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Use of Risk Assessment Panels During Revision of the Tongass Land and Resource Management Plan

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Conservation and Resource Assessments for the Tongass Land Management Plan Revision

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Abstract

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This paper describes the process used to conduct the 16 risk assessment panels and a subsistence working group held during revision of the Tongass land management plan. It provides an overview of how results from the panels were used by forest managers in plan-related decisionmaking, discusses some reactions to the effort, and identifies some opportunities to improve the process. The panel results provided estimates of the relative risk that implementation of a range of alternative approaches to management of the Tongass National Forest would pose to the continued persistence across the landscape of an array of species or resources and estimates of potential socioeconomic effects on communities. As anticipated, results from these risk assessment panels became an integral component of the effects analysis section of the environmental impact statement that provided the context for successfully completing the Tongass Land and Resource Management Plan.

Keywords: Forest planning, effects analysis, National Forest Management Act, old-growth forest, forest policy, Tongass National Forest, socioeconomic issues, southeast Alaska, subsistence, wildlife population viability, fisheries sustainability, well-distributed populations.

Introduction

The Tongass National Forest (NF) in southeast Alaska recently revised its land and resource management plan (USDA Forest Service 1996a, 1996b, 1997a, 1997b, 1997c). Several of the primary issues addressed during plan revision were similar to those recently encountered in the Pacific Northwest (Forest Ecosystem Management Assessment Team [FEMAT] 1993), the Columbia basin (Lehmkuhl and others 1997), and elsewhere. These issues included maintaining enough habitat to support viable and well-distributed populations of wildlife and sustainable production of fish over the long term (e.g., a century or more) while addressing the likely socioeconomic effects of various levels of resource use (e.g., timber harvesting).

The Tongass is unusual among National Forests in at least three aspects important to planning: (1) at 16.9 million acres, it is considerably larger than any other single National Forest (its size exceeds the combined area of all National Forests in Oregon); (2) the acreage is scattered across a narrow strip of mainland and some 22,000 islands that form the Alexander Archipelago; and (3) it has congressionally mandated obligations to provide for rather extensive subsistence use of natural resources (U.S. Public Laws 1980) and to "seek to meet" timber demand (U.S. Public Laws, Statutes 1990).

A principle component of the documentation for the development or revision of a Forest plan is the section of the final environmental impact statement that compares alternatives (USDA Forest Service 1997b). All reasonable alternatives are objectively evaluated with substantial treatment given to each alternative so that comparative merits can be evaluated. In describing the environment affected by each alternative, this analysis discusses direct and indirect effects of implementation on an array of forest resources.

To assist with development of the effects analysis and other components of the revision of the Forest plan for the Tongass NF, a new planning approach was applied by the Forest Service. Research scientists from the Pacific Northwest Research Station (PNW) were incorporated directly into the planning team (Everest and others 1997, Mills and others 1998, Swanston and others 1996). Although full members of the planning team, these PNW scientists had separate and distinct roles. One role was to provide information for development of the effects analysis for the draft Forest plan (USDA Forest Service 1996a, 1996b) by organizing and conducting a series of risk assessment panels that followed an approach used previously in the Pacific Northwest (Cleaves 1993, 1995; FEMAT 1993; Starkey 1998). Besides its past use in the Pacific Northwest, the approach of using professional judgment structured in risk assessment panels was chosen because various wildlife habitat and community relations were poorly understood and there was generally inadequate information on which to base predictive models. In addition, the desire was to complete the planning process quickly, leaving no time for data collection.

Under this approach, structured risk assessment panels were conducted in fall and winter 1995-96 to gather information from subject matter experts regarding the likely effects on an array of resource issues of implementing each draft Forest plan alternative. The resource issues possibly affected included the viability of various old-growth-associated wildlife species, the sustainability of the fisheries resource, old-growth forest ecosystems, the social and economic values of forest resources to residents of southeast Alaska, and subsistence use of forest resources (primarily Sitka black-tailed deer [*Odocoileus hemionus sitkenis*] and salmon).

The purpose of conducting these panels was to provide decisionmakers and the public with information on the relative risk from implementing each alternative to the continued persistence across the landscape of the species or resource in question and the potential socioeconomic effects on communities. Information generated from these panel assessments (Everest and others 1997, Swanston and others 1996, USDA Forest Service 1997d) was used in the effects analysis for the draft Forest plan (USDA Forest Service 1996b) and a summary of results and implications was incorporated into the draft environmental impact statement (USDA Forest Service 1996a).

After time for public comment on these draft alternatives and their associated affects analyses, including the risk assessment panels (app. 1; also USDA Forest Service 1996a, 1997d), the planning team began crafting the "final" alternative for the Forest plan. Leadership for plan revision decided that results from a second set of risk assessment panels convened to evaluate this emerging final alternative would be a useful addition to the analysis of effects. A second set of risk assessment panels therefore was conducted during spring 1997 to consider effects of the emerging final alternative on the viability of certain old-growth-associated wildlife species and the sustainability of the fisheries resource.

This paper discusses the procedures used in conducting these two sets of risk assessment panels and clarifies the nature of the results obtained from them. Some comments and insights on the utility and application of this methodology in the forest planning process, and various reactions to it, also are provided. In addition, information is drawn together on these risk assessment panels[1] that currently appears in several documents (Everest and others 1997; Mills and others 1998; Swanston and others 1996; USDA Forest Service 1996a, 1996b, 1997a, 1997b, 1997c, 1997d).

Procedures

First Set of Risk Assessment Panels

Background—To provide scientifically credible information for revision of the Tongass land management plan, panels of subject matter experts were used to evaluate nine Forest plan alternatives for their likely effects on forest resources and values. The process was adapted from that used, tested, and judged effective in the Northwest Forest Plan (Cleaves 1993, 1995; FEMAT 1993; Starkey 1998). It is important

[1] A report was filed in the planning record (USDA Forest Service 1997d) for each risk assessment panel. The full content of each panel report is not repeated here; however, they form an unpublished appendix (app. 1) to this paper that is accessible electronically on the internet at: <http://www.fs.fed.us/pnw/>; or in hard copy by request to the author or the Documents Coordinator for the Tongass Land Management Planning Record, USDA Forest Service, Alaska Region, P.O. Box 21628, Juneau, Alaska 99802-1628.

that these evaluations not be viewed as precise analyses of the likelihoods of habitat or population conditions, but rather as the informed professional judgments of knowledgeable experts gathered together in a structured format. The process was designed to elicit judgments from these experts about relative risks and likely future outcomes. The product of each panel consists of outcome rating sheets from each evaluator and notes on the deliberations. These items were used to prepare a report for each panel (app. 1; also USDA Forest Service 1997d) that provided input to the effects analyses (USDA Forest Service 1996a) for the draft Forest plan (USDA Forest Service 1996b). Thus the effort was intended to help guide planners and to provide information for them to consider in further alternative design, but not to serve as a rigid discriminator among alternatives.

Selection of panel topics—Considerable debate has transpired about the effects of management practices on habitat that supports populations of various old-growth-associated wildlife species in southeast Alaska (Kiester and Eckhardt 1994; Suring and others 1993, 1994). Furthermore, wildlife viability was one of the five focus issues for this plan revision (USDA Forest Service 1997a). To address these issues, risk assessment panels evaluated northern goshawk (*Accipiter gentilis atricapillus*), Alexander Archipelago wolf (*Canis lupus ligoni*), marbled murrelet (*Brachyrampus marmoratus*), brown bear (*Ursus arctos*), American marten (*Martes americana*), Sitka black-tailed deer, and other terrestrial mammals. The latter included a group of more widely distributed terrestrial mammals and a group of mostly endemic, small mammals whose known distribution in southeast Alaska is somewhat restricted (MacDonald and Cook 1996a, 1996b). Each of these old-growth-associated species has an individual life history; yet, collectively their ecologies likely incorporate the breadth of forest habitat features and other attributes of environmental variation represented across the Forest.

Most of the previous work on wildlife habitats in southeast Alaska indicates a strong association between high-quality habitats and old-growth forest condition (Iverson and Rene 1997, Suring and others 1993). To look at the issue of wildlife habitat and forest condition on a larger, landscape scale rather than focus exclusively on the specific, habitat-related needs of various individual species or guilds, there also was an old-growth ecosystems panel.

Maintenance of fish habitat on the Tongass NF sufficient to sustain the productivity of this world-class resource was the topic of a recent report to Congress (Anadromous Fish Habitat Assessment Team [AFHA] 1995). It also was another of the five focus issues for plan revision (USDA Forest Service 1997a). Accordingly, a fish-riparian risk assessment panel evaluated the salmon habitat resource.

The socioeconomic environment of southeast Alaska and its relation to the resources and uses of the Tongass NF have experienced significant changes in recent years (Allen and others 1998). Additional changes were anticipated, at least partially, in response to direction provided in the Forest plan. Thus, socioeconomic considerations formed another of the focus issues for this plan revision (USDA Forest Service 1997a) and became the tenth panel topic.

Subsistence hunting, trapping, fishing, and gathering activities have long been important to many southeast Alaskan residents (Cultural Survival Inc. 1998). This importance is recognized in Federal law (U.S. Public Laws, Statutes 1980) that provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both natives and non-natives, on the public lands." The law also indicates that customary and traditional subsistence uses of the renewable resources "shall be the priority consumptive use of all such resources on the public lands of Alaska." Even though subsistence per se was not one of the five new focus issues for this plan revision, its importance was recognized as being a continuing public issue (USDA Forest Service 1997a) and the subject was included in this exercise—albeit somewhat differently than in the other risk assessment panels.

Selection and duties of panel participants—Each panel had four (or more for the socioeconomic panel and subsistence working group) evaluators who performed the risk ratings, a local subject matter expert available as a resource person, a facilitator, a scribe, and a silent observer. Panel evaluators were drawn from various Federal agencies and from Alaska state government employees (including the state university) who was appointed by the Governor per the amended Federal Advisory Committee Act (FACA; U.S. Public Laws, Statutes 1972). This compliance with FACA guidelines followed legal advice designed to avoid a potential issue on which the Forest plan could be appealed. Evaluators all had recognized expertise in the area under evaluation. For fish and wildlife, this included technical knowledge of the species and an ecological understanding of general habitat requirements. For subsistence and socioeconomics, this included knowledge of personal use of forest resources for food and fiber and an understanding of community dynamics. Each evaluator served on only one panel topic. Particularly for the wildlife panels, effort was made to select individuals who could set aside values of interested groups and focus on the biological assessment task.

In addition, candidate evaluators, save one exception, were not substantively involved in development of information specific to southeast Alaska that was relevant to the panel's evaluations. For example, the senior author of the wolf assessment (Person and others 1996) was not considered as an evaluator for the wolf panel. He did, however, serve as the resource specialist during both wolf panels. In the overall makeup of the panel, an attempt was made to obtain a range of expertise for both the species and its geographic range, a mixture of research and management backgrounds, and perspectives from habitat and population viewpoints. A limited number of true experts are available in each subject area, and compliance with FACA guidelines further limited the pool of candidates. Thus, even though the effort was made, there were limits to the diversity of participants' backgrounds and the likely existence of particular bias or preconceived ideas.

Facilitators were planning team members who were trained and knowledgeable in the risk assessment process. They conducted the panels and encouraged questions and discussion as appropriate to clarify issues while striving to keep any one member from dominating the group. Furthermore, facilitators attempted to stimulate thinking

and interchange, and identify opportunities for improving the process, probe for consistency, biases, and misunderstandings. In combination with the local resource specialist, each facilitator was encouraged to have evaluators comment on the amount and quality of available information regarding the species and its habitat needs in southeast Alaska.

Scribes were Federal employees who had enough familiarity with the subject matter and process to be able to capture the discussion. They recorded the likelihood ratings (app. 2) and captured in note form the discourse during the session. These notes were used to clarify and track points cited by the evaluators and to support later interpretations.

Identification of specific areas where information was lacking was considered valuable to development of the information needs and monitoring sections of the Forest plan (USDA Forest Service 1997a). After the process was complete, the facilitator, in coordination with the local resource specialists and the scribe, was responsible for preparing the report on that panel for the planning record (app. 1; also USDA Forest Service 1997d).

Silent observers also were Federal employees. They were not necessarily subject matter experts, but they were considered to be capable of judging objectivity. The silent observer's role was to provide a short, written evaluation to the scribe at the end of the panel deliberations on the merits of the process and its level of objectivity. If silent observers or scribes had any concerns with the process during panel deliberations, they were directed to discuss these concerns in private with the facilitator. In contrast to evaluators, scribes and silent observers often served on more than one panel. Lists of duties for the facilitator, scribe, and silent observer are in appendix 3.

Rating mechanism and outcomes, wildlife species—Because of the inherent uncertainty in these judgments, a "likelihood" approach was used to assess levels of risk for most wildlife species. In this system, evaluators individually assigned 100 "likelihood" points by alternative to all projected outcomes. Allocation of all 100 points to a single outcome was considered an expression of complete certainty in that particular outcome, whereas complete uncertainty was expressed by assigning 20 points to each of the five outcomes. Degrees of uncertainty were expressed by spreading points across the outcomes, as will be described later. These ratings were not done in an information void because all available data and pertinent information were made available to evaluators before points were assigned to outcomes.

Results from this assignment of likelihood points do not represent probabilities in the classic sense of frequencies; rather, they represent degrees of belief in future outcomes that are based on reasoned professional judgment and expressed in a probabilitylike scale. The nature of this approach is important to consider for several reasons, including the limited appropriateness of various statistical analysis procedures. The form used for recording assignment of likelihood points appears in appendix 2.

The five outcomes for the wildlife panels were:[2]

I. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain well-distributed breeding populations across the Tongass NF. The concept of well distributed must be based on knowledge of the species' distributional range and life history.

II. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain breeding populations distributed across the Tongass NF. However, some local populations are more ephemeral because of reduced population levels and increased susceptibility to environmental extremes and stochastic events associated with reduced habitat abundance and distribution. Vacated habitats may become recolonized in the future.

III. Habitat is of sufficient quality, distribution, and abundance to allow the species to maintain some breeding populations, but with significant gaps in the historic distribution in the Forest. These gaps are likely permanent and will result in some limitation of interactions among local populations. The significance of gaps must be judged relative to the species' distributional range and life history.

IV. Habitat only allows continued species existence in refugia, with strong limitations on interactions among local populations. The significance of extirpations across islands or regional landscapes must be evaluated relative to the species' distribution, range, and life history.

V. Habitat conditions result in species extirpation from Federal land.

In viewing these outcomes, evaluators were reminded that the archipelagic nature of southeast Alaska and the extent of topographic variation were important components to consider (see Burkey 1995).

For each alternative, evaluators assigned their likelihood points across the five possible outcomes. They rated the risk to maintaining habitat sufficient to support a persistent, well-distributed population across the forest after 10 decades of implementation of each management alternative. As such, individual evaluators independently compared each alternative to a preestablished set of outcomes rather than comparing directly among alternatives. Note that the outcome scale is oriented to habitat rather than population. For example, even if all evaluators were 100 percent certain that outcome I would be achieved, this does not necessarily imply that the population would achieve the associated level because of possible exogenous factors, as discussed later.

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[2] The assistance of Winston Paul Smith in developing these Tongass-specific outcomes for wildlife species from those used previously in the Pacific Northwest (FEMAT 1993) is gratefully acknowledged.

The panel on other terrestrial mammals followed this general procedure but evaluated two guilds of old-growth-associated mammals, one considered wide ranging and the other endemic. Within each guild, evaluators selected what they considered to be the most sensitive species or group of species to evaluate the effect of each alternative on the guild. For some alternatives, this group was comprised of a few or even one species. This reflected, in part, differences in geographic distribution of many island endemics and the geographic variation in human-caused disturbance represented among alternatives. In many circumstances, however, several species were viewed as responding similarly to a selected alternative. Regardless, each guild was treated similarly to the single-species panels by assigning only 100 points for each alternative.

The 100-point rating mechanism was used for all wildlife panels except Sitka black-tailed deer. The assessment panel for Sitka black-tailed deer reevaluated a habitat model designed to provide realistic estimates of deer habitat capability (a surrogate for actual population levels) across the Forest (Suring 1992). Thus, the output of this panel was unlike the other wildlife assessment panels. Rather than assigning likelihood points to outcomes, this panel identified variables important to high-quality deer habitat, defined habitat types suitable for deer, and suggested habitat capability coefficients to use in a geographically based, computerized habitat model.

Rating mechanism and outcomes, fish-riparian panel—This panel had two sets of outcomes, one focusing on habitat condition and one on channel condition. Accordingly, there were two sets of evaluators: four fisheries biologists assessing habitat and two scientists with a geomorphology-hydrology background assessing channel conditions. The fisheries biologists assessed the likelihood that implementation of each alternative would result in degradation of freshwater habitat for various species of salmon. As with the wildlife panels, the focus was on likely changes in habitat rather than in fish population levels. This panel used a different set of outcomes than those used by the wildlife panels (see below) and focused on habitat sufficient to support sustainable populations rather than the viable and well-distributed criteria used in the wildlife panels. Overall conditions likely to occur over the next 100 years were assessed; concerns regarding changes resulting from past management were considered in the discussion. This panel also evaluated effects after 10 years of alternative implementation, although these results were subsequently used to a lesser extent.

Risk assessments by alternative were made for anadromous and resident cutthroat trout (*Oncorhynchus clark*i), steelhead (*O. mykiss*), anadromous and resident Dolly Varden char (*Salvelinus malma*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), sockeye salmon (*O. nerka*), and chinook salmon (*O. tshawytscha*). Each evaluator assessed likely habitat conditions, by alternative, after 10 and 100 years of implementation and, as described above for the wildlife panels, accordingly assigned likelihood points (100) to the following outcomes:[3]

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[3] The assistance of Gordon Reeves, Ronald Dunlap, Steve Kessler, and Fred Everest in developing these Tongass-specific outcomes for fish-riparian habitats from those used previously in the Pacific Northwest (FEMAT 1993) is gratefully acknowledged.

I. New management activities will not cause additional degradation of freshwater habitat for the species. Productive habitat will be well distributed across either the Tongass NF or the historic range of the species within the Forest. Habitats that are currently degraded will recover or will be moving toward recovery after 100 years.

II. New management activities will result in minor additional degradation of freshwater habitat for the species. Productive habitat will be adequately distributed across the Tongass NF or the historic range of the species within the Forest. Most habitats that are currently degraded will recover or will be moving toward recovery after 100 years.

III. New management activities will result in moderate additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass NF, or the historic range of the species within the Forest, will contain some gaps where the species will not occur or where populations will be severely reduced. Many habitats that are currently degraded will not recover or will not be moving toward recovery after 100 years.

IV. New management activities will result in major additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass NF, or the historic range of the species within the Forest, will contain large gaps where the species will not occur or where populations will be severely reduced. Most habitats that are currently degraded will not recover or will not be moving toward recovery after 100 years.

V. New management activities will result in severe additional degradation of freshwater habitat for the species. The species will be extirpated or populations will be decimated over much of its historic range on the Tongass NF. Habitats that are currently degraded will not recover or will not be moving toward recovery after 100 years.

The physical scientists-hydrologists rated five possible outcomes for the potential effects of land use on the natural conditions of streams. Natural conditions were defined in terms of the following attributes:

- Large woody debris (pieces per 10,760 square feet of stream channel that are greater than 4 inches in diameter and 3.3 feet long)
- Percentage of pool area
- Stream width-to-depth ratio
- Pools per reach
- Residual pool depth
- Stream bed grain size distribution

Channel conditions were assessed (at 10 and 100 years of plan implementation) for each alternative, and likelihood points (100) were assigned according to the following outcomes:

I. Riparian objectives will be met throughout the Tongass NF. There will be little or no additional degradation from existing conditions due to new management activities. Areas not currently meeting riparian objectives will recover or will be moving toward recovery in 10 or 100 years.

II. Riparian objectives will be met throughout most of the Tongass NF. There will be minor additional degradation from existing conditions due to new management activities. Areas currently not meeting riparian objectives will recover or will be moving toward recovery in 10 or 100 years.

III. Riparian objectives will be met on much of the Tongass NF, but there will be substantial area where they are not met.

IV. Riparian objectives will be met on a small part of the Tongass NF, but they will not be met over the majority of the Forest. There will be major additional degradation from existing conditions due to new management activities. Most areas not currently meeting riparian objectives will not recover or will be not moving toward recovery in 10 or 100 years.

V. Riparian objectives will be met on a very small part of the Tongass NF. Almost all areas will not meet riparian objectives. There will be severe additional degradation from existing conditions due to new management objectives. Areas not currently meeting riparian objectives will not recover or will not be moving toward recovery in 10 or 100 years.

Rating mechanism and outcomes, old-growth ecosystems[4]—The old-growth ecosystems panel also assigned likelihood points to outcomes, but they focused on evaluating the persistence of interconnected and representative late-successional ecosystems across southeast Alaska. The panel relied heavily on information contained in the forest's scheme of 24 biogeographic provinces (USDA Forest Service 1991; fig.1) and closely followed the format and outcomes from FEMAT (1993). The set of outcomes defined for this panel differed from those used for the wildlife species assessments because evaluating ecosystems requires a broader perspective and different assessment criteria than examining habitat needs of individual species.

The ecosystem perspective emphasized the primary producers (e.g., plant communities), particularly the physical, chemical, and biological processes, including disturbance, that influence the dynamics of old-growth forest ecosystems. Projected effects (over 100 years) of each Forest plan alternative on late-successional forests were examined relative to variation in ecosystem quantity and quality and were expressed as likelihood points distributed among four outcomes.

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[4] The assistance of Chris Iverson, Eugene DeGayner, and Tom Spies in developing these Tongass-specific outcomes for old-growth ecosystems from those used previously in the Pacific Northwest (FEMAT 1993) is gratefully acknowledged.

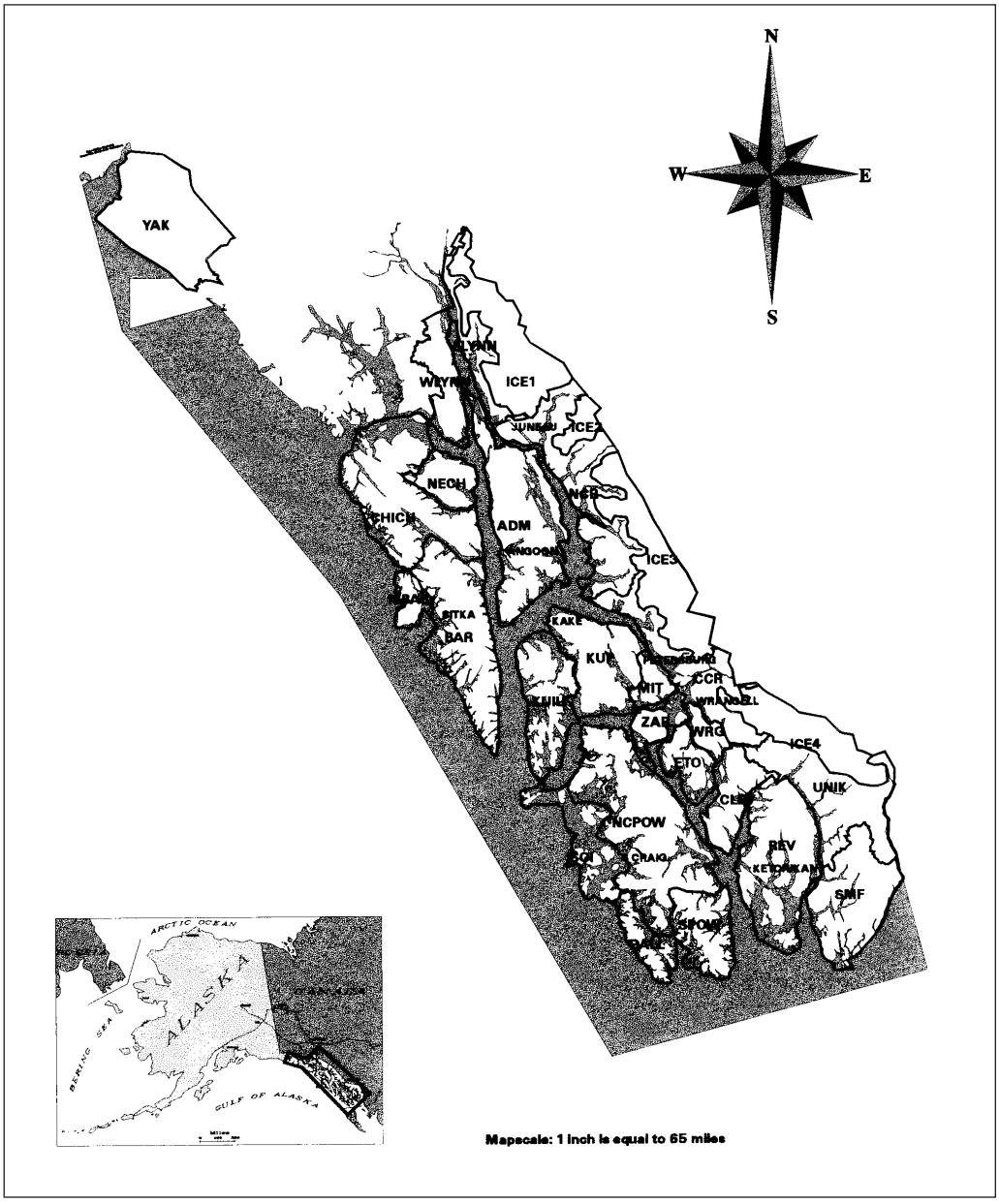

Figure 1—Biogeographical provinces used for the old-growth analysis during revision of the Tongass land management plan.

This process identified three attributes that characterize the quality and quantity components of these ecosystems: (1) abundance and ecological diversity, (2) processes and functions, and (3) connectivity. The panel evaluated each attribute, recognizing that the features were probably not completely independent. Abundance refers to the total area of forest that meets structural or functional criteria according to ecological definitions and conditions within each biogeographical province. Old-growth community types were considered to be any assemblage of species that occurs within or among old-growth forest types.

In the Tongass NF, productive old growth is defined as an unharvested forested area of trees more that 150 years old with more than 10 percent tree cover and an accumulated net saw-log volume of more than 8,000 board feet per acre (Julin and Caouette 1997). The term “productive” refers to the utility of this forested area to provide wood products, although timber volume has been used in Forest planning as a surrogate for wildlife habitat capability. The amount of productive old-growth forest present in 1954, before the onset of large-scale industrial logging, was used as a benchmark for comparisons of abundance in 2095; i.e., following implementation of each alternative for 100 years. Ecological diversity reflected the spatial and temporal distribution of late-successional assemblages across landscapes and the complexities associated with varying local geographic, topographic, edaphic, or climatic features.

Possible outcomes for maintaining abundance and ecological diversity of late-successional or old-growth ecosystems were:

I. Old growth is equal to or greater than long-term (i.e., 100 years) average and is well distributed across environmental gradients, provinces, and community types.

II. Old growth is somewhat less than long-term average in forest types of some provinces; represented in all major forest types, but underrepresented in some types (may be within range of variability).

III. Old growth is below long-term average in most forest types; examples of a few old-growth types are eliminated.

IV. Old growth is well below long-term average in all provinces; examples of several old-growth types eliminated in some provinces.

The term “processes” refer to events and associated features or conditions influencing the development and maintenance of old-growth ecosystems at all spatial and temporal scales. These include tree establishment, maturation, and death; canopy gap formation and vegetation responses; understory development; small- and large-scale disturbances, such as landslides and wind; decay and decomposition; nitrogen fixation; canopy interception of energy or matter; and matter or energy transfer among forest biota and between the forest and the biosphere. The term “functions” refers to ecological values of a late-successional ecosystem or any of its components that contribute to the maintenance of populations or species using these ecosystems and contributing to the diversity or productivity of other ecosystems. Some examples include habitat; climatic buffers; soil development, maintenance, or enrichment, such as through inputs of coarse woody debris or nitrogen fixation; dispersion of biotic and abiotic disturbance through landscapes; and nutrient cycles (e.g., production, storage, utilization, and decomposition).

Possible outcomes of the maintenance of ecological processes and functions of late-successional or old-growth ecosystems were as follows:

I. Full range of disturbance processes are represented; stand structure-dynamics and landscape structure-dynamics-age attributes occur across all provinces.

II. Moderately wide range of disturbance processes; old-growth process and functions that are dependent on large, unaltered landscapes are limited, whereas old-growth process, structure, or functions dependent on a wide range of ages are moderately limited.

III. Old-growth process, structure, or function limited in many provinces; many landscapes and stands too small or young to sustain old-growth processes, structure, or functions or stand structure does not develop.

IV. Old-growth process, structure, or function is extremely limited or absent in some provinces.

Connectivity is a measure of the extent to which the landscape pattern of the old-growth ecosystem provides for biological and ecological flows that sustain old-growth-associated animal and plant species across southeast Alaska. Connectivity does not require that old-growth habitat be contiguous throughout a region. Rather, the spatial distribution of old growth (at any one point in time) across landscapes should be such that old-growth-associated species can readily move or be carried across areas that are not in old-growth ecosystem conditions. Thus, landscape features affecting connectivity of old-growth ecosystems include distance among old-growth areas and forest conditions in the matrix between old-growth areas. The archipelagic nature of southeast Alaska and the often dramatic topographic relief accentuates the implications of human disturbance and additional habitat fragmentation. For the panel assessment, connectivity was compared to conditions in 1954 and emphasized connectivity within islands rather than among islands.

The four possible outcomes characterizing different levels of ecological connectivity of old-growth forest communities and ecosystems evaluated in this assessment were:

I. Connectivity is as effective as it was prior to large-scale timber harvest.

II. Connectivity is effective and characterized by moderate distances between old-growth areas. Matrix contains high levels of old-growth elements and riparian corridors.

III. Connectivity is moderately effective and characterized by moderately wide distances between old growth and elements of old growth in the matrix (e.g., retention patch, riparian corridors, etc.).

IV. Connectivity is impotent. There are wide distances and limited presence of connectivity elements in matrix.

COMMUNITY	ALTERNATIVE								
	1	2	3	4	5	6	7	8	9
Angoon	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Coffman Cove	⇓	⇑/⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇑	⇑
Craig	⇓	⇓/⇔	⇓	⇓	⇓	⇓	⇑	⇔	⇑/⇔
Edna Bay	⇓/⇔	⇑/⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Elfin Cove	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Gustavus	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Haines	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Hollis	⇔	⇔	⇔	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Hoonah	⇓	⇑	⇔	⇑	⇔	⇔	⇑	⇑/⇔	⇑/⇔
Hydaburg	⇓	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇑/⇔
Hyder	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔	⇔	⇔	⇔
Juneau	⇓	⇔	⇔	⇔	⇔	⇔	⇑	⇑/⇔	⇔
Kake	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇔
Kasaan	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑	⇔	⇑/⇔
Ketchikan	⇓	⇓/⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇓/⇔	⇑/⇔
Klawock	⇓	⇑/⇔	⇓/⇔	⇓	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Metlakatla	⇓	⇔	⇓	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Meyers Chuck	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇑/⇔
Naukati	⇓	⇑/⇔	⇑/⇓	⇓	⇓/⇔	⇓/⇔	⇑	⇑/⇔	⇑/⇔
Pelican	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Petersburg	⇓	⇑/⇔	⇔	⇓	⇔	⇓	⇑	⇑/⇔	⇑/⇔
Point Baker	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Port Alexander	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔	⇔
Port Protection	⇓/⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇔
Saxman	⇓	⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇔	⇑	⇔	⇑/⇔
Sitka	⇓	⇑/⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇑	⇑	⇑/⇔	⇑
Skagway	⇔	⇔	⇔	⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇔
Tenakee Springs	⇔	⇑/⇔	⇑/⇔	⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔	⇔
Thorne Bay	⇓	⇔	⇓	⇓	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Whale Pass	⇓	⇔	⇓	⇓/⇔	⇓	⇓/⇔	⇑	⇔	⇑/⇔
Wrangell	⇓	⇑/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇓/⇔	⇑	⇑	⇑/⇔
Yakutat	⇓/⇔	⇔	⇔	⇔	⇑/⇔	⇔	⇑/⇔	⇑/⇔	⇑/⇔

Key	
⇑	Expected increase
⇓	Expected decrease
⇔	No change expected

Figure 2—An example of socioeconomic panel results by community, issue, and alternative.

Rating mechanism and indicators, socioeconomic panel[5]—The socioeconomic panel used nine indicators of social and economic health rather than outcomes to evaluate the impact of different Forest plan alternatives on 32 communities across southeast Alaska. Instead of assigning likelihood points to represent the predicted degree of effect of each Forest plan alternative, these evaluators independently noted an overall direction of effect (positive, negative, or unchanged) for each indicator across every individual community (fig. 2). This process was similar to that used previously by the Chequamegon and Nicolet National Forests in Wisconsin to identify methods and principles for evaluating the social and economic impacts of implementing ecosystem management (Jakes and Harms 1995). Because of a concern that

[5] The assistance of Guy Cellier in developing Tongass-specific information for the socieoeconomic panel and subsistence working group is gratefully acknowledged.

factors exogenous to the Forest plan could have a possibly large but unknown effect on these communities over extended time frames, this panel used a 10-year view of the future rather than the 100-year view used by most other panels.

The list of socioeconomic indicators used in the evaluations was derived from previous experience with issues of importance to communities in southeast Alaska. For each of the selected indicators, a brief written description of the issue and associated implications were provided to panel evaluators, as described below:

1-4. **Resource jobs:** These indicators consider the type of job, how it may be affected by Forest management actions (both direct and indirect), seasonality, dollar value of the job, etc. There were separate resource job categories for timber, commercial fishing, tourism and recreation, and mining.

5. **Economic structure and diversity:** This indicator considers the structure of the community and how it might change owing to the alternative. Is the community's economy dependent on one or many resources? Is the prevalent economic base well diversified? and How is this likely to be affected by the alternative?

6. **Community stability:** How will the current stability within the community be affected by this alternative, based on your knowledge of what this stability is based on?

7. **Quality of life:** What constitutes the most important quality of life issues for the community? and How could this alternative affect these issues?

8. **Recreational opportunities:** Is this alternative likely to affect recreational opportunities? Consider access, quality of the opportunity, travel time, increased road density, and competition.

9. **Access to traditional lifestyle:** People in southeast Alaska have many different requirements for maintaining their particular chosen lifestyle. Even though this indicator category overlaps with some of the others above, are there additional unique lifestyle aspects that may be enhanced (positive or up arrow) or diminished (negative or down arrow) by this alternative?

Rating mechanism, subsistence working group (see footnote 5)—The subsistence working group was structured more informally than were the panels. The rating mechanism used for the subsistence evaluations therefore was less formal that those described above. The group developed five indicators to help them focus on the likely community-level, subsistence-related affects of each alternative. The focus was on management actions that would affect subsistence use of deer and fish and to a lesser extent the gathering of berries, bark, and other items from the Forest. The indicators were:

1. **New urban access:** Would new road access increase competition from non-subsistence users (primarily from Juneau and Ketchikan)?

2. **New rural access:** Would new road access increase competition for the specific community from other rural communities?

3. **Fish streams crossed:** An assumption was made that an increase in road density would result in some degradation to streams and subsequent reductions in fish production and availability to subsistence users. The amount of timber harvest and road density around each community (by alternative) were used as criteria to evaluate the effect of this assumption.

4. **Substantial part of remaining old growth cut in community home range:** Because old-growth forest in a community's home range is important for a variety of subsistence resources besides deer (such as berries, bark, etc.), the assumption was made that cutting a substantial part of a particular home range would be detrimental to subsistence users.

5. **Projected deer harvest >10 percent:** An assumption was made that a deer harvest of more than 10 percent of the habitat capability in wildlife analysis areas[6] (USDA Forest Service 1991) around communities could lead to a decline in deer availability for subsistence users. To evaluate the impact of this assumption, wildlife analysis areas exceeding a 10-percent harvest were highlighted on maps. The habitat capability calculations were based on the model developed by the Sitka black-tailed deer panel.

Primarily by responding to these criteria in a "yes or no" fashion and then aggregating the results, the working group evaluated Forest plan alternatives by community or groups of communities. Twenty years was used as an evaluation period to estimate cumulative effects, the period considered necessary for the next generation to be able to harvest deer.

Conducting the panels—Each risk assessment panel was comprised of a facilitator, a local resource specialist, a scribe, a silent observer and several evaluators. Four evaluators served on the wildlife, fish-riparian (only two for channel conditions), and forest ecosystems panels, five on the socioeconomic panel, and seven on the subsistence working group. One to two weeks before each panel session, evaluators were mailed brief descriptions of the alternatives to be evaluated, procedures for the panel process, and information regarding the Tongass NF. Panel evaluators were asked to familiarize themselves with this material before convening the panel.

Except for the first American marten panel, which was held for logistical reasons in Seattle, Washington, each panel met for 1-1/2 to 2 days in Juneau, Alaska. When it could be arranged, two or more panels were held concurrently. This approach required less repetition in the presentation of general information provided to all panels.

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[6] Flynn, R. June 5, 1989. Letter to TLMP Interdisciplinary Team explaining the new wildlife analysis areas. On file with: U.S. Department of Agriculture, Forest Service, Tongass National Forest Land and Resources Planning Record, P. O. Box 21628, Juneau, AK 99802-1628.

For about 4 hours at the start of the session, the entire group of evaluators, facilitators, scribes, silent observers, and local resource specialists for each set of panels met together for an orientation session. The process began with introductory presentations regarding the environmental and cultural settings of southeast Alaska; the forest planning process, including regulations in the National Environmental Policy Act (U.S. Public Laws, Statutes 1970) and the National Forest Management Act (U.S. Public Laws, Statutes 1976); and an overview of recent events affecting forest management in the Tongass NF (e.g., petitions to list as endangered the Queen Charlotte goshawk and the Alexander Archipelago wolf) and the alternative development process used in this planning effort.

Following this general overview, a detailed description of the general assessment procedures and panel rating process was presented with examples. This presentation included a statement on the purpose of conducting the panels and an explanation of how the information derived from them would be used by the planning team. It was emphasized that this process was not designed to force consensus among panel evaluators, which is somewhat in contrast to a true Delphi process (Linstone and Turoff 1975). General questions regarding the process, the environment, and the alternatives were answered.

The following information was referenced during the introductory presentations or elsewhere in the panel process and made available for further review (this material is all part of the planning record [USDA Forest Service 1997d]): the framework for developing Forest plan alternatives; a map of land use designations (LUD) for each alternative; a map of productive old growth across the Forest in 1954 and in 1994; a map of value comparison unit (VCU)[7] boundaries and total miles of existing roads; Forest-wide standards and guidelines for each alternative; current harvest levels stratified by VCU; and total acres and location map of projected harvest through 2095 for each Forest plan alternative. Medium (1,000 to 10,000 acres) and large (>10,000 acres) blocks of contiguous productive old growth were superimposed on each of the alternative projection maps for 2095. Considerable additional information was provided to the fish-riparian panel, as indicated in appendix 3, which also lists additional information provided to the various wildlife panels.

After this general meeting, each panel met separately. Each session started with a focused introduction by the facilitator to review the role of all panelists, further review the rating system and assignment of likelihood points among outcomes by evaluators, discuss outcomes with an objective of achieving a common understanding, provide further clarification on alternatives as needed, and introduce the local resource specialist. The local resource specialist then gave a Tongass-oriented presentation on the species or resource to be evaluated by the panel. For wildlife panels, habitat issues specific to southeast Alaska were highlighted (e.g., island biogeography, natural fragmentation of habitat, land ownership patterns, past timber harvesting practices, historical distribution of species).

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[7] Value comparison units (VCUs) are distinct geographic areas, roughly analogous to watersheds, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow watershed divides. The Tongass NF has 926 VCUs averaging 18,000 acres in size.

This presentation included handout material, some of which had been made available in advance to panel evaluators. Specific but neutral questions relative to the alternatives were addressed to the local resource specialists and answered, but at this stage of the process there was no discussion allowed among evaluators on the attributes of alternatives. Discussions on the biology of the organism and its habitat requirements were allowed. This distinction was maintained to ensure to the extent possible that the initial assignment of likelihood points to outcomes was done independently by each evaluator. The facilitator assured evaluators that discussion specific to each alternative would occur after the first assignment of likelihood points.

Following the presentations and the question and answer session, each panel member individually made, without consultation, their assignment of likelihood points by alternative. This process took an hour or more as evaluators consulted handout material, their notes, and particularly the maps that projected distribution of old- and young-growth forest after implementation of each alternative for 100 years.

After these initial, independent evaluations were completed and recorded by the scribe (generally at the end of the first day), they were shared anonymously and the facilitator began discussion. The purpose of this discussion was for evaluators to clarify why particular likelihood point assignments were given, clarify differing interpretations of available knowledge, identify knowledge gaps, and clarify how this lack of information was handled by evaluators. Following the discussion, each panel member could again assign likelihood points to each alternative. The facilitator emphasized that the process was not designed to necessarily achieve a consensus rating for each alternative; indeed, evaluators need not change any of their initial assignments of likelihood points. As before, ratings of each evaluator remained anonymous; the scribe recorded scores and computed a mean for each alternative. We thus had an assignment of likelihood points by each evaluator before and after discussion.

In the wildlife panels, the discussion also attempted to clarify which outcomes the evaluators thought would represent habitat conditions suitable to maintaining well-distributed populations. Although no “viability minimum” for persistence of a well-distributed population across the Forest was presented, what particular changes could be made to alternatives to concentrate assignment of likelihood points to either outcome I or II for each alternative was used as a guide in this discussion. The scribe captured salient components of these discussions.

Somewhat in contrast to the wildlife panels, the socioeconomic panel began with a discussion of the socioeconomic indicators, and the local resource expert presented background information on each community to be evaluated. An initial independent evaluation of each community occurred without discussion of Forest plan alternatives or communities. Following evaluation of all communities in each area of the Forest (Chatham, Stikine, and Ketchikan), some discussion occurred.

For all panels, discussions were structured to indicate specific alternative components that could be modified to improve the rating. For example, the discussion attempted to clarify how each of the following components, as incorporated among the various alternatives, influenced each panel member’s assignment of likelihood

points: (1) amount of Forest land available for timber harvest, (2) width of riparian buffers, (3) management activities within riparian buffers, (4) planned timber harvesting rotation (i.e., 100 years vs. 200 years), (5) size and distribution of old-growth reserves, (6) width of estuary buffer, (7) width of beach fringe buffer, (8) watershed-scale timber harvesting constraints, (9) constraints on harvesting timber in primary winter habitat for Sitka black-tailed deer, (10) type of timber harvest (i.e., clearcutting vs. single-tree or small-group selection), (11) additional and total miles of roads, and (12) number of designated wild and scenic rivers.

The facilitator also tried to ensure that assignment of likelihood points was not influenced by factors exogenous to the set of alternatives. For example, risk ratings for murrelets should not be low because of a concern with loss of birds to oil spills or gill netting. Such factors were outside the scope of the analysis and considered equally influential on all alternatives. Discussions to be sure that this sort of information was not used in evaluations also helped to elucidate how judgments were reached.

The discussion attempted to clarify if there were specific biogeographic areas in the Tongass NF where concern was extremely high and thus influenced the forest-wide assignment of likelihood points. For example, if concerns about viability of the northern goshawk were particularly high for southern Baranof Island, then evaluators were asked to characterize what, if any, area-specific mitigation procedures might improve the situation.

After the discussion and second evaluation were completed, panelists were thanked for their participation and the session adjourned. The facilitator used the sets of evaluation forms (see apps. 2 and 5) and the scribe's notes to prepare the panel report (app. 1; also USDA Forest Service 1997d).

Second Set of Risk Assessment Panels

As the final alternative for the Tongass Forest plan was being developed, there was considerable interest expressed by the public and within the Forest Service, the Departments of Agriculture and the Interior, elsewhere in the Administration, and Congress regarding the risk that the alternative might pose to Forest resources, particularly wildlife and fish (neither alternative 10, the Forest Supervisors' preferred alternative in the revised supplement to the draft environmental impact statement [RSDEIS; USDA Forest Service 1996a], nor alternative 11, the then-emerging final alternative, had been subjected to previous risk assessment panels). Recognizing and understanding this interest, the Director of the Pacific Northwest Research Station commissioned the PNW scientists on the planning team to conduct a second set of risk assessment panels. They were conducted in March and April 1997 to provide further information for the effects analysis in the final environmental impact statement for the Forest plan. This set of six risk assessment panels evaluated the northern (Queen Charlotte) goshawk, Alexander Archipelago wolf, brown bear, American marten, fisheries resources (anadromous and resident), and other terrestrial mammals.

This second set of risk assessment panels was commissioned to subject alternatives 10 and 11 to this process and, in so doing, provide a context to help with interpretation of the results. This context was provided for by including some additional alternatives in the array evaluated by these panels. The additional alternatives included:

1. Alternatives 1 (current condition) from the RSDEIS (USDA Forest Service 1996a) and 9* from the 1979 Forest plan (USDA Forest Service 1979): They provided reference points to the alternatives previously evaluated by risk assessment panels. These reference points were important to the interpretation of results from both sets of panels. Having panelists evaluate the historical condition (pre-1954, before the onset of large-scale industrial logging) projected into the future as an alternative, something not done in the first set of panels, also was done to aid interpretation of results (Lehmkuhl and others 1997).

2. A draft of the paper by Everest and others (1997) was available to managers in winter-spring 1997. In it, the authors inferred that if the then-emerging final alternative had been subjected to risk assessment panels for the northern goshawk and the Alexander Archipelago wolf, then the results of those panels likely would have fallen between those obtained for alternatives 1 and 5 in the first set of risk assessment panels. Adding alternative 5 from RSDEIS to the array to be evaluated by this set of risk assessment panels allowed for testing that inference.

3. Alternative 9 from the 1979 Forest plan (USDA Forest Service 1979), as it existed in winter-spring 1997, differed from the version paneled previously (9*) in that updates to the database for lands suitable for timber harvest reduced the amount of old-growth forest that would be harvested over 100 years by some 350,000 acres. Analysis by Everest and others (1997) suggested that area of old growth harvested was an important habitat feature in the first set of risk assessment panels. Because the U.S. Fish and Wildlife Service was basing its then-in-progress listing review of the northern goshawk and the Alexander Archipelago wolf under the Endangered Species Act (U.S.Public Laws, Statutes 1973) on alternative 9 in a mixed form (partially alternative 9 and partially 9* as described here), it was considered desirable to evaluate both forms of alternative 9.

4. There was considerable interest expressed during the public comment period regarding alternative 2 in the RSDEIS (USDA Forest Service 1996b). In response to this interest and to provide another reference point for analysis, this alternative also was evaluated by the second set of panels.

Thus, this second set of panels assessed the risk of implementing alternatives 1, 2, 5, 9, 9*, 10, and 11 and the historical condition to maintaining well-distributed habitat for the six species and groups listed above. It was not considered necessary to evaluate additional alternatives for benchmark information to aid in interpreting results for alternatives 10 and 11. In addition, previous experience indicated possible impacts to the utility of the process if panelists gathered in this format were asked to evaluate more alternatives than was considered to be absolutely necessary. As indicated earlier, the process is not designed to be a fine-precision exercise, but rather one to provide decisionmakers and the public with informed professional judgments obtained through a structured, objective process.

As with the primary process used in the first set of risk assessment panels, these panels were designed to evaluate the likelihood that various Forest plan alternatives would maintain enough well-distributed habitat to support viable, or sustainable in the case of fish, populations of specifically identified, old-growth-associated species. As with the previous wildlife panels, these evaluations were made under the assumption that each management alternative being evaluated would be implemented for 100 years.

Evaluators for this second set of panels were the same individuals as previously for the other terrestrial mammals and Alexander Archipelago wolf panels. The same evaluators also were used for the fish-riparian panel, although only habitat conditions were assessed and thus the physical scientists and hydrologists who participated in the first panel were not involved in the second one. One evaluator changed on the bear panel owing to a change in employer and thus his FACA status; two evaluators changed on the American martin panel and one on the northern goshawk panel owing to their unavailability. Newly selected evaluators met the criteria described previously. Facilitators, scribes, and silent observers were selected as described for the first set of panels.

These panels were all held in Juneau, Alaska, and conducted under the same format used for the first set of panels with two additions: an appraisal of alternative features and a more structured discussion regarding viable and well-distributed wildlife populations.

Appraisal of alternative features—From reports from the first set of risk assessment panels (appendix I; also USDA Forest Service 1997d), a synthesis was prepared to clarify how panel evaluators considered that the various elements of draft alternatives would contribute to maintaining wildlife viability (see table 3 in Everest and others 1997). Because this synthesis was done after the fact, there was some subjectivity in assigning values to the various features discussed by the panelists. To avoid this postpanel process, each evaluator in the second set of panels was asked to complete an alternative appraisal form (app. 5) as they did their assignment of likelihood points to alternatives. As described for the assignment of likelihood points during the first set of panels, this appraisal form was also filled in twice—before and after alternative-specific discussion.

Indepth discussion of viable and well-distributed populations—During discussions in the first set of panels, the five outcomes were examined relative to maintaining habitat sufficient to support well-distributed and viable populations of various species across the planning area. Notes from these discussions and some postpanel phone calls to evaluators to help clarify their thoughts were used to derive for reporting purposes two new categories from the original five outcomes: (1) outcomes that represented habitat conditions such that wildlife populations likely would remain well distributed, and (2) outcomes that represented habitat conditions such that wildlife populations likely would not remain well distributed.

Category 1 was generally perceived to represent outcomes I and II whereas outcomes III, IV, and V generally fell in category 2. Subsequent data presentations from the first set of panels often used mean values from these derived outcomes to present the results (Everest and others 1997, Swanston and others 1996). This approach was consistent with that used in FEMAT (1993).

The discussion on habitat sufficient to support "well-distributed" populations had limited structure in the first set of panels and did not address possible relations between "well distributed "and "viable." To further aid understanding on these issues, the second set of panels had a rigorous, indepth discussion of these terms and how they related to the habitats described in the five outcomes used in the assignment of likelihood points. These discussions were captured in the notes for this second set of panels and are presented in the panel reports (app. 1; also USDA Forest Service 1997d).

With these additions and the availability of reports from the first set of panels, the second set of panels proceeded in the same way as the first. The written reports from these panels (app. 1; also USDA Forest Service 1997d) frequently reference the earlier panel for the particular species and thus provide some further summary information from both panels.

During preparation for the second set of panels, concerns were raised about various outside parties attempting to influence the process by contacting the evaluators before their participation in these panels. To determine the extent of any such contact, all evaluators were asked during the second set of panels if they had received any outside contact regarding their participation in this effort; none had.

Results and Discussion

All 16 panels were completed in a timely manner under often hectic and contentious circumstances.[8] Results from all panels were prepared as individual reports that were placed in the planning record (app. 1; also USDA Forest Service 1997d). From all panels where likelihood points were assigned, all data were presented in the reports. In the summary information, mean values from the second set of evaluations were used for comparisons, as they were considered to be the best single indicator of the results. Because of the nature of the data and the strong desire to not overstate the degree of confidence in it, no statistical tests were conducted.

As anticipated, these panel results became an integral component of the effects analysis section of the environmental impact statement (USDA Forest Service 1997b), which provided the context for completing the Forest plan (USDA Forest Service 1997a). Besides the expressed desire to have risk assessments conducted on the various management alternatives in the draft Forest plan, the need to use these panel results in evaluating effects of alternatives on various fish and wildlife species was heightened by the decision to not use outputs from habitat capability models (Suring 1992) to compare alternatives, as had been done in the past (USDA Forest

[8] For example, the original schedule for holding the risk assessment panels was interrupted twice by Federal government shutdowns, which were due in part to the controversy generated between Congress and the Administration by the planning effort for the Tongass NF.

Service 1991). The lack of spatial specificity in these models, as well as other concerns with their reliability, were primary components of the decision to not use them in the effects analysis.

The exception to this approach was the habitat capability model for deer (Suring 1992), which was the focus of the deer panel. The panel discussed the model and suggested certain changes to it. With these changes and some further postpanel enhancements, it was used in projecting habitat capability for deer in the Forest plan (USDA Forest Service 1997a). The importance of deer as the primary food source for wolves was emphasized repeatedly in the wolf panel. The importance of deer as a food resource to rural residents of southeast Alaska was also a primary feature of the subsistence working group, which emphasized the need for habitat protection within each community's home range—factors considered in the final plan.

Results from both fish-riparian panels were in close agreement with those in AFHA (1995) which formed the base for development of the "AFHA consistent" (Everest and others 1997) standard and guidelines in the Forest plan. Results from both goshawk panels and both wolf panels were in general agreement with the information in the assessments on these species in southeast Alaska (app. 1; also Iverson and others 1996, Person and others 1996), although some would suggest that the second wolf panel led to a more liberal interpretation of conservation needs than did the assessment.

The assessments and panels for these species, coupled with the more general ecosystems panel, were integral to development of the conservation strategy in the Forest plan (USDA Forest Service 1997a). This strategy was of heightened importance because of the deliberations by the U.S. Fish and Wildlife Service regarding the possible threatened or endangered status for the wolf and goshawk in southeast Alaska that were ongoing at the time.[9] Results of the marbled murrelet panel were also in concert with the assessment on that species (DeGange 1996) and contributed to the overall conservation strategy.

Results from the first set of panel evaluations were available to the Forest Supervisors as they prepared their preferred alternative (USDA Forest Service 1996a, 1996b). Results from the second set of panels clearly were used by managers in writing the final alternative in the Forest plan. This influence is evident in appendix N of the environmental impact statement (USDA Forest Service 1997b); Forest plan standards and guidelines for goshawk, marten, and small mammals (USDA Forest Service 1997a); and language on these same species in the record of decision (USDA Forest Service 1997c). Additional conservation measures were adopted by managers in part to reduce the risk, as indicated by the panel results, of not maintaining habitat sufficient to support viable and well-distributed populations of these species. These items were noted in the evaluation of the use of scientific information in the Forest plan (Everest and others 1997).

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[9] In August 1997, the U.S. Fish and Wildlife Service determined that listing of the Alexander Archipelago wolf and the northern goshawk in southeast Alaska as threatened or endangered was not warranted.

Another, perhaps indirect, use of the panel results in the Forest plan was in generating the "Information Needs" section (see app. B in USDA Forest Service 1997a). Many of the priority information needs also were discussion topics during panel deliberations; for example, a priority information need deals with the relations between socioeconomic conditions in rural communities and resource allocations in the Tongass—a focus of the socioeconomic panel. In both of the other mammals panels, the critical need for additional habitat use and distribution information for small, endemic mammals was specifically noted and became a high-priority information need. That the panel process contributed to defining information needs is in agreement with Cleaves' (1995) suggestion that uncertainty assessments can help guide information gathering and research.

The second set of panels also specifically addressed the issue of habitat sufficient to support viable and well-distributed populations of various wildlife species. In the panel evaluators' view, the terms were not synonymous. The concept of well-distributed habitat was a more difficult condition to meet than was maintenance of habitat sufficient to sustain viability. Well-distributed habitat dealt primarily with the likelihood that modified habitat would no longer be capable of supporting a continuous territory-to-territory distribution of resident individuals or groups; i.e., some previously occupied territories might become "permanently" (within the 100-year time span) vacant.

For the concept of viability, evaluators for the second set of panels indicated that populations could continue to interact and interbreed within their historical distribution across the Tongass NF in the presence of some additional human-caused "permanent" (over the 100-year time span) gaps in habitat. The presence of additional gaps did not necessarily mean that interaction among population segments would be diminished.

The second wolf panel noted the ability of individual wolves to cross many miles of habitat no longer occupied by wolves to interact and breed with other wolves. The American marten panel understood that their concept of a habitat gap—being as wide as a previously occupied home range—likely had little if any effect on species' interactions or interbreeding. It would take the loss of several contiguous home ranges (1 to 3 square miles each) to affect interaction enough to markedly influence viability.

The discussion on habitat sufficient to support viable and well-distributed populations is interesting in its own right, particularly when one reflects on the viability direction contained in the regulations (USDA Forest Service 1982) for implementing the National Forest Management Act (Raphael and Marcot 1994; U.S. Public Laws, Statutes 1976).[10]

[10] Federal regulations for implementing the National Forest Management Act (USDA Forest Service 1982 [36 CFR 219.19:43048]) state: "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." A viable population is defined for planning purposes as "one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area." Furthermore, "habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that individuals can interact with others in the planning area."

This discussion also serves, however, to emphasize that interpretation of the panel results is incomplete if the focus is only on the likelihood scores—as frequently happened with these results by many interested parties.

Because of the discussions regarding concepts of viable and well-distributed populations that occurred during the second set of panels, the results of these panels likely reflect a more complete understanding of these concepts relative to the habitat outcomes than do the first set of panels. These discussions generally indicated that habitat conditions associated with meeting the concepts fell somewhere within outcome III with well-distributed being a more stringent criterion to meet than viable. The likelihood of maintaining habitat sufficient to support viable and well-distributed populations therefore was not fully captured by any one outcome and thus was summarized as the range in means between scores assigned to outcomes I and II, combined and outcomes I, II, and III combined (app. 1). This approach also portrays the quantitative results of the panels as a range rather than perhaps causing a mistaken perception of precision by providing only a single number.

The following tabulation shows the likelihood of maintaining habitat sufficient to support well-distributed and viable wildlife populations, as assigned by the second set of panel evaluators to the then-emerging final alternative for the Tongass land management plan (alternative 11):

Species	**Likelihood of well distributed and viable**[11]
Northern goshawk	71 — 97
Alexander Archepilago wolf	83 — 97
Brown bear	68 — 93
American marten	36 — 91
Other mammals (endemic)	19 — 55
Other mammals (widely distributed)	38 — 82

For the second set of panels, a qualitative appraisal of the alternative features in terms of their contributions to maintaining habitat was made by the evaluators (app. 5). Full interpretation of the panel information requires use of all these results, not just the likelihood scores. The appraisal of alternative features and the panel notes provide a credible context to track the assignment of likelihood points to outcomes. Clearer direction for use and a modified format for this appraisal form likely would have enhanced its utility; several evaluators expressed difficulty with it.

[11] For the second set of risk assessment panels, the likelihood of maintaining habitat sufficient to support well-distributed and viable wildlife populations is appropriately presented as being within the mean of the scores that bracket outcome III, as this "zone" is where the evaluators generally indicated that their concepts of viable and well distributed fell. Evaluators indicated that the likelihood of well distributed equaled the sum of outcomes I and II (19) for endemic mammals.

Some other items that could be considered to improve the process of conducting such risk assessment panels include developing a checklist of specific items that the silent observer needs to consider, making background information available to evaluators at least 2 weeks before convening the panel, enhancing clarity of how to deal with the relations between the planning area and the portion of that area occupied by National Forest or other Federal lands, and clearly addressing the possible anchoring effect that may be generated by a first set of panels if the same evaluators are going to participate in a second set of panels.

An often cited but erroneous interpretation of these panel results is that only a mean value of 80 or more likelihood points assigned to outcomes I and II combined is an acceptable score. This misconception likely developed from the FEMAT panel process, where a summary statistic of 80 likelihood points assigned to their outcome A (roughly comparable to our combined outcomes I and II) was used for comparison purposes (Cleaves 1995, FEMAT 1993, Starkey 1998). In the Tongass plan revision process, the PNW scientists on the team did not designate what level of risk was acceptable for these panel results or for any other component of the manager's decision (Everest and others 1997). Rather, the panel results served as documentation of the levels of risk associated with an array of management alternatives about which the managers made informed decisions. As indicated by Starkey (1998), the degree of risk, as generated from such assessment panels, that is "acceptable" is a societal decision, not one of science.

Although the sum of likelihood points assigned to outcomes I and II combined or outcomes I, II, and III combined was a commonly used parameter during discussions of these panel results, another valid way to view the outcome scores is to focus on the assignment of likelihood points to outcomes IV and V. These values represent the likelihood that a species would exist only in refugia (outcome IV) or would be extirpated (outcome V) from the planning area in 100 years. Using American marten and the emerging final alternative from the second set of panels as an example, there was a mean score of 9 points assigned to outcome IV and none to outcome V. Thus, after 100 years of full implementation of alternative 11 across the Forest (e.g., the available sale quantity is harvested every year for 100 years), there was a high (91 points out of 100) likelihood that habitat sufficient to maintain persistent populations of American marten will occur in a spatial pattern considerably more dense than mere refugia. There was zero likelihood that American marten would be extirpated from the forest.

Another often misunderstood component of the panel evaluation process is that all ratings represent risk levels under a maximum effects scenario; e.g., the maps for each alternative portrayed effects of implementation at the full implementation level (maximum allowable cut is harvested each year). In reality, this action is highly unlikely, but the assumption was necessary to put comparisons among alternatives on the same base. The 100-year timeframe was challenged by some as being far too long because plans are revised every 10 years; it was criticized by others as being far too short to properly capture the likely cumulative effects of management actions on habitat modification. Because evaluations of the timber resource were made on a 150-year timeframe in this Forest plan (USDA Forest Service 1997a), 100 years seems a reasonable timeframe within which to make the habitat evaluations.

Attention also was drawn to the different standard used in evaluating risk to various wildlife species—viable and well-distributed populations—and that used for fish—sustainable levels. This choice was a management decision and not an inherent property of the panel process, although it might have been difficult to conduct the fish-riparian panel by using a concept of viable and well distributed and the result may have been less useful to managers.

Like much of the effort associated with this revision of the Tongass land management plan, the panel process for risk assessment and results derived from these received intense public, political, and media scrutiny. Some insight into the nature of this scrutiny can be gained by reading the proceedings from the April 18, 1996, Senate Hearing on the Tongass Land Management Plan (U.S. Senate Hearing 104-670, 1996). For example, during this hearing, Alaska's Senator Murkowski, chairman of the Senate Committee on Energy and Natural Resources, likened the process employed in the socioeconomic panel to use of a Ouija® board. His Alaskan colleague, Representative Young (in his role as chairman of the House Committee on Resources), subsequently quoted rather factually from the results of this same panel in a letter to the Alaska Regional Forester discussing impacts to local residents generated by the Tongass plan.[12]

The anxiety on the part of some regarding the risk assessment panels may have resulted from the perception that a closed door process was used to conduct them in contrast to the perceived openness of the overall land management planning process. Some would suggest that because it's the public's business, it should be conducted in public. This argument also could be applied to other components of the planning process not open to the public. Others indicated that by not having the risk assessment panels open to the public, a tremendous educational opportunity was lost. The other side of this argument is that the desire to have them open was really a hidden attempt to try to influence the outcome.

Risk assessment panels clearly need to be conducted in an environment where the assembled experts can focus on the task, a job made difficult in a public forum. Cleaves (1995) suggests that anonymity and confidentiality of panel evaluators is important, although these conditions were not maintained for the Tongass panelists. In fact, the silent observer's report from one panel was leaked to the press shortly after completion of panel deliberations, which led to the false charge that because one of the evaluators was the president of a local Sierra Club chapter (not true) the panel was biased (Whitney 1996). Those desiring to use expert judgment in risk assessment panels in the future to address management questions are encouraged to consider mechanisms that make the process more available to the public without sacrificing the integrity of the results.

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[12] Young, Don. 1998. Young wants Forest Service to increase assistance to Alaska communities harmed by Clinton's anti-Tongass plan [Press release]. March 31. Washington DC: U.S. House of Representatives, Committee on Resources. 2 p.

The expressed concern by certain individual and interest groups regarding the use of risk assessment panels during the plan revision is perhaps a symptom of the larger debate regarding application of risk assessment in whatever form to ecological problems. There is strong opinion about approaches and use of the resulting information when uncertain outcomes are being estimated. Lackey (1996), for example, characterizes the spectrum of debate on use of risk assessment in an ecological context from those who would like to mandate its use (including some in Congress and certain scientists) to those who characterize risk assessment as "scientifically indefensible, ethically repugnant and practically inefficient." Todd and Burgman (1998) present an interesting statistical treatment regarding realistic levels of uncertainty and reliability in such data. Lackey (1996) further comments that risk analyses of any significant ecological problem will result in options that create both big winners and big losers—a further reason why results from such risk assessment panels should be presented as input to decisionmakers and not used as the sole basis for decisionmaking.

Another component of the closed versus open debate over these risk assessment panels was the limitations that FACA (U.S. Public Laws, Statutes 1972) placed on the selection of participants. Because of FACA direction, only Federal employees or State of Alaska employees specifically appointed by the Governor of Alaska to represent him in the process could serve on the panels. This direction precluded selection of any non-Alaska university scientists or various private sector scientists who likely could have met the other necessary qualifications. With an apparent lack of appreciation of this legal limitation, several critics summarily dismissed the composition of the panels as being inherently biased (toward a need for further conservation) and used this as a basis to challenge the results (see Tongass land management plan appeals 97-13-00-0097 and 0103 and 0107 in USDA Forest Service 1997d). Interestingly, these FACA guidelines were not followed in risk assessment panels for FEMAT (FEMAT 1993) or the Columbia basin project (Lehmkuhl and others 1997).

The PNW scientists involved in the Tongass process stressed that their roles involved production of value neutral information and their not advocating any particular outcome (Everest and others 1997, Mills and others 1998). In following this approach, they used the panel results as an expression of risk based on the technical expertise of the evaluators. Overall, they found that the results provided a sound, technically competent representation of the risks associated with the various management alternatives evaluated.

There is, however, a particularly difficult problem when relying on the opinion of technical experts (instead of hard data): that of separating clearly their personal and organizational values from their technical opinion (Lackey 1996, Philpot 1992). Our mechanism for detecting such situations was use of the silent observer. It is not known how successful this mechanism was, although only one instance of possible bias was noted. One improvement might be to make available to the silent observer a checklist of items to consider. Other ways of attempting to achieve objective results when relying on professional judgment should be pursued.

Other than assuring that all three components of the process—the likelihood scores, the discussion notes, and the appraisal of alternative features—were internally consistent, rankings were not "adjusted." In FEMAT (1993) and the Columbia basin

assessment (Lehmkuhl and others 1997), certain rankings of risk assessment panels were “changed” if the panel leader or other team members considered that errors or misinterpretations had occurred. That such adjustments were not made with risk assessment panel results during the Tongass revision was partially because the PNW scientists assigned to the revision team had limited expertise in some of the areas that were paneled. It also was not done because the scientists were concerned that any changes might have been viewed as an attempt by them to achieve a particular outcome. However, in developing future risk assessment panels to address ecological problems, a mechanism to deal with this issue needs to be part of the planning process.

Conclusion

This paper describes the process used to conduct the risk assessment panels for revision of the Tongass land management plan, provides an overview of the results and how they were used in decisionmaking, and discusses some reactions to the effort. Although controversial, the results of the risk assessment panels did form a basis for development of the environmental impact statement (USDA Forest Service 1997b), which provided the context for completing the Forest plan (USDA Forest Service 1997a). Whatever the future holds for ecological risk assessment (Lackey 1994), I encourage those contemplating the use of this risk assessment technique to learn from and build on the details and procedures presented here and elsewhere about the Tongass experience.

Based primarily on the FEMAT experience (Cleaves 1993, FEMAT 1993, Starkey 1998), Cleaves (1995) provides an excellent set of guidelines to consider when conducting risk assessment panels and communicating their results. In the absence of “complete” (or that judged to be sufficiently comprehensive), data-based information, this Tongass experience supports Cleaves’ (1995) view that assessments by subject matter experts are most reliable when rigorous and systematic processes have been employed to control and compensate for outside influences, inconsistencies, and eccentricities inherent in human judgment. Furthermore, to be useful to decisionmakers, the assessment results must be timely and presented in a form that can be readily used. Followup procedures to evaluate how decisionmakes used results from risk assessment panels and other information provided to them (Everest and others 1997) further enhances the value of the product.

Metric Equivalents

1 inch = 2.54 centimeters
1 foot = 0.305 meter
1 square foot = 0.0929 square meter
1 acre = 0.405 hectare
1 mile = 1.61 kilometers
1 square mile = 2.60 square kilometers

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Appendix 1

This appendix consists of the 16 individual risk assessment panel reports and the report of the subsistence working group. The original documents are on file in the planning record for the Tongass National Forest plan revision (USDA Forest Service 1997d). The items listed in this appendix are accessible at the web site for the USDA Forest Service, Pacific Northwest Research Station: http://www.fs.fed.us/pnw. Hard copies may be obtained from the author or from the Documents Coordinator, Records of the Tongass Land Management Plan, USDA Forest Service, Alaska Region, P.O. Box 21628, Juneau, Alaska 99802-1628.

Authors and titles are as follows:

First set of panels—

Cellier, G. 1995. Subsistence working group results.

Cellier, G. 1996. Socioeconomic panel results.

DeGayner, G. 1996. TLMP revision old-growth assessment panel summary.

DeGayner, G. 1996. Sitka black-tailed deer panel.

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Iverson, C. 1996. American marten viability assessment panel summary.

Iverson, C. 1996. Alexander Archipelago wolf viability assessment panel summary.

Iverson, C. 1996. Brown bear viability assessment panel summary.

Iverson, C. 1996. Northern goshawk viability assessment panel summary.

Julin, K. 1995. Other terrestrial mammals panel assessment summary.

Smith, W. 1996. Marbled murrelet panel—panel assessment meeting notes.

Second set of panels—

DeGayner, G. 1997. Summary of the 1997 American marten risk assessment panel.

Dunlap, R. 1997. Summary of the 1997 fish habitat risk assessment panel.

Iverson, C. 1997. Summary of the 1997 other terrestrial mammals assessment panel.

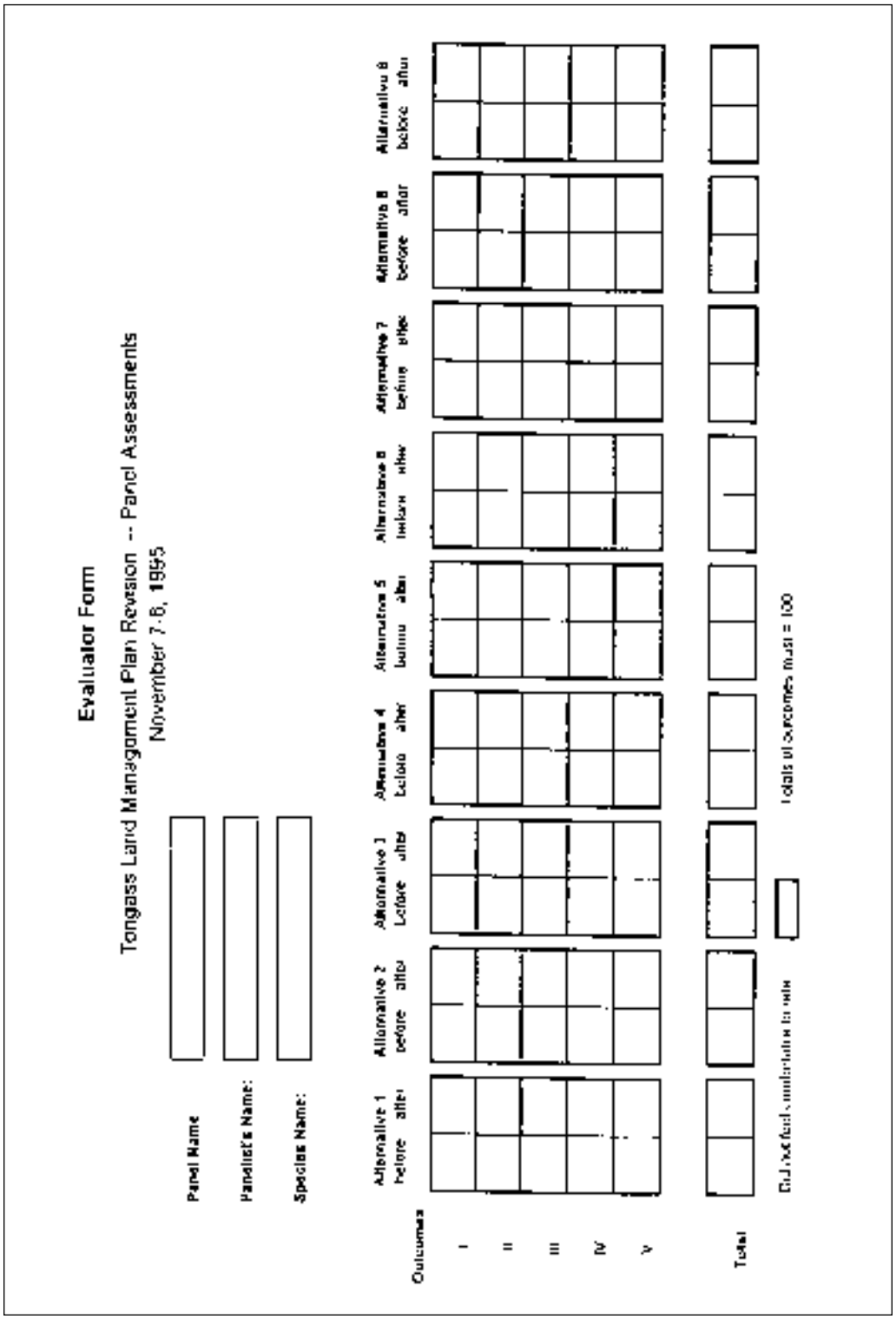
Iverson, C. 1997. Summary of the 1997 Alexander Archipelago wolf risk assessment panel.

Iverson, C. 1997. Summary of the 1997 northern goshawk risk assessment panel.

Meade, C. 1997. Brown bear risk assessment panel summary.

Appendix 2
Evaluator Form

This form was used to record the assignment of likelihood points in both sets of risk assessment panels.



Appendix 3
Specific Duties

The specific duties of panel facilitators, scribes, resource specialists, and silent observers are outlined.

Facilitator—

- Explains roles of all participants in process.
- Explains rating system and assignment of likelihood points to outcomes.
- Discusses outcomes; makes sure they are clearly understood by each evaluator.
- Explains appraisal of alternative features (this occurred during the second set of panels).
- Provides further clarification on alternatives as needed.
- Introduces resource specialist.
- Explains that after the presentation by resource specialist there will be a question-and-answer session, but at this stage it should not develop into a discussion among evaluators on the alternatives themselves. Explains that discussion regarding the biology of the organism and its habitat requirements is allowed. Reminds evaluators that discussion specific to each alternative will occur after the assignment of likelihood points.
- Leads question-and-answer session.
- After question-and-answer session, hands out likelihood scoring sheets and features appraisal sheet (second set of panels) and again asks if there are any questions about the rating system.
- Monitors ratings to maintain evaluator independence.
- Works with scribe to enter likelihood point assignments on the computer after all ratings and appraisals have been completed (most likely this will end the first day of the session).
- Presents data to panel and shows where their dispersion is the greatest in assignment of likelihood points and appraisal of features. Uses these differences and those noted by the resource specialist to start discussion.
- Leads discussion; ensures that the following are covered, by alternative:
    - Clarifies why there were differences among panelists, if there were differences.
    - Clarifies why there were differences among evaluators' ratings and the resource specialist's ideas, if there were differences.

- Clarifies how lack of knowledge was handled.
- Clarifies how a concern about one part of the Forest translated to a Forest-wide likelihood rating. Notes all area-specific locations of concern.
- Discusses each component on the matrix chart in terms of how changes to it might increase the likelihood of obtaining higher level outcomes for specific alternatives (the appraisal of alternative features was included in the second set of panels).
- Discusses how adoption of other Forest plan standards and guidelines might raise likelihood ratings.
- Clarifies what exogenous factors might exist and determines if they influenced the ratings (goal is that they should not).

- After discussion, allows evaluators to again rate alternatives.
- Works with scribe and resource specialist to structure key points for the panel report.

Scribe—

- Takes comprehensive but not verbatim notes of the panel session.
- Captures questions and answers from evaluators, facilitator, and resource specialist.
- Captures key points of presentation by resource specialists.
- Captures questions and answers among evaluators and resource specialists (does not necessarily need to identify questions by person).
- Records likelihood scores and appraisal of alternative features directly into spreadsheets on computer; with appropriate help, calculates the summary statistics and prints for subsequent discussion.
- Presents summary statistics to facilitator.
- Captures discussion in notes; tries to keep track of all salient points (does not need to identify points by person).
- Stops discussion if necessary to clarify points for the notes.
- Ensures that facilitator covers all points highlighted for discussion (see above description of facilitator duties).
- Enters the second set of likelihood scores and data from the appraisal of alternative features (second set of panels) into the computer.

- Provides copy of notes to the facilitator as soon as possible.
- Appends silent observer's writeup to the notes.
- Revises panel notes after review by facilitator and resource specialists.
- Assists facilitator with use of notes in developing panel report.

Resource specialist—

- Describes input materials prepared for the panel.
- Presents what is known and not known about the species and its habitat needs in the Tongass NF. Clarifies fact from opinion; notes if there are different interpretations in the literature (about 1 seems appropriate).
- After the presentation, answers individual questions raised by evaluators and participates in any discussion on the species and its habitat needs. This is not to be an alternative-specific discussion; that will occur after evaluators have assigned their likelihood points.
- Assists the facilitator with discussion as necessary.
- Reads scribe's notes and, along with facilitator, helps edit draft.
- Assists facilitator with development of key points for panel report.

Silent observer—

- Observes the entire panel process without commenting (may discuss any observations or concerns with the facilitator during breaks).
- Takes notes on panel proceedings to use in developing an evaluation.
- Provides the scribe with a written evaluation of the process at the end of the panel meeting. The evaluation should focus on the objectivity of the process (did we do what we said we were going to do in a value neutral manner) and on all the individuals participating (e.g., note any "overdominance or meekness"). If any exogenous factors affecting the assignment of likelihood scores were detected, then these should be noted.

A suggested addition to these duties for future consideration is to provide the silent observer with a specific checklist of items on which they are asked to comment.

Appendix 4
Additional Information Provided to Panelists

Fish-riparian panels—The fish-riparian risk assessment panels had a thorough briefing to acquaint panelists with the fish and stream resources of the Tongass NF (including past management activities), as well as information on strategies considered for future management that could affect aquatic resources. Although some panelists were quite familiar with the Tongass NF, they all needed to have a similar knowledge base before assessing effects of land-use alternatives on fish habitats. They therefore were provided with the following information (unless noted otherwise, these items are available from the planning record, USDA Forest Service 1997d):

- The classification system for stream channel types and process groups in the Tongass NF (USDA Forest Service 1992).
- The array of fish, riparian, soil, water, and wetlands standards and guidelines used in the Forest plan alternatives (from the proposed Forest-wide standards and guidelines; USDA Forest Service 1996b, 1997d).
- A list of management objectives for riparian areas in the Tongass NF.
- A description of how information on channel process groups (USDA Forest Service 1992) and riparian prescriptions were integrated and applied in the Forest plan alternatives. Forest plan alternative maps and an alternative matrix were displayed.
- A map of current roadless areas in the Tongass NF.
- Existing roads per square mile by VCU (see text footnote 7).
- The miles of roads anticipated, by alternative, Forest-wide, in 10 years and 100 years. Both the total miles of roads and maintained miles of roads were shown.
- The number of acres of projected timber harvest on mass movement hazard index soil classes 1, 2, 3, and 4 (Swanston 1997), by alternative, Forest-wide, in 100 years.
- The “best management practices” used to manage riparian and aquatic habitat (USDA Forest Service 1996c).
- A fish habitat reserve strategy previously designed for the Tongass NF (see watershed reserve strategy in USDA Forest Service 1997d).
- A system that rates the importance of individual watersheds for fish production (USDA Forest Service 1979; see the forest habitat integrity plan in USDA Forest Service 1997d).
- A strategy for managing areas in the Tongass NF with unstable soils (Swanston 1997).
- A monitoring plan to assess the effectiveness of management strategies for protecting fish and riparian habitats in the Tongass NF (USDA Forest Service 1996b, 1997a).

- The Anadromous Fisheries Habitat Assessment (AFHA 1995).
- Distribution map of streams across the Tongass NF (see streams map in USDA Forest Service 1997d).
- A watershed restoration strategy for the Tongass NF and Alaska Region (USDA Forest Service 1995).
- Information regarding the delivery of woody debris to streams in southeast Alaska (Murphy and Koski 1989).
- Fish model outputs that project usage of habitat capability by management area for coho salmon 120 years into the future (Paustain and others 1990, USDA Forest Service 1997d).
- Acres of forest land by alternative to be managed for timber harvesting (aggregated within VCUs [see text footnote 7] by 10-percent increment categories).
- Miles of streams affected by timber harvest or roads by Forest plan alternative.
- Number of acres of land experiencing timber harvest within 100 feet of streams in the past decade.
- Cumulative acres of timber previously harvested in riparian areas.
- Number of acres and miles of streams in Forest areas within legislated reserves.
- Acres across the Tongass NF classified as riparian.
- Fish harvest statistics over the past three decades.
- A list of forest streams considered impaired by the Alaska Department of Environmental Conservation (USDA Forest Service 1997d).
- Distribution maps for resident and anadromous fish on the Tongass NF.

The following topics were explored during the discussion that followed the rating of Forest plan alternatives by the panel evaluators:

- Adequacy of process group direction (USDA Forest Service 1992) by riparian management option.
- Effectiveness of each riparian management option, including tradeoffs between risks to fish habitat and the potential for timber production.
- Basic differences in alternatives (i.e., partial cutting or clearcutting) and the resulting potential effects on fish.

- Potential effectiveness of “best management practices” (USDA Forest Service 1996c) in providing for fish habitat.

- Role of monitoring in meeting management objectives for fish and riparian habitats.

- Role of headwater (non-fish-bearing) streams in providing for downstream fish habitat, including the role of unharvested buffers and potential risks associated with the blowdown of trees in buffers.

- Potential cumulative effects within watersheds from treatment of watersheds with different management prescriptions.

- Potential changes in streamflow over the short and long terms.

- Likelihood of meeting water quality standards.

- Assessment of anticipated effects of Forest plan alternatives on fish and riparian habitats over the next 10 years (as it might differ from the 100-year evaluation).

- Viability of fish stocks and species and the likelihood of their being well distributed across the Tongass NF.

- Listing in order of their importance the major factors associated with management actions that affect fish habitat (these might include role of source areas for large woody debris adjacent to fish habitat, role of source areas for large woody debris upstream of fish habitat, role of cumulative activities in a watershed that may affect stream timing or flow, role of source areas for stream sediment, role of specific roads, temperature, dissolved oxygen levels, etc.).

- Consideration of how the “risk” of unplanned actions (actions that should not have occurred; e.g., not providing fish passage in an anadromous fish stream) may affect fish populations.

- Role of past actions in rating future effects.

Wildlife panels—In addition to the presentations made by each local resource specialist and the general information provided, the following additional visual or written information was provided (unless noted otherwise, these items are available from the planning record, USDA Forest Service 1997d):

- Marbled murrelet

    - Distribution map of murrelets in southeast Alaska during the 1970s and 1980s.
    - Boundary map of the 21 biogeographical provinces in southeast Alaska.
    - Map of the habitat conservation strategy by Forest plan alternative.
    - Existing proportion of young growth in the Forest by VCU (see text footnote 7).
    - Projected proportion of second growth in the Forest by VCU (see text footnote 7) in 2095 for each alternative.
    - Current distribution across the Forest of timber volumes by low, medium, and high volume classes (Julin and Caouette 1997).

- Queen Charlotte goshawk

  - Draft of the northern goshawk conservation assessment (Iverson and others 1997).
  - Acres of productive old-growth forest below 500 feet, below 1,200 feet, and on slopes of less than 35 percent that already have been harvested for timber.
  - Acres of productive old-growth forest below 500 feet, below 1,200 feet, and on slopes of less than 35 percent that are projected to be harvested for timber by 2095 for each Forest plan alternative.
  - Percentages of productive old-growth forest that were harvested between 1954 and 1994, by VCU (see text footnote 7).

- Alexander Archipelago wolf

  - Draft of the Alexander Archipelago wolf conservation assessment (Person and others 1997).
  - Wolf hunter and trapper harvest statistics (1975-95).
  - Existing road density by wildlife analysis area (see text footnote 6).
  - Estimates of Sitka black-tailed deer habitat capability by wildlife analysis area (see text footnote 6) and by biogeographical province.
  - Map of the planned road system for Prince of Wales Island following full implementation of Forest plan alternative 9.

- Brown bear

  - Riparian buffer widths for each of the three riparian management options (USDA Forest Service 1996b) and for the moderate gradient mixed control and floodplain process groups (USDA Forest Service 1992).
  - Map of the planned road system for Prince of Wales Island following full implementation of Forest plan alternative 9.

- American marten

  - Map of the planned road system for Prince of Wales Island following full implementation of Forest plan alternative 9.
  - Percentages of productive old-growth forest that were harvested between 1954 and 1994 by VCU (see text footnote 7).

- Other terrestrial mammals

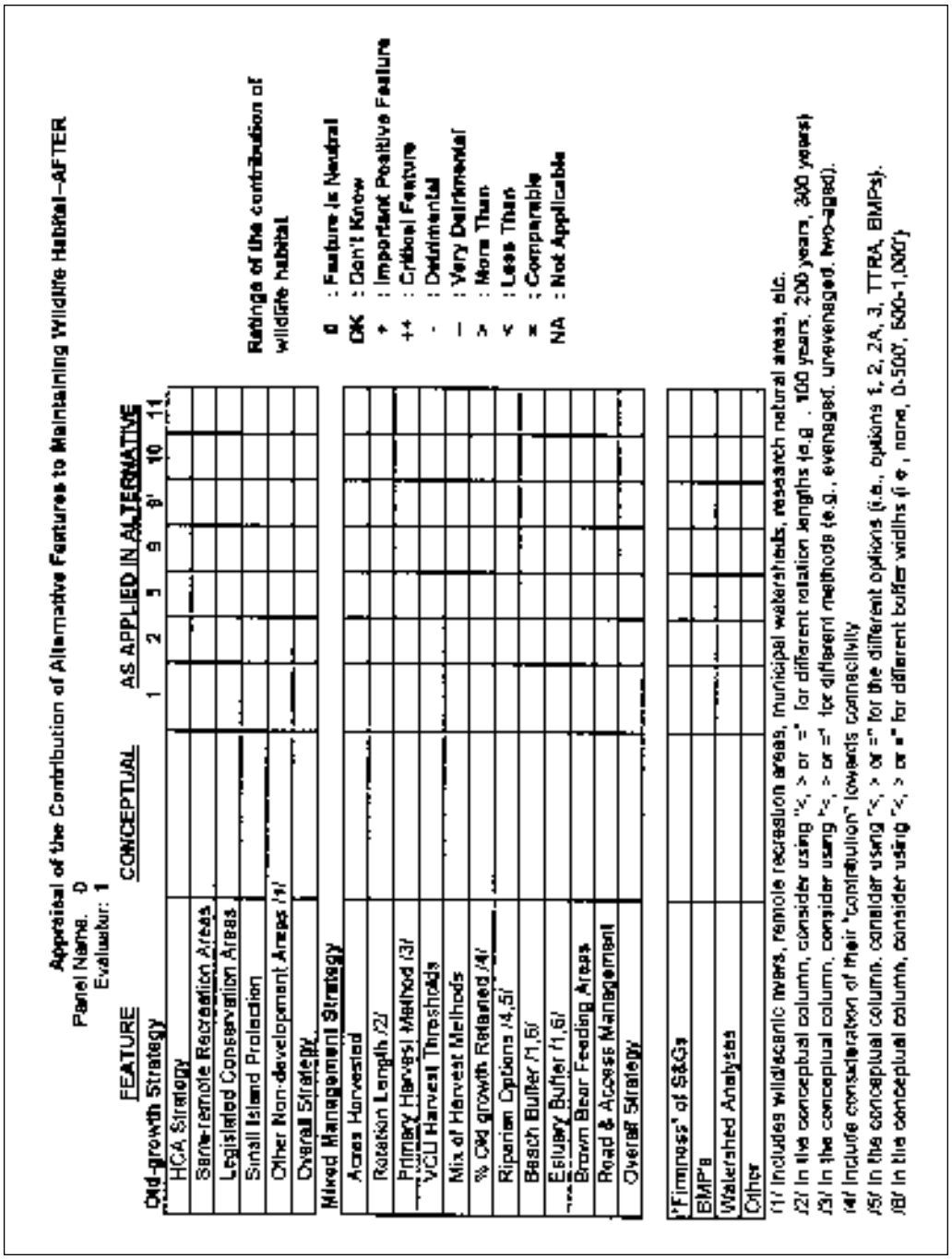
  - Publications about the mammals of southeast Alaska (MacDonald and Cook 1996a, 1996b).
  - Map of the roads planned in the Ketchikan Area following full implementation of Forest plan alternative 9.
  - Article by Burkey (1995).

In addition, an assessment of the projected additional miles of roads per VCU (see text footnote 7) through 2095 for each Forest plan alternative was provided to evaluators on all wildlife panels.

Appendix V

Alternative Appraisal Form

This form was used in the second set of risk assessment panels. The intent of the form was to gain insight into how panel evaluators considered that the various elements of draft alternatives contributed to maintaining wildlife viability or fish sustainability. The "+/-" structure of the form caused some difficulty for evaluators in that some ended up with the opposite interpretation of a positive or negative feature than was intended. An arrow system similar to that used in the socioeconomic panel (see fig. 2) is suggested for future use.



Appraisal of the Contribution of Alternative Features to Maintaining Wildlife Habitat–AFTER

Panel Name: D

Evaluator: 1

FEATURE	CONCEPTUAL	AS APPLIED IN ALTERNATIVE										
		1	2	3	4	5	6	7	8	9	10	11
Old-growth Strategy												
HCA Strategy												
Semi-remote Recreation Areas												
Legislated Conservation Areas												
Small Island Protection												
Other Non-development Areas /1/												
Overall Strategy												
Mixed Management Strategy												
Acres Harvested												
Rotation Length /2/												
Primary Harvest Method /3/												
VCU Harvest Thresholds												
Mix of Harvest Methods												
% Old growth Retained /4/												
Riparian Options /4,5/												
Beach Buffer /1,6/												
Estuary Buffer /1,6/												
Brown Bear Feeding Areas												
Road & Access Management												
Overall Strategy												
"Firmness" of S&Gs												
BMPs												
Watershed Analyses												
Other												

Ratings of the contribution of wildlife habitat

0 : Feature is Neutral
DK : Don't Know
+ : Important Positive Feature
++ : Critical Feature
- : Detrimental
— : Very Detrimental
> : More Than
< : Less Than
= : Comparable
NA : Not Applicable

/1/ Includes wilderness rivers, remote recreation areas, municipal watersheds, research natural areas, etc.
/2/ In the conceptual column, consider using "<, > or =" for different rotation lengths (e.g., 100 years, 200 years, 300 years).
/3/ In the conceptual column, consider using "<, > or =" for different methods (e.g., even-aged, uneven-aged, two-aged).
/4/ Include consideration of their "contribution" towards connectivity
/5/ In the conceptual column, consider using "<, > or =" for the different options (i.e., options 1, 2, 2A, 3, TTRA, BMPs).
/6/ In the conceptual column, consider using "<, > or =" for different buffer widths (i.e., none, 0-500', 500-1,000')

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Shaw, Charles G., III. 1999. Use of risk assessment panels during revision of the Tongass Land and Resource Management Plan. PNW-GTR-460. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 43 p. (Shaw, Charles, G., III, tech. coord.; Conservation and resource assessments for the Tongass land management plan revision).

This paper describes the process used to conduct the 16 risk assessment panels and a subsistence working group held during revision of the Tongass land management plan. It provides an overview of how results from the panels were used by forest managers in plan-related decisionmaking, discusses some reactions to the effort, and identifies some opportunities to improve the process. The panel results provided estimates of the relative risk that implementation of a range of alternative approaches to management of the Tongass National Forest would pose to the continued persistence across the landscape of an array of species or resources and estimates of potential socioeconomic effects on communities. As anticipated, results from these risk assessment panels became an integral component of the effects analysis section of the environmental impact statement that provided the context for successfully completing the Tongass Land and Resource Management Plan.

Keywords: Forest planning, effects analysis, National Forest Management Act, old-growth forest, forest policy, Tongass National Forest, socioeconomic issues, southeast Alaska, subsistence, wildlife population viability, fisheries sustainability, well-distributed populations.

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