1ST PANEL
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United States Department of Agriculture

Forest Service

Tongass National Forest
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Reply To: RG-G-10-b

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Subject: Fish/Riparian Assessment Panel Summary

To: TLMP Revision Planning File

From: Ron Dunlap, TLMP IDT

Introduction

On November 7, 8 and 9, 1995, a six-member panel met to offer professional judgment regarding the effects of nine management alternatives on the fisheries resources of the Tongass National Forest. Of the six panelists, four were fisheries scientists and two were geomorphology/hydrology scientists (physical scientists).

A complete set of notes was taken during the 3-day session, including all processes and rating procedures and panelists' likelihood outcome ratings. These notes are available in the TLMP planning record and are not repeated here except for important factors affecting likelihood outcomes.

Background Information

An overview of the Tongass National Forest and the panel process was presented to members of all panels. The presentations included:

- Overview video of forest planning: Bruce Rene', TLMP.
- Overview presentation and discussion of alternatives; Chris Iverson, TLMP.
- Panel assessment procedures; Terry Shaw, TLMP.

Panelists were provided verbal, written, and graphical information concerning biological resources and management of the Tongass National Forest (Forest).

The following talks were delivered to the panel:

- Tongass Land Management Planning Tools and Process, Steve Kessler, TLMP Team
- Channel Types and Their Characteristics, Steve Paustian, Chatham Area Hydrologist
- Overview of the Best Management Practices, Steve Paustian

- Standards and Guidelines for Riparian Protection. Ron Dunlap. TLMP Team

Written materials provided to the panel included:

Coho Fish Model (# of smolts projected for 120 years)
Commercial Salmon Harvest Southeast Alaska 1979 - 1991
Commercial Salmon Harvest 1878 - 1991
Stream Segment Level Characteristics (Paustian and others, 1992)
Draft Monitoring and Evaluation Plan (for fish habitat, 11/1/95)
Riparian Buffer Distance (working matrix)
Miles of streams by process groups, area and stream class
Background Information for the Fish/Riparian Panel
Draft Forest-wide Standards and Guidelines for Fish
Draft Forest-wide Standards and Guidelines for Riparian
Multivariate Geomorphic Analysis of Forest Streams; Implications for Assessment of Land Use Impacts on Channel Condition. Richard Wood-Smith. J. M. Buffington. Earth Surface Process and Landforms, Vol. 20, 000-000 (in press)

- Draft Forest-wide Standards and Guidelines for Transportation
- Fisheries Input to the Forest Habitat Integrity Plan (FHIP), ADF&G, Sporfish Div., 1978
- Pacific Salmon Distribution in Southeast Alaska
- Fish / Riparian Outcomes
- Spreadsheet: Road miles to be constructed by alternative, by VCU, in 50 years
- Spreadsheet: Road miles to be constructed by alternative, by VCU, in 20 years
- Spreadsheet: Sum of Total Miles of Road to be Constructed, by VCU, in 100 years
- Spreadsheet: Sum of Total Miles of Road to be Constructed, by ecological province, in 100 years
- Spreadsheet: Sum of Total Miles of Road to be Constructed, by management area, in 100 years
- Overview of Controlling stability characteristics of Steep Terrain in Southeast Alaska: with Recommendations for Revising and Standardizing Mass Movement Hazard Indexing on the Tongass National Forest (Draft) by Doug Swanston
- A Preliminary Assessment of Fish Habitat and Channel conditions for Streams on Forested Lands of Southeast Alaska, 1993 Survey Results, Alaska Working Group on Cooperative Forestry Fisheries Research, Technical Report 95-01, May 1995
- Recommended Best Management Practices, FSH 2509.22
- Channel Type User Guide, Alaska Region Publication Rl0-TP-26
- Watershed Restoration Strategy, Alaska Region. V2.1 (Sept. 1994)
- Tongass Land Management Plan Framework for Development of Draft Alternatives
- Best Management Practices 1994 Implementation Monitoring Report
- Past Harvest by Decade by MMI Rating
- Summary of Fish Improvement Opportunities
- Past Harvest within 100 feet of Streams
- Summary of miles of roads constructed in 100 years by alternative

- Summary of Total Road Construction by Alternative at end of decades 1, 2 and 5

Fish/Riparian Panel Assessment Elements

For each of nine possible management alternatives, fisheries scientists rated five possible outcomes for each of eight species of fish, including both resident and anadromous life strategies for two of the species. The fish considered in the assessment were:

- sockeye salmon *(Oncorhynchus nerka)*
- chinook salmon *(Oncorhynchus tshawytscha)*
- pink salmon *(Oncorhynchus gorbuscha)*
- chum salmon *(Oncorhynchus keta)*
- coho salmon *(Oncorhynchus kisutch)*
- steelhead trout *(Oncorhynchus gairdneri)*
- cutthroat trout - anadromous *(Oncorhychus clarki)*
- cutthroat trout - resident *(Oncorhychus clarki)*
- Dolly Varden char - anadromous *(Salvelinus malma)*
- Dolly Varden char - resident *(Salvelinus malma)*

The fisheries scientists predicted habitat conditions, for each proposed alternative if it were implemented for the next 100 years. The scientists then assigned a total of 100 likelihood points across the following outcomes:

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

Outcome 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 National Forest, or the historic range of the species within the Forest. Most habitats that are currently degraded will recover or be moving toward recovery after 100 years.

Outcome III. New management activities will result in moderate additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass National Forest, 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 be moving toward recovery after 100 years.

Outcome IV. New management activities will result in major additional degradation of freshwater habitat for the species. Distribution of productive habitat across the Tongass National Forest, 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 be moving toward recovery after 100 years.

Outcome 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 National Forest. Habitats that are currently degraded will not recover or be moving toward recovery after 100 years.

For each of nine possible management alternatives the physical scientists rated five possible outcomes for the potential effects of land use alternatives on the natural conditions of streams. Natural conditions were defined in terms of the following attributes:

- large woody debris (pieces/1,000 m^2 greater than 10 cm in diameter and 1 m long).
- percent pool area
- stream width-to-depth ratio
- pools per reach
- residual pool depth
- stream bed grain size distribution.

The physical scientists predicted channel conditions, 100 years from now, and assigned likelihood points (100) to the following outcomes:

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

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

Outcome III: Riparian objectives will be met on much of the Tongass National Forest, but there will be a substantial area where they are not met. There will be moderate additional degradation from existing conditions due to new management activities. Many areas currently not meeting riparian objectives will not recover or be moving toward recovery in 100 years.

Outcome IV: Riparian objectives will be met on a small part of the Tongass National Forest, 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 currently not meeting riparian objectives will not recover or be moving toward recovery in 100 years.

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

Only following the likelihood of outcome assessment were the panelists allowed to discuss their individual considerations and opinions. Following the discussions, the panelist were asked to re-evaluate the alternatives and re-distribute likelihood of outcome points for each alternative. The outcomes of the second group of scores, post discussion, and the discussion points, serve as the basis for most of this report.

Panelists were then asked to evaluate the likelihood of outcomes by alternative, for the first 10 years of forest plan implementation. The 10 year assessment is included at the conclusion of this report.

PANEL ASSESSMENT FOR 100 YEAR OUTCOMES

The assessment panel outcome conclusions and comments fall into the two main categories of fish and stream channel morphology. Fish, for the purposes of this discussion, are divided into three categories, chinook, sockeye, and an other category in which coho, pink and chum salmon, steelhead and cutthroat trout and Dolly Varden char, are included. This subdivision is to assist in summarizing the panel findings and does not imply each of the fish species combined in the combined category are necessarily equal in all respects of the assessment findings.

Chinook Salmon,

Chinook salmon typically spawn and rear in large river systems, which are often transboundary (flowing out of Canada through Alaska). The panelists believed most of the large river systems had little or no management activities taking place in their watersheds; and because of these watershed's large sizes, management activities that do occur would have little impact. Chinook salmon were assigned the highest number of points, of all species, for Outcome I across all alternatives, indicating the panel believed the chinook would be least affected by management actions (Table 1).

Table 1. Average 10 Year and 100 Year Outcomes for chinook salmon by Alternative. (Note that because these are averages they may not sum to 100 points.

	Alternative 1		2		3		4		5		6		7		8		9	
	years		years		years		years		years		years		years		years		years	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
Outcome I	94	94	88	88	90	89	90	89	90	89	88	88	86	85	88	88	88	88
Outcome II	7	7	8	9	9	10	9	10	9	10	11	9	13	11	11	9	11	9
Outcome III	0	0	4	4	1	1	1	1	1	1	1	4	1	4	1	4	1	4
Outcome IV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outcome V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

<u>Sockeye Salmon.</u>

Sockeye salmon typically spawn and rear in lakes. A few sockeye salmon populations spawn and rear in streams; some migrate upon emergence from the gravel to rear in salt or brackish water. Because of the sockeye salmon's preference for lake habitat, panel members assigned higher proportions of the likelihood points, across all alternatives, to outcomes I and II, than they did for stream-rearing fish (Table 2). The panel opined lake habitats, because of the protection afforded them (no commercial timber harvest within the riparian area or 100 feet, which ever is greatest and only uneven aged management within the next 400 feet of the no harvest area) and because of their natural resiliency to impacts, were less effected by management activities. Likelihood scores assigned to Outcomes II through V recognize some detrimental affects could occur due to management activities. The panelists singled out sediment from roads as the most likely cause of detrimental effects.

Table 2. Average 10 Year and 100 Year Outcomes for sockeye salmon. (Note that because these are averages they may not sum to 100 points.)

	Alternative 1		2		3		4		5		6		7		8		9	
	years		years		years		years		years		years		years		years		years	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
Outcome I	90	92	43	50	70	72	70	72	73	73	45	52	43	48	45	52	43	50
Outcome II	10	8	15	22	20	22	23	20	23	22	18	23	15	22	20	22	15	20
Outcome III	0	0	40	25	10	7	8	8	5	5	38	22	38	23	33	23	38	25
Outcome IV	0	0	3	3	0	0	0	0	0	0	3	3	5	5	3	3	5	3
Outcome V	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2

<u>Combined Stream Spawning Fish.</u>

A combined group of fish includes coho, pink and chum salmon, steelhead trout, cutthroat trout (resident and anadromous) and Dolly Varden char (resident and anadromous). Typically these fish use streams or rivers for spawning and their fry, upon emergence, rear in the stream habitat for one or more years (resident Cutthroat trout and Dolly Varden char depend on freshwater systems. including streams. throughout their life-cycle); or. as with chum and pink salmon. migrate to salt or brackish waters to rear. The panelists expressed a general opinion that the relative risk to each of these species could be influenced by the proportion of their life cycle spent in the freshwater ecosystem. Since resident cutthroat trout and resident Dolly Varden char are dependent on freshwater ecosystems throughout their lives, they could be at greatest risk. Since steelhead trout and coho salmon both spawn and rear (for one or more years) in freshwater, they may be at greater risk than pink and chum salmon. Pink and chum salmon rear in saltwater after emergence from freshwater incubating habitats.

Generally, as total miles of roads and acres of potential timber harvests increased, fewer likelihood points were assigned to outcomes I and II and more likelihood points were assigned to outcome III and in some cases outcomes IV and V (Table 3). Therefore, by definition, the possibility of gaps in species distribution increases with increased miles of road constructed and acres harvested. For some species a gap in distribution may have greater significance than for others. Some species such as cutthroat and steelhead trout appear to have isolated populations which may be more susceptible to local extirpation.

Species specific comments are summarized below. Comments which were applied to all, or most, species are summarized under the heading "Major Discussion Points."

Cutthroat Trout - Some panelists raised concerns for cutthroat trout in improperly classified streams. Recent information indicates some streams normally classified as Class III streams (non-fish bearing) are important for cutthroat trout during certain times of the year. They cautioned that such activities as road crossings and timber harvest could affect cutthroat populations. They also pointed out fish presence should not be the only requirement for defining Class II streams but the presence of fish habitat should also be a consideration.

One panelist expressed concern that some populations of Cutthroat trout utilize an individual lake, or several lakes in close proximity, and may use stream habitats within thirty miles of the lake habitat. These populations may be isolated populations with little genetic exchange with other populations.

Dolly Varden char - Because Dolly Varden char were thought to be more ubiquitous and probably more resilient than the other species discussed, the panel considered them to be at less risk of detrimental impacts due to management activities than other fish.

Steelhead Trout - Steelhead trout were considered by the panel to be more sensitive to disturbances in riparian areas compared to coho salmon to similar riparian disturbances. One factor contributing to their sensitivity may be the longer length of time that steelhead trout rear in freshwater habitats. One panelist stated that a mitigating factor may be that steelhead trout populations are limited to "20 or 30 larger populations" found in large, more resilient rivers.

Protecting those rivers could reduce concern of risks to steelhead trout. A lack of protection afforded these watersheds could result in extirpation of the local population and, given the limited number of populations on the Forest, create greater concerns for the viability of steelhead trout.

Coho Salmon - One panelist commented that coho salmon have an ubiquitous distribution and therefore may be at less risk of negative impacts due to management activities if impacts could be concentrated into fewer watersheds. The distribution and frequency of large woody debris in streams is an important component of coho habitat. Panelists recognized that some past timber harvests have resulted in less large wood being recruited into streams. The depletion of woody debris in streams may continue for more than 100 years. The rate of recovery of streams following depletion of instream large wood is unknown.

Pink Salmon - One panelist stated that pink salmon may be more sensitive to increased levels of sedimentation than coho salmon. Further discussion revealed that much more information is needed about sediment routing and the effects of fine sediment on pink salmon spawning. Pink salmon, because they are more dependent upon the lower portions of the watersheds, could be more susceptible to cumulative watershed impacts

Chum Salmon - One panelist stated some populations of summer-run chum salmon are currently low due to bycatch in the pink salmon fishery. Panelists opined chum salmon are more dependent on favorable riparian conditions than are pink salmon therefore more importance was given in to riparian protection in the assessment of alternatives. The following generalizations were advanced by the panel. (1) Estuary habitat protection is particularly important to chum salmon. (2) One-hundred foot buffers around estuaries and estuarine channel types is not sufficient to protect chum salmon spawning habitat. (3) One-thousand foot buffers provide extra protection. (4) Roads should not be located adjacent to these important habitats. Panelists recognized the limited occurrence of some freshwater rearing by chum fry.

Table 3. Average 10 Year and 100 Year Outcomes for coho, pink and chum salmon, steelhead and cutthroat trout and Dolly Varden Combined. (Note that because these are averages they may not sum to 100 points.)

Alternative	1		2		3		4		5		6		7		8		9	
	years		years		years		years		years		years		years		years		years	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
Outcome I	90	88	32	24	55	45	56	49	58	51	39	27	21	17	35	23	20	17
Outcome II	10	13	35	23	37	35	37	38	35	37	36	33	29	20	35	29	35	22
Outcome III	0	1	30	42	8	19	7	13	6	11	23	34	43	46	27	39	39	46
Outcome IV	0	0	5	11	1	2	1	1	1	1	3	7	8	16	4	9	6	15
Outcome V	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1

Stream characteristics.

The occurrence of large wood debris, pool frequency and percent area. width-to-depth ratios, residual pool depth and grain size stream bed distribution, were stream characteristics considered by the panel to assess alternatives. The physical scientists agreed Outcome I could not be achieved under any management alternative (Table 4). It was their judgment that watersheds already heavily disturbed by previous management would not be recovered in 100 years and current practices would continue to degrade some habitats. therefore. no likelihood points were assigned to Outcome I.

The physical scientists suggested that as road mileage and acres of harvest increased, the likelihood that riparian management objectives would not be met increased. The panel opined greater riparian protection. longer timber harvest rotations, and reserves (including Wild and Scenic river designation) increased the likelihood the riparian management objectives would be met. An assumption was made that greater numbers of roads would'be located in higher elevations on less stable terrain and harvest would occur on less stable areas when compared to historical harvest and road construction. All panelists agreed that if this scenario were true, then the result would be a greater likelihood of hillslope failure. erosion of fine sediment from road surfaces, and capture and re-routing of natural drainage.

Table 4. Average 10 Year and 100 Year Outcomes for Physical Stream Characteristics (Note that because these are averages they may not sum to 100 points.)

	Alternative																	
	1		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**	
	years		years		years		years		years		years		years		years		years	
	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
Outcome I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outcome II	95	90	0	5	40	35	45	40	50	45	35	30	0	0	5	10	0	0
Outcome III	5	10	85	70	55	60	50	55	45	50	55	60	65	60	85	70	70	65
Outcome IV	0	0	15	25	5	5	5	5	5	5	10	10	35	40	10	20	30	35
Outcome V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Alternative Outcomes

The following management alternatives are listed in order of increasing risk (least risk to greatest risk) to the physical characteristics of stream channels and the species considered: 1,5,4,3,6,8,2,9, and 7.

The panelists generally agreed on the possible outcomes of the management alternatives effects on the fisheries resources and stream channel attributes, with some exceptions. This is demonstrated by identical rankings of alternatives although the physical scientists gave lower over-all scores to each alternative. The absence of likelihood points assigned to Outcome I by the physical scientists may reflect the differences between outcome definitions provided to the fisheries scientists and physical scientists, respectively.

All panelists agreed that Alternative 1 presents the least risk to the fish resource. However, the physical scientists concluded there was no likelihood that no degradation from current conditions would be an outcome in any of the alternatives. Fisheries scientists assigned 89 points to the Outcome I that "new management activities (Alternative 1) would not cause additional degradation."

Alternatives 3,4 and 5 were assigned similar outcomes. The fisheries scientists assigned about half the possible points to the likelihood outcome I would be met. The physical scientists scored Alternatives 3,4,5 and 6 similarly but assigned Outcome III the greatest number of points and Outcome II the second greatest number of points.

In alternatives 2,6,7,8 and 9 most likelihood points assigned to Outcomes III and IV. This group of Alternatives was viewed by the panel as having a greater likelihood that riparian objectives would not be met on a substantial area of the Forest or across the majority of the Forest where riparian habitat occurs and that either some gaps, or large gaps, will occur in the distribution of fish relative to their historic ranges.

Considerations in Distribution of Likelihood Points

Panelists agreed that many past management activities. such as timber harvest and road construction and maintenance. will continue to contribute to degraded fish habitat and stream channel conditions. This current condition was considered across all alternatives , thus precluding likelihood points being assigned to outcome I by physical scientists, in any alternative. While discussing the likelihood of outcomes for each Alternative, assuming each alternative was actually implemented, the panel reached the following conclusions:

Alternative 1. Low activity levels in a relatively small part of the Forest would reduce the level of degradation and should facilitate recovery of degraded areas.

Alternative 2. The road network and area harvested. particularly in MM13 soils, would increase the likelihood of areas of future habitat degradation and reduces the likelihood of habitat recovery. Riparian option 3 applied in all watersheds would likely be less effective in reducing risks to stream channels and fish habitat than the greater levels of protection offered by riparian protection options 1 and 2. Headwater areas are of particular concern since they are afforded little protection under option 3. These concerns decrease the likelihood of obtaining Outcomes I or II and increases the likelihood of Outcome III.

Alternative 3. A moderate network of roads and area harvested would increase the likelihood of areas of future habitat degradation and reduce likelihood of habitat recovery. Increased protection from riparian coverage in FHIP 1 and 2 Watersheds will likely mitigate many effects of roads and area harvested. Inclusion of reserves increases likelihood of recovery of degraded habitat within them.

Alternative 4. Similar to Alternative 3 except this alternative will have a higher likelihood of obtaining Outcomes I and II because longer rotation should reduce disturbance levels. Also, the lack of high levels of riparian protection and the absence of reserves reduce the likelihood points assigned to Outcomes I or II.

Alternative 5. Similar to Alternative 4 with additional reserves could reduce the likelihood of gaps and increase the likelihood of recovery of degraded habitat in these areas.

Alternative 6. Relatively large amount of area harvested and moderate network of roads (same as alternative 5) would increase the likelihood of gaps and decrease the likelihood of habitat recovery. Additional reserves, and long rotation in provinces with reserves, may offset some of effects of area harvested and amount of roads.

Alternative 7. An extensive network of roads and area harvested decreases the likelihood of obtaining Outcomes I and II and increases the likelihood of obtaining Outcome III. Riparian option 3 (applied to all watersheds) is less effective in reducing risk to fish than riparian protection options 1 or 2. Headwater areas are of particular concern since they are afforded little protection under option 3. The lack of estuary fringe protection increases the likelihood that risks to fish will increase.

Alternative 8. A moderate network of roads and area harvested decreased assignment of likelihood points of Outcome I and II. Riparian Option 2 in FHIP 1 Watersheds increases in these watersheds reducing the possibility of gaps in fish distribution. The presence of reserves would reduce the possibility of gaps but only minimally because the reserves are not designed specially for fish.

Alternative 9. An extensive network of roads and area harvested would decrease the likelihood of obtaining Outcomes I or II. The panel expressed concern about increased potential of future degradation and decreased potential of recovery of currently degraded habitat. TTRA riparian requirements, which lack protection on smaller non-fish bearing streams, and the absence of additional reserves and estuary fringe increases the level of risk to fish stocks and results in more likelihood points assigned to Outcome III.

MAJOR DISCUSSION POINTS

Roads - The greatest risk to the fish resource is caused by roads. Increased sediment yield, including yields from roads during construction, use during timber harvest activities, and lack of maintenance or proper closure following timber harvest activities, were all viewed as potential problems for maintaining fish resources. Roads were also viewed as causing risk to fish movement due to perched culverts. At highest risk were stream rearing fish, particularly cutthroat trout that occupy the smaller headwater streams during some parts of their lives. Juveniles of steam rearing fish are often highly mobile during their freshwater stage, moving seasonally between stream reaches. Some panelists expressed concern over the high likelihood that road failures would occur in heavily roaded watersheds. The consensus was that the rate of failure was largely dependent on storm events.

Riparian protection options were thought to provide little reduction in the risks to fish or stream channels caused by roads during construction. Road construction practices were considered by the panel to be an area requiring additional attention to insure that risks to fish and stream channels are not excessively high.

Panelists recommended road maintenance, including roads managed as closed, be identified in the NEPA document; a water quality risk assessment should also be included in NEPA documents. Some concern was stated by one panelist that road maintenance levels identified in the NEPA document are subject to future, unknown, budgets and therefore actual maintenance levels may be lower than indicated, thus increasing the risk to fish. Roads were also considered by the panel to increase risk that improved access would contribute to over-harvest of fish by anglers. Site-specific fish harvest management could be implemented as a mitigation to this concern, although cost of enforcement could increase.

Timber Harvest - Timber harvest activities increased risk to fish resources. Of particular concern was the protection of riparian areas including flood plains. areas of riparian vegetation and certain wetlands associated with riparian system. Also of concern was the amount of protection afforded steeper channels (often not fish baring) in the headwaters areas. Panelists considered it important to maintain the natural function of these steeper channels, including the V-notches. Forested leave strips were considered to be an important measure to insure protection of headwater areas. Protection of estuaries was also considered important when locating roads and timber harvest units. Adequate buffers between estuaries and logging and roading activities were considered in the point likelihood distribution. Estuaries were mentioned as important to most salmonids and 1,000 foot buffers around estuaries were proposed by one panelist to provide extra protection. One-hundred foot buffers were described as "probably inadequate".

The panelist made clear the importance of maintaining a high level of riparian protection. Panelists identified riparian protection Option 1 as providing the best riparian area protection with Option 2 providing the second best level of protection. All alternatives with lower relative levels of riparian protection exhibit higher rates of risk to fish resources. The panel suggested increasing all protection to Option 1 for the highest fish valued watersheds and Option 2 for the remaining watersheds. Alternatives 2, 7 and 9 have the lowest levels of protection and thus create the greatest risk to riparian areas. Panelists agreed that, even with the highest level of riparian protection the risk of detrimental effects on fish would still be relatively high, in heavily impacted watersheds, due to cumulative impacts throughout the watershed.

Watershed Analysis - The panelists identified watershed analysis as an important tool in tailoring riparian protection measures and road layout to site-specific conditions. Watershed analysis is considered to be "indispensable" if consideration is being given to modifying riparian protection guidelines to provide less protection. They thought the application of watershed analyses would do much to avoid some negative impacts to the fish resources during resource management activities and help managers predict cumulative impacts to the fish resources. Concern was expressed that standards be identified for an acceptable level of watershed analysis. One panelist said the watershed analysis and an analysis of cumulative effects should be included as part of the NEPA documentation.

Fish Habitat Value application (FHIP) - Panelists supported the use of variable levels of habitat protection. They felt giving greater protection to watersheds having higher fish values was a good management approach but recommended an updating the procedure. The panelists believed the FHIP ratings for fish, developed in 1978, should receive complete revision based on current information.

Riparian Protection Options - The panel supported the application of different levels of protection for riparian areas associated with different levels of fish values. However, the panelists believed that all alternatives should receive Option 1 protection for the highest valued watersheds for fish and nothing less than Option 2 protection across the remainder of the watersheds.

The buffers prescribed in the Riparian protection options were recognized to be subject to blowdown. The panelists believed generally as the buffer widths increased the risk of total buffer blowdown decreased. When asked about the consequences of buffer biowdown one panelists replied that a standing buffer was much more effective than a blown down buffer. but a blown down buffer was better than no buffer at all. The need for site-specific direction on how to manage buffers for windfirmness was recognized. A panelists commented that is was better to increase the widths of buffers now and decrease them later as we learned how to design for windfirmness.

The additional protection afforded high gradient streams, particularly V-notches, by riparian Options 1 & 2 were thought to be particularly important to reducing the risk to stream channels and fish. The group believed stream channel conditions were degraded and risks to fish increased as timber harvest and the associated roads occurred at higher elevations in the watershed, on steeper slopes and on less stable soils.

PANEL ASSESSMENT FOR 10 YEAR OUTCOME

Following the assessment of 100-year outcomes, the panel assessed the likelihood of outcomes for the first decade of plan implementation. With the exception of sockeye salmon (table 2), risks of management activities negatively effecting the physical stream attributes (table 4) or the fish species (tables 1 and 3) were less in a 10 year time period than a 100 year time period The panel identified major storm events as the principle influence in the triggering of shifts in stream channel conditions. The panelists believed that the frequency of major storm events is such that the likelihood of a major storm occurring is less in a 10 year time span than a 100 year time span. Additionally, a time lag exists for the effects of habitat degradation to be reflected by decreases in fish population size. This time lag is attributed to length of time most of the fish in this assessment rear in the ocean before returning to spawn. The likelihood of outcome point distribution does reflect the panelists opinion that there are risks to stream channel processes and fish populations in a 10 year time period.

The distribution of likelihood points for sockeye salmon indicated a slight increase in risk. Upon closer examination it is apparent that this increase is an anomaly attributable to the missing scores from one panelist.