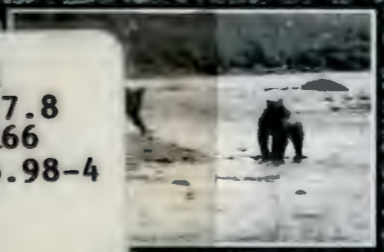
TONGASS FISH AND WILDLIFE

RESOURCE ASSESSMENT 1998



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TONGASS FISH AND WILDLIFE RESOURCE ASSESSMENT 1998

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DIVISION OF WILDLIFE CONSERVATION

DIVISION OF SPORT FISH

DIVISION OF COMMERCIAL FISHERIES

DIVISION OF SUBSISTENCE

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EXECUTIVE SUMMARY

Southeast Alaska is characterized by a productive coastal environment which supports high human uses of fish and wildlife populations for subsistence, personal use, commercial, and recreational purposes. Fish and wildlife resources are primarily associated with the old-growth forests of Southeast Alaska and serve as primary cornerstones to the economy of Southeast Alaska. The demand for these resources is increasing at a rate of over 15% per decade. Fish and wildlife from a relatively small proportion of the region support a relatively large proportion of the economy. The dependence on forest habitats for meeting subsistence needs for deer, fishing industry needs for salmon, and recreational and tourism needs for fish and wildlife is unmistakable. Wolves den among the roots of spruce trees, songbirds glean insects from their trunks and branches, and eagles nest in their crowns. Fish feed on insects that drop from the riparian forest plants along streams, deer forage on the understory herbs, and bears feed on berries from the understory shrubs. Loss or degradation of habitat affects a host of species for many different reasons and compromises the associated human use values.

At the request of Commissioner Frank Rue, the Alaska Department of Fish and Game (ADF&G) compiled fish and wildlife harvest, catch, and productivity data for selected fish and wildlife species. The species were chosen to serve as indicators of the relative importance of particular areas for the production and human use of fish and wildlife. The purpose was to produce an analytical tool to evaluate the significance of potential habitat impacts from proposed developments.

ADF&G staff systematically applied fish and wildlife resource data to specific Southeast Alaska watersheds or clusters of watersheds called Value Comparison Units (VCUs). Each VCU received a series of ranks to assess the relative resource value of each area. To maximize objectivity, numeric resource data provided the foundation of the overall ranking process. These data included coho and pink salmon production, sport fishing catch, subsistence use, brown and black bear harvest, and urban deer harvest. Data on old-growth forests was also compiled by VCU analysis. The specific assessment methods varied but the general results were ordered ranks, from high to low values within each VCU, for each species or topic. For example, Sitka black-tailed deer harvest was broken into four categories, from those VCUs with the highest 25% of deer harvest to those with the lowest 25% of harvest. The ranked values within each VCU for bear, fish, deer, and subsistence were geographically displayed on a set of four color-coded maps (enclosed).

The results of this data analysis were used to identify the highest value Community Use Areas in the state of Alaska's recommendations regarding the Tongass Land Management Plan revision. This report presents the methods used in the analysis and maps that portray the relative value of areas for black bear, brown bear, Sitka black-tailed deer, sport fishing, salmon production, and subsistence use. The information may be further used as a tool by the people of Southeast Alaska to help understand local resource values.

ADF&G believes it is in the state's interest to minimize conflicts between resource developments that result in the loss of habitat productivity and other forest uses that depend on habitat integrity. The best approach is for land owners, land managers and resource users to work cooperatively to protect the highest value Community Use Areas identified in this report, to restore degraded forests and streams, and to insure responsible development practices. Reducing risks to fish and wildlife and maintaining community uses of fish and wildlife is a public trust responsibility.

BACKGROUND

It is an understatement to say that hunting and fishing are highly significant social, economic, and cultural activities of the people of Southeast Alaska. Sitka black-tailed deer, found on the mainland and many islands, are the most hunted of all wildlife species with an average annual harvest of 13,000 deer since 1980 taken by an average of 8,200 hunters a year who enjoyed a 63% success rate. Salmon are the most often used fish species in the region. Tlingit, Haida, and Tsimshian residents maintain traditional salmon harvest areas that are generations old. Today, subsistence harvest of salmon by native and non-native Alaskans alike exceeds 1.2 million pounds annually. Excluding the two largest communities, Juneau and Ketchikan, the total subsistence harvest of fish and wildlife by all other Southeast communities is 4.4 million pounds per year. To replace these wild foods with store-bought equivalents would cost $22-35 million per year. Hunters from Juneau and Ketchikan harvest an additional 600,000 pounds of deer per year.

The productivity of the lakes, streams, bays, and estuaries in Southeast Alaska help stabilize local and regional economies with growing sport and commercial fisheries. A 1988 study determined the total economic effect of sport fishing in Southeast Alaska was to support over 1,100 jobs with more than $28 million in wage earnings (Jones and Stokes Assoc., 1991). Since 1988, angler-days have increased from 398,000 to 510,000 in 1996 and harvest has increased from 378,000 fish to 466,000 fish (Howe et al. 1997). In 1996, 939,000 fish were caught by sport anglers when catch-and-release fish are added to those caught and harvested (ibid).

Fish habitat throughout the region also yields 160 million pounds of commercially caught salmon every year on average with an economic value of $250 million and which supports over 5,000 jobs (Anadromous Fish Habitat Assessment, USFS, 1995).

In 1989, wildlife watching comprised 43% of all visitor activities and accounted for $43 million in income from boat charters, kayak/raft/canoe trips, hiking, flightseeing, and remote lodging. The average growth of this industry's clientele was 33% per year at the time of the study (Shea, 1990).

This Resource Assessment was produced to better understand and document the fish and wildlife resource values of Southeast Alaska. The objectives were two-fold:

1) Use best available information and data on Sitka black-tailed deer, brown and black bears, sport fishing, salmon production, and subsistence to identify relative values of Value Comparison Units (VCUs) for community uses of fish and wildlife.

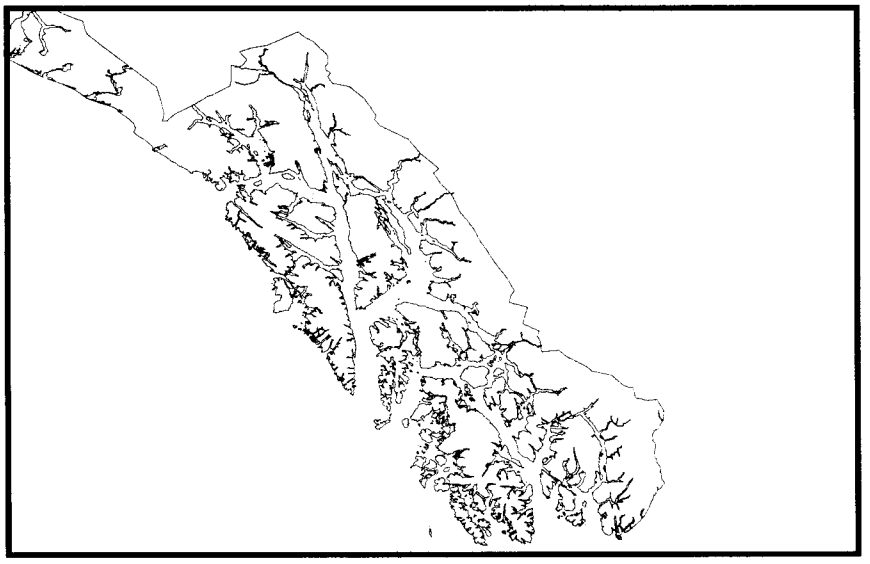
2) Provide the information to the public to aid their understanding of the distribution of fish and wildlife values in Southeast Alaska. The effort will provide information to help guide land owners, managers, resource users, and the general public as they consider future land and resource uses.

AREA DESCRIPTION

Southeast Alaska Region

The area evaluated in this Resource Assessment extends from Ketchikan and Hyder in the south, to Yakutat in the north and from the Canadian border in the east to the outer coastal islands to the west. Southeast Alaska is predominately a temperate coastal rain forest with a maritime climate of frequent wind, cool temperatures, and high rainfall. The dense old-growth forest is dominated by western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*), although other conifer species of cedar, pine, yew, and fir are present in lesser numbers and in patchy distributions. Common understory species include blueberry (*Vaccinium spp.*) and bunchberry (*Cornus canadensis*) which are important food for herbivores. The abundant fish and wildlife resources include salmon (*Onchorhynchus* spp.), steelhead (*Salmo gairdneri*), eulachon (*Thaleichtys pacificus*), Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), brown bear (*Ursus arctos*), black bear (*Ursus americanos*), mountain goat (*Oreamnos americanos*), and moose (*Alces alces*). The distribution and characteristics of forest habitat are influenced by terrain, hydrology, soils, and human disturbance. The interaction of these factors produce a mosaic of many habitat types across the landscape.

The topography is steep and divided by glaciers rivers, fiords, and marine waterways. Patches and stringers of poorly drained soil create wetlands amid the forest. Numerous islands divide the region, creating 11,000 miles of shoreline. The mainland boundary of mountains to the east is capped by glaciers and the largest ice field in North America, creating dramatic elevation and temperature changes. Wind is the primary natural disturbance force affecting forest age, size, and composition of tree species, though other lesser factors include landslides, soil slumpage, insects, fungi, and snow. Timber harvest is the primary source of man-induced disturbance, causing direct and indirect loss of forest habitat. The region is vast and ecologically distinct. The forest habitat, topography, and shoreline all affect how the forest is used by fish and wildlife and the people living in the towns and settlements of Southeast Alaska.



RECREATIONAL AND COMMERCIAL FISHERY VALUES

Summary

The Alaska Department of Fish and Game has compiled two indicators of fishery value for watersheds and VCUs of the Tongass National Forest: "Salmon Production" and "Sport Fishing Use." These indicators portray the relative fishery values that exist among watersheds and VCUs of Southeast Alaska and are useful for the management of fish habitat.

Salmon Production was estimated from indices of pink salmon escapement and coho salmon smolt capability (production). The pink salmon escapement data came from ADF&G's escapement database, and coho salmon smolt capability was calculated from a model developed by the U.S. Forest Service (USFS) and ADF&G.

Sport Fishing Use data are the product of ADF&G's statewide harvest surveys, which measure recreational fishing effort in freshwater systems. These data reveal angler preferences for certain fishing locations.

The Salmon Production and Sport Fishing Use indicators are heavily concentrated within relatively few VCUs: 60% of pink salmon escapement, 72% of coho salmon smolt capability, and 98% of sport fishing use all occur in only 26% (243 VCUs) of the 934 rated VCUs in the Tongass. In fact, 22% of all freshwater angler use occurred in one VCU—the Situk River. These core VCUs and the watersheds they contain, collectively, are considered to be Primary Fish Producers by ADF&G.

As a first attempt to link existing fishery and geographic databases related to the Tongass, this report contains data germane only to this analysis and intended only for use under narrow objectives of the project. Further, while we have taken great effort to insure data quality, our linking of data sources from varied agencies inevitably may contain errors. We thus caution readers to exercise care in adapting these data to other analyses. Finally, the results of our analysis cannot be interpreted as ADF&G's final judgment relating to land use recommendations. Site-specific analysis and ground truthing should be done for the review of VCUs or watersheds proposed for development. Results of this planning exercise also make it clear that significantly expanded, multi-agency efforts are needed to better develop comprehensive land use recommendations that insure long-term productivity of fish habitat and sustainable fish populations and fisheries in and adjacent to the Tongass National Forest.

Introduction

In October 1995, ADF&G Division of Sport Fish began a project to analyze fishery data and rate watersheds (areas draining to one tidewater discharge point) of the Tongass National Forest as to their value to fisheries. These ratings were initiated for use by ADF&G in reviewing land allocations of the USFS in the Tongass Land Management Plan (TLMP). The analysis was also motivated by concerns for the use and possible misuse of an obsolete rating system called "FHIP" (Forest Habitat Integrity Plan). FHIP was developed by ADF&G in 1981 to rate sport, commercial, and subsistence fishery values in watersheds that had been designated for intensive timber harvest under the 1979 TLMP. However, ADF&G abandoned FHIP in 1982, out of concern for biases in the rating system—concerns that exist yet today. Secondly, the FHIP ratings—frequently based on judgment—could be improved by using the many data collected on fisheries and salmonid

abundance since 1981. Finally, commercial fishery representatives were concerned that FHIP ratings were weighted toward recreational fisheries. Consequently, we determined that reexamination and re-rating fishery values for watersheds on the Tongass National Forest was necessary to provide the best possible planning data. To assure that concerns of recreational and commercial fisheries were equally represented, the Division of Sport Fish (SF) and the Commercial Fisheries Management and Development Division (CFMD) assigned staff to the project. The objectives were to:

- Examine available fishery data bases and choose data sets that were forest-wide and continuous over time;
- Compile the data for watersheds;
- Order the data and develop indices of value;
- Describe the distribution of indices within the Tongass.

Methods

The analysis defines the Tongass as the lands of Southeast Alaska encompassed by USFS Value Comparison Units (VCUs). A VCU is "a distinct geographic area that generally encompasses a drainage basin containing one or more large stream systems. Boundaries usually follow easily recognizable watershed divides. These units were established to provide a common set of areas for which resource inventories could be conducted and resource interpretations made" (USFS 1996). However, two VCUs (numbers 0 and 8888) were excluded in our analysis because there were multiple areas for each VCU number and they were located in widely separated areas which would render analysis useless. They represent, in fact, only a few noncontiguous areas of private, municipal, or state lands.

Three data sets of indices of fishery production were chosen for the analysis: coho salmon smolt capability (an estimate of the carrying capacity or maximum numbers the habitat can produce), pink salmon escapement indices, and freshwater sport fishing angler use. Pink and coho salmon were chosen because they are the most ubiquitous of commercial species, occurring in nearly every anadromous watershed in the region. Secondly, pink salmon escapement data is the most comprehensive and continuous of any stock assessment data in the region. In contrast, coho salmon stock assessment data is limited to only a few watersheds; we thus adopted results for this species from a USFS model based on habitat type/fish abundance relationships. These data were considered an index of the actual production (in numbers) of adult coho salmon. Absolute numbers of coho salmon smolt produced were not in themselves the important product of the model; it was the relative values of the modeled abundance that were of interest. Finally, to introduce a human dimension to the analysis, a database of freshwater sport fishing use was compiled to identify watersheds most frequently used by anglers.

Other data sets were examined and rejected. Recreational and commercial marine harvest data is by far the most accurate and extensive fishery data set available in Southeast Alaska. However, the marine harvests could not be allocated to the many watersheds in the Tongass with confidence. Recreational harvest data for freshwater was rejected because of difficulties in assigning relative value among species. (Is a watershed that produces many steelhead more or less valuable than a one that produces many coho salmon?) Chinook salmon data were not used because most chinook spawning and rearing habitat lies outside of the Tongass. Escapement data and/or freshwater harvest data for chum salmon are not comprehensive. Sockeye salmon were not used as an indicator because they are less ubiquitous and do not drive regional fisheries.

ADF&G data on pink salmon production and sport fishing use by stream in the Tongass were assembled, edited, and organized by VCUs, ADF&G Anadromous Stream Catalog numbers, and stream names. It is important to note that because one watershed may cross multiple VCUs, our assignments of angler use and pink salmon escapement to VCUs for this analysis may not be suited to other purposes. Extensive additional sampling and research will be needed to accurately model fish values at this and other levels of resolution that might be desired. Methodology adopted in this analysis was conducted solely to illuminate essential characteristics of the data and provide overall perspective and advice regarding the distribution of fisheries values within the Tongass.

Coho Salmon Smolt Capability

Estimates of coho salmon smolt capability by VCU in the Tongass were obtained from the USFS. The estimates were based on a relationship between coho salmon smolt abundance and riparian habitat and stream channel type and were considered an index of coho salmon production. No estimates of coho salmon smolt capability were available for some VCUs on Admiralty Island, Chichagof Island, the Juneau roadside, and other areas. Within these constraints, estimates for 597 VCUs in the Tongass having some coho salmon smolt production estimates were available. For this planning exercise, the assumption was that the various forms of error in modeled estimates were reasonably constant among VCUs, and estimates of coho salmon smolt production could be ranked by VCU.

Values for coho salmon smolt capability were sorted by VCU in descending order of coho capability. Percentiles of the sorted values were then determined, and coho salmon smolt capabilities summed between percentile cutpoints.

Pink Salmon Escapement Indices

Pink salmon escapements in Southeast Alaska are recorded by ADF&G as "peak" or non-peak counts, determined by observations (usually during aerial surveys) within a year. Sources of error include observer bias, variation in environmental conditions, and other factors that are subjects of considerable and ongoing research.

This analysis assumed that all anadromous streams in Tongass produce pink salmon. However, consistent annual counts are made only for (most) major pink salmon streams in the Tongass. These index streams are surveyed each year except when bad weather, logistics, or similar problems arise. To best chart recent conditions in the most productive streams in the Tongass, we compiled peak escapement counts for index streams from 1980 through 1994. Missing (annual) values were estimated by the average escapement by stream across years (this data set, with missing values estimated, was provided by Tim Baker, CFMD, Anchorage.) We then calculated median (i.e., mid) values for each index stream.

Non-index anadromous streams identified in the Anadromous Stream Catalog were considered "small" producers. Escapement to these streams was, for this analysis, assigned by referring to the order of the stream under the Catalog's ASC hierarchical coding system. Unsurveyed first-order (main stem) streams and second-order tributaries of non-index systems were assigned a peak escapement value of 2,200 fish. Unsurveyed tributaries of index systems received a value of 0 if the index escapement was associated with the main stem reach. Lastly, all third-order or higher tributaries without an index escapement were assigned a value of 0. We estimated the peak escapement value of 2,200 for unsurveyed areas by the first quartile of the distribution of median escapement for index streams. A total of 2,799 first-order

anadromous streams were compiled for the analysis.

The indices of escapement were summed by first-order catalog stream codes, then sorted in descending order of escapement. Percentiles of the sorted values were then determined, and escapements summed between percentile cutpoints.

Sport Fishing Use

Angler effort (use, in angler days in fresh water) was used as an indicator of sport fishing value. Angler use is highly correlated with harvest of salmon, trout, and char by stream in Southeast Alaska and was preferred over indices based on harvest since it eliminated the need for judging the relative value of species. Estimates of angler use for individual watersheds are made annually as part of the ADF&G Statewide Harvest Survey (SWHS) (Mills 1978–94, Howe et al. 1995). All the angler use data for individual watersheds were summed for the years 1977–1994 to form an index of sport fishing value.

In a few instances, freshwater angler use data in the SWHS were reported for general areas such as the "Juneau roadside." Such areas span many different streams and VCUs, and we could not accurately distribute use data among specific areas. Consequently, these data were eliminated from the analysis. Other data were excluded because of an unusually high number of angler days reported relative to harvest. These data were considered an artifact of tourism (e.g., Sheep Creek) and/or ease of access from urban areas (e.g., Herbert/Windfall Lake). Finally, some data were excluded if the contributing fisheries were heavily supported by stocking (Sheep Creek in Juneau, Ward and Ketchikan Creeks in Ketchikan) and would not ordinarily be able to sustain fisheries of this magnitude. Conversely, fisheries with records of stocking but no significant increase in sport harvest for those species were retained in the analysis.

Based on Sport Fish Division's knowledge of the fisheries, sport fishing angler use values were assigned to VCUs in the Tongass. If multiple VCUs were possibilities, one VCU was selected. Angler use was, however, almost always specific to a single identifiable watershed in a VCU. For example, in VCU 2351, angler days of use apply only to Kadashan River and not to other watersheds in the VCU. Editing of the sport fish data to remove enhanced and roadside fisheries eliminated angler use data in 19 VCUs.

The SWHS data have limitations. First, the survey identifies only watersheds where there were a sufficient number of anglers to insure that statistics are relatively precise; as a result, watersheds with high value streams that are infrequently fished are not individually identified (Mills and Howe 1992). Also, no response and inaccurate information by anglers might increase non-detection of some fisheries. However, since the undetected fisheries are almost always small, such problems are likely insignificant in this analysis.

Estimates of angler use by VCU were sorted in descending order of angler use. Percentiles of the sorted values were then determined, and angler use summed between percentile cutpoints.

VCUs Important to Salmon Production and Sport Fishing Use

Data from the three analyses were combined to identify the most valuable watersheds in the Tongass with respect to all three indicators. However, each pink salmon escapement index from the previous analysis had first to be associated with a VCU in the Tongass. Those VCUs containing no anadromous streams (according to the Catalog) were identified and

assigned an escapement index value of 0. Then the escapement estimates were summed for each of the 934 VCUs. These data were then sorted in descending order of escapement, and percentiles of the sorted values were determined as in all the other analyses; each VCU was thus related to a percentile value generated from each fishery value. Each percentile was then transformed to a score on a 1 to 10 scale according to its percentile order (1 = 1-10; 2 = 11-20; etc.).

A score from 1 to 10 was then assigned to each VCU using the maximax procedure (Merritt and Criddle 1993). The maximax procedure selects the lowest (best) score among the pink, coho, and sport use data to represent the score for a VCU. For example, if pink salmon escapement fell in the 10th percentile, coho salmon smolt capability in the 77th percentile, and sport use in the 23rd percentile, the best score (1 for the 10th percentile) would lead to a maximax score of 1. If data were missing from any of the data sets, the best score from the remaining data sets was chosen.

When one watershed crossed multiple VCUs, assignments of pink salmon escapement and sport fishing use for that stream to a VCU within the watershed could not be accurate. Estimating pink salmon escapement by VCU was problematic, for example, as this had not been a focus of past or current research. Where necessary, one VCU in the watershed (typically the lowest numbered VCU) was associated with the estimated pink salmon count for that stream. Such arbitrary assignments were later resolved, as described below, by extending results from the combined (maximax) analysis to watersheds, rather than individual VCUs. This also reflects our belief that it could, or would, be misleading to separate related reaches of major fishery streams by using a VCU-based computer analysis.

Results from the maximax analysis were appropriately linked to watersheds. VCUs in a watershed containing a VCU given the highest maximax score were given the same maximax score if these two conditions were met. First, the stream mouth or a substantial portion of the particular watershed important for its fishery value (high escapement or angler use) had to occur in the VCU, as judged from maps of the streams and VCU boundaries. Second, the magnitude of the fishery value for a high-value watershed found in several VCUs must have been relatively large. The "sharing" of the escapement or angler use with other related VCUs could not, therefore, imply small fishery values on a by-VCU basis.

Stream watersheds or VCUs assigned a maximax score of 1 are denoted Primary Fish Producers. VCUs with no anadromous streams (in the catalog), no modeled coho salmon smolt capability, and low sport fishing use are denoted Nonproducers. All other VCUs and watersheds are denoted Secondary Fish Producers. Primary producers which are so denoted because of top scores for pink salmon escapement and coho salmon smolt capability are referred to collectively as "Salmon Production" areas. Primary producers so denoted because of top sport fishing use scores are referred to as "Sport Fishing Use" areas.

VCUs designated as Primary, Secondary, or Nonproducers were mapped and color-coded to depict their various combinations of values. The following color codes were employed for this purpose: red stripes = Primary Fish Producers with a top Sport Fishing Use score; blue = Primary Fish Producers with a top Salmon Production score; pink = Secondary Fish Producers for Salmon Production; and white = Nonproducers. Red stripes overlay the blue background in those areas with top scores for both Salmon Production and Sport Fishing Use. Annette Island, Glacier Bay Park, and VCUs 0 and 8888 are colored gray and were not rated. Finally, an overlay of gray stripes indicates private, municipal, state, or National

Parks lands within mapped VCUs of the Tongass.

Results

Coho Salmon Smolt Capability

About 56% of the modeled coho salmon smolt capability occurs in 10% of the rated VCUs, and 72% of the modeled capability occurs in 20% of the rated VCUs (Table 1, Appendix A). Because this analysis excludes VCUs which lack estimates of coho salmon smolt capability, the true distribution of values across the Tongass may differ somewhat. Further research will be needed to supply these estimates before a complete ranking of VCUs with respect to their coho salmon smolt capability can be made.

Pink Salmon Escapement Indices

The distribution of pink salmon escapements is also skewed to a minority of streams in the forest. About 51% of the estimated pink salmon escapement occurred in 10% of the anadromous streams and 62% occurred in 20% of the anadromous streams (Table 2, Appendix A). Although further research to estimate indices for non-index streams might show the overall distribution of values to be different than in this analysis, the fact that most major streams are surveyed suggests a robust nature for the essential, skewed distribution of values that were calculated.

Sport Fishing Use

An estimated 507,597 angler days of sport fishing use were expended in 230 fresh water streams of the Tongass from 1977-1994 (Table 3, Appendix A). Thus, sport fishing angler use is also concentrated in a small number of watersheds (expressed as VCUs), according to this analysis. Twenty-two percent of all freshwater fishing effort since 1977 (Table 3, Appendix A) has occurred in a single watershed—the Situk River. Fifty-two percent of all freshwater fishing effort has occurred in only 8 watersheds (expressed as VCUs), fewer than 1% of the total number of VCUs in the Tongass. Ninety-seven percent of the freshwater use was expended in 10% of the Tongass watersheds (expressed as VCUs) (Table 4, Appendix A). Recall that these statistics are generated for wild stock fisheries specifically identified in the SWHS; a large number of other systems in the Tongass are visited by sport anglers at low levels of participation.

Watersheds and VCUs Important to Salmon Production and Sport Fishing Use

Two hundred VCUs received a maximax score of 1 because they fell into the top 10% of VCUs either for coho capability, pink salmon escapement, or freshwater sport fishing use. An additional 26 VCUs contained significant portions of the most important pink salmon streams, and 36 VCUs contained significant portions of the most important sport fishing streams. In total, 243 of the 934 rated VCUs on the Tongass (26%) received a maximax score of 1 (Appendix A) and are thus denoted Primary Fish Producers.

While Primary Fish Producers constitute only 26% of the 934 rated VCUs, they collectively produce 60% of the estimated pink salmon escapement index, 72% of the modeled coho salmon smolt capability, and 98% of the freshwater Sport Fishing Use identified to location in the Tongass (Table 5, Appendix A). Secondary Fish Producers, composing 64% of the rated VCUs, produced 40% of the pink salmon escapement index, 28% of the modeled coho salmon smolt capability, and 2% of the freshwater Sport Fishing Use. Nonproducers constitute 10% of VCUs in the Tongass.

A map entitled "Salmon Production and Sport Fishing Use by Value Comparison Unit (VCU) of the Tongass National Forest" accompanies this report. The map displays the geographical distribution of Primary, Secondary, and Nonproducing VCUs for Salmon Production and Sport Fishing Use.

Discussion

Salmon Production and Sport Fishing Use were heavily concentrated in 26% of the VCUs of the Tongass National Forest. Collectively, these VCUs - Primary Fish Producers - are the core of the region's sport, commercial, and subsistence fisheries.

Recent findings raise concerns about the sustainability of these fisheries. Findings include "current [timber harvest] procedures ...are not fully effective to prevent habitat degradation or fully protect salmon and steelhead stocks over the long term" (USFS 1995). Moreover, in spite of improved timber harvest practices, a "legacy of highly altered watersheds remain" (Bryant 1996). Since timber harvest in anadromous watersheds has been increasingly identified as a contributing factor in the decline of salmonid abundance and diversity in Oregon and Washington (Murphy 1995), it is obvious that some level of reduction will occur also in Southeast Alaska. Past and ongoing timber harvest practices expose some highly productive salmon, trout, and char streams to significant risks.

Thoughtful consideration of the fishery values in the Tongass by VCU is conceptually and practically difficult, because VCU boundaries are not always watershed boundaries. Future efforts among agencies to expand and refine long-term goals for management of the Tongass should focus on identifying fishery value by watershed, rather than by sometimes arbitrary VCUs. While this analysis provides overall perspective and advice regarding the distribution of fisheries values in the Tongass, site-specific analysis and ground truthing are needed for review of VCUs or watersheds proposed for development. Also, a lack of data on many systems, including potentially important salmon producers, dictates caution in the use of the information in this report for land use planning and permitting. Significantly expanded, watershed-focused, multi-agency efforts are required to better develop comprehensive land use recommendations to insure long-term sustainability of fish populations in Southeast Alaska.

DEER HARVEST BY RESIDENTS OF JUNEAU AND KETCHIKAN

Introduction

Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are the most sought after wildlife species by hunters in Southeast Alaska, providing over 600,000 pounds of meat per year to the residents of Juneau and Ketchikan alone. Although deer populations have historically fluctuated in response to winter weather conditions, quality of range, and predation, they have provided an important and dependable food supply over the years. The old-growth forests of Southeast Alaska are prime habitat for deer which depend on it for food and shelter, especially during winters of high snowfall. For this reason, considerable research has been conducted on the impacts of timber harvest on deer populations.

ADF&G encourages public land managers to maintain sufficient deer habitat to ensure sustained yields of deer to support a high level of deer harvest by residents of the region.

The purpose of this analysis is to identify the VCUs which recently have provided the greatest numbers of deer to hunters who live in the large, non-rural communities of Juneau and Ketchikan. A separate analysis of subsistence harvest of wildlife and fish, including harvest of deer, by residents of the smaller, rural communities is found in another section of the report. (Neither analysis shows where hunters have traditionally harvested deer but recently do not because of low deer numbers or poor hunting success.) This information will allow residents of these communities to assess the effect of proposed developments on their individual and community hunting areas. Furthermore, it will provide an objective basis for determining which VCUs are deserving of additional deer habitat protection during implementation of the Revised Tongass Land Management Plan (TLMP).

Methods

Annual deer harvest statistics are solicited from hunters through an annual survey form mailed to a random sample of deer hunters in each community of Southeast Alaska. Based on these annual harvest records, this resource assessment for deer reflects the average number of deer harvested by Juneau and Ketchikan residents between the years 1987 and 1994. The harvest data were first summarized by deer harvest survey areas (WAAs) which consisted of three to five watersheds. Then assumptions were made about the proportional distribution of deer harvested among the VCUs which comprised the survey areas. The VCU harvest distributions were estimated as percentages by local area biologists in Ketchikan and Juneau based primarily on their knowledge of hunting patterns in their management area. Factors that affect hunting patterns are related to relative ease of access, availability of anchorages, density of roads, and productivity for deer. The percentages were multiplied by the reported deer harvest in each analysis area to arrive at the mean number of deer harvested annually from each VCU. Based on the number of deer harvested, VCUs were ranked from highest to lowest for each community. VCUs with approximately the top 25% of harvest ranked the highest and VCUs with the lowest 25% of harvest ranked the lowest. The map in Appendix A displays the VCUs from which 75% of the deer are harvested and a table with the data.

Results

Juneau

Juneau residents harvest an average of 3,696 deer annually. Twelve VCUs contribute 25% of the total annual deer harvest. The most important VCU is Barlow (VCU 125), on the North Mansfield Peninsula of Admiralty Island, contributing 154 deer annually to Juneau hunters. Other very productive hunting areas, in order of importance, include Gambier Bay, Upper Seymour Canal, Youngs Bay, Funter Bay, Glass Peninsula, and Hawk Inlet (all on Admiralty Island). On Chichagof Island, the most productive VCU for Juneau hunters is Idaho Inlet. VCUs on Douglas Island are also quite productive, however because the Island is divided into five relatively small VCUs, no single VCU ranked in the top 12.

Ketchikan

Ketchikan residents harvest an average of 1,527 deer annually. Twelve VCUs contributed 25% of the total deer harvest. The most important VCU is Sweetwater Lake (VCU 573), on north Prince of Wales Island, contributing 73 deer annually to Ketchikan hunters. Other very productive areas, in order of importance, include Smugglers Bay, Helm Bay, and Port Stewart (all on Cleveland Peninsula), Vallenar and Bostwick (on Gravina Island), Ketchikan Lakes and Gnat Cove (on Revillagigedo Island), and Barnes Lake, Tuxekan Passage, Coffman Cove, and Staney Creek (on Prince of Wales Island). It should be noted that Coffman Cove and Staney Creek have been heavily clearcut, and will not produce as many deer when the regenerating conifers close over. Other, less disturbed VCUs will provide more stable deer populations over the long term. A complete ranking of important VCUs is provided on the enclosed map.

Discussion

Deer habitat management should consider those areas most important to hunters in each community, with most productive areas receiving higher priority for protection than less productive areas. The ranking of areas based on deer harvest is a simplified approach to assessing deer values at a scale that, while practical, has limitations. Local harvest numbers do not necessarily convert to local deer habitat productivity and are affected by access, traditional use patterns, visibility of deer, effort, and other immeasurable conditions. Harvest data is useful as an indicator to assess the relative resource values of specific areas.

BROWN AND BLACK BEAR HARVESTS

Introduction

Both brown and black bears are popular targets for big game hunters and wildlife viewers who reside in or visit Southeast Alaska. Since 1989, an average of 164 brown bears and 584 black bears have been killed by hunters annually in the region. Maintaining productive bear populations provides subsistence, recreational, and sport hunting opportunities to Alaskans. Bear hunters, especially those resident and nonresident hunters who use guides, also contribute to the economy of Southeast Alaska. Bear viewing is a popular and growing activity in Southeast Alaska and viewing of bears by tourists as well as residents contributes increasingly to the economy of the region. However, quantifiable data on bear viewing is not readily available. For that reason, the following analysis of bear values by area is limited to relative values associated with bear hunting.

The purpose of this analysis is to identify which watersheds within Southeast Alaska have provided the largest harvest of bears during the ten year period (1985-94) for which data is readily available.

Methods

Harvest Total

Bear harvest statistics are gathered annually on bear sealing certificates. All bears taken in Alaska must be sealed by ADF&G within a few days of their being killed. Information is collected at the watershed scale by ADF&G minor harvest units which generally correspond with the Forest Service's VCUs. At the time a bear is sealed, information is recorded on the location of kill by watershed (VCU), residency of hunter, method of transport used in the hunt, whether or not a guide was used, how many days hunters spent afield, and other data.

For this analysis, we simply added the number of bears killed legally by hunters in each VCU during the years 1985-1994. Bears killed in defense of life and property (DLP) were not counted. ADF&G harvest records include harvest from all lands in Southeast Alaska, private, state, and municipal as well as lands within National Forest boundaries. VCUs which are entirely or predominantly (>50%) outside of National Forest boundaries are included in the list but were not considered in our ranking of important National Forest VCUs for bear hunting.

Spatial Scale

Bear habitat varies greatly across Southeast Alaska. In general, the islands support more productive forest habitats and larger more concentrated bear populations than the mainland. Because ADF&G wants to maintain productive and huntable wildlife populations well distributed throughout the forest for humans to use wherever they live in the region, it is important to evaluate important bear hunting areas on something smaller than a forest-wide scale. We identified six subregions within the Tongass, primarily oriented around major islands or island groups, that serve as a frame of reference when evaluating individual VCUs.

Results

The enclosed map contains tables listing the most important VCUs (providing 75% of harvest within region) from highest to lowest based on the number of bears of each species harvested from them during the period 1985-94.

Brown bears

Brown bears occur on the mainland in Southeast Alaska and on the major islands of Admiralty, Baranof, and Chichagof (ABC islands) as well as smaller neighboring islands such as Kruzof (VCUs grouped with Baranof Is.) and Yakobi (grouped with Chichagof). Harvest of brown bears in the Mainland subregion is considerably lower than in the ABC islands. In the ABC islands, most harvest comes in areas with good boat anchorages for hunter access.

In the Mainland subregion, the five most important VCUs to brown bear harvest include Eagle River and Lake on Bradfield Canal, the Aaron and Berg Creek drainage off Blake Channel, the Unuk and Chickamin Rivers, and Walker Cove in Misty Fjords. VCUs that account for the second highest tier of mainland harvest, include three VCUs in Berners Bay, in the Port Snettisham area Limestone Creek and Whiting River, and the Bradfield River.

In the Chichagof Island subregion, the Sitkoh River VCU has the highest harvest. However, four VCUs at or near the Portage between Tenakee Inlet and Port Frederick are in the top ten. Other high harvest VCUs included Ushk Bay, Slocum Arm, Crab Bay, and Idaho Inlet, as well as private land in Spasski Creek drainage.

In the Baranof Island subregion, four VCUs on northeast Baranof around Kelp Bay and Catherine Island are in the top ten. Other important brown bear harvest areas are Rodman Saoak, and Fish bayson north Baranof, and Gut Bays and Port Walter on east and Red Bluff Baranof.

In the Admiralty Island subregion, eight of the top eleven brown bear harvest VCUs are on the south end of the island. Among them are Pybus, Gambier, Hood, Chaik, Whitewater, and Herring bays. Other high harvest VCUs include Hawk Inlet, Young Lake, and private land at Kathleen Lake.

Harvest in the Yakutat subregion can not be calculated by VCU because VCU boundaries in the Yakutat area do not correspond with ADF&G minor harvest units. Brown bears do not occur in the Central Islands subregion or Prince of Wales Island subregion.

Black bears

In the Mainland subregion, the highest 25% of harvest comes from VCUs on the west side of Lynn Canal in Excursion Inlet, St. James Bay, and at Pt. Couverden as well as at Port Snettisham, Hobart Bay (where most bears are hunted from the road system), Carroll Inlet, George Inlet, and in Misty Fjords at Portage Cove. VCUs providing the next highest 25% of black bear harvest on the mainland include the Juneau area, the upper Taku River, Berners Bay, Echo Cove, Gilbert Bay, Windham Bay, Sandborn Canal, Farragut Bay, Traitors Cove, and in Misty Fjords at Marten Arm of Boca de Quadra and Hidden Inlet.

In the Central Islands subregion, the most important VCUs for bear harvest are on northern Kuiu island and along Rocky Pass. Tebenkof Bay on Kuiu and both sides of Wrangell Narrows are also important harvest areas. Northern Kuiu is popular with black bear hunting guides.

In the Prince of Wales Is. subregion, bear harvest is closely associated with road access and a high percentage of bears killed (as high as 80% in some VCUs) are taken by hunters using roads for access rather than boats or planes, as elsewhere in Southeast Alaska. A more thorough analysis of areas important to road and non-road hunting has been proposed.

Many of the VCUs which have produced high black bear harvests are wholly or predominantly private lands. Of the National Forest VCUs responsible for high bear harvests, Staney Creek drainage produced the most bears. Others were: Harris River, Troeaders Bay, Thorne Bay, Luck Lake, Red Bay, 12 Mile Arm, Coffman Cove, and three VCUs in the Whale Pass area.

Harvest in Subregion 10 (Yakutat) can not be calculated by VCU because VCU boundaries in the Yakutat area do not correspond with ADF&G minor harvest units. Black bears do not occur on the ABC islands.

Discussion

There is one primary caution concerning these data. Bears range more widely across the landscape than deer. Rating harvest by the scale of single drainages may be misleading in that in some areas of high bear harvest, the kill may be evenly distributed over the several neighboring VCUs and no single VCU will have a high total. Thus, reporting harvest by VCU may cause one to overlook important areas where several neighboring drainages are important as a whole to bear hunting but no one particular VCU stands out as exceptional.

SUBSISTENCE USE

Introduction

In 1996, ADF&G developed fish and wildlife rankings by VCUs to better understand the relative resource values of these specific areas throughout Southeast Alaska. The ranking process allowed the ADF&G Division of Subsistence to systematically organize its data in such a way to better examine impacts from land use developments. The rankings were used to identify protection needed for the highest valued areas of Southeast Alaska and, specifically, within the Tongass National Forest. The subsistence rankings are also important reference points for residents of Southeast Alaska concerned with the impact of the forest and non-forest land use activities on their subsistence uses.

The methods used in ranking subsistence values were developed through past cooperative work by the Division of Subsistence and the USFS during development of the Northwest Baranof Plan from 1992-95. The purpose of that work was to develop an objective method to identify areas where resource development within timber cutting units would have greater or lesser impacts on the subsistence uses of Sitka residents. Results of that effort were incorporated in the planning record as a ranking of areas according to their subsistence *sensitivity to disturbance*. The success of this earlier planning effort provided a model for ranking the subsistence *sensitivity to disturbance* for VCUs throughout the Tongass. The VCU rankings that were developed provide a tool that may be used to evaluate proposed developments.

Methods

Division of Subsistence resource specialists ranked the VCUs used for subsistence by 29 Southeast Alaska communities where adequate data were available. The communities where rankings were undertaken were part of the Tongass Resource Use Cooperative Survey (TRUCS). Ranking were not done for Juneau and Ketchikan; these cities are considered urban areas not eligible for subsistence under the Alaska National Interest Land Conservation Act and are in non-subsistence use areas under state regulation. Accordingly, these communities were not part of the TRUCS or other subsistence studies. An analysis was presented in an earlier section of this report on deer harvest by Juneau and Ketchikan hunters. Ranking of VCUs for sensitivity to disturbance also was not done for Yakutat; little Tongass National Forest commercial quality timber remains that may be harvested within the Yakutat subsistence use area.

Identification of subsistence use areas for 29 communities were delineated through review of six primary data sources:

1) Division of Subsistence Community Studies and Subsistence Maps. In the 1980s, the division completed field research projects and thorough reports describing subsistence uses, harvest levels, and areas used for subsistence. Ethnographic interviewing, household surveys, and subsistence use area mapping were part of these community studies. Maps prepared showed both the extent of subsistence use of study communities and the intensity of use of different areas within the community territory. Technical reports were completed for Angoon, Hoonah, Kake, Klawock, Klukwan, Petersburg, Sitka, and Wrangell. These studies received support from the USFS.

2) The Tongass Resource Use Cooperative Survey. This study, undertaken by the Division of Subsistence and the University of Alaska,

Institute for Social and Economic Research with USFS support, included a survey of household harvests and uses and mapped household subsistence use in Southeast Alaska communities in 1988. Maps show intensity of subsistence use, by species harvested, for study communities.

3) ADF&G Deer and Other Species Harvest Data. Deer harvest data from these surveys showing where each community has taken subsistence deer were analyzed for the 1987-1995 hunting seasons. Harvest data for moose, mountain goat, and black bear were also consulted.

4) Historic Documents, Records, and Reports. These sources include the existing ethnographic literature on Southeast Alaska cultural groups, other historical documentation, and investigative reports. Some sources, such as Walter Goldschmidt and Theodore Haas, *Possessory Rights of the Natives of Southeastern Alaska* (1946), provide maps and descriptions of subsistence use areas.

5) Personal Research Experience of Division of Subsistence staff in Southeast communities. Division staff have over 30 years of research and planning experience related to subsistence in Southeast Alaska communities with a focus on identifying subsistence areas of particular importance.

6) Limited Review. Draft maps based on this analysis were circulated to Southeast Native Subsistence Commission member communities and presented to the federal Southeast Regional Advisory Council. Maps also received informal community review when staff were in communities on other projects. The VCU rankings and maps based on the rankings were available for review after June, 1996.

In general, the subsistence use areas for Southeast Alaska Native communities tend to closely coincide with the traditional territories that were owned, under customary law, by Tlingit localized clans. The subsistence use areas of most other Southeast Alaska communities are also well defined by research data. Most of the subsistence use areas are compact with use intensity inversely proportional to distance from the community. A few communities have more dispersed subsistence use areas. Because of their small populations and distance from key resources, Hyder and Skagway subsistence use areas are more dispersed than other small communities. Petersburg and Wrangell have large use areas because of their large populations, distance to deer hunting areas, and the wide-ranging commercial fishing activity that has enabled residents to become familiar with, and have access to much of the region. Using these methods, subsistence use areas for the 29 Southeast Alaska communities were rated by VCU.

Ranking was done for the following communities:

- Angoon
- Coffman Cove
- Point Baker
- Edna Bay
- Elfin Cove
- Meyers Chuck
- Metlakatla
- Hydaburg
- Port Alexander
- Port Protection
- Hoonah
- Kake
- Craig
- Klawock
- Klukwan
- Gustavus
- Hollis
- Pelican
- Hyder
- Tenakee Springs
- Whale Pass
- Kasaan
- Saxman
- Sitka
- Skagway
- Haines
- Wrangell
- Petersburg
- Thorne Bay

Community Ranking

For each community, staff referred to available data sources and ranked each VCU within each subsistence use area on a one-to-five ordinal scale for sensitivity to disturbance, with five meaning most sensitive to disturbance. A higher ranking means that the ranked VCU has more subsistence *sensitivity to disturbance*, but the difference between ranks is not defined. That is, a VCU ranked two on this scale is more sensitive to disturbance than a VCU ranked one, however, it is not necessarily twice as sensitive.

Disturbance in this context means any land use activity that could adversely impact subsistence uses.

ADF&G deer harvest data and Division of Subsistence, and TRUCS "intensity of use maps" provided a starting point for ranking VCUs within communities' use areas. Ranking also included consideration of professional knowledge of harvest levels of other fish, wildlife, and plant species, ease of access, distance from community, and cultural importance. For most areas in Southeast Alaska, logging, road construction, or mining are the most likely development disturbances that may affect subsistence uses.

Ranking was done such that approximately 20% of each community's subsistence use area was assigned each of the five ranks. This makes the ranking relative within a community. Because their subsistence use areas included only a small number of VCUs, rankings for Coffman Cove, Edna Bay, Elfin Cove, Gustavus, Hollis, Kasaan, Metlakatla, Meyers Chuck, Pelican, Port Alexander, Port Protection, Saxman, and Whale Pass used a three-point scale with one-third of their land area ranked 1, 3, or 5 respectively. The three-point scale was also used for Petersburg to allow more accurate ranking of its very dispersed use pattern. Because the communities of Klukwan, Skagway and Hyder use only a few VCUs, their subsistence use areas were given a single rank of 3.

Community Maps

Maps show rankings for each of the 29 communities in Southeast. Copies of the community maps were circulated for limited public review. Three of the community maps, those for Hoonah, Kake, and Sitka, are reproduced in this report as examples of local community-level analysis. Copies of *sensitivity to disturbance* maps and tabular data showing VCU rankings for each of 29 Southeast communities may be reviewed at the Division of Subsistence, Island Center Building, Douglas, AK 99824, (907) 465-2629, Attn. Mike Turek.

Combining Rankings

The enclosed large format map combines the results from the rankings done for each of the 29 communities. The community rankings were combined to better understand the regional *sensitivity to disturbance* among all communities. In areas where community subsistence use areas overlap, a VCU defaults to the highest value given for any individual community. For example, if a VCU was used by three different communities ranked 5, 3, and 3, respectively, the combined rank is 5. Similarly, a VCU was given a rank of 4 on the large format map if that was the highest ranking given the VCU for any community which used that area.

Results and Discussion

On the large format map is a table that summarizes the rankings for the 928 VCUs of Southeast Alaska. The vast majority of VCUs are located in the Tongass National Forest, but many VCUs include some municipal, borough, state, Mental Health trust, and private land. Acreage figures refer only to Tongass National Forest Lands. About 37% of all VCUs, comprising about 27% of the total non-national park land area of Southeast Alaska, were ranked 5, meaning most sensitive to disturbance by at least one Southeast Alaska community. About 30% of all VCUs, comprising about 45% of the total non-national park acreage in Southeast Alaska, were ranked as 0 meaning that they are not typically used for subsistence by members of the 29 communities covered (refer to Table 1 below).

These rankings, and the community and regional level maps based on them, provide forest-wide depictions of the extent of

subsistence uses and serve to identify those VCUs where subsistence uses may be most sensitive to disturbance. As such, the rankings provide a useful planning tool. We would note, however, that subsistence patterns may change over time due to variations in species abundance, changes in community subsistence use patterns, competition, forest succession, road development or closure, and other factors. Some areas that have been ranked low may have increasing subsistence use in coming years; this would be true, for example, for areas near Kake and Petersburg where deer populations are rebounding and where moose populations are becoming established. Conversely, subsistence use of some areas of Southeast Alaska could diminish in the future. There are areas today around Hoonah, Sitka, Pelican, and central Prince of Wales Island where deer hunter demand has exceeded deer carrying capacities. This is due to predicted declines in deer habitat capability due to the conversion of old-growth forests to second-growth forest.

Additionally, as much as 10% of current subsistence deer harvest comes from non-National Forest lands. Many of these lands, particularly private lands, have been extensively clearcut and deer habitat capability is expected to decline substantially as the recent clearcuts close over as second-growth forest. When that happens, hunters will most likely shift their effort to nearby National Forest lands. At the same time, demand for deer is expected to increase over time as the human population of Southeast Alaska grows. For these reasons, local communities need to be consulted to better define areas of particular importance for subsistence uses.

Table 1.

Ranking	# of VCUs	% of VCUs	Tongass National Forest Acres	% of Tongass National Forest Area
0	282	30%	7,556,924	45%
1	53	6%	1,035,311	6%
2	34	4%	480,910	3%
3	136	15%	2,064,626	12%
4	83	9%	1,163,004	7%
5	340	37%	4,634,238	27%
Total	928	100%	16,935,013	100%

OLD-GROWTH FOREST HABITAT CONDITIONS

Introduction

Many species of wildlife in southeast Alaska depend either directly or indirectly on old-growth habitat for their basic life requirements. Sitka black-tailed deer depend on the canopy structure of high-volume forests, at low elevation, for shelter from winter snows and access to nutritious forage. Marten depend on the structure of productive old-growth habitat, including dead and down logs, for foraging and denning habitat. Bears, marten, otter, and mink make extensive use of old-growth habitat in the beach fringe and along riparian corridors for foraging and/or denning habitat. Other species, including mountain goats, wolves, bears, and furbearers can be displaced or easily overexploited in areas that are intensively roaded and developed. Add to this the prospect of maintaining important habitat for species whose life histories are only poorly known, and one can appreciate the challenge involved in identifying important habitat that meets the needs of "wildlife" in general.

In 1993, an interagency committee of biologists was formed, called the Viable Population Committee (VPOP), to examine the old-growth habitat relationships of all terrestrial vertebrate species on the Tongass. They identified 8 species that were at risk from logging and associated development, and recommended a series of actions be taken to minimize risks to viable well-distributed populations as required by the National Forest Management Acts regulations (Suring et al., 1993). In addition to a number of specific standards and guidelines, the committee recommended the Forest Service establish a network of various-sized reserves, composed of relatively high-quality old-growth habitat (50% volume class 5 and higher) to meet the estimated minimum requirements of these and other old-growth affiliated species. Their conclusions were endorsed, and expanded upon, by a scientific peer review panel (Kiester and Eckhardt 1994). In theory, this network of old-growth reserves was to provide a "safety net" of protection for all old-growth associated species, including those whose ecology is poorly understood.

Using information from published scientific literature, as well as empirical data from local studies, scientists on the VPOP committee developed a set of recommendations for appropriate size, spacing, and composition of old-growth reserves. They applied their reserve network across the Southeast Alaska landscape, providing planners with one example of how such a reserve system might look on the ground. This reserve strategy, with minor modifications, was incorporated in the 1997 revised Tongass Land Management Plan.

The VPOP committee's early effort to map reserves was hampered by limited access to inventory information showing the extent and quality of old-growth habitats across the Tongass. That information is now readily available. The following analysis makes use of this information to evaluate the relative old-growth habitat quality of every watershed on the Tongass National Forest in terms that reflect its value to a host of old-growth associated wildlife. This analysis is not intended as a substitute for the recommendations of the VPOP committee. Rather, it is an independent analysis of old-growth associated habitat values at the watershed scale. This ranking should provide a useful guide to those VCUs on the Tongass most deserving of additional (or substitute) protection from a wildlife perspective.

Assumptions

There are two basic parameters of effective reserves. One is size, and the other is composition or quality. We assume that the more acres of important old-growth habitat there are, the more valuable a given area will be. We also assume, as did the VPOP committee, that the more concentrated that old-growth habitat is, the more functional it will be. In other words, 1,000 acres of high-value old-growth distributed over 2,000 acres is more valuable than if the same mount of old-growth is dispersed over 10,000 acres. Finally, the long-term security of some species is threatened by roads and development. All things being equal, areas that have minimal roading and fragmentation from development are more valuable as habitat for some species than areas that have been extensively roaded and developed. These three parameters were used to develop an index that reflects the overall old-growth habitat values of VCUs on the Tongass National Forest.

Methods

Old-Growth Score

Because the unit of analysis (VCUs) are different in size, any analysis based on the number of high value old-growth acres, or the % composition in terms of high-value old-growth acres, risks biasing the results towards inordinately large, or inordinately small VCUs respectively. Both the quality (concentration) and quantity of desirable habitat needs to be factored together. We assumed the percentage of land area in productive old-growth was a good measure of the relative quality or concentration of old-growth habitat. The number of acres of highly productive old growth (volume class 5+) below 800 feet elevation served as a measurable indicator of the quantity of the generally more important old-growth habitat. The USFS Geographic Information System (GIS) was used to determine (1) percentage of productive old growth and (2) acres of highly productive old growth in each VCU. These values were multiplied to give a composite index of high-quality old-growth habitat in each VCU. This index was then adjusted based on the amount of logging and roading that had occurred to date in each VCU. Using the USFS assumption that the acres harvested from each VCU were originally in the high-volume (volume class 5+) old growth below 800 feet elevation category, the percentage of those high-volume acres remaining was calculated. The composite habitat value index was then multiplied by this "% unlogged" percentage to arrive at a score which represented the relative value of each VCU in terms of habitat for old-growth associated wildlife.

Keep in mind that this ranking does not necessarily reflect where people see wildlife, or where they kill wildlife. Those characteristics are controlled as much or more by access and proximity to communities, than by wildlife habitat value. A good example is Kuiu Island, which is remote from most large population centers, and has had low deer numbers for the past 15-20 years. Although Kuiu receives relatively little deer hunting at present, the island has historically had high deer, wolf and black bear populations. That potential remains, as long as high habitat quality remains. This evaluation process is designed to identify important old-growth "hot spots" which are important to the long term productivity of many old-growth associated species.

It is important to note that the VCU list used for the old-growth analysis did not include later subdivisions of VCUs made by the USFS. There are only a few of these subdivisions that were used in the other analyses of this project. Where they exist, the ranking refers to the land

area covered by first three digits of the VCU. For example, the ranking associated with VCU 4050 applies to VCU 4050 and VCU 4051 and the ranking for VCU 4170 applies to VCUs 4170, 4171, and 4172.

Spatial Scale

There is a great deal of natural variability of forest characteristics across Southeast Alaska. In general, the southern islands are less rugged, and support more productive forest growth than the northern islands or the mainland. To maintain productive wildlife populations well distributed throughout the Tongass, it is important to evaluate habitat quality on something smaller than a forestwide scale. Ten subregions within the Tongass were identified, primarily oriented around major islands or island groups, that serve as a frame of reference when evaluating individual VCUs. These ten subregions, their component VCUs, and their Forest Service land acreage, are shown in Table 1.

Results

As expected, the mean old-growth habitat score for different subregions varied widely, with mainland and northern subregions having generally lower mean old-growth scores than the islands. Admiralty Island had the highest mean old-growth score (x=1875, n=60 VCUs), while Yakutat had the lowest mean score (x=261, n=42 VCUs). Within each subregion, the VCUs were ranked from high to low based on their score. VCUs in the 90th percentile received the highest rank; VCUs in the 80-90th percentile received the next highest rank, and so on. A complete listing of the scores and ranking for all VCUs in each subregion is available upon request from the Division of Wildlife Conservation (attn. Matt Kirchoff). The following discussion identifies the highest-value VCUs in each subregion.

Northern Mainland (94 VCUs)

This subregion includes the Chilkat Peninsula, VCUs along the east side of Lynn Canal, Douglas Island, and mainland VCUs from Stephens Passage south to Tracy Arm. The three highest rated VCUs were Gilbert Bay, Miegs Peak and Williams Cove, which lie between Port Snettisham and Holkham Bay south of Juneau. Port Snettisham itself was ranked (7th). Closer to Juneau, Auke Bay (4th) and Echo Cove (5th) were the next most highly rated VCUs. In this same area, Montana Creek (11th), Canyon Creek (15th), and Cowee Creek (19th), were ranked in the second tier (80-90th percentile). The west shore of the Chilkat Peninsula ranked 6th, and the Taku River ranked 8th. Other VCUs ranking in the second tier on the Chilkat Peninsula were Earth Station (10th), Point Danger (12th), Pt. Couverden (16th), and Endicott River (18th). Shelter and Lincoln Islands ranked 13th and the back side of south Douglas Island (McDonnough) ranked 14th; both of these are important deer hunting areas for Juneau residents.

Chichagof Island (114 VCUs)

Kadashan (VCU 2350), in Tenakee Inlet, was the highest-rated VCU on Chichagof Island. Nearby, Trap Bay (VCU 2380) was rated number 7. Northern Chichagof had many highly rated VCUs, including Point Adolphus (2nd), Lemesurier Island (3rd), Port Frederick (4th), Idaho Inlet (5th), Chicken Creek (6th), and Elfin Cove (9th). Poison Cove, in Peril Strait, was rated 10th. Second tier VCUs on northern Chichagof included Mud Bay (11th), Loon Lakes (12th), Port Althorp (13th), Neka Bay (15th) and Surge Bay (17th). In Upper Tenakee Inlet, important VCUs were Goose Flats (14th) and Seal Bay (18th). The majority of other important VCUs were clustered in upper Hoonah Sound, including Granite Creek (16th), Ushk Bay (19th), and Patterson Bay (20th).

Baranof Island (66 VCUs)

Important old-growth areas on Baranof Island were widely distributed. The 3 most important VCUs on Baranof were the South Basin in Kelp Bay, Neva Strait (north of Sitka), and Whale Bay (on south Baranof). Hanus Bay, in Peril Straits, was ranked 4th; while Cape Burunof (south of Sitka) was ranked 5th. Important VCUs in the second-tier included Saook Bay (7th), Lake Eva (9th), South Kruzof (10th), Fish Bay (11th), and Krestof Island (13th). These and other VCUs near Sitka are particularly important deer hunting areas for Sitka residents.

Admiralty Island (60 VCUs)

Admiralty Island has relatively high old-growth habitat values throughout, but especially so on the southern half of the island. The 3 most important VCUs in terms of old-growth habitat for wildlife were Hood Bay, Gambier Bay, and Pybus Bay. Gambier Bay is also the second most productive VCU for Juneau deer hunters. Mitchell Bay and Kanalku Bay, near Angoon, were the 4th and 6th highest-rated VCUs. The Fishery Creek drainage, south of Lake Florence, was rated 5th. Other important VCUs in the second tier included Wheeler Creek (7th), Hasselborg Lake (8th), Favorite Bay (9th), Wilson Cove (10th), Chaik Bay (11th), and Eliza Bay (12th).

Central Islands (63 VCUs)

This subregion includes Kuiu, Kupreanof, Mitkof, Zarembo, and a number of smaller islands in the central part of the Alexander archipelago. The highest rated VCUs were all on Kuiu Island. The highest rated VCU was Bay of Pillars, lying just north of Tebenkof Bay Wilderness Area. The 2nd, 3rd, 4th and 6th rated VCUs lie just south of Bay of Pillars, and include Elena Bay, Alvin Bay, Tebenkof Bay, and Port Beauclerc. Rocky Pass, which straddles the narrow waterway dividing Kuiu and Kupreanof islands, was rated 5th. Other VCUs ranking in the second tier included Explorer (7th), Malmesbury (10th), Port Camden (11th), and Saginaw Bay (12th).

Central Mainland (50 VCUs)

This mainland subregion includes Tracy Arm-Fords Terror Wilderness on the North, and extends to include the Stikine-Leconte Wilderness area on the South. The highest rated area was Farrugut Bay, followed by the Salt Chuck in Port Houghton. Lying in between these 2 VCUs is Sandborn Canal (9th) in Port Houghton. The 3rd, 8th, and 10th-rated VCUs are near the mouth of the Stikine River (Wilkes, Stikine and Cottonwood). Other important VCUs are between Endicott Arm and Port Houghton, including Windham Bay (4th), Sanford Cove (5th), Dry Bay (7th) and Chuck River (8th).

Prince of Wales Island (179 VCUs)

This subregion includes Prince of Wales Island as well as smaller islands to the west, including Kosciusco, Warren, Heceta, Tuxekan, Noyes, Lulu, Baker, San Fernando, Suemez, Dall, Sukkwan and Long. A number of outside islands ranked in the top 10, including Baker (1st), Noyes (3rd), Coronation (5th), and Warren (7th). These islands each contain 1 relatively large VCU, have a high percentage of productive old-growth at low elevations, and are unlogged and unroaded. On Prince of Wales, the most highly-ranked VCUs were clustered to the south. These included Nutkwa (2nd), Klakas Inlet (4th), Nutkwa Creek (6th), Lancaster (8th), Dickman Bay (12th), North Moira (13th), Bokan (14th), and South Arm (15th). On north Prince of Wales Island, the most important VCUs were Port Protection (4th), Shakan (9th), and Mt.

Calder (32nd). On Kosciusko Island, important VCUs included Shipley Bay (24th) and Trout Creek (27th). On Heceta Island, important VCUs included Cone Bay (35th) and Derrumba Ridge (36th). On Central Prince of Wales, Salmon Lake (16th), Anderson Creek (16th), and McGillvery Creek (30th) in the Karta Wilderness rated high. In the Honker Divide Area, the most important VCUs were Sweetwater Lake (19th), Thorne Lake (25th), and Cutthroat Lake (31st).

Cleveland/Etolin/Mainland (68 VCUs)

This subregion is bounded on the north by Stikine Strait, on the south by Behm Canal, and on the west by Clarence Strait. It includes Etolin Island, Wrangell Island, and the Cleveland Peninsula, as well as a number of small islands. Madan, south of Wrangell, was the highest-ranked VCU. Four VCUs on the Cleveland Peninsula were highly ranked, including Yes Bay (2nd), Anan Creek (3rd), Point Stewart (6th) and Union Bay (7th). On Etolin Island, the northern shore (VCU 4620) and McHenry Inlet ranked 4th and 5th, Onslow and Burnett Inlet ranked 9th and 10th. Other VCUs ranked in the second tier include Garnet (8th) and Campbell (10th) on the mainland, and Thoms Place (14th) and Fools Inlet (12th) on Wrangell Island.

Misty Fiords/Revilla Island (138 VCUs)

This subregion includes all VCUs in Misty Fiords National Monument and on islands south of Behm Canal, including Revillagigedo, Gravina, and Duke. The Unuk River (VCU 7860), at the head of Burroughs Bay, was the highest-rated VCU. The majority of top-rated VCUs were on Revilla island, including Princess Bay (2nd), Naha Bay (3rd), Alava Bay (4th), Wasp Cove (6th), Ella Bay (8th), Fish Creek (9th), Behm Narrows (10th), Carrol Inlet (11th), and Gokachin (14th). Other VCUs rating in the top 10% were located at the southern tip of the Tongass National Forest, including Very Inlet (5th), Nakat Inlet (7th), and Willard Inlet (12th). Important VCUs in the second tier included Salt Lagoon (16th), Orchard Lake (17th), Manzanita Bay (18th), and Clover Pass (20th).

Yakutat (42 VCUs)

This smallest subregion is separated from the rest of the Tongass National Forest by Glacier Bay National Park and Preserve. It includes the Russel Fiord Wilderness Area, and mainland VCUs between Yakutat Bay and Dry Bay. The highest old-growth habitat values in this area are found in Dark Forest (VCU 3730), followed by the Akwe River, Lower Russel Fiord, and Khaantak Islands. VCUs ranking in the second tier include the Situk River (5th), the Old Situk River (6th), Lake Redfield (7th), and Chicago Harbor (8th). As the name of the top-rated VCU implies (dark forest), the trees in the Yakutat tend to be younger (150-250 years old), more even-aged, and have a higher component of Sitka spruce (*Picea sitchensis*) than old-growth elsewhere on the Tongass. Some of the "high-volume old-growth" inventoried in this area is probably structurally and functionally closer to maturing second-growth than typical old-growth found elsewhere in Southeast Alaska.

Table 1. Subregions of Southeast Alaska used for analysis of important old-growth habitat areas of the Tongass National Forest.

Sub-region Name	VCU Numbers	National Forest Acres
Northern Mainland	1-61,64,93-124	2,542,598
Chichagof Island	185-286	1,349,580
Baranof Island	287-351	1,168,176
Admiralty Island	125-184	1,050,863
Central islands	398-460	1,392,910
Central mainland	62, 63, 65-92,481-500	1,876,944
Prince of Wales Island	527-707	1,927,180
Cleveland/Etolin/Mainland	461-480,501-526,708-729	1,436,246
Misty Fiords/Revilla	730-867	1,967,506
Yakutat	352-395	753,076

APPLICATION TO TONGASS LAND MANAGEMENT PLAN

Introduction

In 1996, ADF&G used the resource assessment outcomes for deer, bear, fish, subsistence, and old-growth habitat for review of the Tongass Land Management Plan (TLMP) revision. High community use of fish or wildlife, or high fish and wildlife production areas provided the basis for ADF&G and the State of Alaska to identify priority areas in the Tongass National Forest that were essential to maintaining high yields of fish and wildlife for hunters, anglers and others, in communities throughout Southeast.

Methods

Using the resource assessment rankings described in this report, the highest ranked VCUs in the resource assessment for fish, deer, bear, subsistence and, secondarily, old-growth habitat, were reviewed by ADF&G to create a list of priority areas. Several levels of post-ranking review were performed. First, independent reviews of the resource assessment were requested of fish, wildlife, and habitat biologists in the area and regional offices of ADF&G. Second, a series of interdisciplinary meetings were held by regional staff to collaborate on interpretations, compare with old-growth analysis results, and create a draft list of priority watersheds. Besides the data-driven resource assessment, other information used to rank community use areas included: 1) professional knowledge of habitat quality, 2) combinations of high values in one VCU, 3) Viable Population Committee report, and 4) Anadromous Fish Habitat Assessment report. Finally, within the constraints and opportunities of National Forest management and state laws and policies, a list of priority watersheds, called "community use areas", was developed.

Results

The Community Use Areas listed below represent approximately the most important 20% of subsistence use areas in Southeast Alaska, 20% of the brown bear harvest areas, 20% of the urban (Juneau and Ketchikan) deer harvest areas, 40% of the black bear harvest areas, and 30% of the pink production, coho capability, and sport fishing use areas. These were submitted by the State of Alaska to the USFS for consideration in the revision of TLMP with the following recommendation: "work with ADF&G and Southeast communities to determine which of these areas should have appropriate management prescriptions that protect community use, and fish and wildlife values. Avoiding or minimizing timber harvest in areas of high community use will increase the predictability and reliability of the timber supply and ensure the viability of all forest dependent industries."

VCUs with Highest Community Use Values

230, 240, 550, 840, 1200, 2010, 2020, 2030, 2040, 2150, 2170, 2180, 2220, 2230, 2240, 2250, 2260, 2280, 2290, 2390, 2440, 2790, 2970, 2990, 3000, 3010, 3020, 3030, 3090, 3100, 3120, 3130, 3980, 3990, 4000, 4020, 4200, 4210, 4250, 4260, 4290, 4320, 4330, 4340, 4350, 4360, 4470, 4500, 4510, 4520, 4540, 5020, 5140, 5270,.5290, 5320, 5440, 5460, 5542, 5710, 5730, 5740, 5750, 5760, 5770, 5780, 5871, 5880, 5890, 5920, 5930, 5971, 6210, 6240, 6320, 6740, 6750, 6790, 6920, 7150, 7160, 7180, 7190, 7220, 7530, 8060

VCUs with Second Highest Community Uses Values

790, 1960, 2100, 2430, 2450, 2460, 2800, 2810, 4160, 4570, 4580, 4680, 4890, 5380, 5490, 5610, 5830, 6180, 6310, 6340, 7470

VCUs with Third Highest Community Uses Values

2360, 2920, 2940, 4670, 5810, 5910, 5960, 6200, 6250, 7200, 4240, 5940, 5950, 6220, 7390, 2400, 7130, 7140, 7200.

Discussion

The productivity and health of forest habitats influences the abundance of fish and wildlife upon which lifestyles, businesses, and other activities depend. Protection of these Community Use Areas would conserve key fish and wildlife habitat and, thereby, increase the opportunity for forest management to maintain sustained yields of fish and wildlife. However, even full protection of these Community Use Areas would not guarantee sustained yields of fish and wildlife use at current levels within the Tongass. While Old-growth Habitat Reserves within the revised TLMP were designed to maintain habitat for minimum viable populations, they are insufficient to supply sustained yields of fish and wildlife to meet the demands of hunters, anglers, and subsistence users.

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APPENDIX A - SPORT FISH TABLES

Table 1. Distribution of modeled ***coho salmon smolt capability*** in 597 rated VCUs of the Tongass National Forest. Modeled data were ordered from maximum to minimum value to define the percentile cutpoints and to determine the number of VCUs, capability, percent of capability, cumulative capability, and cumulative percent capability at 10-percentile intervals.

Percentile of Distribution	Percentile Cutpoint	No. VCUs in Interval	Capability Interval	Percent of Capability	Cumulative Capability	Cumulative Percent
0	586,680*	-	-	-	-	-
10	49,727	60	7,186,850	56%	7,186,850	56%
20	24,263	60	2,015,917	16%	9,202,767	72%
30	16,351	60	1,200,954	9%	10,403,721	82%
40	12,000	60	810,391	6%	11,214,112	88%
50	8,217	60	605,273	5%	11,819,385	93%
60	5,680	60	411,795	3%	12,231,180	96%
70	3,473	60	268,597	2%	12,499,777	98%
80	1,863	59	157,160	1%	12,656,937	99%
90	736	59	73,122	1%	12,730,059	100%
100	24	59	21,970	0%	12,752,029	100%
Total		597	12,752,029	100%		

* The first datum in the ordered list.

Table 2. Distribution of estimated ***pink salmon escapement indices*** for anadromous stream drainages of the Tongass National Forest. Indices were ordered from maximum to minimum to define the percentile cutpoints and to determine the number of streams, indexed escapement, percent of indexed escapement, cumulative indexed escapement, and cumulative percent indexed escapement at 10-percentile intervals.

Percentile of Distribution	Percentile Cutpoint	No. streams in Interval	Escapement in Interval	Percent of Escapement	Cumulative Escapement	Cumulative Percent
0	242,000*	-	-		-	
10	7,400	280	6,862,602	51.4%	6,862,602	51.4%
20	4,400	280	1,476,683	11.1%	8,339,285	62.5%
30	2,200	280	868,356	6.5%	9,207,641	69.0%
40	2,200	280	616,000	4.6%	9,823,641	73.6%
50	2,200	280	616,000	4.6%	10,439,641	78.2%
60	2,200	280	616,000	4.6%	11,055,641	82.8%
70	2,200	280	616,000	4.6%	11,671,641	87.4%
80	2,200	280	616,000	4.6%	12,287,641	92.0%
90	2,200	280	616,000	4.6%	12,903,641	96.6%
100	257	279	449,369	3.4%	13,353,010	100.0%
	2,799	15,353,010	100.0%			

* The first datum in the ordered list.

Table 3. Nonlinear distribution of ***Sport Fishing Use*** (angler days of effort) in wild stock fisheries from 1977 through 1994 by drainages (expressed as VCUs) of the Tongass National Forest.

No. of VCUs	Percent of total VCUs	Angler effort (days fished)	Percent of effort
1	0.1%	111,937	22%
2	0.2%	154,638	30%
4	0.4%	206,878	41%
8	0.9%	262,762	52%
16	1.7%	333,099	66%
32	3.5%	406,184	80%
64	7.0%	469,809	93%
128	14.0%	500,962	99%
230	25.5%	507,597	100%
.	.	.	.
915	100.0%	507,597	100%

Table 4. Distribution of ***Sport Fishing Use*** (angler days of effort) in wild stock fisheries from 1977 through 1994 by drainages (expressed as VCUs) of the Tongass National Forest. Angler effort was ordered from maximum to minimum to define the percentile cutpoints and to determine the number of VCUs, angler effort, percent of angler effort, cumulative angler effort, and cumulative percent angler effort at 10-percentile intervals.

Percentile of Distribution	Percentile Cutpoint	No. of VCUs in Interval	Effort in Interval	Percent of Effort	Cumulative Effort	Cumulative Percent
0	111,937 *	-	-	-		
10	457	92	491,452	96.8%	491,452	97%
20	45	92	15,073	3.0%	506,524	100.0%
30	0	92	1,073	0.2%	507,597	100.0%
40	0	92	0	0.0%	507,597	100.0%
50	0	92	0	0.0%	507,597	100.0%
60	0	91	0	0.0%	507,597	100.0%
70	0	91	0	0.0%	507,597	100.0%
80	0	91	0	0.0%	507,597	100.0%
90	0	91	0	0.0%	507,597	100.0%
100	0	91	0	0.0%	507,597	100.0%
Total		915	507,597	100%		

* The first datum in the ordered list.

Table 5. Summary of fishery values in VCUs designated as ***Primary Producers, Secondary Producers, and Nonproducers.***

	Pink Salmon Escapement Percent	Coho Salmon Capability Percent	Sport Fishing Effort Percent	Tongass VCUs Percent
Primary Producers	60%	72%	98%	26%
Secondary Producers	40%	28%	2%	64%
Nonproducers	0%	0%	<0.1%	10%

Table 6. Pink salmon escapement, coho salmon capability, and sport fishing effort for VCUs of the Tongass National Forest rated as Primary Fish Producers (maximax score = 1).

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
120	BERNERS RV	115-20-10100	6600	5	90909	1	1355	1	
121			2200	7	ND		0	3	MS1 = SF VCU 120
130	LACE RV	115-20-10200	4400	6	93045	1	0	3	
140	ANTLER RV	115-20-10300	2200	7	96380	1	0	3	
150	ANTLER RV	115-20-10300	2200	7	52252	1	168	2	
230	COWEE CK	115-20-10620	4400	6	11942	5	0	3	MS1 = SF VCU 250
240	COWEE CK	115-20-10620	2200	7	9254	5	0	3	MS1 = SF VCU 250
250	COWEE CK	115-20-10620	6600	5	ND		3719	1	
260	HERBERT RV	111-50-10070-2004	4400	6	159022	1			RS = 2978
270	AUKE LK	111-50-10420-0010	68200	1	34042	2			RS = 12920; MS1 = SF VCU 280,290
280	MONTANA CK	111-50-10500-2003	0	8	78659	1	4943	1	
290	MENDENHALL RV	111-50-10500	15400	3	412	10	577	1	
430	TURNER LK	111-32-10800	7000	5	1262	9	7387	1	
460	TAKU RV	111-32-10320	19800	3	442652	1	3682	1	
590	SPEEL RV	111-33-10300	4400	6	36325	2	624	1	
610	WHITING RV	111-35-10050	4400	6	95010	1	182	2	
710	CHUCK RV	110-32-10090	143800	1	12000	4	106	2	
750	NANCY CK	110-33-10080	70372	1	ND		0	4	
760	CHUCK RV	110-32-10090	0	9	23271	3	0	4	MS1 = PK VCU 710
780	RUSTY RV	110-34-10030	40000	1	ND		0	4	
790	GLEN CK	110-34-10060	36230	2	4353	7	0	4	MS1 = PK VCU 780
840	SANBORN CR	110-34-10080	80300	1	12000	4	0	4	
900	FARRAGUT RV	110-14-10070	22010	2	181985	1	13	3	
1290	BEAR CK	111-50-10800	5400	6	4324	7	657	1	
1330	ADMIRALTY CK	111-41-10050	13200	3	7264	6	1830	1	
1480	KATHLEEN CK	112-17-10120	3300	7	ND		596	1	
1500	FLORENCE LK CK	112-17-10250	1311	8	ND		7111	1	
1560	MOLE HARBOR CK	111-13-10010	41100	1	ND		106	2	
1570	FRESH WATER LK CK	112-67-10250	10683	4	ND		12195	1	
1670	JIMS CK	112-67-10400	0	9	ND		1254	1	
1700	NE GAMBIER BAY	110-23-10030	82800	1	ND		0	5	
1800	ELIZA CK	109-30-10060	58300	1	ND		34	3	
1820	OLD MANS CK	110-22-10020	71214	1	ND		274	2	
1930	MUD BAY RV	114-23-10700	4000	7	26473	2	1433	1	
1931			4400	6	ND		0	5	MS1 = SF VCU 1930
2010	PORTAGE CK	114-33-10130	18600	3	33560	2	588	1	
2040	GAME CK	114-31-10130	16000	3	48792	2	2657	1	

–continued–

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort[1,3]	Percentile score	COMMENT (see key below)
2050	GARTINA CK	114-31-10090	13200	3	12029	4	485	1	
2070	SPASSKI CK	114-27-10300	7400	5	18571	3	1416	1	
2170	KENNEL CK	112-50-10250	0	9	10602	5	1612	1	
2180	PAVLOF RV	112-50-10100	719	8	22756	3	2172	1	
2290	S. OF SEAL BAY	112-45-10360	40200	1	20490	3	0	5	
2351	KADASHAN CK	112-42-10250	42200	1	50317	1	1879	1	
2390	KOOK CK	112-12-10250	1282	8	15465	4	1601	1	
2430	SITKOH BAY	113-59-10025	45000	1	29562	2	0	5	
2440	SITKOH CK	113-59-10040	2200	7	9446	5	8341	1	
2450	PERIL STRAIT	113-51-10020	40400	1	8223	5	0	5	
2490	LISIANSKI RV	113-95-10060	31600	2	6515	6	141	2	MS1 = PK VCU 2620
2620	LISIANSKI RV	113-95-10060	48000	1	18093	3	0	5	
2630	GOULDING RV	113-81-10030	5000	6	ND		1187	1	
2650	GOULDING RV	113-81-10030	6600	5	ND		0	5	MS1 = SF VCU 2630
2700	LEO CK	113-61-10030	38238	1	ND		0	6	
2710	FISH CAMP CK	113-72-10020	55600	1	ND		0	6	
2740	FORD ARM LK CK	113-73-10030	32400	2	ND		2800	1	MS1 = PK VCU 2710
2750	FLAT COVE	113-73-10080	48800	1	ND		0	6	
2810	USHK BAY	113-56-10030	38200	1	23278	3	0	6	
2820	FICK COVE CK	113-57-10010	37200	1	20133	3	0	6	
2830	PATTERSON BAY	113-57-10050	57811	1	37494	2	0	6	
2840	GRANITE CK	113-58-10400	45000	1	24303	2	73	2	
2841			0	9	ND		0	6	MS1 = PK VCU 2620
2870	FISH BAY CK	113-65-10040	59800	1	16317	3	220	2	
2950	EVA CK (EVA LK CK)	113-52-10040	3535	7	11238	5	8960	1	
3080	S. KRUZOF	113-41-10050	48400	1	66814	1	0	6	
3110	INDIAN RV (SITKA)	113-41-10190	50500	1	24275	2			RS = 3332
3130	KATLIAN RV	113-44-10030	12200	4	16822	3	740	1	
3140	CLEAR RV	112-21-10050	55400	1	6233	6	0	6	
3210	KIZHUCHIA CK	113-41-10420	3200	7	8107	6	1829	1	
3230	SALMON CK (SITKA)	113-41-10320	6000	6	7365	6	4527	1	
3240	SILVER BAY	113-41-10315	11000	4	2193	8	496	1	
3260	BARANOF RV	112-11-10050	13200	3	452	10	4521	1	
3290	RED BLUFF BAY	109-20-10180	113800	1	ND		61	2	
3370	SASHIN CK	109-10-10090	64800	1	739	9			RS = 1795
3440	PLOTNIKOF CK	113-22-10280	8800	5	ND		4785	1	
3460	WHALE BAY	113-22-10030	44406	1	ND		365	2	
3470	BENZEMAN LK CK	113-34-10050	41800	1	ND		0	6	
3480	EKATERINA LK CK	113-32-10060	58000	1	ND		0	6	

–continued–

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
3660	SITUK RV	182-70-10100	13200	3	156820	1	111937	1	
3661			6600	5	ND		0	6	MS1 = SF VCU 3660
3670	LOST RV	182-80-10100	26400	2	113838	1	10522	1	
3690	ANKAU	183-50-10100	4400	6	ND		5138	1	
3700	ANKAU	183-50-10100	0	9	5073	7	11748	1	
3720	AHRNKLIN RV	182-70-12000	33000	2	586680	1	0	6	
3730	AHRNKLIN RV	182-70-12000	2200	7	52721	1	0	6	
3770	DANGEROUS R. TB	182-60-10050	0	9	56046	1	0	6	
3790	ITALIO RV, EAST FK	182-50-10100-2010	17600	3	277592	1	2442	1	
3810	AKWE RV	182-40-10100	0	9	ND		768	1	
3820	AKWE RV	182-40-10100	11000	4	235784	1	186	2	
3840	ITALIO RV	182-50-10100	2200	8	8160	6	0	6	MS1 = SF VCU 3790
3870	USTAY RV TB	182-40-10100-2018-3005	4400	6	85415	1	39	3	
3890	EMILE CK	182-30-10100-2011	13200	3	180719	1	21	3	
3950	ALSEK RV	182-30-10100	0	9	7613	6	5836	1	
3990	SAGINAW CK	109-44-10390	34900	2	84667	1	23	3	
4000	SECURITY BAY	109-45-10130-2008	32500	2	167075	1	50	2	
4020	ROWAN BAY	109-52-10080	43270	1	155532	1	200	2	
4030	KUTLAKU CK	109-52-10350	29350	2	86804	1	11	3	
4050	ALECKS CK	109-62-10130	68800	1	52390	1	13	3	
4070	WOLF CK	109-62-10290	40900	1	78412	1	0	7	
4090	BEAR HARBOR CK	105-10-10240	69300	1	12000	4	0	7	
4160	ALVIN BAY	105-31-10200	39607	1	10340	5	0	7	
4190	KISUTCH CK	105-32-10730	42784	1	22583	3	0	7	
4200	PORT CAMDEN CK	109-43-10060	20600	3	68770	1	228	2	
4210	KADAKE CK	109-42-10300	28000	2	117775	1	1900	1	
4230	GUNNUK CK	109-42-10040	10300	4	72497	1			EN = 175
4240	BIG CK (KUP. IS)	110-16-10110	22400	2	103302	1	0	7	MS1 = SF VCU 4411
4250	HAMILTON RV	109-42-10100	21000	3	58793	1	2327	1	
4260	HAMILTON RV	109-42-10100	0	9	147128	1	2301	1	
4270	BIG JOHN CK	105-32-10160	24200	2	102454	1	0	7	
4280	TUNEHEAN CK	105-32-10040	50149	1	137110	1			EN = 251
4290	TUNEHEAN CK	105-32-10040	0	10	106561	1	103	2	
4320	ZIM CK	106-41-10570	28850	2	63045	1	51	2	
4340	KAH SHEETS CK	106-42-10100	14300	3	50042	1	2074	1	
4350	CASTLE RV	106-43-10210	33000	2	56551	1	5159	1	
4360	CASTLE RV	106-43-10210	17600	3	50242	1	0	7	MS1 = SF VCU 4350
4410			4400	6	ND		0	7	MS1 = SF VCU 4411

–continued–

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
4411		106-43-10570	24200	2	36975	2	4493	1	
4450	PETERSBURG CK	106-44-10600	33200	2	61853	1	25374	1	
4470	FALLS CK	106-44-10060	92400	1	69574	1	946	1	
4480	HARVEY LK	106-43-10050-0010	17600	3	12383	4	541	1	
4500	BIG CK (BEAR CK)	108-50-10030	5441	6	79357	1	862	1	
4510	BLIND SLOUTH TB	106-44-10315	68200	1	12994	4			EN = 85606
4520	OHMER CK	108-40-10500	30800	2	53790	1			RS = 1914
4630	KUNK CK	108-10-10150	3869	7	1152	9	459	1	
4680	NAVY CK	106-22-10160	42400	1	2400	8	0	7	
4720	HATCHERY LAKE CK	106-21-10030	31100	2	14534	4	1395	1	
4730	KUDAYS CK	107-10-10700	38500	1	71795	1	0	7	
4790	THOMS CK	107-30-10300	10600	4	25134	2	2926	1	
4890	MUDDY RV	108-60-10030	30800	2	81153	1	141	2	
4920	STIKINE-DRY IS.	108-40-10075	22150	2	189953	1	0	7	
4930	ANDREW CK	108-40-10150-2008	29100	2	185718	1	10698	1	
4950	KETILI RV	**108-40-10150-2033**	19800	3	388498	1	279	2	
4960	STIKINE DELTA SL	108-40-10110	17600	3	174976	1	0	7	
4970	GOVERNMENT CK	108-40-10150-2004	2200	8	97387	1	0	7	
4980			0	10	30283	2	0	7	MS1 = SF VCU 4930
5020	MILL CK	107-40-10070	11000	4	12000	4	1443	1	
5090	MARTEN CK (WGL)	107-40-10380	10600	4	23173	3	804	1	
5110	HARDING RV	107-40-10490	4000	7	12000	4	593	1	
5140	BRADFIELD RV	107-40-10530	8800	5	64152	1	0	7	
5190	EAGLE RV (BRAD.CAN)	107-40-10550	36200	2	14952	4	1759	1	
5220	ANAN CK	107-20-10010	134000	1	12000	4	10590	1	
5320	RED BAY CK	106-41-10300	35200	2	ND		1380	1	
5330	RED BAY CK	106-41-10300	6600	5	19245	3	0	8	MS1 = SF VCU 5320
5341	SALMON BAY	106-41-10180	4400	7	20756	3	1403	1	
5380	BIG CK (108 CK, POW)	106-30-10800	42701	1	12000	5	1006	1	
5460	CHARLEY CK	103-90-10580	95570	1	10368	5	0	8	
5480	TOKEEM CK	103-90-10720	59685	1	3187	8	0	8	
5520	GRASSY LAKE	106-30-10250	15400	3	7576	6	112	2	MS1 = SF VCU 5730
5541	SARKAR RV	103-90-10140	15400	3	51405	1	3914	1	
5542			8800	5	ND		0	8	MS1 = SF VCU 5541
5680	W. PORTILLO CHANNEL	103-50-10920	37400	1	9565	5	0	8	
5690	S. PORT REAL MARINA	103-50-10750	55000	1	12568	4	0	8	
5700	PORT ALICE	103-90-10480	2200	8	3195	8	683	1	
5710	NAUKATI CK	103-90-10260	47745	1	52466	1	736	1	
5730	SWEETWATER LK	106-30-10670-2004-0020	3080	7	68253	1	42701	1	

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VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
5750	THORNE RV	102-70-10580	60000	1	38135	2	12425	1	
5760	THORNE RV	102-70-10580	0	10	36096	2	0	8	MS1 = SF,PK, VCU 5750
5770	LOGJAM CK	106-30-10670-2004-3030	0	10	4541	7	1467	1	
5780	THORNE RV,NORTH FK	102-70-10580-2026	0	10	46404	2	0	8	MS1 = SF,PK, VCU 5750
5800	THORNE RV,NORTH FK	102-70-10580-2026	0	10	30620	2	0	8	MS1 = SF,PK, VCU 5750
5810	LUCK CK(EAGLE POW)	106-10-10300	31000	2	12272	4	512	1	
5860	THORNE RV	102-70-10580	24200	2	4263	7	33	3	MS1 = SF,PK, VCU 5750
5871	STANEY CK	103-90-10310	101624	1	10603	5	6728	1	
5880	STANEY CK	103-90-10310	0	10	130494	1	0	8	MS1 = SF,PK, VCU 5871
5890	SHAHEEN CK	103-90-10420	62200	1	31396	2	1617	1	
5900	STANEY CK	103-90-10310	0	10	18029	3	0	8	MS1 = SF,PK, VCU 5871
5920	SALT LAKE BAY	103-80-10440	88881	1	11548	5	0	8	
5930	ELEVEN MILE CK	103-70-10110	37144	1	22908	3	0	8	
5940	N. BIG SALT LAKE	103-60-10270	76945	1	26221	2	80	2	
5950	STEELHEAD CK	103-60-10290	91200	1	27715	2	3264	1	
5960	THORNE RV	102-70-10580	0	10	33935	2	0	8	MS1 = SF,PK, VCU 5750
5971	THORNE RV	102-70-10580	0	10	40969	2	150	2	MS1 = SF,PK, VCU 5750
5972			0	10	ND		0	8	MS1 = SF,PK, VCU 5750
6050	KARTA RV TB LK	102-60-10870-2012-0010	0	10	7426	6	19516	1	
6060			0	10	26413	2	0	8	MS1 = SF VCU 6050; PK VCU 6070
6070	KARTA RV	102-60-10870	43210	1	22948	3	0	8	MS1 = SF VCU 6050
6080	MCGILVERY CK	102-60-10870-2021	0	10	5494	7	0	8	MS1 = SF VCU 6050; PK VCU 6070
6090			32611	2	7341	6	0	8	MS1 = SF VCU 5950
6091	KLAWOCK		129000	1	ND		0	8	
6100	MAYBESO CK	102-60-10840	30600	2	7966	6	804	1	
6210	TWELVEMILE CK	102-60-10720	56200	1	7789	6	715	1	
6220	HARRIS	102-60-10820	101600	1	36341	2	5544	1	
6230	ST. NICHOLS CK	103-60-10590	44600	1	12977	4			EN = 40252
6231			0	10	ND		0	8	MS1 = PK VCU 6230
6232			0	10	ND		0	8	MS1 = PK VCU 6230
6240	TROCADERO BAY	103-60-10750	126400	1	18149	3	141	2	
6250	S. PORT ST. NICHOLAS	103-60-10620	98445	1	22958	3	0	8	
6300	PORT ESTRELLA	103-50-10210	51159	1	6445	6	127	2	
6310	NO. TLEVAK ST.	103-40-10005	40600	1	15249	4	0	8	
6320	SODA CK	103-40-10130	139174	1	49741	1	0	6	
6390	BOBS BAY	104-30-10350	39575	1	11147	5	0	9	
6710	W. DUNBAR INLET	103-40-10480	26727	2	19544	3	0	9	MS1 = PK VCU 6320

–continued–

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
6720	EEK LK (MAIN)	103-25-10090-0020	61400	1	6994	6	1238	1	
6740	PORTAGE CK	103-25-10300	159400	1	17019	3	86	2	
6750	SUNNY CK	102-40-10870	49200	1	3691	7	0	9	
6790	E. CHOLMONDELEY	102-40-10050	66415	1	24704	2	0	9	
6820	MILLER CK (POW IS)	102-30-10890	40800	1	10302	5	159	2	
6840	KEGAN CK	102-30-10670	30898	2	11285	5	3502	1	
6860	NUTKWA LAGOON	103-21-10080	155000	1	10344	5	0	9	
6870	KLAKAS INLET	103-15-10230	108033	1	6692	6	116	2	
6920	JOHNSON COVE CK TB	102-30-10170-2004	53555	1	41809	2	0	9	
6960	HUNTER RV	103-11-10190	51000	1	17053	3	25	3	
6980	HUNTER RV	103-11-10190	0	10	16992	3	0	9	MS1 = PK VCU 6960
6981			0	10	ND		0	9	MS1 = PK VCU 6960
7090	BLACK BEAR CK	107-10-10300	61400	1	12000	5	0	9	
7220	WASTA CK	101-80-10400	52568	1	39631	2	196	2	
7240	WOLVERINE CK	101-80-10680	15400	3	19575	3	5204	1	
7270	SHORT CK	101-80-10840	9000	4	9312	5	1140	1	
7280	SHORT CK	101-80-10840	0	10	1865	8	239	2	MS1 = SF VCU 7270
7300	HERMAN CK	101-75-10050	50000	1	ND		0	9	
7330	KLU CK	101-80-10200	11000	4	3738	7	1385	1	
7380	MARGRET CK	101-90-10390	11600	4	18823	3	626	1	
7390	TRAITORS CK	101-90-10290	99400	1	5287	7	84	2	
7420	NAHA RV	101-90-10500	62000	1	15619	4	26866	1	
7440	CARROLL RV	101-45-10780	87500	1	4171	7	0	9	
7480	WHITE RV	101-45-10240	82800	1	26830	2	2691	1	
7530	SHOAL COVE CK	101-45-10880	40400	1	50782	1	143	2	
7540	FISH CK (KTN)	101-43-10330	3500	7	336	10	2859	1	
7542			0	10	ND		0	9	MS1 = SF VCU 7540
7670	W. RYUS BAY	101-23-10740	39600	1	90955	1	0	10	
7730	ELLA CK	101-51-10900	4400	7	ND		1721	1	
7750	MANZANITA CK	101-71-10430	6600	6	21125	3	1496	1	
7820	GRANT CK	101-75-10100	44286	1	ND		0	10	
7830	GRANT CK	101-75-10100	0	10	ND		0	10	MS1 = PK VCU 7820
7840	EULACHON RV	101-75-10150	9000	4	6695	6	0	10	MS1 = SF VCU 7860
7860	UNUK RV	101-75-10300	13200	4	194460	1	3811	1	
7880	UNUK RV	101-75-10300	6600	6	ND		0	10	MS1 = SF VCU 7860
7990	WALKER CK	101-71-10260	47501	1	ND		388	2	
8020	GOAT CK, BIG	101-60-10300	65200	1	ND		184	2	
8060	FISH CK	101-15-10500-2006	25800	2	68278	1	4307	1	
8159			65800	1	ND		0	10	

–continued–

VCU	Representative name	Representative Anadromous Stream Catalog No.	Estimated pink salmon peak escapement[1,2,3]	Percentile score	Coho salmon capability (ND = no data)	Percentile score	Estimated angler effort [1,3]	Percentile score	COMMENT (see key below)
8170	WILSON RV	101-55-10200	242000	1	ND		1925	1	
8179			0	10	ND		0	10	MS1 = SF,PK, VCU 8170
8189	WILSON RV	101-55-10200	6600	6	ND		0	10	MS1 = SF,PK, VCU 8170
8210	WINSTANLEY CK	101-51-10100	2200	8	ND		1770	1	
8260		101-55-10600	2200	8	ND		651	1	
8269			14400	3	ND		0	10	MS1 = SF VCU 8260
8270	BADGER LK	101-55-10730-0020	4400	7	ND		0	10	MS1 = SF VCU 8260
8340	HUMPBACK CK	101-30-10830	162400	1	ND		2851	1	
8380	MARTEN RV	101-30-10600	90000	1	42798	2	0	10	
8390			0	10	2010	8	0	10	MS1 = PK VCU 8380
8419	KETA RV	101-30-10300	87050	1	ND		26	3	
8429	KETA RV	101-30-10300	0	10	ND		0	10	MS1 = PK VCU 8419
8430	TOMBSTONE CK	101-15-10190	62000	1	24214	3	0	10	
8590	N. VERY INLET	101-23-10190	48408	1	ND		0	10	

KEY: MS1 = SF VCU = #: Maximax score of 1 assigned due to important sport fishing stream in common with VCU = #.
MS1 = PK VCU = #: Maximax score of 1 assigned due to important pink salmon stream in common with VCU = #.
RS = #: Roadside fishery. Angler effort = # assigned to this VCU was removed; see text.
EN = #: Enhanced fishery. Angler effort = # assigned to this VCU removed; see text.

[1] Angler effort and pink salmon escapement are estimated by stream. When streams cross VCU boundaries, the estimates are assigned to one VCU; thus, these estimates are not accurate at the VCU level, and 0 values assigned to other VCUs do not imply absence of sport fishing or pink salmon.

[2] All VCUs in this list contain anadromous streams, and thus, presumably, pink salmon.

[3] The ordering of VCUs having similar (tie) or 0 fishery values is arbitrary.

Salmon Production and Sport Fishing Use
by Value Comparison Unit (VCU)
on the Tongass National Forest

ALASKA DEPARTMENT OF FISH AND GAME
Salmon Production
Primary Salmon Producers
Secondary Salmon Producers
Nonproducers (salmon)
Sport Fishing Use
Primary Sport Fish Producers
Management Boundaries
Non–National Forest Lands (underlying color indicates rating)
Non–National Forest Lands (not rated)
Value Comparison Units (VCU)
N
S
E
W
Yakutat
Yakutat Foreland
Russell Fjord
Klukwan
Skagway
Haines
Lynn Canal
Glacier Bay National Park and Preserve
Gustavus
Elfin Cove
Icy Strait
Pt. Adolphus
Pelican
Chichagof Island
Hoonah
Tenakee Springs
Pt. Couverden
Juneau
Taku Inlet
Admiralty Island Nat. Mon.
Stephens Passage
Chatham Strait
Angoon
Sitka
Sitka Sound
Kruzof Island
Baranof Island
Port Alexander
Cape Ommaney
Pt. Gardner
Frederick Sound
Hobart Bay
Endicott Arm
Cape Fanshaw
Kake
Kuiu Island
Kupreanof Island
Kupreanof
Petersburg
Mitkof Island
Stikine River
Wrangell
Zarembo Island
Wrangell Island
Etolin Is.
Point Baker
Port Protection
Sumner Strait
Whale Pass
Coffman Cove
Edna Bay
Prince of Wales Island
Clarence Strait
Meyers Chuck
Thorne Bay
Klawock
Craig
Hollis
Kasaan
Hydaburg
Dall Island
Cleveland Peninsula
Revillagigedo Island
Ketchikan
Saxman
Metlakatla
Misty Fjords National Monument
Hyder
Coronation Island
Cape Decision
Gulf of Alaska
Dixon Entrance
LOCATION MAP
ALASKA
Southeast Alaska

Salmon Production and Sport Fishing Use on the Tongass National Forest

The Alaska Department of Fish and Game used three sources of data to assess fishery values in stream drainages and geographical units called Value Comparison Units (VCUs) of the Tongass National Forest:

- PINK SALMON PRODUCTION—based on ADF&G estimates of the number of adults returning to anadromous streams in the Tongass National Forest
- COHO SALMON PRODUCTION—based on USFS estimates of the capability of selected waters of the Tongass National Forest to rear coho salmon smolts
- FRESHWATER SPORT FISHING USE—obtained from the ADF&G Sport Fish Statewide Harvest Survey.

The pink and coho salmon data were used to evaluate *Salmon Production* values, and the freshwater sport fishing effort data were used to evaluate *Sport Fishing Use* that takes places in those drainages and VCUs which contain sizable trout, char, and sockeye salmon fisheries.

These data revealed that *Salmon Production* and *Sport Fishing Use* are highly concentrated in a relatively small number of VCUs:

- **60–72% of the Tongass *Salmon Production***
- **and 98% of *Sport Fishing Use***
- **occur in 26% of the Tongass VCUs**

These high production VCUs are called **Primary Fish Producers**. Most of the remaining salmon production in the Tongass comes from a larger group of VCUs (64% of Tongass VCUs) termed **Secondary Fish Producers**.

Comparison of Primary and Secondary Fish Producers

Category	Percent of Tongass Pink Salmon Production	Percent of Tongass Coho Salmon Smolt Production	Percent of Tongass Sport Fishing Use	Percent of Tongass VCUs
Primary Fish Producers	60%	72%	98%	26%
Secondary Fish Producers	40%	28%	2%	64%
Nonproducers	0%	0%	<0.1%	10%

Geographic features shown on this map are from the GIS databases of the Tongass National Forest, Alaska Department of Natural Resources and Interrain Pacific. Trans-Pacific Computing collaborated on database design and initial phases of map production. Cartographic design and final map production was a cooperative effort between ADF&G and Interrain Pacific.

Projection: State Plane Zone 1

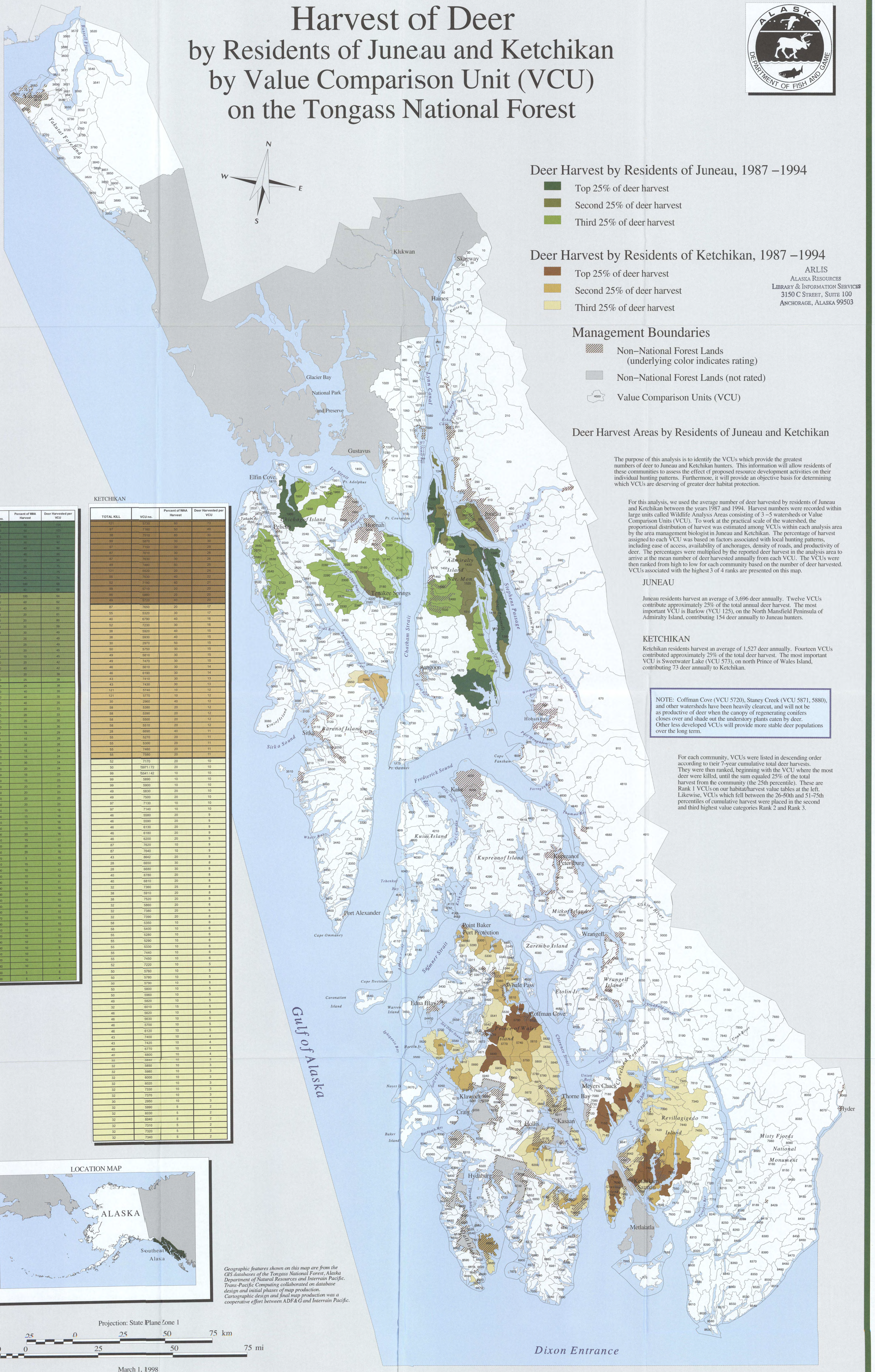
25 0 25 50 75 km

10 0 25 50 75 mi

March 1, 1998

Harvest of Deer
by Residents of Juneau and Ketchikan
by Value Comparison Unit (VCU)
on the Tongass National Forest

ALASKA DEPARTMENT OF FISH AND GAME



Deer Harvest by Residents of Juneau, 1987 –1994

- Top 25% of deer harvest
- Second 25% of deer harvest
- Third 25% of deer harvest

Deer Harvest by Residents of Ketchikan, 1987 –1994

- Top 25% of deer harvest
- Second 25% of deer harvest
- Third 25% of deer harvest

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Management Boundaries

- Non–National Forest Lands (underlying color indicates rating)
- Non–National Forest Lands (not rated)
- Value Comparison Units (VCU)

Deer Harvest Areas by Residents of Juneau and Ketchikan

The purpose of this analysis is to identify the VCUs which provide the greatest numbers of deer to Juneau and Ketchikan hunters. This information will allow residents of these communities to assess the effect of proposed resource development activities on their individual hunting patterns. Furthermore, it will provide an objective basis for determining which VCUs are deserving of greater deer habitat protection.

For this analysis, we used the average number of deer harvested by residents of Juneau and Ketchikan between the years 1987 and 1994. Harvest numbers were recorded within large units called Wildlife Analysis Areas consisting of 3 –5 watersheds or Value Comparison Units (VCU). To work at the practical scale of the watershed, the proportional distribution of harvest was estimated among VCUs within each analysis area by the area management biologist in Juneau and Ketchikan. The percentage of harvest assigned to each VCU was based on factors associated with local hunting patterns, including ease of access, availability of anchorages, density of roads, and productivity of deer. The percentages were multiplied by the reported deer harvest in the analysis area to arrive at the mean number of deer harvested annually from each VCU. The VCUs were then ranked from high to low for each community based on the number of deer harvested. VCUs associated with the highest 3 of 4 ranks are presented on this map.

JUNEAU

Juneau residents harvest an average of 3,696 deer annually. Twelve VCUs contribute approximately 25% of the total annual deer harvest. The most important VCU is Barlow (VCU 125), on the North Mansfield Peninsula of Admiralty Island, contributing 154 deer annually to Juneau hunters.

KETCHIKAN

Ketchikan residents harvest an average of 1,527 deer annually. Fourteen VCUs contributed approximately 25% of the total deer harvest. The most important VCU is Sweetwater Lake (VCU 573), on north Prince of Wales Island, contributing 73 deer annually to Ketchikan.

NOTE: Coffman Cove (VCU 5720), Staney Creek (VCU 5871, 5880), and other watersheds have been heavily clearcut, and will not be as productive of deer when the canopy of regenerating conifers closes over and shade out the understory plants eaten by deer. Other less developed VCUs will provide more stable deer populations over the long term.

For each community, VCUs were listed in descending order according to their 7-year cumulative total deer harvests. They were then ranked, beginning with the VCU where the most deer were killed, until the sum equaled 25% of the total harvest from the community (the 25th percentile). These are Rank 1 VCUs on our habitat/harvest value tables at the left. Likewise, VCUs which fell between the 26-50th and 51-75th percentiles of cumulative harvest were placed in the second and third highest value categories Rank 2 and Rank 3.

JUNEAU

Total Harvest	VCU no.	Percent of WAA Harvest	Deer Harvested per VCU
307	1250	50	154
114	1700	90	103
155	1420	60	93
307	1260	30	92
226	1350	40	90
226	1360	40	90
164	1370	55	90
301	1280	25	75
301	1330	25	75
164	1380	45	74
68	1900	100	68
169	1400	40	68
64	1240	100	64
104	1520	60	62
155	1430	40	62
307	1290	20	61
301	1310	20	60
169	1410	35	59
163	2200	30	49
195	350	25	49
195	370	25	49
226	1340	20	45
301	1300	15	45
169	1390	25	42
104	1510	40	42
195	330	20	39
151	1680	25	38
151	1560	25	38
88	1480	40	35
88	1500	40	35
88	2090	40	35
163	2190	20	33
163	2210	20	33
151	1540	20	30
301	1320	10	30
195	340	15	29
195	360	15	29
88	2100	30	26
163	2220	15	24
163	2230	15	24
81	1930	30	24
121	2320	20	24
151	1530	15	23
151	1550	15	23
113	2130	20	23
113	2150	20	23
113	2170	20	23
113	2180	20	23
121	2280	15	18
121	2290	15	18
121	2310	15	18
121	2330	15	18
88	1490	20	18
113	2140	15	17
81	1920	20	16
81	1960	20	16
301	1270	5	15
81	1910	15	12
121	2300	10	12
121	2340	10	12
114	1690	10	11
100	2590	10	10
100	2630	10	10
100	2640	10	10
100	2650	10	10
100	2660	10	10
100	2670	10	10
100	2680	10	10
100	2710	10	10
100	2720	10	10
100	2730	10	10
88	2080	10	9
88	2110	10	9
88	2120	10	9
81	1940	10	8
113	2160	5	6
81	1950	5	4

KETCHIKAN

TOTAL KILL	VCU no.	Percent of WAA Harvest	Deer Harvested per VCU
121	5730	60	73
97	7160	50	49
38	7510	80	30
99	5870	30	30
97	7150	30	29
87	7610	30	26
87	7630	30	26
49	7480	50	25
121	5520	20	24
55	7530	40	22
52	7190	40	21
99	5710	20	20
99	5880	20	20
49	5720	40	20
87	7650	20	17
55	5320	30	17
40	6790	40	16
52	7230	30	16
38	5920	40	15
38	5930	40	15
30	2970	50	15
50	5750	30	15
49	5810	30	15
49	7470	30	15
46	5610	30	14
46	6190	30	14
43	7410	30	13
43	7430	30	13
121	5740	10	12
121	5770	10	12
30	2960	40	12
58	5380	20	12
58	5390	20	12
58	5500	20	12
58	5510	20	12
28	6690	40	11
55	5270	20	11
55	5300	20	11
55	7460	20	11
55	7580	20	11
52	7170	20	10
50	5971 / 72	20	10
99	5541 / 42	10	10
99	5890	10	10
99	5900	10	10
49	5830	20	10
49	7500	20	10
97	7130	10	10
97	7140	10	10
46	5580	20	9
46	5590	20	9
46	6130	20	9
46	6180	20	9
46	6200	20	9
87	7620	10	9
87	7640	10	9
43	8642	20	9
28	6650	30	8
28	6680	30	8
40	6780	20	8
40	6810	20	8
32	7360	25	8
38	5910	20	8
38	7520	20	8
32	5860	20	6
32	7380	20	6
32	7390	20	6
58	5350	10	6
58	5400	10	6
55	5280	10	6
55	5290	10	6
55	5330	10	6
55	7440	10	6
55	7450	10	6
52	7220	10	5
50	5760	10	5
50	5780	10	5
50	5790	10	5
50	5800	10	5
50	5960	10	5
49	5820	10	5
32	6010	15	5
46	5620	10	5
46	5630	10	5
46	5700	10	5
46	6120	10	5
43	7400	10	4
43	7420	10	4
40	6770	10	4
40	6800	10	4
32	5840	10	3
32	5850	10	3
32	5980	10	3
32	6000	10	3
32	6020	10	3
32	7330	10	3
32	7370	10	3
30	2950	10	3
32	5990	5	2
32	6030	5	2
32	6040	5	2
32	7310	5	2
32	7320	5	2
32	7340	5	2

LOCATION MAP

Geographic features shown on this map are from the GIS databases of the Tongass National Forest, Alaska Department of Natural Resources and Interrain Pacific. Trans-Pacific Computing collaborated on database design and initial phases of map production. Cartographic design and final map production was a cooperative effort between ADF&G and Interrain Pacific.

Projection: State Plane Zone 1

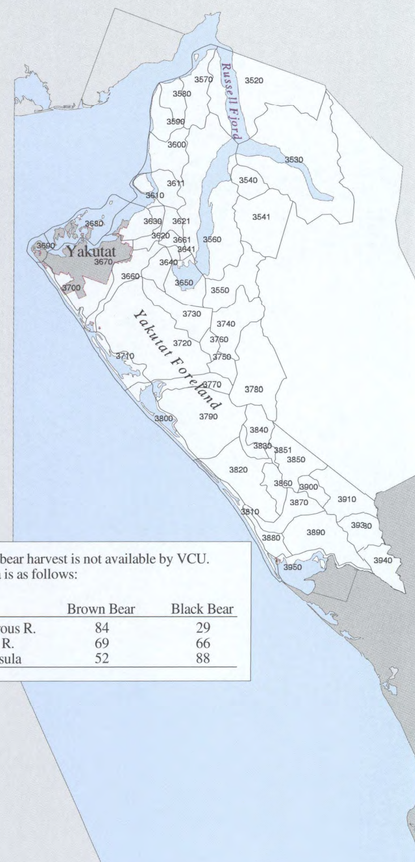
25 0 25 50 75 km

10 0 25 50 75 mi

March 1, 1998

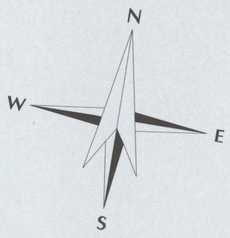
Harvest of Black and Brown Bear
by Value Comparison Unit (VCU) on the Tongass National Forest

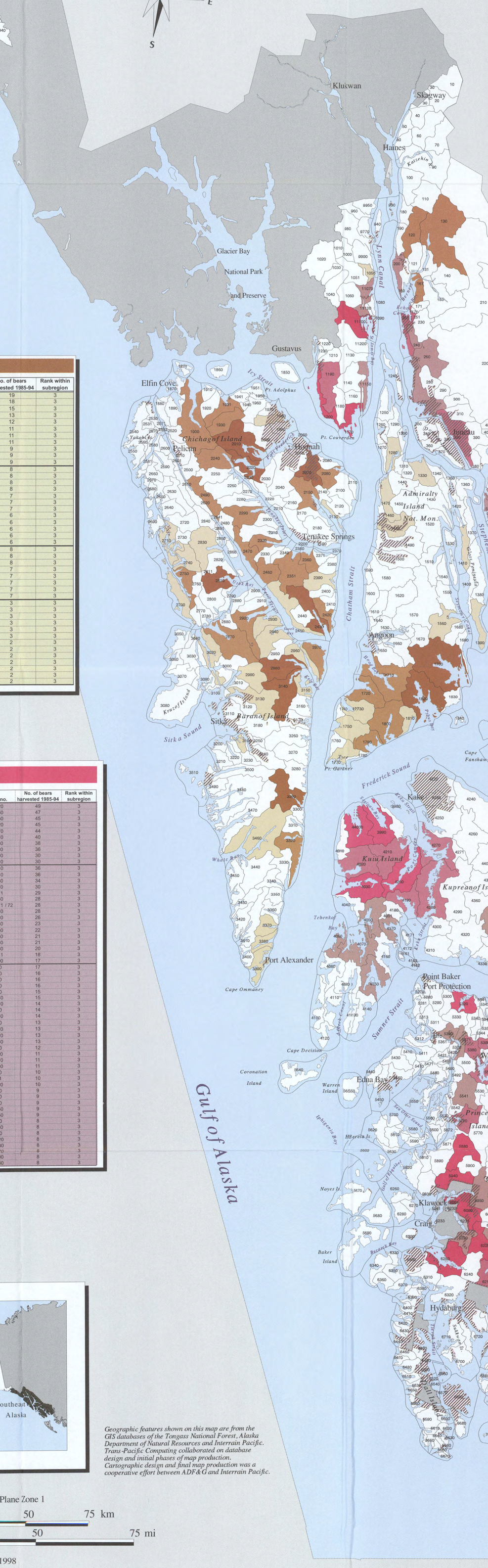
ALASKA DEPARTMENT OF FISH AND GAME



NOTE: Yakutat area bear harvest is not available by VCU. Harvest by larger area is as follows:

Area	Brown Bear	Black Bear
Yakutat Bay –Dangerous R.	84	29
Dangerous R. –Alsek R.	69	66
Russel Fjord & Peninsula	52	88





Brown Bear Harvest by VCU, 1985 –1994

- Top 25% of brown bear harvest
- Second 25% of brown bear harvest
- Third 25% of brown bear harvest

Black Bear Harvest by VCU, 1985 –1994

- Top 25% of black bear harvest
- Second 25% of black bear harvest
- Third 25% of black bear harvest

Management Boundaries

- Non–National Forest Lands (underlying color indicates rating)
- Non–National Forest Lands (not rated)
- Value Comparison Units (VCU) — 4020

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Anchorage, Alaska 99503

Brown Bear

ADF&G subregion	VCU no.	No. of bears harvested 1985-94	Rank within subregion
Admiralty Island	1820	54	1
	1700	51	1
Baranof Island	2980	17	1
	3290	17	1
	3140	16	1
Chichagof Island	2430	24	1
	2020	21	1
	2070	20	1
	2010	18	1
	2810	16	1
Mainland Revilla Wrangell Etolin	5190	10	1
	7930	7	1
	5030	6	1
	7860	6	1
	7990	6	1
Admiralty Island	1710	39	2
	1720	32	2
	1800	28	2
	1790	21	2
Baranof Island	2920	13	2
	2970	11	2
	2870	9	2
	3320	9	2
Chichagof Island	2750	15	2
	1900	14	2
	2320	14	2
	2240	13	2
	2351	11	2
	2490	10	2
	1930	9	2
	2150	9	2
	2290	9	2
	2420	9	2
	2460	9	2
	2470	9	2
	1931	9	2
	2090	9	2
	2360	9	2
Mainland Revilla Wrangell Etolin	120	5	2
	161	5	2
	130	4	2
	530	4	2
	610	4	2
	5140	4	2

ADF&G subregion	VCU no.	No. of bears harvested 1985-94	Rank within subregion
Admiralty Island	1280	19	3
	1730	18	3
	1480	15	3
	1330	13	3
	1770	12	3
	1410	11	3
	1460	11	3
	1560	11	3
	1390	9	3
	1750	9	3
	1810	9	3
Baranof Island	2940	8	3
	2960	8	3
	3370	8	3
	3130	8	3
	2930	7	3
	3150	7	3
	3190	7	3
	3380	6	3
	3390	6	3
	3460	6	3
	2990	6	3
	3020	6	3
Chichagof Island	2710	8	3
	2740	8	3
	2830	8	3
	2130	7	3
	2390	7	3
	2450	7	3
	2700	7	3
	1980	7	3
Mainland Revilla Wrangell Etolin	1050	3	3
	4930	3	3
	5110	3	3
	7240	3	3
	8020	3	3
	8370	3	3
	570	2	3
	4920	2	3
	4950	2	3
	7820	2	3
	8189	2	3
	8199	2	3
	8419	2	3

Black Bear

ADF&G subregion	VCU no.	No. of bears harvested 1985-94	Rank within subregion
Central Islands	4000	108	1
	4030	84	1
	3990	77	1
	4200	74	1
Prince of Wales archipelago	5880	98	1
	5940	88	1
	6090	66	1
	6190	62	1
	5320	58	1
	6220	58	1
	6250	58	1
Mainland Revilla Wrangell Etolin	7530	61	1
	1200	50	1
	750	47	1
	1110	46	1
	7460	38	1
	550	37	1
	1170	34	1
	7780	34	1
	7480	33	1
Central Islands	4190	73	2
	4280	72	2
	4270	67	2
	4020	61	2
	4210	59	2
	4470	58	2
Prince of Wales archipelago	5860	57	2
	5810	56	2
	6210	52	2
	5720	49	2
	5390	48	2
	5710	45	2
	5380	44	2
	5510	39	2
	6200	38	2
Mainland Revilla Wrangell Etolin	320	32	2
	7390	32	2
	460	30	2
	161	29	2
	710	28	2
	250	26	2
	570	26	2
	840	26	2
	7440	26	2
	8370	26	2
	8500	26	2
	1190	21	2
	900	20	2

ADF&G subregion	VCU no.	No. of bears harvested 1985-94	Rank within subregion
Central Islands	4520	49	3
	4050	47	3
	4150	45	3
	4420	45	3
	4170	44	3
	4070	40	3
	4530	38	3
	4060	36	3
	4350	30	3
	4410	30	3
Prince of Wales archipelago	6840	36	3
	6740	36	3
	6130	34	3
	6070	30	3
	5371	29	3
	5750	28	3
	5971 / 72	28	3
	6870	28	3
	5360	26	3
	5830	23	3
	6780	22	3
	5950	21	3
	6230	21	3
	5850	20	3
	5541	18	3
	6100	17	3
Mainland Revilla Wrangell Etolin	640	17	3
	200	16	3
	510	16	3
	790	16	3
	520	15	3
	4840	15	3
	1070	14	3
	890	14	3
	4830	14	3
	270	13	3
	4770	13	3
	7370	13	3
	7380	13	3
	530	12	3
	1100	11	3
	7470	11	3
	7500	11	3
	260	10	3
	661	10	3
	4780	10	3
	500	9	3
	610	9	3
	690	9	3
	4750	9	3
	7160	9	3
	240	8	3
	1150	8	3
	650	8	3
	4920	8	3
	4930	8	3
	4670	8	3
	7200	8	3
	8380	8	3

Bear Hunting Areas in Southeast Alaska

The primary Alaska Department of Fish and Game (ADF&G) bear management goal is to maintain productive bear populations well-distributed throughout areas in Southeast Alaska where people enjoy hunting and viewing bears. To help determine where these areas are we analyzed bear harvest data from the 1985/86 through the 1994/95 hunting seasons to map and rank the highest use bear hunting areas in several subregions of Southeast Alaska.

Harvest data used for this map come from bear sealing records collected yearly and recorded by ADF&G harvest areas. This map shows the data by the Forest Service's Tongass National Forest VCUs (Value Comparison Units) which coincide in most cases with ADF&G harvest areas and watershed boundaries.

Bear habitat varies greatly across Southeast Alaska –the islands generally support more productive habitats and larger, more concentrated bear populations than the mainland. Areas used by the public for hunting and viewing of bears are likewise not distributed evenly throughout the region. They are determined by their proximity to roads, communities, and natural anchorages as well as the number and density of bears the areas support. In order to maintain productive and huntable bear populations well–distributed in all human use areas of the region, it is important to rate hunting areas on a smaller than forestwide scale. ADF&G identified six subregions within Southeast Alaska, primarily oriented around major islands or groups, that serve as a frame of reference when evaluating individual VCUs.

BROWN BEAR SUBREGIONS

Each of the "ABC" islands: Admiralty, Baranof and Chichagof –is considered a separate subregion for brown bear harvest rankings, and the mainland area from Portland Canal to Glacier Bay, including Revillagigedo, Wrangell, and Etolin islands, is the fourth subregion.

BLACK BEAR SUBREGIONS

The same mainland area is a subregion for black bear harvest rankings; the Prince of Wales archipelago is another subregion; and the large central islands (Kuiu, Kupreanof, and Mitkof/Woewodski) form the third subregion for black bear harvest rankings.

COMBINED BLACK AND BROWN BEAR SUBREGIONS

Black bears are not found on the ABC islands, and there are no brown bears on Prince of Wales or the central islands. On the other hand, several VCUs in the mainland subregion are important areas for hunting both brown and black bears. Please note that where such overlap exists, only brown bear data are depicted on the map. Black bear harvest totals for these areas can be found in the black bear table for the mainland subregion and in the note on bear harvest in the Yakutat area.

Within the subregions, VCUs were listed in descending order according to their 10-year cumulative total bear harvests. They were then ranked, beginning with the VCU where the most bears were killed, until the sum equaled 25% of the total harvest from the subregion (the 25th percentile). These are Rank 1 VCUs on our habitat/harvest value tables at the left. Likewise, VCUs which fell between the 26–50th and 51–75th percentiles of cumulative harvest were placed in the second and third highest value categories Rank 2 and Rank 3.

CAUTIONS CONCERNING THESE DATA:

Bears range more widely across the landscape than deer –they do not always stay within the boundaries of a single VCU. One problem with rating harvest on the scale of single drainages as we do here is that in some areas of high bear harvest the kill is evenly distributed over several neighboring VCUs, and no one VCU in particular stands out as exceptional. This may cause one at first glance to underrate the importance of those areas to hunter use. Two examples of high overall but evenly distributed harvest areas are Tebenkof Bay on Kuiu Island and the Fort Houghton –Farragut Bay area on the mainland.

Also, because VCU size is not standardized in the region, VCU's with similar habitat, access, and bear numbers can produce widely different harvest numbers by virtue of size alone –the larger the VCU, the more area from which bears can be harvested, all other factors being equal. Thus, VCU size should be considered when evaluating the data on this map.

Geographic features shown on this map are from the GIS databases of the Tongass National Forest, Alaska Department of Natural Resources and Interrain Pacific. Trans-Pacific Computing collaborated on database design and initial phases of map production. Cartographic design and final map production was a cooperative effort between ADF&G and Interrain Pacific.

Projection: State Plane Zone 1

25 0 25 50 75 km

10 0 25 50 75 mi

March 1, 1998

Sensitivity to Disturbance
of Subsistence Use Areas
for Communities in Southeast Alaska

ALASKA
DEPARTMENT OF FISH AND GAME
Sensitivity to Disturbance
Highest
Moderate
Lowest
Typically not used for subsistence
Management Boundaries
Non–National Forest Lands
(underlying color indicates rating)
Non–National Forest Lands (not rated)
Value Comparison Units (VCU)
N
W
E
S
Yakutat
Russell Fiord
Yakutat Foreland
Klukwan
Skagway
Haines
Lynn Canal
Glacier Bay
National Park
and Preserve
Gustavus
Elfin Cove
Icy Strait
Pt. Adolphus
Chichagof Island
Pelican
Hoonah
Tenakee Springs
Chatham Strait
Juneau
Admiralty Island
Nat. Mon.
Stephens Passage
Angoon
Sitka
Baranof Island
Kruzof Island
Sitka Sound
Port Alexander
Cape Ommaney
Frederick Sound
Kake
Kuiu Island
Kupreanof Island
Kupreanof
Petersburg
Mitkof Island
Wrangell
Wrangell Island
Zarembo Island
Etolin Is.
Stikine River
Point Baker
Port Protection
Sumner Strait
Whale Pass
Coffman Cove
Prince of Wales Island
Clarence Strait
Edna Bay
Klawock
Craig
Thorne Bay
Kasaan
Hollis
Hydaburg
Meyers Chuck
Cleveland Peninsula
Revillagigedo Island
Ketchikan
Saxman
Metlakatla
Hyder
Misty Fjords National Monument
Gulf of Alaska
Dixon Entrance

Subsistence Use
by Residents of Rural Communities in Southeast Alaska

The Division of Subsistence, ADF&G, ranked value comparison units (VCU) according to their sensitivity to disturbance for 29 southeast communities. A VCU used for subsistence hunting, fishing, and plant gathering received higher rankings if data suggested that resource development or other disturbance in that VCU would have a relatively greater adverse impact on these subsistence uses.

This map is based on a composite of the rankings for individual communities. Combined communities will default to the highest, most sensitive rank.

Ranking was not done for Juneau and Ketchikan; these cities are considered urban areas not eligible for subsistence under the Alaska National Interest Land Conservation Act and are in non-subsistence use areas under state regulation. Ranking of VCUs for sensitivity to disturbance also was not done for Yakutat.

- Subsistence use areas coincide with the traditional territories owned, under customary law, by Tlingit localized clans.
- A VCU was given a ranking of five on this map if any community ranked it as five, most sensitive to disturbance. A VCU ranked 5 was found to be among those VCUs most sensitive to disturbance by at least 1 of the 29 communities. Similarly, a VCU was given a ranking of four on this map if that was the highest ranking given the VCU for any community.

About 37% of all VCUs were ranked 5 or most sensitive to disturbance by at least 1 Southeast Alaska community. About 30% of all VCUs were ranked as 0 meaning that they are not typically used for subsistence by members of the 29 communities covered.

Ranking	Number of VCUs	Percent of VCUs
0	282	30%
1	53	6%
2	34	4%
3	136	15%
4	83	9%
5	340	37%
Total	928	100%

Subsistence patterns may change over time due to variations in species abundance; local communities need to be consulted to better define areas of particular importance for subsistence uses.

Data Sources Considered:
1. Division of Subsistence Community Studies and Subsistence Maps
2. Tongass Resource Use Cooperative Survey
3. ADF&G Deer and Other Species Harvest Data
4. Historic Documents, Records, and Reports
5. Personal Research Experience of Division of Subsistence staff in Southeast Communities
6. Limited Review

LOCATION MAP

Geographic features shown on this map are from the GIS databases of the Tongass National Forest, Alaska Department of Natural Resources and Interrain Pacific. Trans-Pacific Computing collaborated on database design and initial phases of map production. Cartographic design and final map production was a cooperative effort between ADF&G and Interrain Pacific.

Projection: State Plane Zone 1

25 0 25 50 75 km

10 0 25 50 75 mi

March 1, 1998

Hoonah Subsistence Use Area, Sensitivity to Disturbance Ranked By VCU

Scale 1:565960
1 Inch Equals Approximately 9 Miles

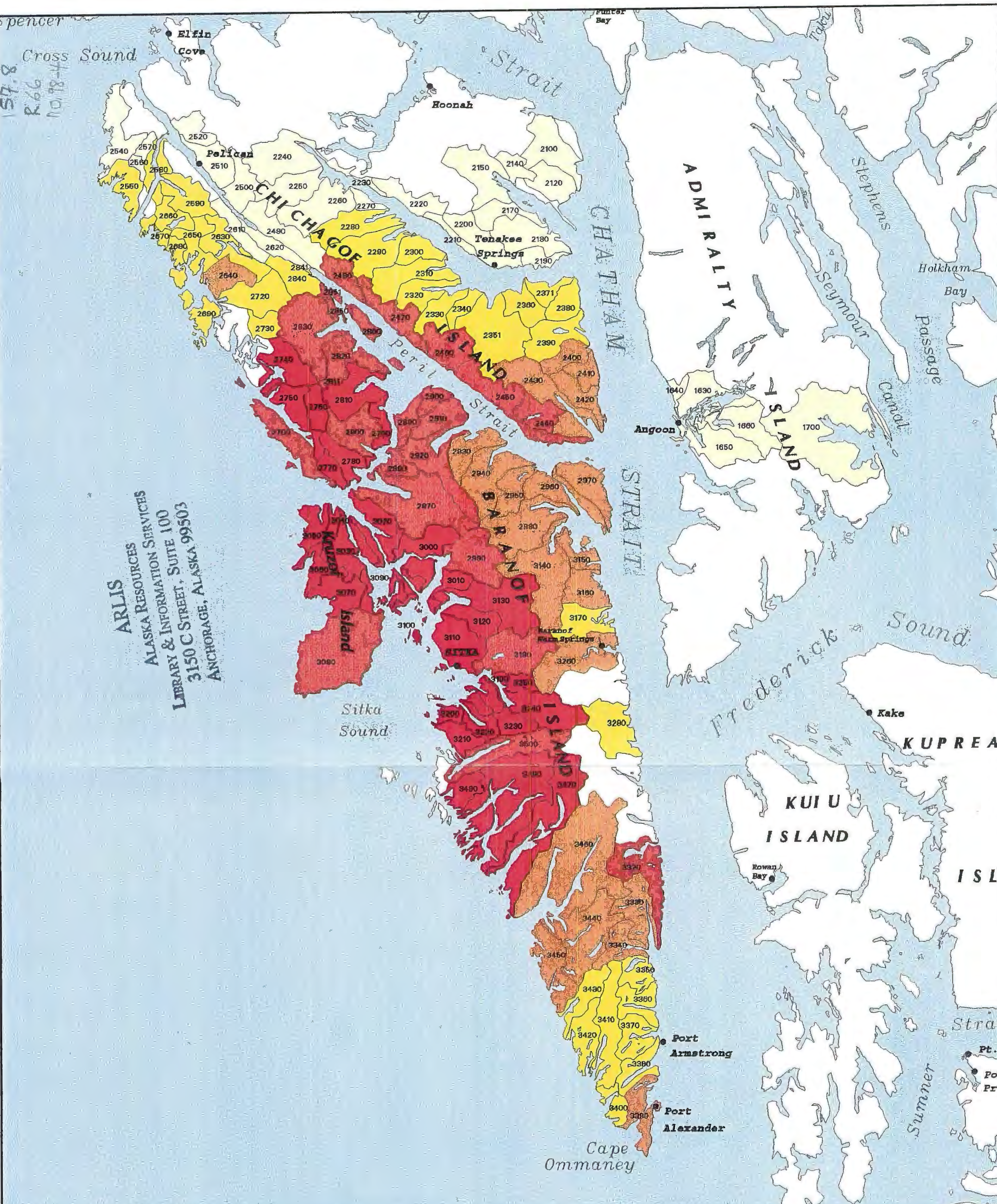
Rankings were prepared to provide a planning and analytic tool for evaluating land use actions in the Tongass National Forest. Value Comparison Units (VCU) within each Southeast Alaska community's subsistence use area were ranked on a five point scale according to their subsistence use sensitivity to disturbance. Rankings are based on consideration of the following sources of information: (1) Division of Subsistence community studies and subsistence maps showing the geographical extent of subsistence use; (2) Division of Subsistence intensity of use research maps for select communities; (3) intensity of use maps based on the Tongass Resource Use Cooperative Survey mapped data; (4) ADF&G deer and other species harvest data; (5) historical records; (6) personal research experience of division staff in Southeast Alaska communities; and (7) limited community review and interviews with subsistence users. Rankings have been adjusted so that equivalent acreage occurs in each ranking category.

Prepared by Bob Schroeder and Mike Turek, Division of Subsistence, ADFG; cartography by Carol Bamhill, Division of Habitat, ADFG. Map Printed: June 02, 1997

LEGEND

VCUs Ranked By Subsistence Use Sensitivity To Disturbance

- 5 = High Rank
- 4
- 3 = Mid Rank
- 2
- 1 = Low Rank



Sitka Subsistence Use Area, Sensitivity to Disturbance Ranked By VCU

Scale 1:802046
1 Inch Equals Approximately 13 Miles

Rankings were prepared to provide a planning and analytic tool for evaluating land use actions in the Tongass National Forest. Value Comparison Units (VCU) within each Southeast Alaska community's subsistence use area were ranked on a five point scale according to their subsistence use sensitivity to disturbance. Rankings are based on consideration of the following sources of information: (1) Division of Subsistence community studies and subsistence maps showing the geographical extent of subsistence use; (2) Division of Subsistence intensity of use research maps for select communities; (3) intensity of use maps based on the Tongass Resource Use Cooperative Survey mapped data; (4) ADF&G deer and other species harvest data; (5) historical records; (6) personal research experience of division staff in Southeast Alaska communities; and (7) limited community review and interviews with subsistence users. Rankings have been adjusted so that equivalent acreage occurs in each ranking category.

Prepared by Bob Schroeder and Mike Turek, Division of Subsistence, ADFG; cartography by Carol Barnhill, Division of Habitat, ADFG. Map Printed: June 02, 1997

LEGEND

VCUs Ranked By Subsistence Use Sensitivity To Disturbance

- **5 = High Rank**
- **4**
- **3 = Mid Rank**
- **2**
- **1 = Low Rank**

Klawock Subsistence Use Area, Sensitivity to Disturbance Ranked By VCU

Scale 1:1025566
1 Inch Equals Approximately 16 Miles

Rankings were prepared to provide a planning and analytic tool for evaluating land use actions in the Tongass National Forest. Value Comparison Units (VCU) within each Southeast Alaska community's subsistence use area were ranked on a five point scale according to their subsistence use sensitivity to disturbance. Rankings are based on consideration of the following sources of information: (1) Division of Subsistence community studies and subsistence maps showing the geographical extent of subsistence use; (2) Division of Subsistence intensity of use research maps for select communities; (3) intensity of use maps based on the Tongass Resource Use Cooperative Survey mapped data; (4) ADF&G deer and other species harvest data; (5) historical records; (6) personal research experience of division staff in Southeast Alaska communities; and (7) limited community review and interviews with subsistence users. Rankings have been adjusted so that equivalent acreage occurs in each ranking category.

Prepared by Bob Schroeder and Mike Turek, Division of Subsistence, ADFG; cartography by Carol Barnhill, Division of Habitat, ADFG. Map Printed: June 02, 1997

LEGEND

VCUs Ranked By Subsistence Use Sensitivity To Disturbance

- 5 = High Rank
- 4
- 3 = Mid Rank
- 2
- 1 = Low Rank