgren | 830 | 12.2% | 87.8% | 10,785 |
| | Williams Cove | 641 | 100.0% | 0.0% | 7,600 |
| | Port Snettisham | 550 | 28.8% | 71.2% | 22,293 |
| | Limestone Inlet | 530 | 100.0% | 0.0% | 9,960 |
| | Taku Inlet | 410 | 24.4% | 75.6% | 33,010 |
| | Taku Harbor | 520 | 9.4% | 90.6% | 6,950 |
| | Sand Bay | 680 | 10.3% | 89.7% | 8,227 |
| | Heigs Peak | 560 | 48.0% | 52.0% | 12,520 |
| Stikine | Farugut Bay - S. Arm | 900 | 94.6% | 5.4% | 27,851 |
| Mainland | Marsha Peak | 5010 | 9.2% | 90.8% | 28,180 |
| | Madan Bay | 5040 | 11.1% | 88.9% | 16,722 |
| | Little Lake Eagle | 5190 | 99.9% | 0.1% | 44,197 |
| | Tom Creek | 5100 | 70.6% | 29.5% | 27,274 |
| | Cat Cr | 870 | 12.1% | 87.9% | 14,029 |
| | Marten Lake | 5090 | 100.0% | 0.1% | 14,603 |
| | N Arm Faragut Bay | 890 | 14.2% | 85.9% | 17,299 |
| | Virginia Lake | 5020 | 13.0% | 86.5% | 30,947 |
| | Blake Channel | 5050 | 35.3% | 64.8% | 26,293 |
| | Dry Bay-Grand Point | 4830 | 5.3% | 94.7% | 10,737 |
| | Oerns Creek | 5080 | 100.0% | 0.1% | 13,590 |
| | Aaron Creek | 5030 | 99.9% | 0.1% | 45,572 |
| Chilkat River | Takhin River | Non-TNF | 0.0% | 100.0% | 79,562 |
| Complex | Ferebee River | Non-TNF | 0.0% | 100.0% | 57,711 |
| | Davidson Glacier | Non-TNF | 4.8% | 95.2% | 45,518 |
| | Chilkat River | Non-TNF | 32.6% | 67.4% | 80,645 |
| | Upper Chilkat River | Non-TNF | 11.5% | 88.5% | 67,752 |
| | Garrison Glacier | Non-TNF | 0.0% | 100.0% | 34,661 |
| | Chilkoot River | Non-TNF | 2.2% | 97.8% | 95,029 |
| | Taiya River | Non-TNF | 0.0% | 91.9% | 124,725 |
| Yakutat | Ahrnklin River (estuary) | 3710 | 99.8% | 0.0% | 7,264 |
| Forelands | Ahrnklin River | 3720 | 99.6% | 0.4% | 64,228 |
| | Khantaak Islands | 3680 | 25.5% | 74.4% | 4,015 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.[b]

**TABLE 2.** Integrated Management Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on developed watersheds with high values and restoration opportunities (refer to Conservation Area Design Map, Appendix A Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| East Chichagof | Port Frederick Portage | 2020 | 77.8% | 22.2% | 17,420 |
| Island | False Island | 2450 | 10.9% | 89.0% | 23,863 |
| | Sitkoh Bay | 2430 | 12.1% | 87.9% | 26,614 |
| | Game Creek | 2040 | 3.0% | 97.1% | 35,470 |
| | Corner Bay | 2360 | 10.7% | 89.2% | 11,582 |
| | False Bay | 2100 | 38.6% | 61.5% | 21,076 |
| | Kennel Creek | 2170 | 15.5% | 84.5% | 10,270 |
| | Upper Mud Bay | 1930 | 0% | 100% | 20,998 |
| East Baranof | Appleton Cove | 2930 | 12.1% | 87.9% | 13,871 |
| Island | Peschani Point | 2910 | 18.3% | 81.7% | 11,311 |
| | Catherine Island | 2970 | 40.2% | 59.8% | 15,858 |
| Island | Rodman Bay | 2920 | 11.5% | 88.5% | 25,200 |
| | Kelp Bay - Portage Arm | 2960 | 26.3% | 73.7% | 16,332 |
| West Baranof | Sitka / Indian River | 3110 | 60.7% | 39.3% | 21,119 |
| Island | St. John the Baptist | 3020 | 88.1% | 11.9% | 21,439 |
| | Redoubt Bay | 3210 | 20.0% | 80.0% | 9,441 |
| | Shelikof Bay | 3070 | 13.4% | 86.6% | 15,128 |
| | Nakwasina R | 2990 | 70.4% | 29.6% | 23,633 |
| | Nakwasina Sound | 3010 | 23.8% | 76.3% | 5,685 |
| | Katlian Bay – North | 3130 | 57.8% | 42.2% | 32,745 |
| | Katlian Bay – South | 3120 | 25.6% | 74.4% | 11,207 |
| | Camp Coogan | 3190 | 100% | 0% | 5,006 |
| Kuiu Island | Saginaw Bay | 3990 | 11.8% | 88.2% | 25,210 |
| | Rowan Bay | 4020 | 12.4% | 87.6% | 32,556 |
| | Kadake Creek | 4210 | 33.1% | 66.9% | 34,607 |
| | Keku Islands | 3980 | 20.6% | 79.4% | 14,208 |
| Kupreanof / | Wrangell Narrows | 4470 | 16.6% | 83.2% | 60,047 |
| Mitkof Islands | Big Creek | 4500 | 23.5% | 76.5% | 20,397 |
| | Sumner Mountains | 4520 | 19.1% | 80.9% | 30,907 |
| Etolin / Zarembo / Wrangell | N. Wrangell Islands | 4550 | 25.2% | 74.8% | 8,602 |
| | Baht | 4560 | 14.4% | 85.6% | 17,957 |
| Revilla Island / | Buckhorn Lake | 7530 | 18.3% | 81.7% | 32,452 |
| Cleveland | Salt Lagoon – Revilla | 7470 | 13.4% | 86.1% | 20,334 |
| Peninsula | Carroll Creek | 7440 | 22.3% | 77.7% | 32,051 |
| | Carroll Inlet | 7460 | 17.0% | 83.0% | 29,941 |
| | Klu Creek | 7330 | 32.4% | 67.6% | 16,767 |
| | Settlers Cove | 8642 | 41.7% | 58.3% | 15,620 |
| | Ward Cove | 7500 | 42.6% | 57.5% | 16,985 |
| North Prince | Harris River | 6220 | 13.8% | 86.2% | 26,536 |
| of Wales Island | Shimaku Cr | 5940 | 0.2% | 99.8% | 18,598 |
| | Staney Creek (estuary) | 5871 | 25.8% | 74.2% | 8,514 |
| | Trout Cr | 5430 | 34.6% | 65.4% | 16,085 |
| | Port Protection | 5270 | 76.4% | 22.5% | 8,380 |

**TABLE 2 (cont.).** Integrated Management Watersheds for combined focal species and ecological systems based on the Marxan spatial optimization tool parameterized with emphasis on developed watersheds with high values and restoration opportunities (refer to Conservation Area Design Map, Fig 1).

| Biogeographic Province | Watershed Name[a] | VCU | Administrative protection (%) | Development Lands[b] (%) | Acres |
|---|---|---|---|---|---|
| North Prince | Sea Otter Sound | 5550 | 35.6% | 64.4% | 15,568 |
| of Wales Island | Lower Staney Creek | 5880 | 12.4% | 87.6% | 26,662 |
| (continued) | Edna Bay | 5460 | 9.5% | 90.5% | 14,113 |
| | Shaheen Creek | 5890 | 46.0% | 54.0% | 20,725 |
| | Control Lake | 5950 | 11.4% | 88.6% | 20,761 |
| | Flicker Creek | 5290 | 14.7% | 85.3% | 14,913 |
| | New Tokeen | 5560 | 34.7% | 65.3% | 7,134 |
| | Salt Chuck N Karta | 5980 | 21.4% | 78.5% | 12,686 |
| | Red Lake | 5330 | 17.6% | 82.4% | 13,347 |
| | Thorne Bay | 5860 | 19.1% | 80.9% | 15,582 |
| | Klawock Lake / Inlet | 6091 | 2.2% | 97.8% | 44,533 |
| | Logjam Creek | 5770 | 22.9% | 77.1% | 29,425 |
| | Exchange Cove | 5390 | 19.3% | 80.7% | 9,045 |
| | Naukati Bay | 5710 | 8.6% | 91.4% | 19,463 |
| | Buster Bay | 5300 | 15.1% | 84.9% | 11,005 |
| | Red Bay | 5320 | 13.2% | 86.8% | 15,594 |
| | Salmon Bay Highlands | 5340 | 38.8% | 61.0% | 8,633 |
| | Colpoys | 5341 | 24.3% | 75.6% | 2,030 |
| | Salmon Bay Rapids | 5350 | 24.9% | 75.1% | 6,727 |
| | El Capitan L | 5360 | 25.2% | 74.8% | 9,249 |
| | El Capitan Peak | 5371 | 17.4% | 82.6% | 9,614 |
| | Whale Pass – Big Cr | 5380 | 8.4% | 91.6% | 12,542 |
| | Squaw Cr | 5400 | 20.5% | 79.5% | 5,150 |
| | Neck L. | 5500 | 17.6% | 82.4% | 10,623 |
| | Sarheen Cove | 5492 | 52.2% | 47.9% | 7,028 |
| | Twelve Mile Arm | 6210 | 32.8% | 67.3% | 28,337 |
| | Head Trocodero Bay | 6240 | 27.5% | 72.5% | 19,508 |
| | Hydaburg R. | 6210 | 13.9% | 86.1% | 28,507 |
| | Hetta Inlet | 6730 | 4.3% | 95.7% | 39,814 |
| Lynn Canal / | Montana Creek | 280 | 68.6% | 31.4% | 8,900 |
| Mainland | Homeshore (Icy Strait) | 1200 | 10.5% | 89.5% | 12,444 |
| | Ansley Basin | 1180 | 40.1% | 60.0% | 13,594 |
| | Peterson Creek / Eagle River | 270 | 64.6% | 35.5% | 12,887 |
| | Upper St. James River | 1060 | 79.3% | 17.2% | 19,752 |
| | Humpy Creek | 1190 | 59.5% | 40.5% | 30,403 |
| Stikine River / | Point Agassiz Peninsula | 4890 | 17.1% | 82.9% | 40,522 |
| Mainland | Eagle Bay | 5200 | 50.7% | 49.2% | 18,216 |
| | N Fork Bradfield River | 5140 | 24.4% | 75.6% | 29,094 |

[a] Watersheds with >85% designated within legislatively protected areas are not shown.
[b] Development lands include areas available for timber harvest under the 1997 TLMP as well as private or other lands lacking administrative protection or conservation buffers.

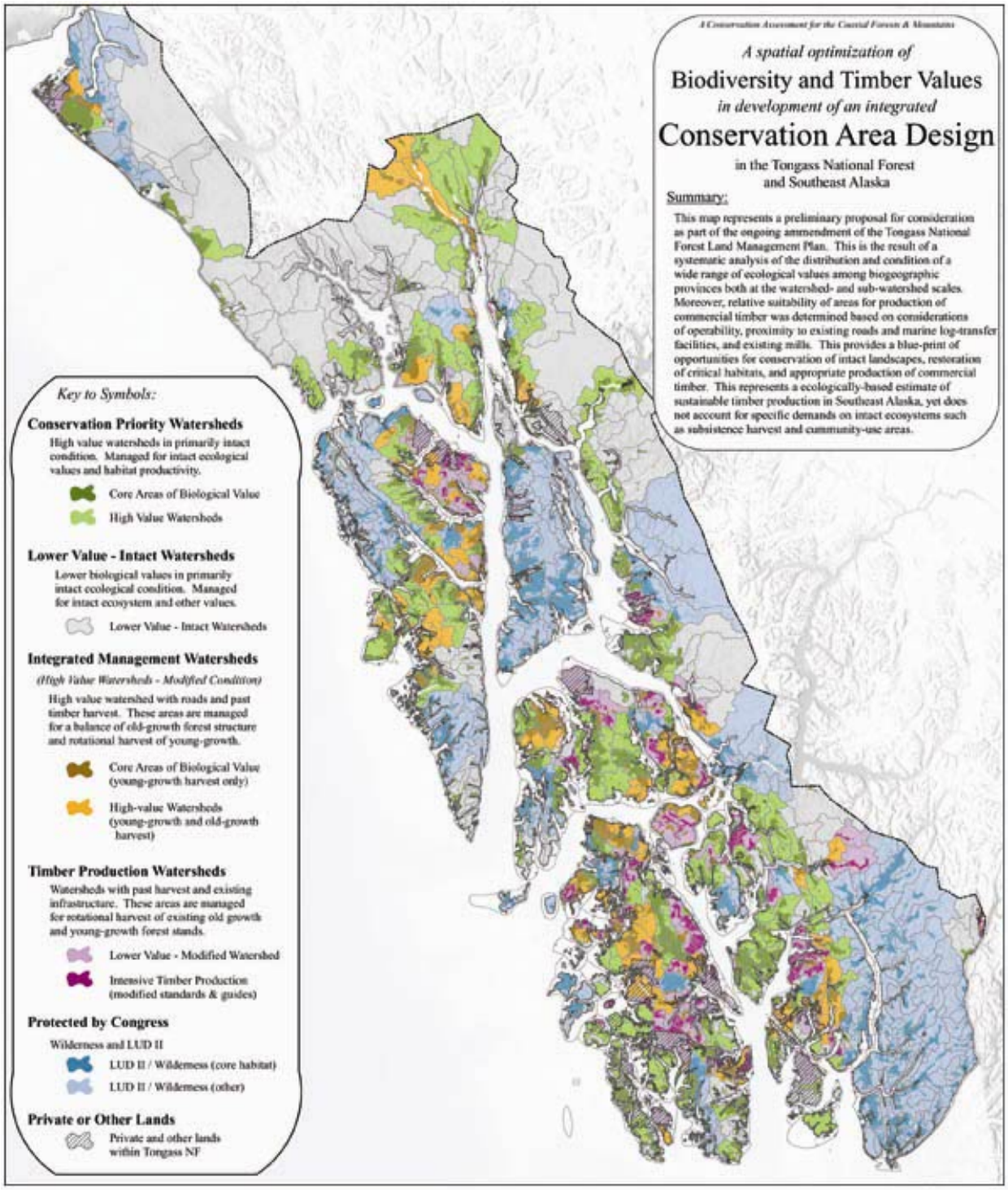


Figure 1. Conservation Area Design for southeastern Alaska and the Tongass National Forest (from Schoen and Albert 2007).