Pacific Northwest Region

June 1990

Final Environmental Impact Statement

Land and Resource Management Plan

Appendix H - Hydrologic Cumulative Effects Assessment

Mt. Baker-Snoqualmie National Forest

Appendix H

DEVELOPMENT AND APPLICATION OF A HYDROLOGIC CUMULATIVE EFFECTS ANALYSIS PROCESS ON THE MT. BAKER-SNOQUALMIE NATIONAL FOREST

1990

In response to comments received on the DEIS, additional analysis (with considerable peer review and involvement of interested public groups) was done to address the issue of hydrologic cumulative effects and develop a procedure to meet water quality management requirements on the Mt. Baker-Snoqualmie National Forest.

Public Comments to the DEIS on Hydrologic Cumulative Effects

There were a total of 117 substantive comments from the public on fishery resources; 66 of these comments directly or indirectly addressed cumulative effects of forest practices on fishery and water quality values. In addition, 60 of the 75 substantive comments regarding the management of riparian areas were directed to impacts or effects to riparian values from forest management activities over space and time. The general public comments also included a number of comments in this area, including: "cumulative effects analysis for fish is inadequate;" "cumulative effects of forest activities on watersheds and water resources are not addressed;" "need more MMR's (MR's) for soils, watershed;" and "protect vital watersheds."

Substantive public comments were received from the following agencies and tribal governments:

Washington State Department of Fisheries
Washington State Department of Wildlife
U.S. Fish and Wildlife Service
Environmental Protection Agency
Lummi Indian Tribe
Nooksack Indian Tribe
Sauk-Suiattle Indian Tribe
Skagit System Cooperative
Tulalip Indian Tribe
Muckelshoot Indian Tribe

There were two predominant areas of concern: the relationship between timber management activities (harvesting, road construction) and the viability of fish and fish habitat. (For example, what are the effects of sedimentation and bedload movement generated by Forest management activities to on- and off-Forest fishery resources, over space and time?) A second area of concern was the effectiveness of Best Management Practices to protect and maintain fish habitat and riparian areas, and the effectiveness of fish habitat restoration/improvement as a measure to mitigate the effects of forest management activities, over space and time. In one section of their input, The State strongly recommended, in place of BMP's, the need for MR's be developed for fish, in order to provide strengthened Forest-wide requirements for the protection of habitat.

Chronology of Developing a Process to Address the Issue

During preparation of the DEIS, the Forest recognized the need for a method to address hydrologic cumulative effects on all areas of the Forest including riparian lands so that a more effective range of management options could be developed. However, no methodology was identified that could be directly adopted to the Forest to meet management requirements, specifically for water quality and riparian areas. As a result, in the draft EIS, consideration of hydrologic cumulative effects was focused on: 1) identifying the major causes of adverse cumulative effects on water quality and/or quantity; and 2) identifying watershed potentials for unacceptable adverse cumulative effects.

At the June 16, 1988 meeting with the Regional Forester to "Set the Course," highlights of public comments to the DEIS were presented. The Forest identified cumulative effects as one of two major issues identified in the public response that needed attention in progressing to a final forest plan.

Strategies to address the hydrologic cumulative effects issue were developed at this meeting. Included were additional public consultation, a literature search and work to determine if predictive models to determine hydrologic effects on westside Cascade watersheds were available (working with the Director of Watershed, Regional Office).

An informal progress report was made to Regional Office Resource Directors in early December, 1988 and a formal "Check the Course" meeting was held December 21, 1988.

At the "Check the Course" meeting, work to date on the hydrologic cumulative effects analysis was presented. No suitable model had been found, and the Forest had proceeded to develop an MBS-specific process (discussed in detail below.) In addition, no predictive model had been found to tie sediment production to fish habitat capability. This led to inclusion of fisheries as a major component of hydrologic cumulative effects analysis. Final results of the analysis were not available yet and the Forest was directed to continue work, with an additional "Check the Course" meeting scheduled.

On June 14, 1989, at a second "CTC" meeting, the results of the Forest's work were presented. The procedure for identifying a method to meet water quality and riparian MR's would be applied in all alternatives. It's intent, again, is to insure that effects of management activities prescribed by the Forest Plan meet the intent of water quality laws and regulations. Arrangements for peer (scientific community) and industry review were discussed.

During the summer and fall of 1989, meetings were held with State and Federal agencies, timber industry representatives, members of the academic and scientific communities, and representatives of environmental groups. The purposes of the meetings were to describe the process being used, solicit reactions to the process, and identify opportunities to improve the process.

The meeting with timber industry representatives created considerable interest and apprehension on their part, as expected. In a letter dated Oct 6, 1989, they stated their understanding of the issues that were presented at the meeting and requested additional information that has been subsequently given to them. They also stated in their letter that they would submit written comments in the near future. No additional comments had been received on May 7, 1990.

The meeting with members of the scientific community resulted in several useful comments. Comments made by the scientists at the meeting and subsequent written comments indicate they had a favorable impression of the procedure. Dr. Terrance Cundy (hydrologist) stated in written response (11/13/89) that the approach should be thoroughly documented and described so that outside analysts can understand the procedure, assumptions, and the philosophical context. He also stated: "As described, the approach is based on watershed and stream processes and functions. I believe this is a good strategy."

Dr. R. Dennis Harr, research hydrologist, also provided written feedback (11/10/89). He provided some comments related to how we displayed the acceptable and unacceptable criteria relative to upper and lower watersheds, and the dynamics of woody debris. He stated that "any additional information you can include to describe how you arrived at the harvestable acreage by decade figures would improve the credibility of these figures". He further stated that rain-on-snow criteria was an important issue that was not addressed on the example watershed (Finney Creek) used at the meeting. In conclusion he stated: "All in all, I think what you have developed is the best that could have been developed given the current state of knowledge."

Drs. Jim Sedell and Gorder Reeves (fisheries biologists) were also at the meeting and provided written feedback (12/13/89). They provided comments as to how we might better define acceptable and unacceptable criteria for in-channel stability, pool condition, and large woody debris.

We have also presented the process to the Washington State Department of Natural Resources (DNR), the Greater Forest Ecosystem Alliance, and at meetings sponsored by the National Audubon Society's Adopt-a-Forest Program. People at these presentations showed considerable interest and we felt that our information was well received. The DNR was especially interested but somewhat apprehensive as they are concerned that this process could have a significant effect on them.

Background and Legal Requirements

The Organic Act of 1897 provides that "No national forest shall be established except to improve or protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, ..."

The Multiple-use Sustained-Yield Act of 1960 also requires that the National Forests be administered for among other things, watershed, wildlife and fish purposes.

In addition, the Council on Environmental Quality (CEQ) regulations require that all Federal Agencies consider cumulative impacts in environmental analysis. CEQ regulation 40 CFR 1508.7 defines cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." General requirements for cumulative effects analysis are identified in the National Environmental Policy Act (NEPA) regulations, 40 CFR 1508.25, (a)(2) & (c) and 1508.27 (b)(7).

The National Forest Management Act (NFMA) regulations require a systematic Planning process and state that, to the extent feasible, this process be used to meet both Planning and National Environmental Policy Act requirements. Therefore, it is necessary to analyze cumulative effects as part of our Forest Plan.

Through the Boldt Decision (Phase II) we are managing through cooperative efforts fish habitat on National Forest lands in usual and accustomed fishing areas of Puget Sound Treaty Tribes. Responses to our Draft Forest Plan from tribal biologists, as well as State Agency biologists and other Federal

agencies such as EPA and the U.S. Fish and Wildlife Service, dictate we display a hydrologic cumulative effects analysis in our Final Forest Plan.

Section 208 of the Clean Water Act and Section 319 of the Water Quality Act of 1987 are the legal precedents that most affect forest management because they address nonpoint source pollution. The Region has established some guidelines on how we will comply with those water quality requirements.

1. Requirements of the Clean Water Act will be met by applying Best Management Practices. (See FSM 1561.5, R-6 Supplement 48 (8/79), agreement with the State of Washington.)

2. Within the concept of Best Management Practices, cumulative effects should be addressed and impacting activities scheduled and dispersed, when water quality might be unacceptably impacted. This is particularly important for high risk areas where management activities have been or might be concentrated over a short period of time.

3. Within the bounds of the above direction, Forest should address water quality in their analysis in the manner most appropriate given their information base and particular conditions.

Guideline 2 above is of particular concern on the MBS because of the occurrence and frequency of management activities in watersheds having a large amount of unstable soils.

Regional direction (1920 Regional Forester letter dated 9-24-84) states, "To avoid adverse cumulative soil and water effects, management actions should be dispersed rather than concentrated. Beyond that precept there was little in the way of hard scientific facts that could be relied upon." The concern on the MBS is that in many of the more sensitive watersheds on the Forest, dispersing management activities and state-of-the-art BMP's are not adequate to avoid unacceptable adverse hydrologic cumulative effects. It appears in some cases such things as reducing future outputs or foregoing outputs for a period of time may be necessary.

Process Used by the Forest

Refer to Attachment 1 for the References used to develop the Forest's hydrologic cumulative effects strategy.

The process used by the Forest to complete its hydrologic cumulative effects analysis consisted of two separate parts. These were: 1) Watershed Sensitivity Analysis - a preliminary analysis of the sensitivity of all watersheds and the assignment of each watershed to one of three categories of sensitivity and 2) Watershed Condition Analysis and analysis to determine the actual method or constraint to be used to meet MR's - a three step site-specific analysis of each watershed in the two most sensitive categories from the Watershed Sensitivity Analysis. The first step of this second analysis further examined the stream channel conditions and upslope conditions for each watershed. The next step was to determine, based on the above conditions and other considerations, whether the watershed was in an acceptable or unacceptable condition. The final step in the second analysis was to establish a maximum level of harvest on national forest lands that will maintain a watershed in an

acceptable condition or will improve an unacceptable watershed to acceptable conditions.

Watershed Sensitivity Analysis

A preliminary analysis was made of the sensitivity of all watersheds on the Forest using the following set of watershed condition factors: 1) management history, 2) climatic conditions, 3) presence of landslides, 4) inherent soil stability, 5) stream channel stability, and 6) off-site impacts. A team of the Forest's Soil Scientist, Hydrologist, Fishery Biologist, and Geotechnical Engineer made the first-cut analysis based on information at hand and their extensive field experience. This analysis was based on the planning guidance found on pages 8-9 of the "Process for Cumulative Effect Analysis" (RO letter 9/24/84). As a result of this analysis, watersheds were placed in one of three categories defined as follows:

Category I: watersheds where there has been little or no effect on water quality or quantity values. The existing natural and geomorphic features produce stable watershed conditions within the watershed and off-site. Of the total on the Forest, 8 watersheds were rated as Category I.

Category II: watersheds with recent management activity (over the last 30 to 40 years) that, together with some natural events, have caused adverse impacts to water quality - quantity values within and/or outside the Forest's watershed boundaries. The existing natural and geomorphic features can and have produced unstable conditions in some areas of the watershed. There are 53 Category II watersheds on the Forest.

Category III: watersheds with a very high frequency of management activities over the past 30 to 40 years. The magnitude of these activities has been significant within the watershed (large areas with activity occurring in a very short time period - 5 to 15 years). The existing natural and geomorphic features have produced and can continue to produce highly unstable and dynamic watershed conditions (within the watershed and off-site). Significant impacts have occurred within and outside the Forest's watershed boundaries. Of the total, 17 watersheds were rated as Category III. All of these lie north of Highway 2.

Watershed Condition Determination of Method/Constraint to Meet MR's

After the watershed sensitivity analysis, it was determined that an additional, more site-specific, analysis of the Category II and III watersheds would be necessary because of past level of management activities in most of these watersheds. The results of this additional analysis would identify limits of activity necessary to protect or allow recovery of these watersheds. The sensitivity of the Category I watersheds was determined to not be as critical and normal silvicultural created opening constraints would mitigate any unacceptable adverse cumulative effects.

The Forest organized individual District Interdisciplinary (ID) teams to conduct the watershed condition and method or constraint analysis for Category II and III watersheds.

The ID teams were composed of the most experienced personnel (with up to 25 years experience on the Forest) from the Supervisor's Office and each District, many of whom could offer insight from their personal experience over the years of working on the Mt. Baker-Snoqualmie. The team reviewed in-place empirical data and developed historical perspectives on watershed conditions from examination of aerial photos taken over the past 30 to 40 years. This process was applied to every Category II and III watershed on the Forest (a total of 70 watersheds).

The Regional Hydrologist worked with the Forest in developing a format for a worksheet for documenting the process in each watershed. That format required the IDT to direct their analysis and answer questions about stream channel conditions. We separated the analysis and discussion between the upper watershed (1st and 2nd order streams) from the lower watershed (3rd and 4th order streams). For both the upper and lower watershed areas, we looked at present and past in-channel stability, streambank stability, status of large woody debris, and channel pattern (lower watershed only). (See Attachments 2 and 3: diagram defining Upper and Lower watershed limits and a text: Evaluation of Present Stream Channel Conditions.)

The team also looked at upslope conditions by reviewing past harvest rates, road density and condition, presence of landslides, amount of unstable soils, and ability to revegetate and recover.

Some other considerations were incorporated, such as: 1) our expectations of the effect of new or improved Best Management Practices (BMP's), 2) what the estimated effects of mitigation measures would be if prescribed, 3) the relationship of the mature sawtimber left in a watershed to streams and unstable soils, 4) the amount of roading necessary to harvest the remaining timber and potential location to streams and unstable soils, and 5) the practicability of helicopter logging.

All of the above analysis and documentation was summarized in order to provide an overall evaluation of the existing watershed conditions. It was also used to reach an agreement on a desired future condition measured at the Forest boundary. (See Attachment 2 - Determining Watershed Boundaries). Thus, extensive state and private logging outside the National Forest was not considered. Depending upon the consensus of the IDT on the magnitude of the past cause and effect relationships projected to the future, a maximum harvest acreage per decade was assigned for each watershed. In addition, each watershed was rated as being in an acceptable or unacceptable condition. (See Table 1 for a summary of the criteria used to rate watershed condition as acceptable or unacceptable.)

The harvest rate assigned to a watershed is meant to maintain an acceptable condition, or improve an unacceptable condition within the National Forest. The harvest rate was developed based on the tentatively suitable acres identified in the EIS and became a dispersion constraint - the method to meet management requirements and applied to all alternatives.

Preliminary Results of Analysis and Steps to Proceed to Final Forest Plan

A total of 70 Category II and III watersheds were analyzed by the ID teams at the Ranger Districts. The documentation and results of the watershed condition

and management requirement analysis were reviewed by a Forest Supervisor's Interdisciplinary (ID) team and a Regional ID team to assure consistency in application of the principals of this analysis strategy.

Table 1
Criteria for Determining Watershed Condition

Criteria applicable to all stream orders (1st, 2nd; 3rd, 4th). Acceptable/ unacceptable rating is determined by considering the upper and lower watershed and arriving at an overall score.

ACCEPTABLE	UNACCEPTABLE
In-Channel Stability	
Channel scouring is evident but not excessive and can be attributed to natural causes.	Considerable amount of deep downcutting with evidence of continued scouring. Documentation indicates majority is the result of management activities.
Pool Condition	
Pool area occupies as much surface area as riffles. Ratio of 50/50 or better (pools/riffles). Pools are 2 feet or deeper (3rd & 4th order).	Pools are consistently shallow, usually being less than 2 feet deep and tend to be much less than 50% of the surface area. Pools tend to be filled in by sediment and/or bedload.
Streambank Stability	
80% to 85% of banks appear stable.	Extensive exposed banks with instability conditions predominating.
Wood Debris	
Adequate moments of embedded, well-anchored LWD are in place. Riparian area condition provides for recruitment of LWD into the future.	LWD is not in place and well-anchored. Because of lack of LWD, system lacks structure to provide stable pools and channel stability. Riparian area is lacking in the ability to recruit future supply of LWD.

As a result of the watershed condition analysis, 19 watersheds were rated as being in an unacceptable condition and 51 in an acceptable condition. The preponderance of the unacceptable watersheds were found on the more geological sensitive north end of the Forest - 15 of 19, approximately 80%. (see Chapter III of the EIS for a description of the geology of the Forest.)

The consequences of a watershed being rated in an unacceptable condition would be the application of a tighter harvest level for some period, usually at least the first two decades of the Plan. This allows for hydrologic recovery to take place before resuming what could be a higher harvest level and still avoid

adverse hydrologic cumulative effects. However, only one unacceptable watershed (AZ #31, Deer Cr. SE) was assigned to a "no harvest" level because of the seriousness of the watershed condition. This "no harvest" would occur for the first two decades of the Plan and harvesting could resume at an acceptable level in the third decade.

All of the other unacceptable watersheds showed some level of harvest. In most cases, the level was reduced for the first two decades increasing in the third and fourth decades. The ID team's rationale was that some harvest could take place in a watershed while recovery was taking place if the harvest activity would be conducted using improved BMP's and located in the less sensitive portion of the watershed.

This analysis is not meant to be an end in itself. It is viewed as a programmatic level of analysis that will be used for the Forest Plan. It is the intent of the Forest to continue to monitor these effects of management in an effort to fine-tune many of the assumptions we made at this programmatic level of analysis. We are presently developing a strategy for project level analysis of hydrologic cumulative effects which would be a source of more specific information that would help us: 1) develop and design better options for project implementation and 2) adjust any planning level assumptions. We view this as adaptive management.

A summary of the results of the watershed condition analysis and the results of the analysis - a set maximum number of acres available for timber harvest, per decade, by watershed - is shown in Table 2. Table 3 displays additional information about watersheds found to be in unacceptable conditions. Also, refer to the Attachments for additional documentation of the analysis and the rationale for the watershed condition and the constraint. Summary sheets are included for all watersheds considered, plus one completed worksheet for a watershed.

Modeling

The hydrologic cumulative effects analysis procedure developed by the ID team is incorporated into the Forest's FORPLAN model as a set of constraints. To meet the water quality and riparian management requirements, there is a set maximum number of acres available for final harvest by watershed.

Accessibility constraints applied by watershed set a maximum on the amount of an area that can be scheduled for harvest in a decade. For the first decade, the accessibility constraints were developed by calculating the percent of the area that can be entered, while still "keeping" watersheds that rated acceptable from deteriorating, and allowing watersheds in an unacceptable condition to recover (eventually to an acceptable condition). The percents that went into FORPLAN modeling were based on the maximum harvest acreage limits developed by the ID team.

For the second and subsequent decades, the method or constraint to meet MR's was modeled by "flow constraints" on acres of final harvest Forest-wide (by North and South). Accessibility constraints were not used in these decades because of insufficient information available from the model to track the vegetation condition class by zone after management is implemented in the first decade. The flow constraints were developed in concert with the Forest's

resource specialists to reflect the continuing need to manage, in order to keep cumulative hydrologic effects below the unacceptable levels. The flow constraints allow final harvest acres in Decade 2 to increase by 4% over the Decade 1 final harvest acres; by 10% in Decade 3 over Decade 2; by 4% in Decade 4 over Decade 3; and 0% increase thereafter - a total increase in final harvest acres of approximately 18% over the first decade levels.

Individual Watershed Worksheets

Again, refer to the Attachments for more detailed information. The complete worksheets and maps for all watersheds analyzed are available in the Planning Records.

Table 2
AZ SUMMARY

AZ	NAME	CATEGORY	RATING	TOTAL ACRES	NF ACRES	ACRES HARVEST PER DECADE 1	2	3	4
Mt. Baker Ranger District									
2	ILLABOT CK	II	A	15,606	15,522	425	425	425	425
3	CHILLMUNRD	II	A	11,677	11,677	250	250	250	250
4	CANYON CK	III	U	17,463	17,463	100	200	420	420
5	LRNOFKNOOK	II	A	16,521	13,284	400	400	400	400
6	GLAMFNOOKN	II	A	12,500	9,441	280	280	280	280
8	MDFKNOOKUR	II	A	6,777	6,777	250	250	250	250
9	URNOFKNOOK	II	A	24,942	24,731	980	980	980	980
10	MDFKNOOKSO	II	A	6,187	6,187	200	200	200	200
11	SOFORKNOOK	III	U	19,825	19,045	325	325	390	450
14	SWIFT-PARK	II	A	6,607	6,439	250	250	250	250
15	BAKER	II	A	23,810	23,142	650	1025	1025	1025
16	BKLKUNRD	II	A	10,764	10,300	350	350	350	350
17	LKSHANNON	II	A	10,194	10,012	300	300	300	300
18	LKSHANUNRD	III	U	12,968	11,888	200	300	400	400
20	JACKCRMUR	III	U	11,274	8,404	200	325	325	325
22	MRSKRVMR	II	A	13,896	12,482	625	625	625	625
23	URSKAGITRV	II	A	10,775	9,483	330	330	330	330
26	CASCADE RV	II	A	23,713	23,671	1100	1100	1100	1100
27	LRSKAGITRV	II	U	3,547	3,252	75	75	185	185
28	LRSKRVMUR	II	A	11,003	10,961	550	550	550	550
29	DEER CK NW	III	U	12,261	10,474	100	200	400	400
30	FINNEY CR	III	U	21,226	20,888	100	100	850	850
31	DEER CR SE	III	U	6,274	6,274	0	0	262	262
32	DEERCRUNRD	III	U	7,179	7,179	110	110	220	220
38	SAUK RV NE	II	U	6,420	6,209	100	100	200	200
Darrington Ranger District									
34	MRNOFKSTNO	II	U	3,887	3,887	200	200	200	200
35	MRNOFKSTSO	II	A	8,784	6,990	500	500	500	500
37	URNOFKSTIL	III	U	31,339	30,809	1000	1000	1000	1000
39	SAUK RV SE	III	A	45,128	43,421	1700	2500	3000	3000
40	SUIATTLERV	II	A	42,108	41,749	2500	1700	1700	1700
41	SU-RVMUNRD	II	A	10,792	10,792	750	350	350	350
42	WHITECHUCK	II	A	15,965	15,965	650	650	650	650
44	CANYON CR	III	U	16,388	15,816	250	250	250	250
45	SAUDRVUNRD	II	A	16,450	16,450	450	450	450	450
46	LRSOFKSTLL	III	U	17,696	16,008	350	350	350	350
48	URSOFKSTLL	III	U	35,140	34,063	500	500	500	500
49	SAUKRVFORK	III	A	25,721	25,446	250	250	250	250

Table 2 (continued)

AZ	NAME	CATEGORY	RATING	TOTAL ACRES	NF ACRES	ACRES HARVEST PER DECADE 1	2	3	4
Skykomish Ranger District									
47	SULRVUNRDN	II	A	3,631	2,597	150	200	200	200
51	SULRVURSE	II	A	6,609	6,166	300	300	300	300
52	SULTAN RV	III	A	15,682	7,917	100	100	100	100
53	NFSKYURSO	II	A	20,990	19,830	650	650	650	650
54	NFKSKYURNO	III	A	14,421	14,001	500	500	500	500
55	NOFKSKYRV	III	A	12,330	9,735	1060	1060	1060	1060
56	NFKSKYURW	II	A	11,930	11,192	310	310	310	310
57	SKYRVMUNRD	II	A	11,358	9,227	350	350	350	350
59	TYE RIVER	II	A	6,796	4,095	100	150	150	150
60	BECK-RAPID	II	A	44,810	39,788	3600	4000	4000	4000
61	SOFKSKYUR	II	A	5,258	5,153	240	240	240	240
62	SOFKSKYRV	II	A	3,589	2,344	270	270	270	270
63	SKY-TOLT	II	A	20,828	3,632	300	200	200	300
65	SFKSKYALMR	II	A	24,726	23,503	430	430	430	430
67	TY-BEC-MU	II	A	21,389	20,166	700	1000	1000	1500
68	FOSSRVALMU	II	A	6,546	6,313	500	500	500	500
69	MILLERALMU	II	A	5,955	5,386	200	200	200	200
North Bend Ranger District									
70	TLTRVMUMUR	II	A	7,266	6,612	250	250	250	250
71	NFKSNQALMU	II	A	9,457	7,305	700	700	700	700
72	TAYLORALMR	II	A	6,554	6,172	250	250	250	250
73	MFKSNQALMU	II	A	5,025	4,345	350	350	350	350
74	URMFKSNQMU	II	A	12,289	11,529	800	800	800	800
75	PRATT-ALMU	II	A	10,009	9,165	650	650	800	1000
77	SFKSNOQMU	II	U	25,097	17,419	200	200	200	200
81	URGREENRV	II	U	36,073	17,062	500	500	1000	1500
82	GREENRVNO	II	A	34,567	7,384	300	300	800	800
83	GREENRVSO	II	A	27,548	12,124	1000	1500	2500	3000
White River Ranger District									
84	GREENWATER	II	U	28,754	18,520	650	880	1320	1320
85	LRWHITERV	II	U	4,346	2,321	250	250	250	250
86	CLEARWATER	II	A	3,315	3,315	407	407	407	407
90	HUCKLBRYCK	II	A	10,008	10,008	1300	1300	1300	1300
91	WFWHITERV	II	A	16,874	16,874	2000	2000	2000	2000
93	CARB-PUYAL	II	A	20,967	15,711	1150	1150	1150	1150

Table 3
Summary Table of Unacceptable Condition Watersheds

Number	Name	Total Acres	N.F. Acres	Acres of Tent. Suit. Mature Timber Remain.
4	Canyon Creek (N)	17,463	17,463	3,463
11	S.Fk.Nooksack	19,825	19,045	7,263
18	Lake Shannon	12,968	11,888	5,912
20	Jackman Cr.	11,274	8,404	3,083
27	Lower Skagit	3,547	3,252	1,055
29	Deer Cr. NW	12,261	10,474	4,329
30	Finney Cr.	21,226	20,888	5,574
31	Deer Cr. SE	6,274	6,274	2,428
32	Deer Cr. Unrd.	7,179	7,179	4,160
34	M.R.N.Fk.Stilly	3,887	3,887	1,625
37	N.Fk. Stilly	31,339	30,809	11,572
38	Sauk R. NE	6,420	6,209	2,174
44	Canyon Cr. (S)	16,388	15,816	5,828
46	Lower S.Fk.Stilly	17,696	16,008	5,342
48	Upper S.Fk.Stilly	35,140	34,063	8,615
77	S.Fk. Snoq. R.	25,097	17,419	5,371
81	Upper Green R.	36,073	17,062	8,447
84	Greenwater	27,867	18,520	6,546
85	Lower White R.	4,346	2,321	1,710

The following Attachments provide more documentation of the hydrologic cumulative effects analysis, including a completed worksheet for one sample watershed and the Summary Sheets for all watersheds.

Attachment 1

Support Documentation for MBS Forest Plan
Watershed Cumulative Effects Assessment

The following listed references (citations, publications) were used to develop the Forest's hydrologic cumulative effects strategy for the Forest Plan. This Forest strategy development began in 1984 and has evolved for the past five years to its present form. Because of the complexity and gaps in knowledge in this subject area, our strategy has been dynamic; as new information and knowledge as been published, we have reviewed and incorporated, it appropriate, this into our strategy.

Basic Documents Used to Develop the CEA Strategy

1. **"Management of Wildlife and Fish Habitats in Forests of Western Washington and Oregon, Part 1", 1985.**

   Chapter 10 Salmonids, principal authors: Fred Everest, Neil Armantrout, Steven Keller, William Parante, James Sedell, Thomas Nickelson, James Johnston, Gorden Haugen.

2. **"Streamside Management: Forestry and Fishery Interactions", 1987.**

   Variables Related to Fish Habitat - Chapters 1-6.

   Forest Management of the Streamside Zone - Chapters 8-9.

Supporting Documents Used to Develop the CEA Strategy

1. **"Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge", Geppert, Lorenz, Larson, 1984.**

   * validation that there is a potential for cumulative effects from current forest practices.

   * control of much of the cumulative effects is possible by manipulating future application of forest practices in time and space.

   * using basin examination approach to analyze watershed cumulative effects.

2. **"Watershed Workbook: Forest Hydrology Sensitivity Analysis for Coastal British Columbia", D. J. Wilford, 1987.**

   * identification of important in-channel attributes and how these respond to past and proposed timber management activities.

   * change in channel morphology linked to changes in upslope conditions.

   * recovery aspects of impacted in-channel conditions as well as upslope recovery.

* use of empirical data and professional judgement to establish linkages between forest management activities of past and present to upslope conditions, to in-channel conditions, and finally to fish habitat.

3. **"Cumulative Watershed Effects: Problem and Approach, L. M. Reid, G. Ziemer", 1988.**

   * framework for linking upslope conditions to in-channel conditions.

   * use of empirical correlations, process-based studies, local watershed studies, and professional experience and judgement together or in combination to assess watershed cumulative effects.

4. **"Cumulative Watershed Effects: An Empirical Evaluation of Responses by Stream Biota, Charles Hawkins, L. Decker", (current).**

   * approach to establish relationships between physical variables (upslope physical features, in-channel morphical attributes, and management activity) to biotic variables (fish abundance) within the stream system.

   * use of basin-wide approach.

   * reliance on establishment of empirical relationships between forest management activities (type and intensity) and biotic variables to predict cumulative effects on a basin basis.

5. **"Fish Habitat Evaluation Handbook (Monitoring), FSH 2609.23, USDA/USFS/R-6", 1985.**

   * identification of in-channel attributes likely to be influenced by forest management activities.

   * identification of in-channel attributes that could be estimated and or measured from existing District knowledge and data.

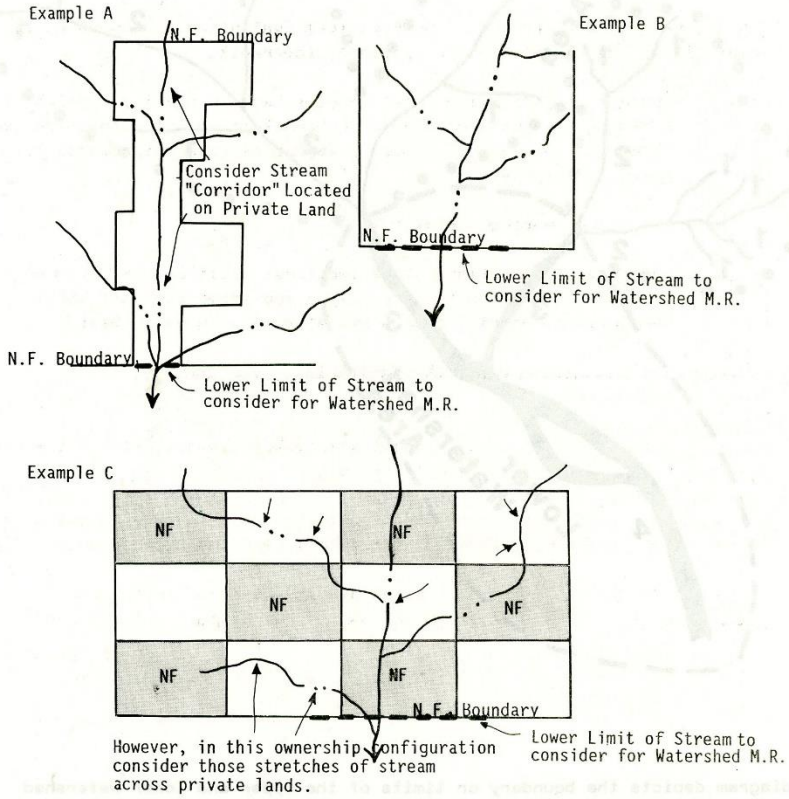
   * identification of in-channel attributes that could be quantitatively be measured now in the future.

Attachment 2

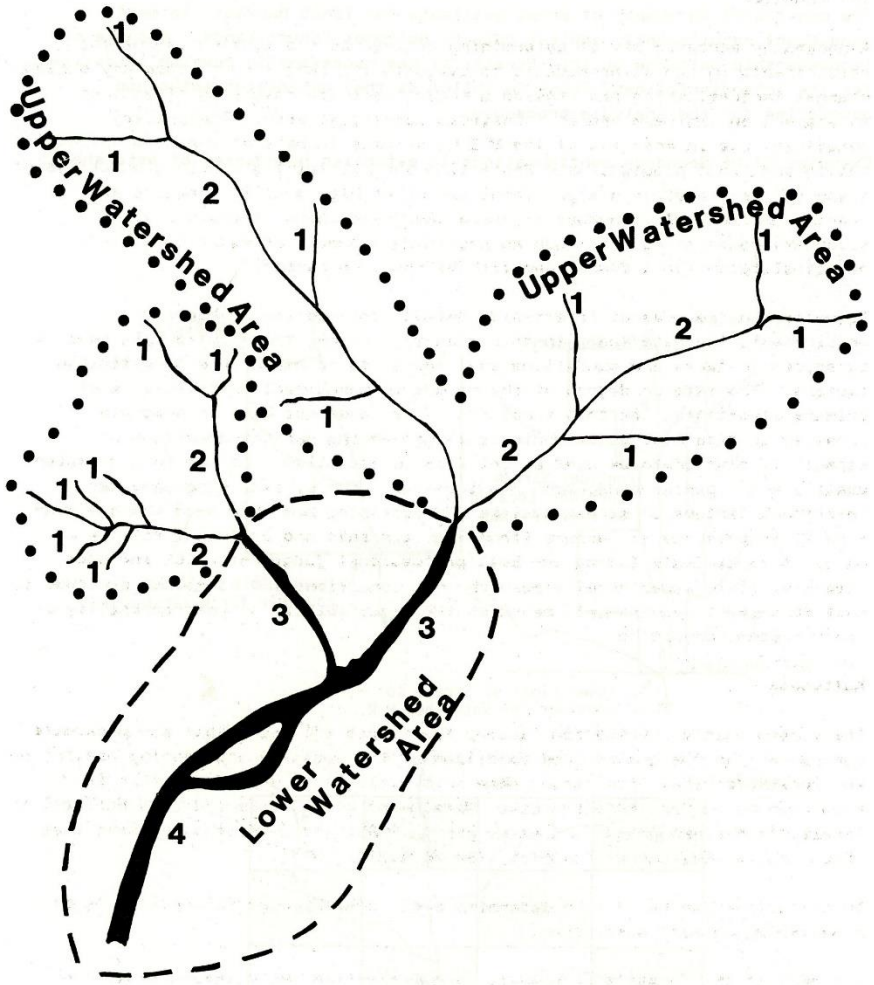
Determining Watershed Boundaries for the Hydrologic Cumulative Effects Analysis

The constraint on number of acres available for final harvest, to meet management requirements, applies only to National Forest lands. Because of landownership patterns on this Forest, it was necessary to develop guidelines for the Interdisciplinary Teams to follow as they delineated watershed boundaries for the analysis procedure.

Examples of NF Boundary configurations to establish boundaries of watersheds:



Attachment 3



This diagram depicts the boundary or limits of the upper and lower watershed areas, based on the stream channel network system. Generally, most of the first and second order channels are in the upper watershed area, while the third and fourth order channels are in the lower watershed. Note that these orders DO NOT correspond to the Class I, II, III, and IV Stream Classes referred to elsewhere in the documents.

Attachment 4

Process used to Evaluate Present Stream Channel Conditions

Introduction

A generally accepted way of determining whether we are meeting management requirements in our watersheds is to evaluate the condition of some key stream channel factors, which can provide a measurement for assessing effects of management on instream and/or downstream beneficial uses. The primary beneficial use in most all of the MBS watersheds is habitat for substantial salmon and trout populations. Protecting and maintaining viable populations of these species requires a significant amount of high quality spawning and rearing habitat. In a number of these same watersheds, there are also secondary benefitting uses such as providing a supply of water to a municipality or for a downstream fish hatchery operation.

To determine the present Forest-wide methods for meeting management requirements for watersheds in this planning period, the requirements need to be stated in terms and conditions that translate to measurable or estimable factors. The rate or degree of change due to management activities is of primary importance. At this time, the forest does not have an adequate Forest-wide data base on salmonid spawning/rearing habitat condition or capability that could be used as criteria to establish a method to meet water quality and riparian management requirements. But by examining some key in-channel factors of stream systems and assessing how they have changed over time it is possible to measure (from the data sets and empirical data we do have) or to estimate (using our best professional judgement which includes extensive field experience) stream channel conditions and establish a method to meet management requirements based on the acceptability or unacceptability of their present condition.

Rationale

The stream channel evaluation factors identified are reasonable and proximate surrogates for the quality and condition of the spawning and rearing habitat on the Forest for that time period when such evaluations are made. This is supported by current research (see "Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington", 1985) and current management (see "Fish Habitat Evaluation Handbook, FSH 2609.23", 1987).

These factors can be used to determine past, present, and future effects of proposed management activities.

For most of the Forest's watersheds, the protection and maintenance of high quality salmoid habitat will also afford the secondary beneficial uses within these watersheds the same degree of protection.

Furthermore, the protection and maintenance of substantial amounts of high quality salmonid habitat in the stream and river systems within the Forest boundaries will influence downstream, off-Forest, non-USFS beneficial uses within these watersheds.

To measure and/or to estimate the rate of change or the degree of change over time, assume the time period (at a minimum) to be from 1950 to the present (the past 35-40 years). In most of the Forest's watersheds, this time period has

resulted in the most significant changes to stream channel conditions. We are interested mainly in the changes due to management activities during this time. The ID Team will examine and note the difference between changes related to management as opposed to those changes caused by major natural events such as floods or landslides.

In most, if not all the major Forest watersheds, the salmonid populations, especially the salmon and steelhead runs, have been able to adapt, over time, to a range of natural or background conditions and events to reproduce and maintain viable populations. Within the major watersheds, there is no known evidence of where a population of salmon or steelhead has been lost or become unviable due to a natural condition or event.

The resource objectives for fish habitat and watershed restoration or improvement activities within the forest's watersheds are to accelerate the natural recovery of fish habitat, unstable channel and upslope conditions.

The entire watershed will be analyzed. However, it is appropriate to examine upper watersheds (1st and 2nd order streams and their adjacent riparian areas) separate from lower main-stem channels (3rd-5th order streams and associated floodplains).

Evaluating on a watershed basis creates a problem in coming up with the final product because the boundaries of the Forest AZ's are not always pure watershed boundaries. In a number of situations, more than one (sometimes 3 or 4) AZ constitutes a watershed. In these cases, the ID Team should evaluate the stream channel conditions on a watershed basis (not on an AZ basis).

Documentation during this step is critical. At a minimum, a time-series of aerial photos should be used to make these stream channel evaluations. Use of this resource tool needs to be supported by empirical data and file data where it is available. Be sure to record data or work from external sources (agency, tribes, and research).

Determination

Evaluate the upper watershed area, the fish bearing first and second order channels (these are the Forest's lightly and deeply incised Class III and IV streams). The ID Team needs to determine the existing overall stream channel condition (for the entire upper watershed area) based on three in-channel factors of in-channel stability, streambank stability and LWD.

In assessing in-channel stability:

Determine how many of these channels are either down-cut or have scoured to bedrock.
Is channel scouring evident now and in the past.
What is the pool frequency in these small channels. Has it changed?
What is the present and past ability of these channels to store/transport sediment to downstream third to fifth order channels.

In assessing streambank stability:

Determine how many or what percent of these channels have significant area of exposed streambanks as evident from present and past bank

erosion. (If possible, make qualitative estimate of natural versus man-caused bank erosion.)

In assessing Large Woody Debris (LWD):

Determine how many or what percent of channels having an adequate amount of LWD in the channel (structures for pool formation). Has there been a significant change over time?
What is the recruitment for future LWD into these channels from the adjacent riparian areas.

Evaluate the lower watershed area, the third to fifth order channels, and determine the existing overall stream channel condition based on the following channel factors of in-channel stability, LWD, and channel pattern.

In assessing in-channel stability:

Examine the entire channel length and determine the extent of downcutting and widening.
Determine what has been the ability of these channels to store/transport sediment.
Determine the frequency or amount of bedload deposition in these channels over time.
Determine the overall pool quantity and quality (size and depth) in these channels.

In assessing LWD:

Determine the presence or amount of LWD along the entire channel length.
Determine if it is stable and if it is well distributed or is it all concentrated in one or two areas.

In assessing channel pattern:

Determine what type of channel, straight or meandering; is it one channel or is it braided. Assess overall changes.
If possible determine the sinuousity of the channel in order to describe channel response to changes in sediment loading and flow. (See page 23.77 in FSH 2609.23)

When attempting to determine these in-channel factors, focus attention on those channels where there has been timber harvesting and road building activities during the past 30-40 years. Also determine what percent or portion these impacted channels are in relation to all the streams in the watershed.

Based on how the ID Team evaluated the upper and the lower watershed areas, make an overall determination if the present stream channel conditions of that watershed are acceptable or unacceptable. In some cases acceptable and unacceptable conditions may exist in the same watershed. Document where such condition exist and consider this in the final analysis. Again, keep in mind the analysis should be in the context of changes due to past management activities.

Appendix H

Description of Present Condition Upslope

Past Harvest Rate

Determine clearcut acres harvested per decade by ownership. Consider the effects of location of existing clearcuts to streams and unstable soils.

Road Density and Condition

Roads decrease slope stability and modify slope hydrology.

Determine miles of road constructed per decade and present density in miles/mi2. Add supporting statements where applicable to address factors such as:

- Relation to unstable soils.
- Stacked roads on hillslopes.
- Condition of fills and cutslopes.
- Condition of road drainage system.

Presence of Landslides

Landslides are a major source area for sediment.
Consider and document:

- Size.
- Distribution.
- Delivery of sediment to channel.
- Source whether natural, in unit, or road related.
- Observed changes in rate of occurrance.
- Compare with effects in adjacent undeveloped drainages.

Attachment 5
Sample Completed Worksheet - For One Watershed

WATERSHED: _FINNEY CREEK_ **ALLOCATION ZONE:** _#30_

	ACRES
TOTAL WATERSHED:*	**21,226**
NATIONAL FOREST	20,888
TOTAL HARVESTED	10,012
TENTATIVELY SUITABLE	17,019
PRIVATE LAND	338
TOTAL HARVESTED	202
TOTAL AZ:	**21,226**
NATIONAL FOREST	20,888
TENTATIVELY SUITABLE	17,019
MATURE (MLS & MSS) TIMBER	5,574
PRIVATE LAND	338

* All w/in NF boundary

I. STREAM CHANNEL CONDITIONS:

UPPER WATERSHED AREA

A. IN-CHANNEL STABILITY :

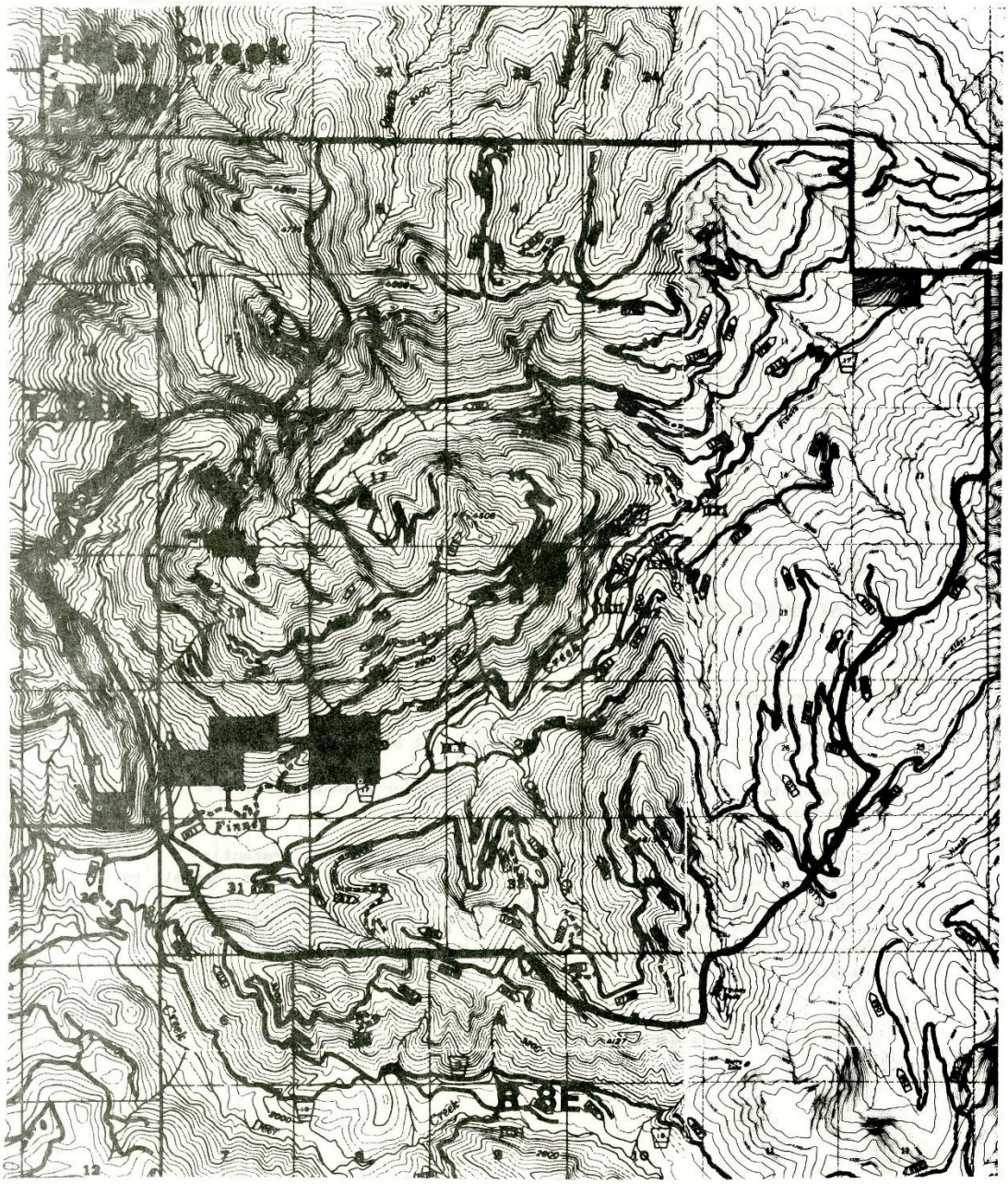
How many 1st & 2nd order channels are down-cut or scoured to bedrock?

Approximately 75% (12 of 16 streams) of the major channels that are tributary to Finney Creek are affected.

Comment on the channel scouring that is evident (past and present):
Debris torrents originating in the upper watershed have scoured channels to bedrock in the streams described above. Some natural scouring in highly unstable soils (Nervous Bride Creek area) prior to the mid 1970s did occur. There has been increased scouring since the mid 1970s largely due to human related activities.

Comment on the pool frequency:
Pool frequency has decreased due to the increased scouring activity.

Comment on the ability to store/transport sediment to downstream 3rd to 5th order channels:
Due to the steepness of channel gradients and loss of pool storage & in-channel woody debris, streams have lost ability to store sediment.



B. STREAMBANK STABILITY:

How many, or what percentage of these channels have exposed banks as evident from present or past bank erosion?
Approximately 80 - 85% of the 1st and 2nd order channels.

C. LARGE WOODY DEBRIS:

Comment on the amount and stability of LWD in these channels:
There is very little large woody debris remaining.

Comment on the recruitment potential of LWD into these channels from the adjacent riparian areas:
On the north side tributaries: Six major tributaries are lacking LWD recruitment potential due to past harvest activities adjacent to them.

On the south side tributaries: Moderate to high potential for LWD recruitment is possible adjacent to these streams.

LOWER WATERSHED AREA

A. IN-CHANNEL STABILITY:

Comment on the extent or the amount of down-cutting along the entire channel length:
Some downcutting in the intermediate reaches of Finney Creek itself (below the slide @ MP 9.0 on Rd. #17). Some deposition is apparent in other reaches.

Comment on the ability of these channels to store/transport sediment:
Low to moderate ability to store sediment and moderate to high ability to transport, due to the fact that fine sediments have been removed leaving a coarse, cobble-sized substrate.

Comment on the overall pool quantity and/or quality (size and depth) in these channels:
Pool quantity and quality is significantly decreased.

Comment on the extent or frequency, over time, of bedload deposition in these channels:
Significant deposition began in the mid-1970s due to debris torrent activities in the side channels (tributaries to Finney Cr.).

B. LARGE WOODY DEBRIS:

Comment on the extent or amount of LWD along the entire channel length:
Due to increase in sediment transport and dam break activity, the majority of the large woody debris has been removed from the system.

Comment on the stability and the distribution of LWD along the entire channel length:
Poor - largely not there and what is present is in a few scattered jams or clumps above the mean water level. A few individual scattered, loose pieces are present, but not stable.

C. CHANNEL PATTERN:

Comment on the predominant channel type (straight or meandering, 1 or 2 main channels or braided channels):
Primarily straight - mostly one main channel.

Comment on the sinuosity of the channel:
Historically, there was some sinuosity in the headwaters area, but this has since been lost.

II. UPSLOPE CONDITIONS

A. PAST HARVEST RATE:

Percent cut per decade: (Of Entire Watershed)

NF ownership	Private
≤1% cut 30's	_0% cut 30's
_0% cut 40's	_0% cut 40's
_4% cut 50's	≤1% cut 50's
13% cut 60's	≤1% cut 60's
17% cut 70's	≤1% cut 70's
14% cut 80's	_0% cut 80's
48% total	_1% total

Comments on location of previous cutting in relation to streams, unstable soils, etc:
Prior to the mid-1970s, harvest was fairly well dispersed. Following extensive blowdown in the mid to late 1970s harvest became concentrated in the upper watershed. Less attention was given to riparian protection and unstable soils prior to 1980.

B. ROAD DENSITY AND CONDITION:

What is the avg. Rd mi/sq mi density in the tent suit area? - 4.0 miles/sq. mi.
(There are a total of 106.4 miles in the WS)

15% constructed 30's-50's
41% constructed 60's
40% constructed 70's
_4% constructed 80's

Comments on location of roads in relation to unstable soils:
In several areas existing roads cross unstable soil areas. Generally, these unstable soil areas are limited to stream draws.

Comments on placement of roads on hillsides (stacking):
There is a high degree of stacking in the entire watershed.

Comments on conditions of cuts and fills:
Prior to the mid-1970s, road construction specifications called for sidecast excavation with uncontrolled fill placement. This amounts to 50 - 60% of the existing road system. Approximately 19 miles of the maintenance level 1 & 2 roads have been treated (sidecast pullback, waterbarring, insloping, etc.). An extensive watershed/road deficiency inventory is currently underway with FRP funds planned to correct existing deficiencies prior to future failures occurring.

Comments on condition of road drainage system:
Prior to the mid-1970s constant grades were prevalent with culvert spacing and sizing inadequate. Waterbar activities were limited to temporary roads and the work that was done in this regard was largely inadequate. We have begun road rehabilitation efforts in the drainage to correct existing deficiencies. (See inventory note above.)

C. **PRESENCE OF LANDSLIDES:**

The following are the known major landslides in the watershed:

1. Nervous Bride Creek area (natural slide area)
2. Gee Point/Upper Finney area (occurred in 1960 to 1970's)
3. Clendenen Creek slide (1940's/natural)
4. Rd. #17, MP 9.0 (1986)
5. Homestead Creek area (1970's/80's)
6. Hatchery Creek
7. Quartz Creek

Comment on size of landslides:
Other than the MP 9.0 slide & Homestead Cr. area, most landslides are relatively small in area & translate into debris torrents downstream channels (See Section A - In-channel Stability).

Comment on distribution of landslides:
They are evenly distributed.

These slides have contributed to the instability of streambanks:

There have been 8 slides in 7 years along 2 miles of Finney Creek--all triggered by rain-on-snow storm events. The largest is about 20,000 CY and the smallest about 8,000 CY--all initiated in harvested areas.

During 1983, Deer Cr. and Finney Cr. had 37 significant slides in harvested areas triggered by rain-on-snow storm events.

Comment on delivery of landslide material to the channel:
Most landslide material reaches 3rd and 4th order channels due to the steepness of gradients.

What is the major source of landslides?

Natural: There have been five natural landslides associated with fault zones and rock type changes:

1. Nervous Bride Creek area
2. Gee Point/Upper Finney area
3. Clendenen Creek slide area

4. Hatchery Creek
5. Quartz Creek

(Ref. 1978 Geologic Map by Morrison)

In unit: Most are related to yarding road or landing failures from concentrated water near stream courses. There has been one major in-unit failure (Homestead Creek area).
Road related: There have been several small-sized sidecast road failures with one major event (Rd. #1721 which is known as Finney Cr. 9 Mile Slide). Also, there have been numerous road drainage structure failures due to inadequate sizes and/or upslope debris torrents.

Comments on observed changes in rate of occurrence:
Aerial photography was reviewed from 1940, 1956, 1964, 1972, 1979, & 1983. From studying these photos it has been determined that the rate of occurrence significantly increased after the mid-1970s. 34% of the National Forest acres were harvested between 1964 and 1983. This heavy harvest had no or very little apparent impact on downstream channel condition until rain-on-snow flood events in 1975,1977,1979, and 1980 (higher elevation). These flood events are documented by ERFO damage reports and changed channel conditions.

D. UNSTABLE SOILS:

24% of the tentatively suitable area is unstable as shown in the SRI.

Comments on distribution, extent and effect of unstable soils:
The lower north side and the entire south side of the drainage, as well as the west side of the headwaters are the main areas of unstable soils in the Finney Creek watershed.

The potential for debris torrents and scouring due to management activity (harvesting and road construction) is greatly increased in the areas of unstable soils.

It should be noted that large management related landslides have occurred in areas not identified as unstable soils.

E. ABILITY OF LAND TO REVEGETATE:

Describe major areas not revegetated:
Major areas scoured to bedrock are limited for the most part to the 9 Mile Slide and stream sluice-out tracks. In addition, steep road cutbanks, and undercut channel banks along main stream channel.

Comments on Recovery Rate:
Where debris torrent activity is occurring, channel banks are not revegetating due to constant disturbance.

Natural revegetation occurs readily wherever denuded areas are mechanically stable.

Clearcut areas: Most harvested areas are well revegetated. Recovery of cutover areas occurred in 20 years (comparison of 1964 & 1984 aerial photos).

Note: Past prescribed broadcast burning practices have significantly contributed to soil loss, increased sedimentation, and delayed revegetation recovery in certain areas of the watershed.

III. OTHER CONSIDERATIONS

A. Comment on the expected effectiveness of new BMP's:
BMPs are identified as such things as: yarding methods, temporary and system road construction specifications/methods, landing construction control, riparian area protection, etc.

Effectiveness will be limited to the immediate area of application. BMPs will not be significantly effective due to the past widespread activity in the watershed.

B. Describe other mitigating measures needed to meet MR,s (sidecast pullback etc.):
Sidecast pullback (landings & road fills), insloping, installation of waterbars on closed roads, installation of driveable waterbars on open, high clearance roads, addition of more drainage structures including dipped and hardened crossings, revegetation, in-channel stabilizing structures, have been identified in general as being needed. Detailed mitigation measures will be documented when the Finney Creek Inventory is completed.

C. Determine the location of mature saw timber in relation to streams and unstable soils:
Of the remaining mature saw timber, a large portion (approx. 50%) is located adjacent to streams or within unstable soil areas.

D. Determine future road needs:
Minimal new system road construction is identified as being needed. Construction of temporary roads will be minimal also and only as needed to obtain adequate deflection or better directional angle for yarding operations.

E. How many acres are to be helicopter logged? 400 acres
(Forest Plan review, 1988)

IV. SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photography revealed that past harvest activities up to 1975 (29% of N.F. lands in the watershed) had little apparent impact on stream condition. Between 1976 and 1988 additional heavy harvesting in the upper watershed (20% of N.F. lands), coupled with rain-on-snow flood events (1975,77,79, & 80) caused a large increase in sediment yield and transport through debris torrents & landslides. Dispersion of harvest was not provided for. Upper watershed, in-channel streambed and bank conditions are highly disturbed where debris torrents have occurred. This has affected 75% of the major 1st and 2nd order streams. Sediment from these events and other landslides has been deposited in the mainstem of Finney Cr. The ability to retain sediment in the side channels has been greatly reduced. Pools have been filled in and/or scoured which has severely impacted the resident trout habitat. The main channel of Finney Creek has been scoured, widened, and straightened. Woody debris has been re-distributed and/or lost from the system. Because of these factors the ID team rated the condition of the AZ as unacceptable.

The average harvest rate in the 1960's, 70's and 80's was 3137 acres per decade on the AZ. This rate resulted in an unacceptable watershed condition. The Finney Creek watershed is still in an unacceptable condition. This condition will not change until natural recovery and watershed restoration measures are completed in the first decade. The decline in watershed condition must be halted before any timber harvest and road construction activities can take place.

Watershed condition in 1976 was determined to be unacceptable based on observation of stream conditions in the lower WS. Considering that rooting strength deteriorated for 8 years, it is assumed this condition was triggered at the 1968 harvest level. This rate was 16% on NF land. In order to provide for adequate dispersion of harvest throughout the suitable acres, and for in-stream recovery to occur it is assumed that 15% disturbance in 30 years can be tolerated beginning in the third decade (5% / decade X 17,019 tent. suitable acres = 850 acres harvest per decade).

Minimal harvest activities of not more than 100 acres/decade for the first two decades may be possible provided that all watershed restoration measures are completed, the decline in watershed condition is halted, and the following best management practices are strictly adhered to: 1) harvest will be distributed throughout the watershed and not concentrated in any one sub-basin, 2) new long-term road construction will be restricted to gentle stable ground, 3) management activities must be no closer than 1/8 mile from unstable soil areas, 4) all materials will be yarded using full suspension methods, 5) there will be no harvest allowed in Class I, II, III and IV stream riparian areas, 6) all disturbed areas (including but not limited to temporary roads, skid trails, landings, fire lines) will be revegetated and drained prior to the current year fall/winter storm period, 7) all short-term roads must meet the preceding criteria, 8) emphasis will be placed on using KV generated dollars for watershed/fish restoration work, and 9) emphasis will be placed on using timber sale road reconstruction dollars for road drainage restoration.

It is assumed that by the 3rd decade (year 2010) the watershed (channel recovery, canopy closure, root strength) should be recovered sufficiently to allow a harvest rate of 850 acres/decade for the next two decades.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS:_ _ACCEPTABLE _XX_UNACCEPTABLE

1/ MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 acres
2: 100 acres
3: 850 acres
4: 850 acres

1/ This expression becomes the watershed constraint to meet water quality and riparian MR's; it will be considered in all alternatives in the FEIS.

Items Considered:

1. Past Harvest Rate/Condition of Watershed
2. Restoration Needs
3. Effectiveness of BMPs - Overall Watershed
4. Future Harvest/Road Needs - Helicopter v.s. Conventional
5. Acres Harvested/Acres Saw Timber Remaining/Proximity to Unstable Soil
6. Road Density

Recovery Rate References:

Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington; Reade E. Brown; Chapter Narratives Part 1, USDA Forest Service, Pacific Northwest Region, June 1985, Page 238.

Elk River Area Analysis Pilot Project; Siskiyou National Forest; 19__; cites OSU-PNW research.

Canyon Creek Cumulative Effects Study; Mt. Baker-Snoqualmie National Forest; R.A. Nichols; 1986.

Attachment 6

Summary Sheets for All Watersheds

Illabot Creek - AZ 2

(Includes: Illabot, Bluebell, Iron, Arrow, Otter, and Marten Creeks)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The following discussion of fisheries values are based on various surveys, reports, and observations which include: 1) Seattle City Light reports: "Development of Flow Recommendations for a Proposed Small Hydroelectric Project on Illabot Creek: Using the Instream Flow Incremental Methodology" (K. McDowell, March 1983) and "Skagit Valley Small Hydro Environmental Reconnaissance" (S. Ralph and C. Hall, August 1981); 2) Washington Department of Fisheries: "A Catalog of Streams and Salmon Utilization", Volume 1. Puget Sound (R. WiLliams, R. Laramie and J. Ames, November 1975) including supplements; and 3) field reconnaissance by ID Team members and 4) personal conversations with other resource agency fisheries biologists.

Illabot Creek is an important tributary to the Skagit River with significant anadromous fisheries values throughout at least 10 miles of its length. It also has important resident fisheries values in upper portions of the drainage, including tributaries. The stream descends through a narrow canyon from RM 10 at Illabot Lake to RM 2.5 near the Forest Service boundary. The stream channel within this section contains numerous cascades and falls with large boulders and rubble. The tributaries are precipitous and drop off steep slopes which have been extensively logged in some areas.

Electro-fishing and spawning surveys were conducted in Illabot Creek by Seattle City Light in 1982. Adult steelhead trout were observed as high as RM 7.7 and juvenile rainbow trout (suspected to be the anadromous form) were sampled above Illabot Lakes at RM 10.5. Anadromous fish seen during these surveys included adult chum, coho, chinook salmon, steelhead trout and Dolly varden char. Resident fishes included rainbow trout, cutthroat trout, mountain whitefish and Dolly varden char. Major tributaries to Illabot Creek and their respective anadromous barrier RM include: Iron (RM .25), Bluebell (RM .25), Arrow (RM .25), Otter (RM .25).

Illabot Creek has a high level of natural instability that has been aggravated by past management activities. New activities that add more sediment or increase channel instability would reduce the amount of valuable anadromous fisheries and resident trout resources in Illabot Creek and its tributaries.

In channel stability in all channels is fair to good. Streambank stability is fair. Much of fragile stability in the watershed is due to the natural soil and geologic conditions. Pools are relatively medium to high in quality and quantity in most of the channels. Moderate amounts of LWD exist in most channels and the recruitment potential from adjacent riparian areas is moderate. This results in an acceptable watershed condition at the present time.

Allocation Zone 2 on Forest Service land consists of 13,134 acres in Illabot Creek, 2,147 acres in Jordan Creek and 241 acres in the middle Skagit River drainages. The Illabot Creek watershed also contains 13,703 acres in the Glacier Peak Wilderness, State and private lands. Over 35% of the tentatively suitable acres (3,088 acres) are in a pole-sized or clearcut stand condition which reduces harvest dispersion opportunities during the next 4 decades. Most of the remaining mature timber is on steep, marginally productive sites that are more difficult to access. Consequently most of the future harvest would occur on the more sensitive areas.

Review of aerial photography (1956 to 1983) revealed that past harvest activities up to 1986 have generally been concentrated in the Iron Creek and upper reaches of Illabot Creek. The harvest rate over the last 3 decades has been approximately 620 acres/decade. This rate of timber harvest combined with the natural background instability of the channel have had some negative impacts on the Illabot Creek system. There have also been several road/harvest related failures in the past which have contributed sediment to the Illabot Creek system.

The ID team concluded that the watershed is in a delicate balance at this time considering the past rate of concentrated harvest and natural instability conditions. Based on the preceding factors, and assuming there is good dispersion of harvest, the ID Team recommends that the watershed could withstand a 425 acre (5% of 8466 acres tentatively suitable) harvest level without sustaining adverse cumulative effects to the watershed and ultimately to the fisheries resources.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: **_XX_ACCEPTABLE** **_ _UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 425 acres
2: 425 acres
3: 425 acres
4: 425 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Chilliwack - AZ 3

(Includes drainages: Liumchen, Quartz, and Damfino Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photography revealed that past harvest activities up to 1986 had minimal impacts to the upslope and in-channel areas in the AZ except in Liumchen Creek. Plans have existed since 1982 to develop the Liumchen Creek Watershed as a main domestic water source for the City of Chilliwack, B.C.,

Canada (correspondence with Mike Currie, Hydrological Engineer, B.C. Ministry of Environment, Lower Mainland Region, Surrey, B.C., Canada). Plans are still on the books for construction 3 to 5 years in the future. The rest of the AZ (ie., Damfino and Quartz Creeks) has had to harvest activity. The AZ has been rated as acceptable because of the following:

Channel scouring due to management activity only evident in Liumchen Cr. Other scouring in 1st&2nd order channels due to natural causes. Overall channel stability is good.

Pool frequency in 1st&2nd order channels is at least 50/50 except in Liumchen Cr. Pools in 3rd & 4th order channels are of moderate to high quality.

Majority of 1st&2nd order channels exhibit some degree of exposed banks, most due to natural processes. Bank stability along 3rd&4th channels is fair to good.

Large Woody Debris is in moderate to high abundance in all channels. High potential for LWD recruitment from adjacent riparian stands along all channels.

Adequate dispersion of future harvest is possible with helicopter logging which would keep the road density at a low level and would avoid the unstable soil areas. Since the past harvest rate has been low, about 230 acres (2%) of NF land, the upper watershed and instream conditions have not been significantly impacted by management activities. Therefore, the ID team concluded that the harvest could be increased somewhat without adverse impacts. The team recommends that 250 acres (10% of tentatively suitable) could be harvested per decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** _ _ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 acres
2: 250 acres
3: 250 acres
4: 250 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Canyon Creek - AZ 4

(Includes: Whistler, Kidney and mainstem Canyon Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Anadromous fish can access Canyon Creek up to a cascades barrier formed by large boulders and LWD, located at RM 4.4 within the National Forest Boundary

(Roger Nichols personal observation, 1987). Anadromous fish that inhabit Canyon Creek include: spring chinook, coho, pink and chum salmon and steelhead, cutthroat and Dolly Varden trout. Depletion of wild spring chinook stocks in Puget Sound and the Columbia River basins have been a major concern of fisheries resource agencies (US Fish & Wildlife Service, WDF, National Marine Fisheries Service, Nooksack & Lummi Tribes). Since 1980 there has been an intensive effort by these agencies to improve the depleted spring chinook stocks in the Nooksack River basin. Canyon Creek, which is an important tributary to the North Fork Nooksack River, has been an important spawning area for spring chinook. Aggravation of unstable channel conditions in Canyon Creek has increased the concern for any further reduction in fish habitat and has emphasized the need for a stream/watershed rehabilitation program.

Above the barrier there are approximately 7 miles of resident trout (Dolly Varden, cutthroat and brook) habitat (based on FS stream surveys, personal communications with WDW fisheries biologists and conversations with local fishermen) in the mainstem Canyon Creek not including tributaries. There are plans to modify the barrier so that anadromous fish, especially steelhead trout, would then have access to an additional 7+ miles of Canyon Creek. Cooperative (FS, Nooksack Tribe, Fourth Corner Fly Fishers) stream/watershed rehabilitation projects have been completed annually in a number of reaches of Canyon Creek since 1986 (log/boulder/jersey barrier deflector erosion control structures, willow planting/grass seeding) to help reduce stream bank and channel instability.

Review of aerial photos, stream habitat/condition inventories (1982, `83, `84, `85,`86) by Forest Service and/or Lummi Fisheries Dept., and various studies (Lummi fisheries report 1984, USFWS and Lummi Fisheries Dept. report 1987 Cummulative effects Study for AC-1 timber Sale 1986) indicate that a substantial increase in sediment delivery has occurred in the Canyon Creek drainage. Other effects observed include: the inability of the stream to transport sediment, loss of LWD, loss of riparian vegetation, and loss of pools. Stream deposition and scouring was found to correspond to a general loss of pools, spawning gravels and an overall reduction in anadromous fish habitat in Canyon Creek. Timber harvest and road building activities that add to the existing channel instability conditions would reduce the fish habitat. Because to these factors, the ID team rated this AZ unacceptable.

During the 1950's, 1960's and 1970's timber was harvested at a rate of 1327 acres per decade(7% of the total watershed per decade). However, this harvest was not dispersed over the entire watershed but was concentrated into an area of about 7000 acres or about a third of the AZ (primarily on the lower slopes adjacent to Canyon Creek). This rate of harvest activity combined with associated road construction and old management practices has resulted in the unacceptable stream conditions described above.

Degradation of the watershed began in the mid 1960s when the average rate of harvest was 1130 acres/decade when considering the portion of the watershed in which harvest was being concentrated, which was primarily that which was accessible by road. Based on this information we feel that a harvest rate of around 420 acres/decade would maintain the watershed at an acceptable level once recovery has occurred.

Ten percent of the remaining mature timber and approximately 700-800 acres of poles which will be mature during the 4th decade (a total of approximately 4200 acres) equates to 420 acres/decade harvest of tentatively suitable land.

Harvest during the first two decades would need to be reduced to allow for the recovery of the watershed. In the first decade harvest would be limited to about 100 acres. In the second decade that would increase to 200 acres. Beginning with decade 3 harvest would reach and be maintained at 420 acres which is 4.8% of the tentatively suitable.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 acres
2: 200 acres
3: 420 acres
4: 420 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lower Reach, North Fork Nooksack - AZ 5
(Includes Cornell, Gallop, Hurst, Coal, Deerhorn, Boyd, Lookout, Fossil, Cascade, and Deadhorse Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

All of the NF Nooksack River (up tod the North Fork Falls) and most of the major tributaries (Cornell, Gallop, Boyd, Deadhorse Creeks) contain anadromous fish species including 5 species of salmon and 3 species of anadromous trout. Anadromous fish utilize portions of these streams for adult holding, spawning and juvenile rearing habitat in areas where stable channels, LWD and pools are located. Many of these streams, especially in reaches above barriers to anadromous fish, contain resident trout (including rainbow, cutthroat and Dolly varden).

Some unstable watershed conditions occur in areas of past concentrated disturbance (i.e., private land in the Cornell/Gallop Creek subwatersheds and the National Forest land east of Deadhorse Creek, and Little Mountain. On the remainder of the National Forest land, past harvest activities have been well dispersed throughout the tentatively suitable acres. The AZ was rated acceptable because of lower watershed conditions of very little downcutting, medium quantity and quality of pools, and moderate LWD. Past harvest rate has been variable over the past 4 decades but has averaged about 400 acres/decade. The team concluded that continuation of this rate through dispersion, helicopter, and BMPs will allow hydrological recovery to continue in those disturbed subwatersheds. The ID team concluded that this 400 acres/decade rate

(4.2% of tentatively suitable) can be sustained while maintaining an acceptable watershed condition. Any increased harvest rate will not sustain this condition considering the condition of private inholdings, and the need to sustain the anadromous and resident fisheries habitat described above.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 400 acres
2: 400 acres
3: 400 acres
4: 400 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Glacier Creek/M.F. Nooksack, North - AZ 6

(Includes: Upper Clearwater Creek, Upper Rocky Creek, Thompson, Coal, Deep, Little,

Davis, Smith, Balls and Glacier Creek.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Based on stream survey data (Forest Service stream habitat surveys (1983), small hydro proposals. Nooksack Tribe Fisheries Dept., Lummi Fisheries Dept.) anadromous fish have been documented in Thompson Creek and Glacier Creek upstream to a cascade/barrier falls at R.M. 3.6. It is possible that steelhead and salmon can access upper portions of Glacier Creek depending upon stream flow conditions at the falls. Stream surveys indicate that the portion of Glacier Creek above the falls contain resident trout (rainbow and Dolly Varden trout).

It is suspected that resident trout utilize the National Forest portions of the Clearwater and Rocky Creek drainages as well as upper tributaries of Glacier Creek based on information from studies of adjacent drainages.

The ID team rated the AZ as marginally acceptable due to little downcutting, but loss of storage and transport capacity, and reduced pool quantity and quality.

Based on aerial photo review of past management activities it was determined that the rate of occurrence of landslide activity significantly increased after harvest and road building activities in the 1960's. This rate of harvest was 16% in the Rocky/Clearwater Creek part of the AZ, and 2% in the Glacier /Thompson Creek partion; these two rates involved approximately 860 acres of harvest in the 1960's. Harvest rate significantly decreased in the 1970's and 1980's. This decrease in management activity, coupled with a reasonable rate

of harvest with adequate dispersion, has been effective in maintaining a marginally acceptable upper watershed and instream condition.

Past harvesting over the last 3 decades has been very variable in the AZ; for example from 190 acres in Glacier/Thompson Creek area during the 1980's to 1528 acres in the Clearwater/Rocky Creek area during the 1960's. It was the judgement of the ID team that 1528 acres harvest rate in the 1960's was a rate that could not maintain an acceptable watershed condition because (1) past harvest activities on private lands, (2) reduced opportunity for harvest dispersion throughout the AZ, (3) concerns for water quality protection in the Middle Fork Nooksack River Municipal Watershed (ie., Rocky/Clearwater Creek watershed), (4) high anadromous fish habitat concerns in Thompson Creek, (5) concern for protection of domestic water use of Thompson Creek tributaries and (6) unstable soils evenly distributed throughout the remaining mature timber acres. Based on these factors it is recommended that a maximum of 280 acres or 4% of the tentatively suitable acres can be harvested per decade over the next 4 decades and still maintain an acceptable watershed condition.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 280 acres
2: 280 acres
3: 280 acres
4: 280 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Middle Fork Nooksack - AZ 8

(Includes tributaries that drain into the Middle Fork Nooksack River: Clearwater,
Rocky and Warm Creek.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

Review of aerial photography revealed that past harvest activities up to 1986 had some negative impacts on soil and water resources in the headwaters of Rocky and Clearwater Creeks, which are outside the AZ. There have not been any harvest activities in the AZ. The streams are in an acceptable condition because of relatively little downcutting, a high pool quality, and moderate amounts of LWD. All of the AZ is within the Middle Fork Nooksack River municipal watershed (City of Bellingham). A significant portion of the tentatively suitable acres are comprised of steep, rocky and wet soils of low productivity. Most streams in the area have not been surveyed or sampled to determine fish populations present. There are cutthroat trout in Warm Creek.

There is good opportunity to disperse harvest throughout the AZ. Harvest has not yet occurred within the Warm Creek headwaters on National Forest lands. Approximately 1/4 of the remaining mature timber in the AZ would be helicopter logged. Only 14 miles of new road construction (ie., mostly within the Warm Creek drainage) would be needed in the future, bringing the road density to 2.1 miles/sq. mile. Based on these factors, along with consideration of the impacts of the previously harvested areas upstream, it is recommended that a maximum of 250 acres/decade (4.4% of the tentatively suitable) could be harvested while maintaining an acceptable watershed condition.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** ___ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 acres
2: 250 acres
3: 250 acres
4: 250 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach, North Fork Nooksack - AZ 9

(Includes: mainstem NF Nooksack River and Wells, Barometer, Anderson, Swamp, Ruth,
Bagley, Razorhone, and White Salmon Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Based on stream surveys and creel census information (small hydro and conversations with WDW biologists and local flyfishermen) there are healthy populations of resident trout (rainbow, cutthroat, brook) in many tributaries of the NF Nooksack River above Nooksack Falls at Wells Creek. Trout habitat is below optimum levels in some areas including the mainstem NF Nooksack R. above Silver Fir Campground and in White Salmon Creek due to channel aggrayation, stability problems, and corresponding loss of habitat.

Review of aerial photography revealed that past harvest activities up to 1986 have generally been well distributed throughout the AZ. However, there are unstable watershed conditions in areas of past concentrated disturbance (ie., mainstem NF Nooksack R. above Silver Fir Campground, White Salmon, Wells and Anderson Creek areas). Overall, the distribution conditions, along with current BMP's, have been effective in maintaining acceptable upper watershed and instream conditions.

The watershed presently is in a acceptable hydrologic condition due to:

In-channel conditions: channel scouring in 1st and 2nd order channels due to management activities is evident in 2 tributaries (Wells & White Salmon Creeks), other scouring due to natural causes. Channel stability in the 3rd-4th order channels is fair to good.

Pool Condition: pools are usually less than 50% of the surface area in many 1st & 2nd order channels, but greater than 50% in the fish bearing 3rd-4th order channels.

Streambank Stability: over 30% of the 1st&2nd order channels exhibit exposed banks, most due to natural causes. Banks along 3rd&4th order channels are in stable condition.

LWD: adequate to moderate amounts of LWD in both 1st&2nd and 3rd&4th order channels. Moderate potential for recruitment of wood into these channels from the adjacent riparian areas.

Due to the relatively low amount of unstable soils in the National Forest portion of the watershed, the high percentage of helicopter logging in the future, and the low future road needs (ie., 7.5 miles) it is recommended that the past harvest rate of 500 acres/decade on Forest land , averaged over the 50's, 60's, 70's, and 80's, could be increased to 980 acres/decade (7% of tent suit). This increase would not change the present overall acceptable upper watershed and instream conditions provided that BMP's are strictly adhered to and dispersion of harvest continues. Increasing the harvest rate to above 980 acres/decade on National Forest land would result in concentrating harvest activities in the more sensitive areas.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** _ _ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 980 acres
2: 980 acres
3: 980 acres
4: 980 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Middle Fork Nooksack, South - AZ 10
(Includes un-named trib. in Sec. 35, Sisters, Hildebrand, Ridley Creeks, main Middle Fork Nooksack River, Rankin and Wallace Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The City of Bellingham water supply diversion dam located at RM 7.2 prevents anadromous fish migration upstream into the AZ. However, there are plans being

considered to build fish passage structures at the diversion so that anadromous fish may access the upper Middle Fork Nooksack in the future. Presently there are resident trout species (rainbow, cutthroat and Dolly Varden trout) in most tributaries in the AZ.

Based on aerial photo review and on-the-ground observations, it is determined that past management activities in the Rankin Creek area on the north side of the Middle Fork Nooksack River have resulted in an unacceptable watershed condition for that portion of the AZ, although the overall condition of the AZ was rated as acceptable. Much of the AZ is in a less than desirable condition but this is due to a large degree to natural conditions. However, further degradation should not be allowed to occur. The most significant amount of this disturbance occurred in the early 1960s (primarily due to the salvage of extensive blowdown from a single storm event). Vegetative recovery is relatively good at this time.

Past harvest of NF acres in the AZ has varied from approximately 800 acres in the 60's to a total of 145 in the 70's and 80's. Although some soil instability exists east of Green Creek and in the Hildebrand Creek area, where some residual impacts are still left from the 60s, there is good opportunity to disperse harvest over the mature timber acres remaining in the tentatively suitable ground. Approximately one half of this mature timber would be harvested by helicopter. Because of this, the amount of future road construction needed for harvest activities would be quite low (i.e., about 7 miles of new system road). Also, the existing road density of 1.6 miles/sq. mi. is relatively low in comparison to other areas of the District. Even though this AZ is within the Middle Fork Nooksack Municipal Supply Watershed for the City of Bellingham, future harvest dispersion combined with strict attention to BMPs could increase harvest (increased compared to harvest rate during 70s and 80s) from 145 acres to 200 acres. This 200 acres/decade is also less than the 800 harvest rate of the 1960s, a rate that demonstrated unacceptable in-channel damage in certain parts of the AZ. This 200 acres/decade over the next four decades will maintain an acceptable watershed condition.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** ___ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 acres
2: 200 acres
3: 200 acres
4: 200 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

South Fork Nooksack - AZ 11

(This includes the following streams: Loomis Creek, Wanlick Creek, Bell Creek, Pine Creek, Heart Creek and the upper mainstem SF Nooksack.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photos (1940, 1956, 1964, 1972, 1979, 1983 & 1986), on-site observations (personal observations by certain team members over past 20 years) and stream/fish habitat condition inventories (1983, 1986 & 1988 Forest Service and U.S. Fish & Wildlife Service) indicate that the upper watershed and instream conditions are unacceptable and in a declining condition in the South Fork Nooksack River and in the Wanlick Creek portion of this AZ. The yreceding information indicates that there is high background instability in the South Fork Nooksack River and Wanlick Creek drainages which contributed to the unstable instream conditions as described. Timber harvest and road construction have accelerated these in-channel processes, particularly in the Wanlick Creek drainage, resulting in an increase in sediment delivery to the South Fork Nooksack R./Wanlick Creek drainages. Other effects observed include: the inability of the stream to transport sediment, loss of LWD, loss of riparian vegetation, and loss of pools. Stream aggradation was found to correspond to a general increase in stream temperature, in-filling of pools and an overall reduction in anadromous and resident fish habitat. All of the above observations led to the determination of an overall rating of the AZ as unacceptable.

The U.S. Fish & Wildlife Service, Lummi and Nooksack Tribes report (Schuett-Hames, Wampler and Doughty. October 1988. "An assessment of the availability and quality of spring chinook holding and spawning habitat in the South Fork Nooksack River", 1986) concludes that "The major freshwater limiting factors for South Fork spring chinook appear to be: adult mortality from poaching; predation and stress during holding due to lack of woody cover; lack of cool water temperatures and inadequate pool depth; and loss of eggs due to stream channel instability." Water quality surveys conducted by the U.S. Fish & Wildlife Service as well as the Lummi and Nooksack Tribal Fisheries Departments since 1985 indicate that the South Fork Nooksack River frequently reaches water temperatures in the high 60's in late summer. High water temperatures (> 65 degrees F) can stress salmonids and increase their susceptibility to disease and even result in mortality. Based on data presented in the U.S. Fish & Wildlife Service, Lummi and Nooksack Tribe Report there were 10 days between August 7 and August 27, 1986 when the maximum daily water temperature was equal to or exceeded the 65 degrees F.

Stream surveys conducted by the Forest Service and volunteers during August and September, 1988, in Wanlick and Heart Creeks indicate that populations of rainbow and Dolly varden trout are in these streams. Although there are a series of 4 falls on the mainstem South Fork Nooksack River located between river miles (RM) 30 and 31, approximately 2 miles below the Forest Service Boundary, it is suspected that the rainbow trout in Wanlick Creek are juvenile steelhead trout based on available evidence (discussions with WDW and Nooksack Tribal fisheries biologists indicating that these barriers are only partial barriers to steelhead trout and surveys by the Nooksack Tribe that found adult steelhead above RM 33). Conversations with Washington Department of Wildlife

fisheries biologists and fishermen indicate that the Forest Service portion of the South Fork Nooksack River, particularly between RM 33 and 37, is an important trout fishing area. Resident trout in this area include rainbow, cutthroat and Dolly Varden trout. Anadromous fish species that potentially could be in the river include spring chinook, coho, chum, pink and sockeye salmon, summer and winter steelhead, cutthroat and Dolly Varden trout.

During the analysis of this AZ, the I.D.Team observed that past harvest took place, almost exclusively, on those acres that are being classed as tentatively suitable in the Forest Plan. Therefore, for this discussion all past harvest is expressed in terms of a percentage of tent. suitable in an effort to arrive at an equatable number to be used as as MR and expressed in terms of acres of harvest/decade.

Harvest began in the Wanlick Creek drainage in the 1960's and by 1964 significant stream channel impacts had occurred after approximately 322 acres of the watershed had been harvested (review of 1964 aerial photos). A rate of harvest of 373 acres occurred in the 1970's and 1180 acres in the 1980's. Wanlick Creek was analyzed separately and these rates of harvest apply to just that drainage which is only a part of the total AZ. Of the 1180 acres , approximately 1000 acres occurred on private land within the headwaters of a tributary to Wanlick Creek. This is a unique situation in that the drainage in which the heavy harvest took place has its headwaters on private land outside the N.F. boundary and then drains in a direction that flows inside the N.F. boundary before it joins main Wanlick Creek. The I.D.Team felt the impact of this past harvest activity on the entire Wanlick drainage was so significant that it was necessary to assess that impact when establishing the MR for the AZ. Presently, there is a high risk that continued harvest in the Wanlick Creek portion of the AZ will increase stream instability. Excessive sedimentation would further reduce habitat for the already tenuous summer steelhead populations. It is deemed necessary that the Wanlick drainage be allowed a recovery period (2 decades) before additional harvest take place just to protect the hydrologic integrity. The disturbance level in Wanlick Creek should not exceed 375 acres in 30 years (recovery based on canopy closure, channel stability, root strength, etc.) or an average of 125 acres/decade and watershed recovery should be complete before new harvesting begins. By 2015 some harvesting could occur in the 2nd half of decade 3. The full 125 acres could be harvested in decade 4.

Stream conditions in the South Fork Nooksack River are dominated by high natural sediment inputs from Pine and Heart Creeks and the headwaters of upper SF Nooksack River which drain the flanks of the Twin Sisters Mtn. (aerial photo review).

Past management activities were concentrated along the mainstem of the South Fork Nooksack River and have impacted watershed conditions (aerial photo review). The past harvest rate in the SF drainage, exclusive of Wanlick Creek was 260 acres in the 1960's, 801 acres in the 1970's and 63 acres in the 1980's. Approximately 2000 acres of the remaining mature timber would be helicopter logged and 4 miles of new road construction would be required in the future for the portion of the AZ exclusive of Wanlick Creek. This would allow for better dispersion of future harvest units throughout the AZ. However, there are significant fisheries habitat concerns (see above) as well as significant impacts from mining activities (olivine). Much of the remaining mature timber occurs on upper slope ground that is marginally stable (ie.,

steep, shallow, wet soils) and has a moderate to low productivity. Based on these conditions it is recommended that the harvest rate on tentatively suitable acres should be set at 325 acres.(5% x 6472 tent. suitable acres)

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

	S.F. Nooksack R.	Wanlick Creek	Total Acres
1:	325 acres	0	325
2:	325 acres	0	325
3:	325 acres	65	390
4:	325 acres	125	450

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Swift-Park Creeks Watershed - AZ 14

(Includes Swift Cr., Rainbow Cr., Shuksan Cr., Morovitz Cr., and Park Cr.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The lower reaches of Swift and Park Creeks, below barriers located at RM 2 and RM 1.8, respectively, are utilized by chinook, coho and sockeye salmon and anadromous from Baker Lake and resident trout. Rainbow, Shuksan and Morovitz Creeks are all tributaries of Swift Creek and most likely contain resident trout. Morovitz Creek has been documented to contain coho salmon up to RM 1.75 (Beak Study for Puget Power & Light). There is a lack of LWD in many of these streams. Most pools are formed by boulders, bedrock outcrops and undercut banks. The pools are of medium quality and there is a moderate amount of them in these streams. There are extensive beaver pond areas in the Morovitz Creek area that are utilized by juvenile coho salmon. Reduction in LWD, and sedimentation that fills in pools or impacts spawning gravels would reduce the amount of available habitat for fish in these streams.

The AZ was rated acceptable because of lower watershed conditions of very little downcutting, moderate ability to store sediment, good ability to transport sediment, medium quantity and quality of pools, and moderate amount of LWD throughout.

Past harvest has been well distributed throughout the AZ. Although unstable soils have been generally avoided, there are two specific areas where watershed conditions have been impacted by management activities: 1) the Morovitz/Marten Lake area, and 2) the upper Shuksan Creek drainage. The past harvest rate on NF lands has been variable but has averaged about 410 acres per decade over the past 4 decades.

Even though future harvest could be dispersed, current road density is moderate (3.0 miles/sq. mi.), little new road construction would be required (approx. 2.0 miles), and some of the mature timber (roughly 200 acres) would be helicopter logged, it is concluded by the I.D. team that the 410 acres per decade rate could not be sustained and still maintain an acceptable watershed condition. While past harvest activities generally avoided unstable soil areas, much of the remaining mature timber is located in marginally stable, steep, shallow, and wet soil areas. There is a high risk that harvest activities could trigger mass wasting and stream sedimentation in these areas which would impact existing fish habitat. For these reasons the I.D. team recommends a harvest rate of 250 acres per decade (4.25% per decade) of the tentatively suitable acres over the next 4 decades.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 acres
2: 250 acres
3: 250 acres
4: 250 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the Final Forest Plan.

Baker Lake - AZ 15 & 16

(Includes Dillard, Sandy, Little Sandy, Boulder, Little Park, Shannon, Baker River,
Hidden, Lake, Noisy, Ermine, Silver, Four Mile, Welker, and Anderson Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

Based on various surveys and reports (WDF Stream Catalog, 1975, WDF and FS Stream Surveys, Beak & Assoc., Puget Power & Light Co.) chinook, sockeye and pink salmon utilize the Baker Lake basin. Anadromous and resident forms of rainbow (steelhead), cutthroat and Dolly Varden trout also utilize the basin based on records of fish collected at the Puget Power & Light Co. fish collection facility at Concrete on lower Baker River. Important streams in the AZ that are utilized by anadromous fish and the river mile (RM) location of the barrier to anadromous fish include: Baker River (RM 9), Sandy (RM .75), Little Sandy (RM 1), Little Park (RM 1), Shannon (RM .5), Hidden (.25), Blum (.25), Lake (.25) Creeks. The upper reaches of these streams and most of the remaining strerams in the AZ contain resident trout.

Overall pool quality and quantity is low in most streams. Exceptions are portions of Sandy, Noisy and Little Sandy Creeks. Much of the pool habitat is formed by boulders and bedrock outcrops. The majority of LWD has been removed from Anderson, Welker, and portions of Sandy Creeks. There are moderate

amounts of LWD remaining in portions of most of the other streams (ie., upper reaches of Welker, Silver, Noisy and Lake Creeks) in the AZ. Baker River and Boulder Creek, two of the largest streams in the basin are lacking in LWD due to natural conditions. Activities that reduce LWD, fill in pools or impact spawning habitat would further reduce the available fish habitat in the AZ.

To a large degree, past harvest has been well distributed throughout AZ #15. However, while unstable soils have generally been avoided, the following specific areas have been impacted from concentration of past harvest activities (Ref. 1964 & 1983 aerial photos): 1) the Sandy/Dillard Creek area, 2) Anderson Creek, and 3) Boulder Ridge. Effectiveness of new BMPs will be limited to the immediate area of application and will not be effective in improving upper watershed and in-stream conditions in the first decade in these impacted areas. For this reason and considering the fisheries resource in the Baker Lake basin the I.D. team recommends no harvest for the first decade in the three impacted areas described above.

Over the past four decades the harvest rate in AZ #15 on the west side of Baker Lake has been variable: 2061 acres in the '50s,452 acres in the '60s, 571 acres in the '70s, and 1026 acres in the '80s. The average rate overall has been 1278 acres over the past four decades. No harvesting has occurred in AZ #16 on the east side of Baker Lake. However, the average rate of past harvest for the eastside is 237 acres considering the past harvest in the Anderson Creek Drainage (AZ15).

A significant portion of the remaining mature saw timber in AZ #16 (approx. 1000 acres) is located in marginally stable, steep, wet soil areas along the east side of Baker Lake. Harvesting in these areas would create an unacceptable high risk of mass wasting and stream sedimentation.

The IDT concluded the overall rating for this watershed and these allocation zones should be acceptable. Even though the team felt pool quality in this drainage could be better and LWD is only available in moderate amounts, the condition of the stream channel and banks are generally satisfactory when considered with overall pool conditions and availablity of LWD.

Future Harvest Rate in AZ #15: Of the 16,102 acres of tentatively suitable land on the west side of Baker Lake, approximately 10,800 acres are located outside of the Sandy/Dillard Creek and Boulder Ridge areas. It is felt that these acres (10,800) could be harvested at the rate of 650 acres per decade starting in the first decade. Translating that average to the remaining suitable timber the IDT felt the harvest rate could be increased to 650 acres and maintain the acceptable hydrologic condition of the watershed. Therefore, by eliminating harvest in the first decade in the Sandy/Dillard Creek and Boulder Ridge areas on the west side, and the Anderson Creek Road area on the east side, the first decade harvest level would be 650 acres. When the tentatively suitable acres for Sandy/Dillard, Boulder Ridge, and Anderson Creek are added back in for decades two through four the total tentatively suitable in the AZ is 17,357 acres. For this period it is felt a harvest rate of 1025 acres/decade is sustainable in the AZ while maintaining an acceptable watershed condition.

Future Harvest Rate in AZ #16: In this AZ, it is felt that 4870 acres of the total 5870 acres of tentatively suitable is actually available for future harvest management after the 1000 acres of marginal ground mentioned above is

removed from consideration. It is felt this remaining 4870 acres could be harvested in decades one through 4 at a rate of 350 acres/decade, while maintaining an acceptable watershed condition in this AZ. A higher percentage for this AZ seems appropriate because of the large portion of the AZ that will undoubtedly be helicopter logged.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

	AZ #15	AZ #16
1:	650 acres	350
2:	1025 acres	350
3:	1025 acres	350
4:	1025 acres	350

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lake Shannon - AZ 17

(Includes Rocky, Part Time, and Sulphur Creeks)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

Rocky and Sulphur Creeks are major tributaries to Lake Shannon, a large reservoir located on Baker River north of Concrete, Washington. The following discussion of fish and fish habitat is based on information from various fish and aquatic habitat reports and surveys that have been completed on Rocky and Sulphur Creeks. Many are related to small hydro project proposals by Puget Power & Light Co. and other companies in these drainages (Koma Kulshan, Beak & Assoc., Washington Department of Fisheries etc.).

The lower portions of Sulphur and Rocky Creek, below RM .5 and RM 1.3, respectively, are suspected as being utilized by coho and sockeye/kokanee salmon (WDF Stream Catalogue, R.W. Williams and others, 1975) and anadromous and resident trout. Fish surveys (snorkel and electro-fishing) conducted related to the Koma Kulshan Small Hydro Project found some resident trout in intermediate reaches of both Sulphur and Rocky Creeks. These surveys indicate that there is habitat to support small resident trout populations. Pool quality and quantity in these streams is fair to good with most pools formed by boulders and bedrock outcrops; with few formed by LWD. Management activities that result in the filling in of these pools and/or scouring or burying spawning gravels would reduce this habitat being available to fish in these streams.

Some unstable watershed conditions occur in areas of past concentrated disturbance (i.e., Schrieber's Meadow and upper Rocky Creek areas).

Overall, the in-channel conditions are poor to fair in the 1st&2nd order channels, scouring is widespread in tributaries to Rocky and Sulphur Creeks, in the 3rd&4th order channels conditions are fair to good due in part to the armoring and bedrock nature of many of these channels. Streambank stability in the 1st&2nd order channels is only fair, half due to natural causes and the remaining related to land management activities. Bank stability in 3rd&4th order channels is generally good. Large Woody Debris is generally lacking in the 1st&2nd order channels, but good in the 3th&4th order channels. The stability and distribution of LWD in these channels is only fair.

The past harvest rate (over past 40 years) on commercial Forest land within this AZ has averaged 8% per decade. The existing road density is high, at 4.0 miles/sqmi and the anticipated new road construction over the next decade (7.0 miles) would increase this density to 4.8 mi/sqmi. A moderate amount of unstable soil (14%) exists in the tentatively suitable acres. Steep sideslopes and shallow soils remain on most of the remaining suitable acres. Only 16% of the tentatively suitable acres can be helicopter logged.

For these reasons, the I.D. Team felt the past harvest rate of 8% per decade could not be sustained in the future while maintaining acceptable in-channel and fish habitat conditions.

A rate of 5% per decade of tentatively suitable acres is recommended for each of the next 4 decades; this would result in 300 acres per decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 300 acres
2: 300 acres
3: 300 acres
4: 300 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lake Shannon - AZ 18
(Includes Thunder, Watson & Survey Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The Thunder-Shannon Allocation Zone (AZ #18) includes the drainages that flow into Lake Shannon from the east, i.e. Thunder Creek. The Thunder Creek drainage includes Watson and Survey Creeks. Based on surveys and reports (WDF Stream Catalog, 1975; Thunder Creek Small Hydro Projects, Scott Paper Co. & Puget Power & Light Co.) anadromous fish (primarily coho salmon and sockeye)

utilize Thunder Creek up to RM 3.3. The upper reaches of Thunder, including the tributaries, Watson and Survey Creeks, would be expected to contain resident trout. Due to past timber harvest and road construction practices, primarily on private land within the Forest Service boundary, fish habitat is in poor condition due to the high channel instability which has resulted in most pools being filled in with sediment and spawning areas impacted due to scouring and aggradation. Activities that add more instability and consequently more sediment to the streams will further impact fish habitat.

Review of aerial photography revealed harvest activity began in the mid 1940's with road building and harvest on the private land adjacent to Thunder Creek. Within a period of 5 years a contiguous area that included about 1000 acres of private and 600 acres Forest Service was harvested on the north side of Thunder Creek (much of this was on steep sensitive soils). This intensive harvest and poor road construction caused massive soil movement into lower Thunder Creek and resulted in tremendous damage to the stream and fish habitat. Most of the 1st-2nd order channels exhibit evidence of channel scour in harvested portions of the watershed. Pool frequency in these small channels is less than 50%, especially in and downstream of harvest areas. Over 50% of these channels have exposed and unstable banks, again these are located in and downstream of harvest areas. LWD is lacking in these channels also, and there is little or no potential for LWD recruitment from the adjacent riparian areas. Heavy deposition has occurred in the lower channel areas (Thunder and Watson Creeks). This has resulted in little or no pools in these channels. These channels have little or no LWD. Because of these factors, the team rated the condition of the AZ an unacceptable. Much of this channel is still in a recovery mode. Harvest continued on private land through the 1950's in the lower watershed. Only a minor amount of harvest (mainly Forest Service) has occurred since the 1950's. The upper 2/3 of the Thunder Creek drainage has remained unroaded and unharvested. Some of this area, mainly in the stream draws, contains sensitive soils similar to those harvested in the lower watershed.

Past harvest is certainly not indicative of what future harvest will bring using BMP's in the upper 2/3 of Thunder creek but there is similarity in soil types that lead us to exercise caution when determining the harvest rate in this area. As we have observed, concentration of harvest can result in serious consequences in this drainage. Because past harvest was so intense and the effects significant, it is difficult to determine what harvest level the watershed could withstand based on this information alone. Information on other similar watersheds indicate that harvest levels of about 7-10% of the remaining suitable area is the rate of harvest that can be sustained while maintaining an overall acceptable watershed condition. The amount and location of sensitive soils in this area would lead us to use the low end of this range.

With the extent of negative effects and the nature of the in-channel recovery at the present time, the ID team recommends that harvest in the first two decades be 200 acres in the first decade and 300 acres in the 2nd decade to allow for further recovery of the stream's in-channel condition. By decade 3 and 4, the rate of cut could be increased to 400 tentatively suitable acres being harvest each decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 acres
2: 300 acres
3: 400 acres
4: 400 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Jackson Creek - AZ 20
(Includes Jackman and Webber Creeks)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Fish habitat information is based on the following surveys and reports: WDF 1975 Stream Catalog, including Supplements; T. Williams-channel condition report for lower Jackman Creek, 1960's?; Jackman Creek small hydro project proposals-Puget Power & Light Co. and Scott Paper Co. Jackman Creek has a barrier to anadromous fish located at RM 1.5 below the Forest Service boundary. Upper reaches of Jackman Creek contain resident trout and receive some fishing pressure.

Reaches in Jackman Creek that have received heavy timber harvest and road construction activity have significant channel instability problems which have contributed to poor fish habitat conditions. Pool quantity and quality are poor in these reaches from sediment filling in pools and scouring and aggrading spawning gravels. In the harvested areas, streambank stability is unstable and the LWD is lacking and there is little or no potential existing for recruitment from the adjacent riparian areas. Generally these in-channel conditions exist for both 1st and 2nd order as well as for 3rd and 4th order channels. Because of these in-channel impacts, the watershed is presently in an unacceptable condition. The headwater reaches of Jackman Creek, where no harvest activities have occurred, are in good condition except where natural avalanche conditions have contributed to unstable channel conditions. Activities that add more sediment to the channel could impact fish habitat. Jackman Creek has the potential to become good anadromous fish habitat (especially steelhead trout) providing upstream sediment sources are reduced, channel stability is increased and debris jam barriers are removed.

Limited harvest began in the Allocation Zone in the 1950's. The main harvest began in the 1960's when the road was built along the south side of Jackman Creek. 1722 acres of the private land and 230 acres of the Forest Service land was cut in the 1960's. It is no coincidence that this is the time period that we saw the most dramatic increase in sediment to Jackman Creek and a corresponding decrease in fish habitat. Sediment sources included road sidecast failures, stream debris torrents, and in unit slumping. Harvest continued in the 1970's and 1980's at the reduced rate of 370 acres/decade on private and

about 732 acres/decade on National Forest Land. Since the Forest Service cut has been concentrated on 2/3 of the total allocation zone the effective harvest rate has been about 490 acres. Some sedimentation has occurred even at these reduced rates which indicates that an acceptable harvest rate would be lower than 490 acres.

Based on past harvest rates the ID team feels that a harvest rate of about 325 acres/decade (7% of tentatively suitable) could be sustainable in this allocation zone without effecting the recovery of the watershed.

Harvest in the 1960's was so high that effects of it are still present in the Jackman stream system and fish habitat is being limited. It will take additional time for these effects to subside and for the upslope in-channel recovery to take place. Therefore, the ID team recommends that harvest be reduced in the first decade to 200 acres and limited to the previously uncut upper Jackman area.

OVERALL MANAGEMENT REQUIREMENT RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 acres (assumes harvest will be in upper Jackman Creek)
2: 325 acres
3: 325 acres
4: 325 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Middle Reach, Skagit - AZ 22

(Includes drainages: Barr (Bark), Sutter, Rocky, Patent, Corkindale, Backus Creeks)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Based on the following information [Forest Service Stream surveys (1983), WDF Stream Catalogue (1975) with new supplements, Percy Washington report "Fishery Enhancement Survey of Upper Skagit River Tributaries" (1984), and the Rocky Creek small hydro project proposal], Rocky Creek contains anadromous fish in the lower 2 miles and probably contains resident trout populations in the upper reaches. The lower 1/4-1/2 miles of Bark, Sutter and Corkindale Creeks are utilized by anadromous fish from the Skagit River. These streams contain adequate spawning habitat but are limited in rearing habitat for anadromous fish. Patent (a tributary to Rocky Creek) and Backus Creeks contain populations of resident trout. Lower Backus Creek has a significant population of cutthroat trout that is providing an excellent fishing opportunity.

Review of aerial photography revealed that past harvest activities up to 1986 had some negative impacts on soil and water resources in portions of the AZ. The generally southerly aspect of the several drainages that flow south and east to the Skagit River are subject to rain-on-snow events and debris torrent activity (Ref. Buggy and Olson timber sale EA's and analysis files).

The ID team rated the AZ as acceptable due to lower channel conditions of some downcutting, moderate to high ability to store and transport sediment, high pool quality and quantity, and moderate amounts of LWD. However, activities that contribute additional sediment to these streams would increase channel instability, fill in pools, scour or aggrade spawning gravels and result in a further reduction in fish habitat.

Only a minimal amount of timber harvest and road construction activity has occurred to date in this AZ, as indicated by the 0.3 miles/sq. mile road density and 21 acres harvest on National Forest land in the past 3 decades. Good opportunity would exist for future harvest dispersal except that only 2829 acres of mature timber exist out of 7,959 acres of tentatively suitable land. The remaining approximately 5000 acres are in pole-sized timber, which may not be available for harvest until after the 4th decade. As a result, harvest dispersion opportunities may be limited within the remaining 2829 acres of mature timber.

Much of the 5000 acres of pole-sized timber in the tentatively suitable land occurs on marginally stable and/or marginally productive land where soils are shallow, droughty and located on steep slopes. It is doubtful that some of these acres will ever be harvested. Based on the preceding factors, the ID Team recommends that about 625 acres per decade (approximately 8% of the tentatively suitable) could be harvested and still maintain acceptable upper watershed, instream and fish habitat conditions in drainages within this AZ.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** _ _ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 625 acres
2: 625 acres
3: 625 acres
4: 625 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach Skagit River - AZ 23
(Includes Olson, Diobsud, Falls, Bacon, Jumbo, Steelhead and Oakes Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

The following discussion of fish and fish habitat is based on various surveys and reports (WDF 1975 Stream Catalog, including supplements, WDF (annual spawner/redd counts) and FS Stream Surveys (1983), and the Percy Washington report (Fishery enhancement survey of upper Skagit River tributaries, 1984 for Univ. of Washington).
Chinook, coho, chum, sockeye and pink salmon and anadromous and resident forms of rainbow (steelhead), cutthroat and Dolly Varden trout utilize Bacon (up to RM 6) and Diobsud Creeks (up to RM 1.8) two of the most important tributaries to the Skagit River. Lower portions of Olson (RM 1.5), Falls, Jumbo, Steelhead and Oakes Creeks also are utilized by most species of salmon and anadromous trout.

Bacon Creek is a powerful stream that has a moderate to high amount of channel instability which has reduced pool and spawning habitat quality and quantity. Pools important for adult holding and juvenile rearing habitat have a moderate amount of filling in and spawning gravels are impacted at some times due to scouring and aggrading. This instability is primarily due to a combination of erratic stream flows and high bedload movement, primarily from natural conditions. Timber harvest and road construction activities have also contributed to this instability (ie., Jumbo, Steelhead and Oakes Creeks). Activities that increase sediment to the Bacon Creek drainage could further reduce fish habitat.

Diobsud Creek has an excellent pool/riffle ratio and spawning habitat up to the impassable falls. The stream channel is generally in a delicate balance with the natural instability contributing an adequate level of spawning gravel replacement but not too much that pool habitat is impacted.

Olson Creek has a high sediment load, primarily due to natural conditions, that has been contributing to a certain amount of instability and reduction in fish habitat.

Pool quantity and quality is decreasing and in a declining watershed condition in Bacon and Olson Creeks due mainly to natural conditions. Diobsud Creek upstream of the east Diobsud main tributary is in good condition but overall fish habitat is in a delicate balance. Any additional sediment entering the Diobsud, Bacon and Olson Creek drainages could reduce the available fish habitat as a result of moderate to high amounts of LWD existing in a majority of the 1st-2nd order channels and the recruitment potential from the adjacent riparian stands is good. In the 3th-4th order channels, moderate amounts of LWD is well anchored and distributed in the upper sections of these channels but is limiting in the lower portion of most of these channels especially in Bacon, Diobsud, and Olsen Creeks. After analysis of these factors, the ID team rated the AZs as acceptable.

AZ #23 occupies the roaded portions of the Bacon, east Diobsud and Olson Creek drainages. While unstable soils have generally been avoided during harvest and

road construction activities in these areas, three locations (i.e., east Diobsud, Oaks Peak and the lower Falls Creek areas) have been impacted from concentrated harvest activities. Effects of BMPs, during future harvest within and downslope of these areas, will be limited to the immediate area of application until more vegetation recovery occurs. Future harvest dispersion opportunities appear good in AZ 23, considering 1600 acres is helicopter logging. AZ #24 occupies the upper watershed, unroaded portions of Bacon (i.e., upper Falls Creek drainage on west side of watershed), Diobsud and Olson Creeks. Unstable soils are scattered throughout these areas, usually associated with 1st and 2nd order channels. 12 miles of road will be needed for future harvest.

Approximately 5500 acres of pole size timber occurs in these AZs, which may limit the opportunity for dispersion during the first 4 decades.

For purposes of looking at these two allocation zones on a watershed basis, the ID team combined them to assess the in-channel and upslope conditions, and then split them out into three watershed areas to determine the maximum acres available for harvest. The 3 watershed areas are: 1) the Bacon Creek drainage, 2) the Diobsud Creek drainage, and 3) the Olson Creek drainage.

In the Bacon Creek watershed area, the past harvest rate has averaged about 370 acres, since the 1950's. The I.D. team determined this rate has been to high in this watershed and recommends a reduced harvest rate to 295 acres per decade to maintain acceptable upper watershed, instream and fish habitat conditions.

Of the remaining tentatively suitable acres (5,291) in the watershed, approximately half of the acres occur in the Diobsud watershed, and half in the Olson Creek watershed.

Since the Diobsud Creek channel is in a delicate balance, due primarily to natural conditions, and sustains a significant anadromous fisheries resource, the I.D. team has determined the Diobsud Creek watershed portion of the AZ's can only sustain a 50 acre harvest rate per decade.

The I.D. team concludes that the Olson Creek drainage can sustain a 210 acre harvest rate per decade and maintain an acceptable upper watershed and instream condition.

To maintain a acceptable in-channel condition, a 2% harvest rate in Diobsud, combined with a 4% harvest rate for Bacon creek and a 8% rate for Olsen Creek should bot be exceeded. AZ 23's share of this harvest would be 330 acres per decade and should be dispersed among the subwatersheds as follows:

Watersheds:	Olson Watershed	Diobsud Watershed	Bacon Watershed	AZ Total
AZ 23 Future harvest Per decade	70 ac.	15 ac.	245 ac.	330 ac.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 330 acres
2: 330 acres
3: 330 acres
4: 330 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Cascade River - AZ 26

(Includes: mainstem, South Fork and North Fork Cascade R., Day, Lookout, Monogram,
Marble, Irene, Sibley, East Fork Sibley, Hard, Swamp, Pincer, Sonny Boy, Barrett,
Kindy, Vee and Found Creeks)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The following fisheries discussion is based on various surveys, reports and observations including: Forest Service 1983 Stream Surveys, WDF 1975 Stream Catalog (including supplements), conversations with WDF and tribal fish biologists, fish electro-fishing associated with fish habitat improvement and timber sale related KV projects, and annual interagency salmon spawner/redd counts.

A wide variety of fish utilize the mainstem of the Cascade River. Chinook, coho, pink, and chum salmon and steelhead trout reportedly use the mainstem and the lower portions of many tributaries for transportation, spawning and rearing up to RM 16, however, there apparently is unrestricted access for anadromous fish up to RM 22.5. Anadromous forms of rainbow, cutthroat and Dolly Varden trout use the upper reaches of the mainstem Cascade River and many tributaries for transportation, spawning and rearing habitat. Above anadromous barriers many of the streams in the drainage contain resident trout. The mainstem Cascade River between Marble and Sibley Creeks has been described as providing excellent spawning and rearing habitat for salmon. Important tributaries for anadromous fish and their respective barriers (RM) include: Marble (RM .9), Sibley (RM .5), Found (RM .5), Kindy (RM .5), Sonny Boy (RM .25), and the North (RM .5) and South Forks (RM 4) of the Cascade River.

The Cascade River is a large tributary to the Skagit River. The channel capacity is inadequate, the lower banks are in poor shape, the upper banks are in fair shape and the channel is in good to excellent shape except in certain areas. Channel instability ratings are high for a specific reach starting immediately below Found Creek upstream in the mainstem to the South Fork. These conditions are due primarily to natural factors but management activities

have aggravated problems in a few specific locations (e.g., Vee Creek). Activities that aggravate the existing channel instability in those specific locations in the Cascade River and its tributaries could negatively impact existing fish habitat conditions. Pool/riffle ratios are less than 50/50 in the upper watershed but this is more a function of the natural gradient. Pool quality and quantity are good in the lower watershed. LWD exists in moderately good amounts. In-place debris is relatively stable and recruitment opportunities s are good. Upon summing up these conditions, the ID team concluded that the AZ condition was acceptable.

Allocation Zone 26 consists of 23,713 acres of National Forest in the Cascade River drainage. The watershed also contains 70,000 in Glacier Peak Wilderness and North Cascades National Park. There is an additional 25,000 acres of State and private for a total of 118,000 acres.

Review of aerial photography revealed that past harvest activities up to 1986 have generally been concentrated in the lowland portions of the Cascade River. There has been some dispersion upslope into Sibley and Irene Creeks. The past harvest rate over the last 4 decades has averaged about 530 acres/decade (including wildfire acres). This rate has impacted watershed and fish habitat conditions in heavily harvested areas which include: Sibley, Found, lower Kindy Creeks. There have been some road/harvest related failures in the past and a few of these have been significant contributors of sediment (particularly Kindy and Vee Creeks).

The Cascade River is a relatively stable watershed where dispersed harvest activity can occur (tentatively suitable). Past harvest has had little effect overall on watershed and fish habitat conditions except where mentioned above. The ID team concludes that harvest can occur, assuming good dispersion of harvest and new BMPs. An estimated 1100 acres (8% of the tentatively suitable)) acres could be harvested per decade without adverse cumulative effects.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 1100 acres
2: 1100 acres
3: 1100 acres
4: 1100 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lower Reach, Skagit River - AZ 27
(Includes Cumberland, Texas, and Wild Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This allocation zone is made up of 4 small drainages: Texas Creek and Wild Creek (that flow into Cumberland Creek), upper Cumberland Creek, and an area that drains into the Skagit River to the north. No fish sampling has occurred in these streams on National Forest land.

Approximately 80% of the 1st and 2nd order channels are in an unstable condition, widespread channel scouring is evident, and most of these channels have unstable streambanks. Also,little or no LWD exist in these channels and there is little or no potential for recruitment of LWD from the adjacent riparian areas. Because to this the ID team rated the AZ as unacceptable.

Since 1960, 1620 acres of National Forest land (or approximately 45% of the AZ acres) has been harvested. This is an average of 15%/decade when considering the entire allocation zone. However, most of the harvest during that period was not dispersed over the entire allocation zone but was concentrated into only 60% (2130 acres) of this area. Therefore,the effective rate of harvest in this area was 540 acres/decade. It is these areas (namely Texas Creek and in general the north end of the allocation zone) that have experienced the greatest amount of stream debris torrents. Harvest at this rate of 540 acres/decade has led to unacceptable stream conditions.

Since past, heavy harvest in the Texas creek area has caused unacceptable stream conditions in that and other streams, the ID team concluded that this area needs a period of recovery of 20 years before any further harvest is scheduled. After that time the remaining 100+ acres of mature saw timber should be harvested in two entries, about 50 acres per entry with a recovery of 2 decades between entries.

Approximately 900 of the 1050 acres of mature saw timber is located in the southern end of the allocation zone in the Wild Creek and upper Cumberland creek areas.

The upper Cumberland Creek area has received considerable, recent harvest (200+ acres in 1980's). It too should be allowed to recover for a 20 year period before rescheduling harvest. After that period harvest could resume in that area at a rate of about 60 acres/decade.

The ID team concluded that since there has been little past harvest in Wild Creek, harvest could begin in that area and maintain adequate dispersion at the rate of 75 acres/decade. 6

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 75 acres
2: 75 acres
3: 185 acres
4: 135 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lower Reach, Skagit - AZ 28
(Includes: O'Toole, Boyd, Mill, and Pressentin Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The streams in this area on National Forest land have not been sampled to determine fish populations present but based on available information form adjacent drainages resident trout species (rainbow, cutthroat and Dolly Varden) would be expected to occur in portions of these streams. Anadromous fish populations do occur in downstream areas off National Forest.

The ID team has rated the AZ as acceptable because of lower watershed conditions of some downcutting and deposition, moderate to high ability to store and transport sediment, high quantity and quality of pools, and moderate amount of LWD.

Review of aerial photography revealed that past harvest activities up to 1983,292 acres per decade on National Forest Land had little apparent impact on stream condition. Most of the harvest has been near ridge top locations except for some of the O'TOOLE SKYLINE T. S. harvest units. These units are adjacent to O'Toole Creek and unstable soils. Full suspension of yarded materials provided adequate protection of riparian areas and unstable soils in these areas.

Many of the remaining mature timber areas (ie., 2200 acres) would be helicopter logged. This would allow better dispersion of harvest units throughout the tentatively suitable areas and lessen the risk of potential adverse impacts from road construction. The roads that would be required for future harvest would be on or near ridge tops. BMP's have been and would continue to be effective in protecting the soil and water resources in these areas.

Since past harvest in the AZ has been low and channels have not been adversely impacted it is recommended that a harvest rate of 550 acres/decade (8% of tentatively suitable acres) would maintain acceptable upslope and instream watershed conditions.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 550 acres
2: 550 acres
3: 550 acres
4: 550 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Deer Creek, Northwest - AZ 29
(Includes Little Deer, Day, and DeForest Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photos, stream habitat/condition inventories, and the DeShazo Study has shown a substantial increase in sediment delivery to the Little Deer Creek drainage. Other effects observed include: the inability of the stream to transport sediment, loss of LWD, loss of riparian vegetation, and loss of pools due to timber harvest and road building activities. Stream aggradation was found to correspond to a general increase in stream temperature, filling in of pools and an overall reduction in anadromous fish habitat in Little Deer Creek. Stream temperature monitoring since 1983 has shown that temperatures frequently exceed 60 degrees F during the summer (Forest Service and Tulalip Tribe temperature monitoring) and indications are that Little Deer Creek has become temperature sensitive. Because of these conditions, the drainage condition is rated unacceptable.

An average timber harvest rate of 1070 acres per decade in the Little Deer Creek drainage during the 1950's, 1960's,and 1970's including FS and Private land. This combined with associated road construction and old management practices has resulted in these unacceptable stream conditions (poor future storage capacity, poor pool quality and quantity, and very little LWD). The major portions of past timber harvest activity in the drainage occurred by 1975. Dispersion of harvest was not provided for. It is estimated that these areas will have recovered in 30 years.

In Little Deer Creek in the first decade, there would be a high risk that additional timber harvest activities would continue the current degradation in watershed condition (even considering the use of current BMP's) and contribute to a worsening of instream conditions. These recommendations are based on the following factors: (1) the remaining tentatively suitable area is interspersed with many existing clearcuts, unidentified sensitive soils and steep, unproductive sites and (2) any additional sedimentation would further channel degradation and reduce habitat for the tenuous summer steelhead and salmon

populations in Little Deer Creek. If no further harvest activities occur before 2005, it is expected that the watershed condition would become acceptable.

In the first decade 100 acres of timber is recommended in the Day Creek portion of the AZ without further degrading instream conditions. This is based on the following factors: (1) a substantial amount (approximately 345 acres) of mature timber is left in the upper elevations, (2) much of the area would be helicopter logged which has less impact on soils, and (3) there is very little road stacking.

Considering in-stream recovery in 2005 in the Little Deer and DeForest Creek drainages and adequate dispersion of harvest throughout the suitable acres the ID team concluded that 400 acres (3rd & 4th decade) can be harvested per decade with little or no risk of further stream degradation. This equates to 5% of the tentatively suitable acres. Since 2005 occurs in the middle of decade 2, 200 acres can be harvested in this decade. The ID team recommends that no harvest occur in the Little Deer Creek watershed in the first decade. Harvest of the full 400 acres in the AZ would occur in the third and fourth decades. This rate would allow for adequate dispersion of harvest throughout the suitable acres, and would still allow for instream recovery.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: __ ACCEPTABLE XX UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 acres
2: 200 acres
3: 400 acres
4: 400 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Finney Creek - AZ 30

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photography revealed that past harvest activities up to 1975 (29% of N.F. lands in the watershed) had little apparent impact on stream condition. Between 1976 and 1988 additional heavy harvesting in the upper watershed (20% of N.F. lands), coupled with rain-on-snow flood events (1975,77,79, & 80) caused a large increase in sediment yield and transport through debris torrents & landslides. Dispersion of harvest was not provided for. Upper watershed, in-channel streambed and bank conditions are highly disturbed where debris torrents have occurred. This has affected 75% of the major 1st and 2nd order streams. Sediment from these events and other landslides has been deposited in the mainstem of Finney Cr. The ability to

retain sediment in the side channels has been greatly reduced. Pools have been filled in and/or scoured which has severely impacted the resident trout habitat. The main channel of Finney Creek has been scoured, widened, and straightened. Woody debris has been re-distributed and/or lost from the system. Because of these factors the ID team rated the condition of the AZ as unacceptable.

The average harvest rate in the 1960's, 70's and 80's was 3137 acres per decade on the AZ. This rate resulted in an unacceptable watershed condition. The Finney Creek watershed is still in an unacceptable condition. This condition will not change until natural recovery and watershed restoration measures are completed in the first decade. The decline in watershed condition must be halted before any timber harvest and road construction activities can take place.

Watershed condition in 1976 was determined to be unacceptable based on observation of stream conditions in the lower WS. Considering that rooting strength deteriorated for 8 years, it is assumed this condition was triggered at the 1968 harvest level. This rate was 16% on NF land. In order to provide for adequate dispersion of harvest throughout the suitable acres, and for in-stream recovery to occur it is assumed that 15% disturbance in 30 years can be tolerated beginning in the third decade (5% / decade X 17,019 tent. suitable acres = 850 acres harvest per decade). Minimal harvest activities of not more than 100 acres/decade for the first two decades may be possible provided that all watershed restoration measures are completed, the decline in watershed condition is halted, and the following best management practices are strictly adhered to: 1) harvest will be distributed throughout the watershed and not concentrated in any one sub-basin, 2) new long-term road construction will be restricted to gentle stable ground, 3) management activities must be no closer than 1/8 mile from unstable soil areas, 4) all materials will be yarded using full suspension methods, 5) there will be no harvest allowed in Class I, II, III and IV stream riparian areas, 6) all disturbed areas (including but not limited to temporary roads, skid trails, landings, fire lines) will be revegetated and drained prior to the current year fall/winter storm period, 7) all short-term roads must meet the preceding criteria, 8) emphasis will be placed on using KV generated dollars for watershed/fish restoration work, and 9) emphasis will be placed on using timber sale road reconstruction dollars for road drainage restoration.

It is assumed that by the 3rd decade (year 2010) the watershed (channel recovery, canopy closure, root strength) should be recovered sufficiently to allow a harvest rate of 850 acres/decade for the next two decades.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _XX_UNACCEPTABLE
MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 acres
2: 100 acres
3: 850 acres
4: 850 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Deer Creek, Southeast - AZ 31 & 32
(Includes Deer and Higgins Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

Review of aerial photos, stream habitat/condition inventories, and the DeShazo Study has shown a substantial increase in sediment delivery to the Deer Creek drainage. Other effects observed include: the inability of the stream to transport sediment, loss of LWD, loss of riparian vegetation, and loss of pools due to timber harvest and road building activities. Stream deposition and widening was found to correspond to a general increase in stream temperature, filling in of pools and an overall reduction in anadromous fish habitat. Based on stream temperature monitoring conducted by the Forest Service and Tulalip Tribe since 1983 temperatures frequently have exceeded 60 degrees F. Deer Creek is considered a temperature sensitive stream, a condition that is limiting to fish. Because of these factors, the AZ has been rated as unacceptable.

Since the 1960's approximately 2950 acres of AZs 31 and 32 have been harvested. This is an average harvest rate of 985 acres per decade for the 13,453 acre watershed. However, this harvest was not dispersed over the entire area but rather was concentrated into only about 5300 acres of AZ 31 (largely along Deer Creek and Higgins Creek). The effective rate of harvest in these concentrated areas was about 19% per decade overall (985 acres/5300 acres). This rate of harvest has led to serious degradation of Deer Creek and Higgins Creek and is unacceptable.

The ID team concludes that harvest in AZ 31 should be deferred for at least two decades to allow instream recovery. After that time harvest could continue at a rate of 262 acres/decade (5% of the tentatively suitable acres). Harvesting at this rate will maintain an overall disturbance level of 15% (Based on a 30 year stream channel recovery period). The ID team concludes a maximum 15% disturbance level in 30 years is appropriate for this area because of the inherent instability of the soils.

The 262 acres/decade rate (based on tentatively suitable lands) would also apply to AZ 32 due to the instability of the soils in this area. 5% of 4391 tentatively suitable acres is 220 acres/decade. However the first two decades would be reduced to 110 acres/decade to enable a quicker recovery of Deer Creek and Higgins Creek channel conditions.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: __ _ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

	AZ 31	AZ 32
1:	0 acres	110
2:	0 acres	110
3:	262 acres	220
4:	262 acres	220

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Middle Reach, N. F. Stillaguamish - AZ 34
(Includes: Segelson and Swede Creeks)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Fish habitat is poor to fair overall in the confined channels of Swede and Segelson Creeks. Pools are generally shallow and small, and local areas of heavy deposition are common for both main channels. Habitat deficiencies are the result of extensive streamside logging on upper Segelson Creek, and unsupervised mining operations and road building in upper Swede Creek. Removal of LWD throughout accessible channel reaches both on and off-Forest have further deteriorated the ability of the watersheds to store sediments and alter stream power.

The ID team has concluded that this AZ is in an unacceptable condition. This rating is supported by upslope factors of numerous slides, heavy road stacking, channel scouring, raw stream banks, and minimal LWD. In the lower watershed channels there is heavy deposition, shallow and infrequent pools, inadequate and unstable LWD.

The harvest rate in this AZ over the last 3 decades has been 536 acres/decade on National Forest land. There is currently an estimated 1625 acres of mature saw timber on 3123 acres of tentatively suitable land. When evaluating the distribution of the available timber, the ID team concluded that in order to provide the dispersion necessary to provide adequate recovery and protect sensitive areas, the harvest should not exceed 200 acres per decade over the next 4 decades. This will be 6.4 percent of the tentatively suitable lands per decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 ACRES
2: 200 ACRES
3: 200 ACRES
4: 200 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's to be considered in all alternatives in the FEIS.

Middle Reach, N. F. Stillaguamish South - AZ 35
(Includes Boulder River, French and Squire Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Fish habitat is in good condition for the lower watersheds of Boulder River and Squire Creeks, and only fair for French Creek. This is based on the size and number of pools, stream bank stabilities, and amount, size and stability of LWD. Condition of fish habitat in the upper basins is not well documented, but appears to have been altered to a moderate degree in upper French Creek. LWD has been removed from upper French Creek and streambanks are severely disturbed. French Creek also has a marked reduction in pool capacity in the upper watershed. Upper Boulder River is pristine, and upper Squire Creek appears to have mostly recovered from streambank logging. The majority of sediment and mass movement in this allocation zone is the result of natural instability. The ID team concluded the overall watershed condition for this AZ is marginally acceptable.

The majority of the management caused slides in this allocation zone occurred in the upper reaches of French and Squire Creeks as a result of intensive harvest (553 ac.) in the upper watershed in the 1960's. Average harvest rate in the AZ over the past 4 decades was 240 ac. per decade including both private and National Forest lands. In-stream conditions have slightly improved since intensive logging in the 1960's.

Future harvest activities can be well dispersed throughout the tentatively suitable acres due to the 500 acres of helicopter logging areas located primarily in the Jumbo Mtn. and Whitehorse Ridge areas. Heavily impacted areas of the French Creek drainage have no mature timber that will be harvested in the 1st four decades. A large acreage of second growth poles occurs along the lower, generally stable slopes of Whitehorse Mtn. that silvicultural examinations indicate will be available for harvest in the 1st decade. For these reasons, the ID team concludes that 500 acres (9.5% of the tentatively suitable acres) can be harvested in decades 1 through 4.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 500 ACRES
2: 500 ACRES
3: 500 ACRES
4: 500 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach, N. F. Stillaguamish - AZ 37

(Includes: mainstem North fork Stillaguamish River, North, South, and Middle Branches, Crevice Creek, and the headwaters of a few drainages into the Sauk River)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Fish habitat in the North Fork Stillaguamish River is in an unacceptable condition, based on the widespread aggrading evident in the lower gradient reaches both on and off National Forest lands. The basin is also sensitive to increased summer temperatures some years. Heavy deposits of sand have reduced volume of pools, adversely affected spawning gravels, and diminished rearing habitat quality along the margins of the larger channels.

The North Fork Stillaguamish River System was in acceptable condition until the late 1970's and early 1980's. From the mid 1980's unacceptable watershed damage started to occur. The damage coincided with dramatic increases in harvest levels in the late 1970's and early 1980's to up to three times the prior rate.

The unacceptable rating of this watershed is supported by upslope factors of downcut or scoured streams on nearly half of the upslope area, numerous raw stream banks, unstable LWD, older failing roads on unstable soils, and many stacked roads. The lower watershed has heavy sediment deposition and poor quality pools.

The deteriorated condition of this watershed has resulted from an average harvest rate of 3296 acres per decade (11% based on 4 decades harvest). In order to provide for recovery and proper dispersion, a maximum rate of harvest of 1000 acres per decade is recommended. This rate will be 3.6% of the tentatively suitable acres. This harvest level can be accomplished by restricting harvest on sensitive ground, using BMP's, and good harvest dispersion.

This level of harvest over the next 40 years will provide for satisfactory watershed recovery. After the 4th decade, the previous harvest level of 2200 acres per decade that had maintained an acceptable watershed condition, could be re-established. (The 2200 acres was the harvest level prior to the '80's that had maintained an acceptable watershed condition.)

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 1000 ACRES
2: 1000 ACRES
3: 1000 ACRES
4: 1000 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sauk River, Northeast - AZ 38
(Includes White and Hilt Creeks.)
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The following fish habitat description is based on the WDF Stream Catalog (1975 including supplements). Allocation Zone #38 consists of the Hilt and White Creek drainages. White Creek and Hilt Creek are tributaries to the lower Sauk River. White Creek has a falls that block anadromous fish at RM 0.65 and the upper 5 miles are on Forest Service land with the FS boundary located at RM 1.8. Hilt Creek has a falls located at RM .7 that block anadromous fish and the upper 2 miles are on FS land with the FS boundary located at RM 3.5. Based on knowledge of similar streams in adjacent drainages it is expected that resident trout inhabit the upper reaches of White and Hilt Creeks above the anadromous barriers.

Past harvest in the Hilt Creek portion of the AZ, over the past 4 decades has removed 96% of the mature timber, leaving only 50 acres of the 930 acres of tentatively suitable. This has resulted in degraded in-channel condition and an unacceptable watershed condition. This has caused significant impacts to resident fish habitat in the Hilt Creek portion of the AZ. Based on the preceding factors the I.D. team recommends that no further harvesting should occur in the Hilt Creek drainage over the next 4 decades.

In the White Creek portion of the AZ, 1770 acres have been harvested in the past 3 decades (an average of 590 acres per decade). This harvest has been concentrated within the drainage causing unacceptable upper watershed, instream and resident fish habitat conditions. There are limited dispersion opportunities during future harvest in White Creek and much of the remaining mature timber is located on steep, marginally stable ground. For these reasons, the I.D. team recommends that the White Creek drainage can sustain a 200 acre per decade harvest rate and still maintain acceptable watershed, instream and fish habitat conditions. For the first 2 decades this watershed will require additional recovery time to return to an acceptable condition. Therefore, we recommend that the 200 acre/decade harvest rate be cut in half during the first 2 decades. This is 100 acres per decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: __ _ACCEPTABLE _XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 acres
2: 100 acres
3: 200 acres
4: 200 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sauk River - AZ 39

(Includes: The mainstem Sauk River RM 25 to RM 40, and lower Clear, Falls and Helena Creeks, Murphy, Goodman, Dans, Decline, Conn, Gravel, Peek-a-boo, Brown, Burns, Skull, Lyle, Dutch, and Dubor Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

The analysis area for this AZ includes the Sauk (off National Forest lands) to the confluence with Prairie Cr. at RM 15.5. The lower gradient section of the river downstream of the NF lands shows the cumulative effects of sediment aggrading, which are not as evident in the moderate gradient reaches on NF lands. Much of the sediments come from the Sauk River and Dans Creek on NF lands.

Fish habitat in this AZ is moderately productive on NF lands, but appears to have been degraded down-river by widespread channel shifts, filled in pools and overall aggrading. Valley bottom tributaries and river side-channels provide most of the high quality anadromous fish habitat on NF land. Examples of streams which have maintained stable and productive fish habitat are Tiny Kitsutch Cr., Hyakchuck Cr., Dutch Cr., Falls Cr., and Early Coho Cr.

Historical cutting and road building in this watershed have resulted in degradation of individual drainages: Dans Cr. & Murphy Cr. in particular. The dispersed nature of activities geographically and over time, have resulted in marginally acceptable water quality and fish habitat in the anadromous zone in the Sauk River valley. Dans Creek and the Sauk downstream from the NF lands, however, are in an unacceptable condition at this time due to the Dec. 1980 flood that removed most of the LWD and removed the pool structure. There are also numerous slope failures along the Dans Cr. channel and its tributaries (Conn and Decline Creeks).

Average past harvest per decade over the past 4 decades in the AZ was 330 ac. on private land and 4513 ac. on National Forest. All private lands have been harvested at least once except for approximately 40 ac. of mining claims on Gold Hill. Due to current instream conditions and the reduced ability to disperse harvest, the ID team concluded that 1700 ac. could be harvested in the 1st decade, (5% of the tentatively suitable acres) while maintaining an acceptable watershed condition. Beginning with the 2nd decade, this harvest rate could be increased to 2500 acres/decade because of hydrologic recovery taking place, use of state-of-the-art BMP's, and the amount of helicopter logging. By the 3rd decade, some of the 2nd growth area cutover during the 1930's will become available for harvest. Some instream recovery will also have occurred by the start of the 3rd decade. By the 3rd and 4th decade, nearly all of the old cutover area will become available for harvest. (This is 3000 acres/decade, or 8% of the tentatively suitable area.) This increased harvest base will provide improved opportunities for harvest dispersion.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

Unacceptable conditions in Dans Creek

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 1700 ACRES
2: 2500 ACRES
3: 3000 ACRES
4: 3000 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Suiattle River - AZ 40

(Includes: The mainstem Suiattle River RM 12.3 to 26.5, Tenas, Big, Grade, All, Conrad, Black, and Straight Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Because of the large size of the Suiattle River watershed, the instream condition of the main river channel has not been adversely impacted by management activities. The lower channel reaches of Straight and Big Creeks have been impacted, however, and anadromous fish habitat has been slightly degraded. Pools are shallow and fewer in number; channels have become braided (resulting in upstream adult fish passage difficulties at low water), and some LWD has been washed out by flood flows.

Although some unacceptable watershed conditions exist within local areas (i.e., Straight, Tenas, and Big Creek drainages), the ID team concluded that the overall condition of the AZ is acceptable. In general, pool condition, sediment storage, and LWD supply and distribution are adequate for good fisheries habitat and other beneficial downstream water uses.

Past timber harvest within the AZ has been concentrated within the Straight, Tenas and Grade Creek drainages. Unacceptable upper watershed and instream conditions occur in these areas due to these harvest activities.

The past harvest rate since the 1950's in the entire AZ was 1709 acres per decade including both National Forest and private lands. The ID team has concluded that the harvest in the 1st decade can be increased to 2500 acres because: (1)Most of the unstable soil areas (6% of the tent. suitable acres in the AZ) can be avoided, (2)A previously unroaded area (i.e., Huckleberry Mtn.) will be entered, (3) Most of this unroaded area is stable, (4)BMP's will be effectively employed for better stream protection, and avoidance of unstable and marginally unstable areas in road construction and logging. These BMP's will maintain an acceptable watershed condition. The planned 2000 acres of helicopter harvest will also provide excellent harvest dispersion opportunities.

The ID team concluded that the 1st decade harvest rate of 2500 ac. (9% of the tentatively suitable) should be reduced in decades 2-4 to the historic rate of 1700 ac/decade (6% of the tent. suitable area). After the initial entry is

made into the large Huckleberry Mtn. unroaded area, harvest dispersion opportunities will be reduced.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _x_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 2500 ACRES
2: 1700 ACRES
3: 1700 ACRES
4: 1700 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Suiattle River - AZ 41

(Includes: Circle, Harriet, and Lime Creeks, and north facing tributaries to the upper Suiattle River.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Fish habitat in this AZ is confined to streams in 3 upper basins: Circle, Lime, and Danny Boy Creeks. Resident trout habitat quality has diminished in the former two streams by excessive amounts of introduced sediment and little LWD remaining after floods. Anadromous fish habitat, located entirely within the downstream AZ, has been altered by aggrading, alluvial fans and new channels cut by floods on Circle and Lime Creeks. About 40% of the area of this AZ drains into 1st and 2nd order tributaries of the Suiattle River that have not been intensively logged.

Instream conditions are marginally acceptable along the entire lengths of Circle and Lime Creeks. Conditions in Danny Boy Creek and other tributaries and side channels of the Suiattle River, RM 18.4 to 27.6, are fully acceptable. Therefore, the ID team concluded that the overall condition of the AZ is acceptable.

The past harvest rate has averaged 509 acres per decade for the last 3 decades. Most of this harvest has occurred in Circle and Lime Creek drainages.

Proposed future harvest is planned for a large block of stable unroaded area that drains north to the Suiattle River. The majority of the mature timber in the AZ occurs on these slopes. For these reasons, the ID team concluded that 750 ac. (13% of the tentatively suitable) can be harvested in the AZ in the 1st decade and provide adequate dispersion. In decades 2-4, harvest levels will be reduced to 350 acres (6% of the tentatively suitable). This harvest level will provide adequate dispersion and watershed protection while continuing to defer harvest in the heavily impacted portions of Lime and Circle Creeks.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 750 ACRES
2: 350 ACRES
3: 350 ACRES
4: 350 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

White Chuck River - AZ 42

(Includes: The Whitechuck River, Black Oak, Rat Trap, Crystal, Meadow, Owl, Dead Duck, and Stujack Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Anadromous fish habitat appears to be in nearly pristine condition in most of the AZ. This habitat is limited to mainly side channels and the short low gradient mouths of tributaries. The ample supply of woody debris and high quality pools are reasons for the good condition of this watershed. There are exceptions in Black Oak Creek and Rat Trap Creek. In Black Oak Creek the alluvial fan does not provide a single low flow channel for adult salmon passage upstream, and much of the instream LWD has been washed out of the active channel. Rat Trap Creek is another sub-basin that has been heavily impacted by road building and to a lesser extent by timber harvest. These exceptions account for less than 10% of the AZ. Due to the overall good instream conditions, the ID team concluded that the AZ should be rated as acceptable.

Past harvest rate has averaged 519 acres/decade over the past 4 decades. Due to the relatively low percentage (11%) of unstable soils in the AZ, the 500 acres of helicopter areas, harvest dispersion opportunities will be good. The ID team concluded that 650 acres (6% of the tentatively suitable acres) can be harvested in the decades 1-4 while maintaining an adequate watershed condition. In addition, fish habitat improvement and some watershed restoration work will be implemented on Black Oak Creek and on Rat Trap Creek subwatersheds. Harvesting will be deferred in already heavily impacted areas in Black Oak Cr. and Rat Trap Cr.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 650 ACRES
2: 650 ACRES
3: 650 ACRES
4: 650 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Canyon Creek - AZ 44

(Includes: The mainstem Canyon Creek, the North and South Forks Canyon Creek, Meadow, Camp, Boundary, Saddle, and Sevenmile Creeks. A small portion of Jim Creek is also included.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Review of aerial photos, various studies, and on-ground observations show that this AZ has been heavily impacted from previous management activities. Conditions upslope include scoured channels, some heavily stacked and failing roads, landslides throughout, and nearly half the tentatively suitable is in unstable soils. The lower watershed area is characterized by high sediment loads, unstable spawning gravels, poor pool conditions, sparse and unstable LWD, and a diminishing number of returning anadromous fish within recent decades. Because of these factors the ID team has rated the AZ as unacceptable.

Early 1960 photos show that a 1950's harvest rates of 553 ac./decade on NF lands in Canyon Cr. caused slight impacts to Canyon Cr. The impacts began to rapidly accumulate in the 60's when 2727 acres were harvested. In the last 3 decades, the harvest rate has been 1,887 acres/decade, with heavy impacts resulting.

The remaining mature timber in the AZ is located in the lower North Fork, the South Fork, and the portion of National Forest that is below the forks. The South Fork has already been heavily cutover and impacted in the 1980's. These conditions severely limit dispersion opportunities.

During the past 3 decades, the average harvest was 2097 acres/decade from National Forest lands. The ID team evaluated the effects of the 1950's rate of harvest, the effects of the accelerated harvest rate in the last 3 decades, the present condition of the drainage, recovery potential, and the limited options for dispersion , and concluded that the future harvest rates should be no more than 250 acres per decade (2.2% of the tentatively suitable land).

This harvest rate represents the amount that the Interdisciplinary Team believes can be harvested from the more stable areas that provide opportunities to implement Best Management Practices. This should result in a reduction in

harvest related failures and provided for improvement in watershed conditions by the end of the 4th decade.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 ACRES
2: 250 ACRES
3: 250 ACRES
4: 250 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sauk River - AZ 45

(Includes: upper portions of Helena, Goodman, Falls, Murphy, Shake and Swift Creeks, and tributaries to Clear Creek.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Anadromous fish habitat is generally in fair to poor condition. This assessment is based on the lack of high quality pools, high percentage of fine silt within many of the spawning gravels on the river and tributaries, and overall lack of stable LWD. Suspended sediment and bedload deposition has increased within the South Fork Stillaguamish basin in about the past two decades. This river has a naturally high bedload transport rate.

In this allocation zone, 30% of the tentatively suitable mature timber is located within unstable soil areas. Previous timber harvest and road construction in this area have resulted in degradation of the watershed resources - particularly Wiley Creek, Benson Creek, and their tributaries. There will continue to be problems associated with older road construction and timber harvest for some time.

Based on the above identified conditions the ID team concludes that the watershed is in an unacceptable condition.

The past harvest rate on National Forest land and private land within the AZ is 1726 ac./decade for the last 4 decades. The proposed harvest rate of 350 acres per decade (3.9 % of the tentatively suitable) is below the historical average in order to allow the watershed to recover from the effects of previous management activity. Objectives of future management in this AZ are to maintain the ability to disperse harvest, to avoid additional watershed effects above the high natural rate, and to develop and implement a comprehensive watershed rehabilitation plan.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 350 ACRES
2: 350 ACRES
3: 350 ACRES
4: 350 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sultan River - AZ 47

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Washington State Biologist Kramer has written that the lower reach of Williamson Creek is the primary spawning habitat for native cutthroat trout in the Spada system. This reach is downstream from the AZ. Habitat within the AZ is limited primarily by lack of pools and stable LWD. This is due to the sediment and bedload deposition that is occurring.

Williamson Creek is currently in a degraded condition and is gradually recovering. Large quantities of bedload have been transported into and deposited within the main reach of Williamson Creek. Channel widening has also occurred. The channel has also been redirected down the county road as a result of a debris jam. Bedload transport occurs within this drainage at relatively high levels from undisturbed areas, but the landslides from the 70's harvest on private lands also contributed significant quantities of bedload to the system.

Management activities, particularly the harvest on unstable soils in the 70's on private lands and lack of maintenance of the county road, have contributed to the current condition. Timber harvest on all ownerships has occurred at moderate rates in previous decades. Approximately 221 acres was harvested in the 50's, 814 acres in the 60's, and 571 acres in the 70's. The average rate of harvest for these three decades was 535 acres per decade.

The ID team considered this AZ to be in a marginally acceptable condition. The watershed is gradually recovering and restoration work would assist the recovery process. Much of the future harvest on National Forest lands will occur with the use of helicopter which will reduce further damage. Very little additional harvest on private lands is expected for several decades. In order to continue the recovery process, the ID team concluded that the harvest rate should be reduced from previous levels. The team recommends a harvest level of 150 acres within the AZ during the first decade. 150 acres represents 20% of the tentatively suitable lands. The team recommends an increase in the harvest rates in the following decades to 200 acres per decade (27% of tentatively

suitable) due to expected recovery over the 2 decades of reduced activity. (includes the 80's decade when no activity occurred).

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ ACCEPTABLE ___ UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 150 ACRES
2: 200 ACRES
3: 200 ACRES
4: 200 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach, S. F. Stillaguamish - AZ 48

(Includes: mainstem South Fork Stillaguamish River RM 53.3 to RM 70, Palmer, Perry, Coal, Beaver, Deer, Marten, Boardman, Mallardy, and Blackjack Creeks.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The upper part of the AZ is characterized by shallow residual and colluvial soils on steep slopes particularly in the upstream reaches of Perry, Palmer, Coal, Deer Creeks and the upper South Fork Stillaguamish. The lower reaches of the AZ in the Blackjack, Mallardy and Boardman Creek areas are characterized by deep, generally unstable glacial terrace deposits.

The upper 1/3 of the South Fork Stillaguamish channel in the AZ, upstream of Perry Creek (and including the lower reaches of Palmer Creek), contains the best spawning habitat in the AZ. High quality pools are common, spawning gravels have a low percentage of fines, and LWD is abundant in these sections.

The instream conditions of the S.F. channel in the lower 2/3 of the AZ are much more unstable. High bedload deposition, few and shallow pools, and extensive raw stream banks occur below the confluence of Perry Creek. These conditions are the result of both timber harvest activities and failures of the unstable glacio-lacustrine materials. Based on instream conditions in the lower S.F. channel, the ID team recommends an overall unacceptable rating for the AZ.

Average timber harvest rate over the past 4 decades is 1575 acres/decade (all ownerships). The remaining mature saw timber is in areas characterized by irregular terrain and contains numerous small 1st and 2nd order streams. The ability to leave buffer strips on these streams may be difficult. Future harvesting should incorporate BMP's including helicopter and multispan logging

systems. In order to change the present unacceptable in-channel conditions to acceptable, the ID team recommends a future harvest rate of 500 acres per decade (3.7% of the tentatively suitable). This rate will allow hydrologic recovery, though both natural and management rehab activities. As with AZ 46, this AZ will require developing and implementing a comprehensive watershed rehabilitation plan.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 500 ACRES
2: 500 ACRES
3: 500 ACRES
4: 500 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sauk River Forks - AZ 49

(Includes the North and South Forks Sauk River, Sloan, Elliot, and Cadet Creeks, and other tributaries to the upper Sauk River.)

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Anadromous fish habitat in the South Fork Sauk appears to have partly recovered from the December 1980 flood, although the river channel below Monte Cristo Lake is still deficient in high quality pools, stable LWD, and side channels with spawning gravels that are stable for only several months at a time. These conditions will be expected to improve slowly over several decades, barring additional major debris torrents from Bedal Creek or other tributaries.

The ID team concluded that the South Fork was in an unacceptable condition for fish habitat because of extensive channel braiding, few and shallow pools, channel bank failures, high sedimentation levels and recurrent debris torrents and debris flows from Bedal and Chokwich Creeks. These conditions are partially the result of the December 1980 flood. The major slide on the South Fork across from Bedal Creek continues to adversely affect spawning conditions in the downstream river system.

The ID team concluded that the North Fork and Sloan Creek were in an acceptable condition based on the number of high quality pools, minimal past harvest rate, and virtually undisturbed conditions in many tributaries.

The ID team concluded that the overall rating for the AZ was marginally acceptable.

The average harvest rate since the 1960's was 712 acres per decade in the AZ. Considering the unacceptable condition of the South Fork, the ID team concluded that the MR for the AZ should be reduced to 250 ac/decade, (3.8 % of tentatively suitable). Harvest in the 1st decade will primarily be in the North Fork drainage. This harvest level will allow adequate dispersion throughout the tentatively suitable acres in time and space and should provide for adequate recovery and maintenance of instream watershed conditions in the South Fork.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: X ACCEPTABLE __UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 ACRES
2: 250 ACRES
3: 250 ACRES
4: 250 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sultan River - AZ 51

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

In this AZ, all the streams are either 1st or 2nd order channels. These channels support only a resident trout population, there is no anadromous fish habitat. Little current information exists on the resident trout population, but based on similar 1st - 2nd order channels in other Forest watersheds, the populations are probably small and sparsely located. The majority of fish are probably found in the upper S.F. and N. F. Sultan River and upper Elk Creek. The existing habitat is probably capable of supporting this existing population.

Even though most of the channels have scoured to bedrock, enough pools, formed by large boulders and LWD, exist to support these small fish populations. Adjacent riparian areas along these channels offer a moderate LWD potential to these channels. Based on these in-channel attributes, the ID team concluded that the AZ was in an acceptable watershed condition.

There has been no past timber harvesting in the AZ. However, the ID team concluded that about 300 acres per decade (50% of the tentatively suited area) should be the maximum allowable acres for harvest.

Cause/effect relationships, in regards to timber harvest and road building, for establishing the watershed MR within this AZ are unavailable due to the lack of management activity within the area. Most of the timber is in the stream bottoms or near to riparian areas and avalanche chutes or the lower slopes. The removal of large blocks of timber would have a high localized impact on the streams. This would be kept within acceptable limits by cutting less than half of what is available within a decade. The team estimated that about 300 acres could be harvested without experiencing a significant decline in the watershed condition assuming that units were kept small and riparian areas would be protected, preserved, and state-of-the-art BMPs were applied.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 300 Acres
2: 300 Acres
3: 300 Acres
4: 300 Acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Sultan River - AZ 52

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

In this AZ, all the streams are either 1st or 2nd order channels. These channels support only a resident trout population, there is no anadromous fish habitat. Little or no current information exists on this resident trout population, but based on similar 1st and 2nd order channels in other Forest watersheds, the populations are probably small and sparsely located. The majority of fish are probably found in upper S.F. and N.F. Sultan River and upper ElK Creek. The existing habitat is probably capable of supporting this existing population. The Sultan Basin is used as a municipal water supply for the City of Everett and other communities.

Even though most of the channels have scoured to bedrock, enough pools, formed by large boulders and LWD, exist to support these small fish populations. Sediment from upslope areas and the unstable soils surrounding the reservoir have degraded many of these pools. In addition, the sediment has degraded water quality of the municipal watershed. Adjacent riparian areas along these channels offer a fair LWD potential to these channels. Because of the sediment input to the channels it is not considered stable. Based on these in-channel attributes, the ID team concluded that the AZ was presently rated as acceptable but only marginally.

Previous timber harvest on all ownerships within this AZ has averaged 1,970 acres/decade. Harvest was very high in the 1960's and 1970's in preparation for construction of the dam which created the reservoir. Harvest in the 80's was reduced to about 500 acres. About 550 acres of mature tentatively suitable acres remain on NF lands within this AZ. This remaining suitable acreage is either very difficult to access or relatively unstable. Considering the location of the remaining timber and the potential impacts on the Sultan Basin, the ID team determined that a maximum rate of 100 acres per decade (3% of the tentatively suitable) could be harvested within this AZ without substantially degrading the present watershed condition

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 100 ACRES
2: 100 ACRES
3: 100 ACRES
4: 100 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

North Fork Skykomish River - AZ 53, 54, 55, 56
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The North Fork Skykomish River basin encompasses a large watershed area. The basin encompasses all the acres in AZ 43, 54, 55, and 56. The North Fork Skykomish River contains significant populations of coho and pink salmon as well as sea-run trout (steelhead, cutthroat, and Dolly Varden). Smaller numbers of spring and fall Chinook Salmon are also found. All of this anadromous fish production in the river is by natural means. Anadromous fish are known to migrate up to RM 18 on the river to spawn and rear. Many of the major tributary streams to the NF also contain valuable anadromous fish habitat in the lower gradient sections (West Cady, Goblin, Silver, Salmon, Howard, Trout, and Lost Creeks). Besides the anadromous fish presence and utilization of the North Fork, a substantial resident trout population exists in this large river system.

The upper watershed area which encompasses most of AZ 53, 54 and 56, contain many 1st and 2nd order channels that are either avalanche chutes or steep runoff channels that have scoured to bedrock. This scouring has resulted over recent time from numerous high flow storm events especially in the 1970,s and 1980,s. In addition, early railroad logging in the 1920-1930 period harvested both sides of the N.F. Skykomish. Harvesting involved yarding logs across the river in the riparian areas. This had additional impact on the river channel and banks. What pools exist in these channels are formed mainly by rocks and

boulders and little LWD. Potential recruitment of LWD from the adjacent riparian areas is fair. Overall, these channels are slowly recovering from past flood events. In the lower 3rd and 4th order channels, past high flow and flood events (70s and 80s) caused large amounts of in-channel and streambank instability. Additional in-channel and fish habitat impacts occurred following the massive flood repair and cleanup work within the main North Fork channel. Old aerial photos (1940 - 1970) show that most of these channels had moderate in-channel and bank stability. Presently, many of these channels and the fish habitat is recovering from the natural and management caused impacts of the 1970s and 1980s. Natural recovery is presently being supplemented with habitat improvement activities. In-channel and stream bank stability is improving, the quality and quantity of pools is increasing and recruitment of LWD is occurring from the adjacent riparian areas. Because of these improving conditions with the N.F. Skykomish River system, the ID team determined the watershed in an acceptable condition.

The past harvest rate on NF land in the four AZs has been variable. The harvest rate on 53 has averaged 25 acres/decade from 1950 through the 1970's. AZ 54 has averaged 103 acres/decade for the two cutting history decades of 1950's and 60's. AZ 55 has been heavily harvested int the 20's and 30's with an average of 3900 acres/decade. In subsequent decades, starting with the 1940's, the harvest has averaged 430 acres/decade. AZ 56 had 63 acres harvested in the 1960's.

Allowable harvest levels for the individual AZ's within the North Fork Drainage were determined based on specific site characteristics within each AZ and the probable resulting response of management on the watershed as a whole. The majority of available timber and, consequently, future harvest will occur along the lower slopes of side channels to the North Fork. New road construction will be needed to access many of these areas. Historical harvest levels have varied substantially within each AZ, but recent levels appear to be lower than necessary to continue the recovery and maintenance of a stable watershed condition.

Based on the observed condition resulting from past activity and the probable location of future harvest, the ID team determined that 12% of the tentatively suitable lands within each AZ would be maximum harvest rate that the North Fork could tolerate without adversely affecting the watershed condition.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

	AZ 53	AZ 54	AZ 55	AZ 56
1:	650	500	1060	310
2:	650	500	1060	310
3:	650	500	1060	310
4:	650	500	1060	310

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Skykomish River - AZ 57
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

In this AZ, all the streams are either 1st or 2nd order channels. These channels support only a resident trout population; there is no anadromous fish habitat. Little or no current information exists on this resident trout populations, but based on similar 1st and 2nd order channels in other similar Forest watersheds, the populations are probably small and sparsely located. The majority of fish are probably found in the upper Wallace Creek and May Creek areas. The existing habitat is probably capable of supporting this existing population.

Even though most of the channels have scoured to bedrock, enough pools, formed by large boulders and some LWD, exist to support these small fish populations. Adjacent riparian areas along these channels offer a moderate recruitment of LWD to these channels. In addition, these in-channel conditions on Wallace Creek provide for high water quality for use in a downstream (outside AZ) state salmon hatchery. Based on these in-channel attributes, the ID team concluded that the AZ is presently in an acceptable condition.

The ID team determined that a maximum of 350 acres (17% of tentatively suitable) could be logged within this AZ and retain acceptable stream channel conditions. No significant impact was observed as a result of approximately 75 acres harvested each decade in the 1950's and 60's. Substantial damage was noted as a result of railroad logging of 1,000 acres in the 1930's. The remaining tentatively suitable timber is located primarily along perennial streams and lower slopes. The lower slopes are highly dissected by avalanche chutes. The ID team also determined that the removal of the tentatively suitable in four decades (460 acres/decade) along with construction of the required transportation system to accommodate the harvest represented a significant risk to the watershed condition. 350 acres would be satisfactory if distributed with 230 acres in the Wallace drainage and 120 acres in the May Creek Drainage.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ **ACCEPTABLE** ___ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 350 acres
2: 350 acres
3: 350 acres
4: 350 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Tye River - AZ 59
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This small AZ is composed of the Martin Creek and Kelly Creek systems. No anadromous fish utilize these stream systems. The streams do contain resident populations of cutthrout and rainbow trout. Martin and Kelly Creek probably support self-sustaining, small populations of both these trout species. Over time, these stream systems have developed habitat features to support these small populations. Channel and bank stability has been fair to moderate, the quantity and quality of the pools has been good, and the recruitment of LWD to these channels has been in balance. But recent heavy harvesting on the private land and the less intense harvesting on NF land has, and continues to have, impact on the channels and the fish habitat. These are fragile channels due to their location and elevation, and future timber harvesting will require that no further degradation or losses occur in channel stability or in the fish habitat capability. Presently the ID team determined the AZ to be in an acceptable condition.

Prior to the 1980's, only 219 acres of NF land had been harvested and none on private lands. As stated previously, the fragile channels within this AZ were not substantially altered with this level of activity.

Harvest rates in the 80's increased dramatically. An additional 283 acres were harvested on National Forest lands and 1,250 acres on private lands. This rate of harvest and the location of harvest (riparian areas and avalanche chutes) has resulted in degradation of stream channels and an accelerated rate of sedimentation. Due to the short time period since harvest, it is difficult to predict what the full impact will be of the recent activity. Monitoring activities are planned for further evaluation. Considering the observed existing condition, the anticipated harvest of an additional 350 acres of private land during the rest of 1989, and the uncertainty of future impacts, the ID team concluded that future harvest rates, at least for the short term, should be reduced from previous levels. The team proposed 100 acres for the for the 1st decade which represents 9% of the remaining mature tentatively suitable within the AZ. This harvest should occur within the Kelly Creek and West Fork of Martin Creek. Only limited salvage harvest will be scheduled for Martin Creek due to little expected harvest on other ownerships and anticipated gradual recovery, the team increased the rate in future decades to 150 acres/decade. (about 12% of the tentatively suitable).

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: _100 ACRES
2: _150 ACRES
3: _150 ACRES
4: _150 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Beckler-Rapid Rivers - AZ 60
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The Beckler River contains more than 13 mainstem river miles plus 28 tributaries that total about 167 linear stream miles. The Beckler River is the major tributary of the S.F. Skykomish River. The Beckler River contains significant populations of coho and pink salmon as well as sea run trout (steelhead, cutthrout, Dolly Varden). Smaller, but important runs of spring chinook and chum salmon also can be found in the mainstem Beckler River. All of the anadromous fish production is natural production except for the steelhead trout that are outplanted from nearby hatchery production. Natural production in the Beckler River is possible due to fair to moderate amounts of spawning habitat existing, but only fair quality and quantity of rearing habitat is present. Much of the high quality rearing habitat in the Beckler and Rapid Rivers was lost or displaced following the floods in the late 70's and 80,s. In addition, the extensive flood control and prevention work following the floods (LWD removal and channelization) further damaged or destroyed this rearing habitat. Since the mid 80's to the present, natural channel recovery and fish habitat restoration management activities have steadily improved this rearing habitat capability. Rearing habitat capability is improving because the channels have become more stable, the number, size, and location of pools is increasing, and the recruitment of LWD is occurring. The present conditions of the 1st and 2nd order channels and the downstream 3rd and 4th order channels support viable populations of salmon and trout therefore the ID team determined that the Beckler River AZ is in an acceptable condition.

The past harvest rate (for past 2 decades) on both National Forest land and private land has averaged about 3500 acres per decade. The Rapid and lower Beckler River areas are in a process of recovery from past heavy harvest rates that employed poor management practices, and had roads constructed in unstable soil areas. In addition, this portion of the watershed is recovering from past wildfires like the Evergreen Mtn burn. Examination of aerial photos over the past 2 decades shows that hydrologic recovery is occurring on National Forest lands. This recovery is taking place in the watershed despite the presence of large, contiguous acres of harvesting on the upper slopes and in the riparian areas on private land.

The ID team concluded that the implementation of state-of-the-art BMPs and the amount of helicopter logging possible (which would decrease new road needs) in this AZ would allow the District to maintain and slightly increase the past 2 harvest rate of 3500 acres/decade. The ID team determined a slight increase of 100 acres to total 3600 acres could be the maximum harvested in the 1st decade. Hydrologic recovery is taking place on National Forest land as well as private land. Five of the seven parcels of other ownerships in the second growth along the bottomlands of Beckler River have been recently acquired as National Forest lands. These parcels will not be subject to extensive harvesting as they would have if they had remained in private ownership. The potential future impacts to the watershed from management activities, under N.F. administration, will be decreased. Upon consideration of the previous discussed factors, the ID team determined that the harvest rate could be increased on the AZ to 4000 acres/decade for decades 2,3, and 4. These rates, along with state-of-the-art BMPs, are expected to maintain the present acceptable watershed condition in this AZ.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: __X__ ACCEPTABLE ____ UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: ≐3,600 Acres
2: ≐4,000 Acres
3: ≐4,000 Acres
4: ≐4,000 Acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

South Fork Skykomish River - AZ 61
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This small AZ contains only resident fish habitat. The major stream system in the AZ is the upper sections of Barclay Creek and Barclay Lake. Resident rainbow or cutthroat trout populations in this creek are probably small and vulnerable to being depleted with any additional recreational fishing pressure. Creating additional access to upper Barclay Creek with more roads could lead to increased fishing pressure on these small populations. Presently, the habitat is supporting these populations. Channel and bank stability in most channels is fair to good; the pools are small, but still are providing food and cover; and Barclay Creek has a good supply of LWD along its entire channel length. Recruitment possibilities are also good. Because of these conditions, the ID team concluded the AZ to be in an acceptable condition.

Lacking previous cutting history in the immediate area to draw from for background information, the tentatively suitable lands were analyzed in three categories which are:

1. The avalanche chute area of about 600 acres
2. The upper basin area of 600 acres
3. The area below the end of the road of about 600 acres.

The avalanche chute area contains numerous, deeply incised chutes that highly dissect the area. Roading would not be economically feasible. Logging of the timber should leave buffer strips to protect the chutes from sedimentation. Because of the closeness of the chutes, there is very little, if any, timber that could be logged without incurring impacts on the watershed.

The area above the end of the road into the upper basin has many, small feeder streams that are 1st and 2nd order channels. Natural sedimentation of Barclay Lake is occurring. The harvest of more than a minor amount of timber would increase this sedimentation rate. Therefore, the ID team determined that the maximum rate of 60 acres per decade should be established when considering a slow rate of vegetation growth and a relatively long period for hydrologic recovery after impacts occur.

The area south of the end of the road has no severe problems. The private land adjacent to this area has been clear cut but has not full revegetated.

The ID team determined that 180 acres per decade could be harvested and still maintain the acceptable condition of the watershed.

The total harvest that can be harvested from this AZ is 240 acres/decade (about 14% of the tentatively suitable) and still maintain an acceptable watershed condition. Helicopter logging may be employed to harvest up to 2/3 of the area.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ ACCEPTABLE ___ UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 240 ACRES
2: 240 ACRES
3: 240 ACRES
4: 240 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

South Fork Skykomish River - AZ 62
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Barclay Creek is a major tributary that enters the S.F.Skykomish River in this AZ. Barclay Creek contains about 1/2 mile of spawning and rearing habitat for coho salmon and steelhead trout. The remaining portion of Barclay Creek contains good quality resident trout habitat. The S.F. Skykomish River channel that flows within this AZ serves as a migration area for salmon and sea-run trout moving upstream to spawn and rear. This channel area in addition has moderate amounts of spawning and rearing habitat. This habitat is in good condition at present. In-channel stability is moderate and streambank stability is moderate. In addition, a fair number of high quality pools exist in both Barclay Crek and the S.F. Skykomish River channel within this AZ. A moderate amount of LWD exists in almost all the channels. Based on these factors, the ID team determined that the present in-channel conditions in this AZ are acceptable.

Based on a past harvest rate of 364 acres of NF and private lands per decade over the past 4 decades, and the fact that the old railroad logging of the 1930's has hydrologically recovered, the ID team concluded that a maximum of 270 acres/decade (12% of tentatively suitable) rate of clearcutting could be conducted and still maintain the AZ in an acceptable watershed condition. This rate of future allowable harvest was influenced by the bulk of the area being in the scenic corridor along US highway 2. This requirement of meeting visual quality objectives places restrictions on timber management activities. The lower elevations of this AZ contains extensive acreage of second growth timber that is about 50 to 60 years old. Management of these stands will be by thinning to meet the visual quality management objectives. The maximum harvest acreage would be significantly increased in this situation. The exact figure would have to be evaluated on an individual project basis.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 270 ACRES
2: 270 ACRES
3: 270 ACRES
4: 270 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Skykomish and Tolt Rivers - AZ 63
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The majority of the land in this AZ is in private ownership. Only 2195 acres out of 20,825 acres are NF land. This AZ also includes the Deer Creek subwatershed, on the north side of the S.F. Skykomish River, and the Proctor Creek subwatershed on the south side. In addition, this AZ straddles the ridge line separating the Skykomish and North Bend Ranger Districts. Many of the 1st and 2nd order channels in the south portion of this AZ are tributaries that feed into the N.F. Tolt River which is in a North Bend District AZ. In the middle portion of the AZ, Lake Cavanaugh drains both north to the S.F. Skykomish River and south to the N.F. Tolt River. In this AZ, only a resident trout fishery exists. The following description of the in-channel conditions apply to all channels in the AZ especially Proctor, Deer, and the N.F.Tolt. These channels contain populations of resident cutthroat and rainbow trout. In addition, the lower 1 mile channel sections of Proctor, and Deer Creek areas outside the NF boundary, contain anadromous fish habitat. Coho and pink salmon utilize these channel sections for spawning and rearing. Presently these channels (outside the AZ) contain only fair quality habitat for these salmon species. Bedload and sediment deposition, transported from upslope areas (inside the AZ) has displaced or degraded rearing and spawning habitat. The in-channel conditions of Proctor, Deer and the N.F. Tolt presently are in fair to good condition. The 1st and 2nd order channels have only a fair ability to control the heavy bedload transport and deposition process that occurs in the downstream 3rd and 4th order channels. These 3rd and 4th order channels have fair stability, but only a small number of adequate size pools exist. With the future recruitment of LWD from the adjacent riparian stands, the number of high quality pools should increase. Based on the present in-channel conditions, the ID team rated this AZ in an acceptable condition.

The large areas of railroad logging in the watershed have made full hydrologic recovery. These stands are now second growth timber. On private lands they are being placed under intensive management. The DNR lands are being commercially thinned. On private lands these stands are being clearcut. This is expected to continue for the next few years until these stands have been all regenerated. The thinned stands will be regenerated in the next decade.

The ID team concluded that the maximum acreage that could be harvested and still maintain the current acceptable in-channel conditions is about 300 acres per decade. This amounts to about 14% of the tentatively suitable. No recent cutting records are available. This acreage is about what was cut in the last decade and this rate has maintained the AZ in an acceptable condition. With implementation of BMPs and the restrictions of TFW on private lands, the 300 acres should be an acceptable rate of harvest.

In the second decade the impacts of the present high level of private cutting will begin. The level of maximum acreage of NF lands should be reduced to about 200 acres to reduce the potential impact on the watershed. This should hold for the third decade and then increase in the fourth decade to 300 acres (same as decade 1). This is dependant upon the recovery of the private lands that are being cutover.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 300 ACRES
2: 200 ACRES
3: 200 ACRES
4: 300 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

South Fork Skykomish River - AZ 65
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ has 3 main subwatershed areas that were analyzed for their in-channel conditions. Maloney and Money Creeks each have less than 1 mile of anadromous fish habitat. In this lower mile section, both creeks have spawning and rearing habitat for coho and pink salmon as well as for steelhead trout. The present habitat conditions in these channel areas are in fair to good shape. In-channel stability is fair, a fair number of high quality pools exists, and moderate amounts of LWD exist to contribute to pool formation in these channels. The S.F.Skykomish River channel contains moderate amounts of spawning and rearing habitat for coho, pink, and chum salmon. This habitat is in relatively good shape. In the upper sections of the Maloney and Money Creek channels, resident trout habitat exist. On Money Creek, little or no resident fish have been found in recent years. This is probably due to leaching from nearby mine tailings of toxic heavy metals (copper sulfate, arsenic, etc). Other smaller streams in the AZ (Index,Anderson Creeks) probably contain small isolated, self-sustaining populations of resident trout. Habitat conditions are probably capable of supporting these populations. Because of these current in-channel conditions throughout the AZ, the ID team rated the AZ in an acceptable condition.

Maloney Creek has three different situations. The west side of the upper 2/3 of the drainage has no history of timber harvesting. The land allocation is Dispersed Recreation. Therefore, there will be no timber management in the area. The east side of the upper drainage is in the General Forest Allocation. This area has had numerous entries for harvesting over the last two decades. The older cutting areas have nearly reached hydrologic recovery. The lower part of the drainage was clearcut in the early 30's and has revegetated with dense stands of conifers or hardwoods. This part of the drainage has completed its hydrologic recover. The ID team determined that the upper part of the drainage is the restrictive part of the drainage. The maximum level of harvest is low and is estimated at about 60 acres. This may be increased to about 100 acres if cutting is in the lower drainage.

The lands suitable for timber harvest in Money Creek are along the stream bottom and the lower slopes of the drainage. The land allocation is Scenic Forest for this timber. About 600 acres has been cutover in the last 4 decades in this watershed. Because of the natural instability of the stream and because of the location of the timber, the rate of cutting should not be significantly increased. The estimated maximum is 175 acres per decade on the long term basis. The restrictions that the partial retention objective poses makes this maximum practically unattainable.

The main south fork of the Skykomish in this AZ has about 2,000 acres of timber that is suitable and available for management. The lower parts were logged in the 30's and 40's. These areas have fully reached hydrologic recovery. The second growth timber is nearing or has reached culmination of mean annual increment and should be placed under management. This area is in the Scenic Corridor along US 2 and is subject to restrictions to meet the Retention and Partial Retention Objectives.

The background areas are allocated to General Forest and to Dispersed Recreation. The tentatively suitable NF land in the General Forest Allocation is about 2,000 acres. Only a minor amount of cutting has occurred in this area in recent decades. The impacts on hydrologic issues are none to insignificant. Private lands on the upper slopes have been clearcut within the last two decades. The ID team estimated that 200 acres/decade of clearcutting would be the maximum harvest that could be obtained without serious impacts on the hydrologic aspects of the areas.

The area from the north side of Money Creek north through the Lake serene and Anderson Creek drainage is allocated to the Mt Index Scenic Area. The Visual Quality Management is Preservation. No timber harvest is foreseen in this special area.

The total for the AZ is a maximum of 430 acres/decade (4% of tentatively suitable) that could be cut through a regeneration system such as clearcutting. The second growth stands along the bottoms may be managed through commercial thinnings to obtain the Retention and Partial Retention Objectives. The maximum acres cutover then would be significantly increased. The exact amount would be dependant upon many factors and would have to be evaluated on an individual project basis.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: _430 ACRES
2: _430 ACRES
3: _430 ACRES
4: _430 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Tye and Beckler Rivers - AZ 67

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The main watershed in this AZ is the Tye River. It also includes in their entirety the Tunnel, Sawyer, Carroll, Alpine, Anthracite, Bolt Creek subwatersheds. The lower reaches of the Beckler River, Foss River,and Deception Creek drainages are also included. The South Fork Skykomish from its junction with the Tye River to its junction with Beckler River is also included.

Anadromous fish utilize the SF Skykomish River up to Alpine Falls. Chinook, coho, and pink Salmon along with sea-run trout (steelhead and cutthroat) spawn and rear in the main-stem and the side channels. The present habitat conditions in this portion of the SF Skykomish River channel are capable of supporting these populations. Above Alpine Falls, the river becomes the Tye River and only supports a resident fish population for rainbow, cutthroaty and eastern brook trout. These trout populations exist in smaller numbers in the major tributaries to the Tye River. The habitat conditions in these tributaries are probably only in a fair condition given the amount of natural instability, and the amount of timber harvesting (past and present) on the private lands. The habitat conditions of NF lands are also only in fair condition. Future timber harvesting in the AZ will need to maintain or improve these habitat conditions. At this time the ID team determined this AZ to be in an acceptable condition.

The lower slopes along the main SF Skykomish and Tye Rivers were railroad logged in the 1910 -1930 period. Large areas on the adjoining slopes were also burned during this period. These areas have revegetated with conifer or hardwood stands. The hydrologic recovery is completed. These areas have hydrologically recovered.

Most of these lower lands are in private ownership, and second growth timber harvesting has begun. These private lands are either holdings within the AZ or on the AZ boundary. The recent harvesting started in the 50's and a large acreage was harvested in the 60' and 70's. 1306 acres were harvested in the 1960's and about 1194 acres were cut in the 70's. Presently, the areas harvested in the 1950's and 1960's have hydrologically recovered. Harvest areas from the 1970's are near almost full recovery.

About 3600 acres have been harvested on NF lands over the past 4 decades, or an average of 900 acres/decade. The Alpine and Carroll Creek Watersheds have been heavily cut. Alpine Creek has naturally unstable soils along its riparian area and lower slopes. Cutting has not been done in these unstable areas. Therefore, not much in-channel impacts have been noted on this stream or downstream in the Tye River channel.

Carroll Creek has had the heaviest harvesting,but most of the riparian areas have been left uncut. This is a steep gradient stream and the channel transports sediment quickly downstream. Sediment deposition downstream to the Tye River has not caused much impact, but any additional sediment deposition could lead to unacceptable levels of channel damage. This stream is in a delicate balance at the present time.

The remaining sub-watersheds in this AZ are in good condition. The potential harvesting of large tracts on private lands on the lower border of the AZ or adjacent to the AZ creates a potential for impacts to these sub-watersheds.

The ID team concluded that the AZ should be able to withstand a 1500 acres/decade. However, because of the potential impacts on several small watersheds and the forthcoming private land harvesting, this rate should be reduced until the recent and new cutover lands have recovered. Based on a past average harvest rate of 900 acres/decade, the ID concluded that during the 1st decade while hydrologic recovery is underway in the AZ, the harvest rate should be about 75% of the past harvest rate, or about 700 acres/ decade. the ID Team then determined that in the second decade, the rate could be increased to 1000 acres. This level could be held for another decade to compensate for the recovery of the large parcels of private lands that will be harvested. This 1000 acres is 10% of the tentatively suitable NF lands. In the following decade the maximum level of 1500 acres could be obtainable without impacting the watershed values. This represents 14% of the tentatively suitable NF lands.

The Alpine Lakes Land Management Plan provides allocation of land to all of this AZ. The Scenic Corridor along US Highway 2 follows the center of the AZ along the SF Skykomish River and The Tye River. This allocation requires the Visual Resource Management Objective of Retention be met for all the foreground area VRM Objective for middle ground area as Partial Retention. These allocations restrict the methods of cutting, sized of units and indirectly the amount of area that can be cut at one time. This has the overall effect of reducing the impacts on the watershed.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: _ 700 ACRES
2: 1,000 ACRES
3: 1,000 ACRES
4: 1,500 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Foss River - AZ 68

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The AZ encompasses the entire Foss River watershed, a major tributary to the SF Skykomish River. About 7 miles of the mainstem serves as habitat for chinook, pink and coho salmon a well as for sea-run trout (steelhead, cutthroat, and

Dolly Varden). The river contains significant areas of high quality spawning gravels and has many high quality rearing pools formed by LWD and boulders. Overall, the habitat conditions are capable of supporting the existing anadromous fish utilization. In addition, this section of the Foss River as well as in the upper, steeper gradient sections of the West and East Forks contain moderate populations of resident trout. The habitat in these channels also is in good condition. Overall the in-channel conditions in the Foss River are presently in good shape. Because of this, the ID team rated this AZ in an acceptable condition.

Timber harvest and associated activities that have occurred in recent decades within this AZ have not resulted in an observable deterioration in the condition of the watershed. Very few landslides have occurred and those that have are the result of sidecast construction and/or inadequate culvert side.

Harvest rates within this AZ have averaged about 350 acres/decade during the last 4 decades. This 350 acres represents 5% of the total AZ acreage. Decade harvest rates during the 4 decade period have ranged from 245 acres in the 70's to 553 acres in the 60's.

Considering the existing watershed condition and its apparent ability to absorb the level of activity that has occurred during previous decades, the ID team concluded that a harvest level of 500 acres could be sustained in future decades without deteriorating the watershed condition. No harvest is expected on other ownerships for several decades due to the lack of mature timber. This rate of harvest represents a 43% increase over the historic level. The 500 acre/decade harvest rate also represents 10% of the remaining tentatively suitable lands.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE
MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: _500 ACRES
2: _500 ACRES
3: _500 ACRES
4: _500 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Miller River - AZ 69
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ includes the entire Miller River watershed outside of wilderness. Six miles of the mainstem and almost 1 1/2 miles of the West Fork Miller contain spawning and rearing habitat for spring chinook, coho, and pink salmon. In addition, these channel sections are also habitat for steelhead trout and Dolly

Varden. The upper Miller River also contains habitat for resident trout populations. The majority of the resident and anadromous fish habitat is in good condition. The habitat is capable of supporting the existing salmon and trout populations.

In-channel and bank stability is fair to good, the number and quality of the pools is good, and the amount of LWD in the channel is fair. An exception to these good in-channel conditions, is the lower mile of the Miller River Channel. This section is experiencing substantial bedload deposition, causing pools to fill in and become unusable to salmon or trout. LWD is also either buried under this sediment or has been washed downstream. Overall, the Miller system is in good shape, and the ID team determined it to be in an acceptable condition.

Timber harvest activity within this AZ has averaged 214 acres per decade for the past 6 decades. Decade harvest has ranged from a high of 543 acres in the 30's to a low of 46 acres in the 80's. With the exception of the lower mile of the Miller in which deposition is filling some pools, relatively stable conditions exist within the drainage as a result of this harvest level. The remaining tentatively suitable acres are expected to have a greater impact on the watershed than previous harvest. This is because the remaining acres are located in steeper, less stable topography.

The ID team considered this AZ to be in an acceptable condition, and considered the historical average harvest rate as a reasonable rate to continue. The team recommends 200 acres of harvest per decade which represents 6% of the tentatively suitable land.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 ACRES
2: 200 ACRES
3: 200 ACRES
4: 200 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Tolt River - AZ 70

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This cumulative effects analysis has determined that a separate acceptance ratings, one for the South Tolt, and one for the North Fork, was essential to determine the future harvest prescription for the AZ. The logic for this decision was based on past forest management activities in the South Fork

drainage, while the entire North Fork system within the AZ remained unroaded and uncut.

A harvest rate of 452 acres/decade (NF and private) for 2 decades resulted in an unacceptable watershed condition for the South Fork Tolt. Excessive harvesting along the main channel and associated upstream tributaries led to an observed reduction in the quantity and quality of fish habitat. Declining amounts of LWD with inadequate recruitment, lack of riparian cover, channel scouring, and evidence of excessive peak flows were the observed conditions in this analysis. The present channel configurations suggests that fisheries habitat is continuing to deteriorate. Because of these attributes, the South Fork Tolt was rated unacceptable.

The North Fork was rated acceptable. No management activities have occurred within the North Fork Drainage. Fish habitat is fair to good according to onsite observations from district personnel. Pools are of moderate depth and adequate amounts of LWD exist along the North Fork Tolt channel. This LWD is stable and the adjacent riparian stands represent a good potential for future recruitment.

When considering the summation of the conditions throughout the AZ, the ID team concluded that the overall rating was marginally acceptable.

Based on the findings of this assessment, the harvest of 250 acres per decade (11% of tentatively suitable) could be harvested without experiencing unacceptable impacts to North Fork. This is assumed that BMP's will be implemented, particularly retention of riparian areas and minimal road construction. In addition, this rate of harvest will allow for recovery in the South Fork.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 acres
2: 250 acres
3: 250 acres
4: 250 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

North Fork Snoqualmie River - AZ 71

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

This AZ comprises the upper watershed area of the North Fork Snoqualmie River and a major tributary, Lennox Creek. As with river systems in the Snoqualmie

River basin within the NF boundary, this AZ only supports populations of resident trout. These populations include rainbow, cutthroat, and eastern brook trout. Not much is known about the status of these populations but it is suspected that the current habitat conditions support these trout populations.

Overall the stream channels do not provide high quality fish habitat due to the frequency of high flows and steep channel gradients. Past management practices have not affected the stream characteristics nor has fish habitat decreased as a result of past activities. Because of the above conditions the ID team rated this AZ as acceptable.

Harvest rates over the past 4 decades has ranged from 412 to 1000 acres/decade. No significant hydrologic in-channel impacts were observed after examination of the aerial photos and using District knowledge about these channels. But because of the history of flash flows and peak runoff in this AZ and with on-going hydrologic recovery, the ID team determined that 70% of the maximum historic harvest rate could be harvested in this AZ without altering the current acceptable in-channel conditions. In addition, roughly 2900 acres have been identified in the timber sale planning process as being feasible for helicopter logging. In conclusion the ID team determined that 700 acres/decade would be the MR (This is 14% of the tentatively suitable area).

700 acres/decade of harvest is acceptable, based on past management activities. No significant hydrologic impacts occurred as a result of the 595 acres which were harvested in the 1960's. The extremely flashy flows that are characteristic of this drainage could be increased to an unacceptable rate which would create flooding and unstable channel conditions. 700 acres/decade is believed to be the maximum rate that can be harvested before flows are altered to this unacceptable degree.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ **ACCEPTABLE** ___ **UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 700 acres
2: 700 acres
3: 700 acres
4: 700 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Taylor River - AZ 72

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This small AZ includes the 3rd and 4th order channels of the Taylor River and Quartz Creek. These stream systems support resident trout populations of rainbow and cutthroat. Habitat conditions in both systems probably are capable of supporting the existing populations. In-channel stability is fair, the quantity and quality of pools is moderate and the presence and stability of LWD is fair to good, especially in the upper reaches of these two systems. Based on these in-channel conditions, the ID team determined the watershed conditions in this AZ to be acceptable.

Management activities, beginning in the 1940's and continuing intermittently into the 1970's has resulted in 2700 acres of the total acreage within the AZ being harvested. Approximately 2000 acres were harvested during the 1940's for which associated effects are hard to detect at the present time.

A comprehensive comparison of aerial photos taken in 1970, 79, and 84, and comments gathered from district personnel with onsite observations of the AZ, suggests that the effects of road building, falling and yarding timber produced minimal changes to local and downstream conditions. Examination of the entire length of the Taylor River and Quartz Creek failed to show significant differences in channel patterns from upslope disturbances between a 14 year span observed from aerial photos. Two district personnel corroborate this assessment, in part, by commenting on the presence of quality pool habitat on the upper reaches of both channels.

It should be noted that regeneration problems have been experienced in at least two upslope units north of Quartz Creek. Hydrologic response (peak discharge) could be influenced if substantial additional acreage experiences revegetation difficulties after harvest.

Due to the lack of management activity during the past 15 years in Quartz Creek and 50 years in Taylor Creek, direct cause/effect watershed relationships are not available for this AZ. Until these relationships can be established, through monitoring of future activities, observed cause/effect relationships in adjacent drainages which have similar geologic and watershed characteristics have been used to assist in establishing an acceptable maximum rate of harvest for AZ 72.

The maximum decade harvest rate which was established for AZ 70 and AZ 71 represented 3.4% and 7.4% of the total AZ acreages respectively. The consideration of the existing conditions within AZ 72 in conjunction with the cause and effect relationships observed within adjacent drainages (AZ 70 & 71) led the ID team to conclude that a harvest level of 520 acres per decade would be a reasonable maximum harvest rate for this area.

Alpine Lakes Management Plans dispersed recreation category will concentrate future harvest into the Quartz Creek drainage area which contains approximately 3200 acres of the total AZ acreage. Harvest of the entire 520 acres/decade in Quartz Creek would increase stream discharge, soil erosion, bedload deposition,

and eventually decrease existing rearing habitat in the lower reaches of Quartz Creek. In order to avoid the anticipated effects of this level of concentrated harvest, the ID team concluded that a maximum harvest level of 250 acres should be established for AZ 72. Future monitoring of management activities and associated watershed response will provide the information necessary to adjust the harvest levels in future decades.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 acres
2: 250 acres
3: 250 acres
4: 250 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Middle Fork Snoqualmie River - AZ 73

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

This small AZ encompasses a portion of the Middle Fork Snoqualmie River. This river supports low to moderate levels of resident trout populations (rainbow and cutthroat). Present habitat conditions to support these populations are fair. As the AZ further recovers, the in-channel conditions will also improve and habitat quality and quantity should increase. Presently what pools exist in the Middle Fork are moderate in quality. Quantity of such pools is lacking. Presence of LWD is lacking, but the recruitment from the adjacent riparian areas is good. Overall the ID team rated this AZ as in an acceptable condition, especially in light of the on-going hydrologic recovery.

Approximately 1750 acres of the AZ was harvested in the 1930's and 40's. These harvested areas have revegetated and are providing stable conditions within the AZ. Subsequent harvest in the 1970's and 80's has been negligible (approximately 400 acres). While these acres are not hydrologically recovered, their impact on the AZ as a whole is minimal due to the location of harvest in relation to the tributary and main stream channels within the AZ.

Unstable soils are minimal within the AZ, although extensive areas of clay textured soils exist throughout the valley bottom. This results in some turbidity reaching the Middle Fork.

350 acres of harvest per decade within this AZ has been determined to be an acceptable rate. This conclusion is based on the following observations:

Watershed conditions were not substantially impacted by harvesting 330 acres in the 1970's.

Landforms similar to that which was harvested in the 70's and 80's is available for the first decade at a harvest rate of 350 acres/decade.

2600 acres of helicopter logging would lessen ground disturbance from reduced road construction.

Harvest levels in the 2nd and future decades may be influence by inventories that are currently being conducted in order to update suitability information for several areas in this AZ.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 350 acres
2: 350 acres
3: 350 acres
4: 350 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach, M.F. Snoqualmie River - AZ 74
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ includes most of the Middle Fork of the Snoqualmie River. The State of Washington has designated the Middle Fork as quality water for management of resident fish populations. These resident trout populations include cutthroat, rainbow, and smaller populations of eastern brook trout. Fair to moderate fishing pressure presently exists on this special catch-and-release sport fishery. The habitat in the Middle Fork channel presently is capable of supporting fair to moderate numbers of cutthroat and rainbow trout. The channel is relatively stable. Overall pool quality and the quantity is good and there is moderate, stable amounts of LWD in the channel. Because of these attributes, the ID team concluded that the AZ is in an acceptable condition.

The majority of timber harvest (2000 acres) occurred in this AZ in the 1930's and 1940's. Harvest areas and stream channels associated with those harvested areas have fully recovered hydrologically. 255 acres of timber harvest occurred on private lands in the 1970's. This acreage is not fully reforested and minor accelerated discharge and associated scouring has occurred.

The Middle Fork Snoqualmie River transports large quantities of sediment and bedload. Transport occurs primarily during peak flow events. Peak flows are

very flashy events (rapid discharge response to storm events) due to extensive areas of rock outcrops and ice fields.

Due to the lack of recent management activity within the area, direct cause/effect watershed relationships are not available. Until these relationships can be established, through monitoring of future activities, observed cause/effect relationships in adjacent drainages which have similar geologic and watershed characteristics have been used to assist in establishing an acceptable maximum rate of harvest for AZ 74.

The maximum decade harvest rate which was established for AZ 70 and AZ 71 represented 3.4% and 7.4% of the total AZ acreages respectively. The consideration of the existing conditions within AZ 74 in conjunction with the cause and effect relationships observed within adjacent drainages (AZ 70 & 71) led the ID team to conclude that a harvest level of 800 acres per decade (11% of tentatively suitable) would be a reasonable maximum harvest rate for this area. Approximately 90% of this harvest acreage will employ helicopter yarding which will substantially reduce access roading needs and associated ground disturbance and accelerated erosion. Unit size, dispersion, and silviculture treatments are prescribed within the scenic Forest component of the ALMP was considered during the development of the MR. Future monitoring of management activities and associated watershed response will provide the information necessary to adjust the harvest levels in future decades, if necessary.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _XX_ACCEPTABLE __UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 800 acres
2: 800 acres
3: 800 acres
4: 800 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Pratt River - AZ 75

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ comprises most of the Pratt River system, which is a major tributary to the Middle Fork Snoqualmie River. The habitat within the Pratt supports fair to moderate populations of cutthroat and rainbow trout. The upper channel sections are moderately stable, but in the lower 1/4 mile reach area the channel stability is poor to fair, due to the sediment deposition and excessive channel braiding. Pool quality and quantity is moderate in the upper reaches but limiting in the lower reach area. LWD is limiting along the entire channel

length. Except for this lower 1/4 mile reach, the Pratt River Channel and the smaller 1st and 2nd channels are considered to be in an acceptable condition.

Approximately 3,500 acres of timber were harvested within this AZ by railroad logging in the 1930's and 1940's. Evidence of impacts to the Pratt River from this harvest activity is difficult to identify do to very successful vegetative recovery. Pre-harvest photo's are not available, but the main channel of the Pratt appears to be unusually wide for a stream of its size and may have experienced widening as a result of harvest.

The Alpine Lakes Management Plan has designated approximately 1,700 acres of dispersed recreation within this AZ. Dispersed recreation acreage is located along the upper slope positions in the upper half of drainage. Approximately 2,400 acres of tentatively mature acres remain in the AZ if dispersed recreation acres are considered.

Available mature acres (2,400) are located in mid-slope positions (above 2,400 feet) and it extends from the Wilderness boundary down to the confluence of the Pratt with the Middle Fork Snoqualmie River. Immature stands occupy the main channel and lower slope areas.

Maximizing harvest levels during the initial entries will result in the need for extensive road construction. Mature stands of timber are distributed in blocks and narrow bands the entire length of the drainage. In order to disperse cutting units throughout these areas, significant road construction will be required. Potential impacts of both activities need to be considered, particularly during the initial entry.

Cause/effect relationships, in regards to timber harvest and road building, for establishing the watershed MR within this AZ are not available. Considering the extent of road building that will be necessary during the first entries (preliminary planning estimates approximately 15 miles), 650 acres per decade 10% of tentatively suitable) is believed to be a maximum rate of harvest that can be tolerated within each of the first two decades and retain acceptable channel conditions.

Road construction is expected to be substantially less and helicopter logging opportunities increased in the 3rd and 4th decades. This would allow an increase of harvest acreage to 800 acres and 1,000 acres for those decades respectively while providing for maintenance of acceptable in-channel conditions. These acres represent 12 and 15% of the tentatively suitable.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: **_XX_ACCEPTABLE** **_ _UNACCEPTABLE**

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 650 acres
2: 650 acres
3: 800 acres
4: 1,000 acres

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

South Fork Snoqualmie River - AZ 77
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ comprises most of the SF Snoqualmie River system. Resident fish populations of rainbow and cutthroat trout can be found in the SF Snoqualmie is presently managed as a high quality sport fishery by the State of Washington. The present capability of the habitat in this AZ to support these fish populations is in doubt.

Channel scouring and the frequency of debris torrents in many 1st and 2nd order channels plus the amount of sediment and bedload deposition in the lower 3rd and 4th order channels (mouths of tributaries and the SF Snoqualmie) have caused fish habitat degradation in these channel areas. This sediment and bedload deposition has caused a loss of pool quality and quantity. Much of the sedimentation presently seen on the South Fork channel may be attributed to forest fires that removed vegetation and consequently exposed soil surfaces. Because of these conditions, the ID team rated the AZ as unacceptable.

Since the 1930's approximately 14,000 acres of the AZ has been harvested and/or burned. In the last 3 decades an average of 1800 acres per decade were logged. As a result of these activities the South Fork channel and the majority of its southern tributaries have been impacted.

200 acres of harvest on National Forest in conjunction with approximately 440 acres of harvest on private ownerships in considered to be the maximum harvest that the AZ could accommodate within further deterioration of channel conditions.

Based on observed watershed conditions, the ID team concluded that this AZ is currently in an unacceptable condition. The concentration of mature NF timber within drainages which have been heavily impacted during past decades reduces the options of dispersing future harvest activity for mitigation purposes. The ID team concluded that a 60% reduction in the average historic harvest levels would be necessary in order to facilitate recovery of the watershed condition. 640 acres/decade is considered to be the maximum total allowable harvest rate. Considering the anticipated harvest of about 440 acres/decade on private ownership, the ID team concluded that 200 acres/decade (2% of tentatively suitable) would be the maximum harvest level on NF lands which would permit the desired recovery.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 200 ACRES
2: 200 ACRES
3: 200 ACRES
4: 200 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Upper Reach, Green River - AZ 81
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

High road density (4.53 mi./sq.mi.) in conjunction with intense timber harvest activity over the past 20 years has adversely impacted stream channels within this AZ due to increased erosion, sediment transport, and sediment deposition in fish rearing and spawning habitat. Stream surveys conducted in 1982 indicated poor pool/riffle ratios. The surveys also reported sediment deposition along stream channels which aerial photo examination supports. Deposition of sediments and bedload along lower reaches of channels has resulted in channel changes and braiding, particularly in the Green River. Because of these in-channel conditions, the ID team concluded that this AZ to be in unacceptable condition.

Approximately 49% of this AZ has been harvested within the past 3 decades. Harvest activity has been most intense within the upper two thirds of the AZ, extending from Tacoma and Pioneer Creeks in the south to the headwaters of Sunday and Snow Creeks in the north. The upper reaches of the Green River and the Twin Camps drainage have seen the least harvest activity. Average harvest rates over the last three decades have been approximately 1,250 acres/decade on National Forest lands and 4100 acres/decade on private land (5,320 acres/decade overall).

Presently 8,447 acres of mature timber is available for harvest on Forest Service lands and approximately 6,300 acres of mature timber remains on private lands. Based on recent harvest rates and stand age, we estimate that mature timber on private lands will be harvested within the next two decades. 3,500 acres of harvest on private lands is estimated for the first decade with the remaining acreage (2,800 acres) being harvested the following decade.

In order to initiate hydrologic recovery that is considered necessary within this AZ, a lower total harvest acreage/decade will be necessary. Harvest of private lands is expected to continue for at least the first decade at or near the historic average.

A reduced rate of 500 acres/decade during the first 2 decades on National Forest rather than the 3 decade (60's, 70's, & 80's) average of 1,250 acres would help promote the hydrologic recovery in the AZ. The remaining mature

timber on private land in the AZ will probably be completely harvested by the 3rd-4th decades. As these harvested private lands begin to become reforested and the in-channel conditions within the AZ gradually change from unacceptable to acceptable (through natural hydrologic recovery plus watershed rehabilitation activities), harvest rates on NF lands could be increased in the 3rd-4th decades. The ID Team determined that 1000 acres in the 3rd decade and 1500 acres in the 4th decade could be harvested.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: __ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 500 ACRES
2: 500 ACRES
3: 1,000 ACRES
4: 1,500 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Green River - AZ 82
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINI:

This AZ is one of the three that comprise the upper Green River system. The in-channel conditions for the 1st and 2nd order channels on the north side of the Green River are only poor to fair in stability, pool frequency and the presence of LWD. The channel conditions in the Green River are generally in fair condition. Sediment storage is occurring and is affecting some of the pool quality and quantity. There is moderate channel braiding existing in this section of the Green. LWD is present for lacking in sufficient quantity and stability. These overall in-channel conditions probably have the ability to support the existing cutthroat trout populations. These populations are self sustaining populations that receive little or no recreational sport fishing harvest due to the limited access into the Green River Watershed. Because of these conditions, the ID team concluded that the AZ was in an acceptable condition at the present time.

Based on aerial photo examination and field observations, the harvest of 19,000 acres on the total AZ in the last 40 years in conjunction with extensive burned acreage has contributed to increased peak flows, erosion, and sediment transport within the majority of the drainages interior to this AZ. Riparian vegetation is becoming established in some 1st, 2nd, and upper 3rd order streams which had been scoured. This indicates that recovery of degraded channels may be relatively rapid in the area.

Based on current harvest activity and the age class of stands adjacent to that activity, approximately 5,000 acres of harvest/decade is projected within the AZ on other ownerships. Harvest is also occurring immediately adjacent the Green River (just outside the AZ boundary) at an extensive rate. This rate exceeds the 4 decade average harvest of 4750 acres.

1,921 acres of mature tentatively suitable are available. These acres are concentrated in the eastern portion of the AZ. The majority is located in two small tributaries to the Green River (McCain Cr. and Friday Cr.). Very little harvest is expected on private ownerships in this immediate area due to previous harvest.

Due to the concentration of mature timber and the evidence of damage sustained in adjacent stream channels from higher rates of harvest, the ID team concluded that 300 acres/decade (5% of tentatively suitable) is considered to be a maximum harvest rate during decades 1 and 2 that this AZ could tolerate while retaining acceptable watershed conditions.

2,100 acres are currently listed as tentatively suitable poles. Most of these "pole" stands will be available for harvest within two decades. As a result the ID team concluded that 800 acres (14% of tentatively suitable) could be harvested in decades 3 and 4 while protecting watershed integrity and fisheries habitat. The additional available acreage will be dispersed along the southern portion of the AZ in areas other than McCain and Friday Creeks.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE _ _UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 300 ACRES
2: 300 ACRES
3: 800 ACRES
4: 800 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Green River - AZ 83

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

Stream surveys were conducted in 1982-83 in Rock Cr., Champion Cr., and Wolfe Cr. According to the surveys, steep stream gradients and other associated channel conditions are the principal factors regulating fish density and distribution in these systems. Due to these naturally occurring conditions, good fish density and distribution was only observed in Rock Creek. Few small

fish were observed in Champion Creek and no fish were observed in Wolf Creek. The past harvest levels in the last 3 decades and associated activities has not substantially reduced fish numbers in Rock Creek and it is doubtful that activities had much influence on fish numbers in the other two streams surveyed.

Observed watershed conditions suggest that natural limiting factors have determined the overall fish habitat conditions existing within the AZ. Therefore, past forest management activities have produced marginal downstream effects to the watershed and fisheries habitat. Because of the above in-channel conditions, the ID team concluded the AZ is presently in an acceptable condition.

Harvest within this AZ has increased substantially within the last two decades. Total harvest in the 70's was 4,400 acres and approximately 3,500 acres in the 80's. Harvest in the next decade on other ownerships is expected to continue at near the 1980's rate of 3300 acres and decline there after.

Within the past 3 decades, harvest has been well distributed across approximately 10 varying sized tributary drainage areas within the AZ. Harvest has generally occurred in the more stable lower reaches of these drainages. Most headwater areas (1st order streams) are National Forest and have not been harvested.

The harvest level in the last two decades has averaged approximately 4000 acres in the AZ. The cumulative effects analysis suggests that future projected harvest could continue at this rate while maintaining quality fish habitat. Improved BMP's, particularly road location, design, and reduced road density, and retention of riparian vegetation, will further reduce potential harvest related impacts.

Approximately 1000 acres (10% of tentatively suitable) of harvest on National Forest land during the first decade is considered and acceptable rate, considering the projected harvest of 3000 acres of mature timber on private ownership during the same period. Harvest on other ownership is expected to liquidate the remaining mature stands of timber in the second decade, with an expected harvest of approximately 2500 acres. This would allow an increase in harvest on National Forest lands to 1500 acres per decade.

Reduced harvest rates in the 3rd and 4th decades on private ownerships offers an opportunity for an increased rate of channel recovery for the main reach of the Green River during this period. The proposed harvest of 2500 acres in the 3rd decade and 3000 acres (30% of the tentatively suitable) in the 4th decade on National Forest would be below the previous average harvest levels for all ownerships. Maintaining lower harvest rates during this period will assist in restoring stable channel conditions to the Green River.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 1000 ACRES Tentatively suitable mature: 6,545 acres
2: 1500 ACRES
3: 2500 ACRES
4: 3000 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Greenwater - AZ 84

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The current conditions have caused a severe reduction in quantity and quality of anadromous fish habitat. Lack of adequate holding water for adult fish is common along with an associated lack of rearing pools for juvenile fish. The heavy braiding causes isolated pockets of water in low flow which trap fish and increase mortality. Spawning success is limited due to the constant scour and deposition of gravel during each storm event.

Using the four primary criteria for evaluating watershed condition, the following summarizes the in-stream conditions in the AZ. The main channel of the Greenwater has been heavily aggraded from significant upstream materials being flushed downstream. Pools are described as poor in quantity and quality. They are regularly being filled in. Whenever there is high runoff, a significant amount of bank erosion takes place throughout the watershed because of existing instability. LWD has been almost absent in the main river channel until recently. A level of stable debris is being reintroduced artificially through cooperative habitat improvement projects in the AZ.

Heavy aggradation and braiding are present in all portions of the mainstem with the worst problems existing in those sections where the riparian zone was completely harvested. Past heavy roading and harvesting on Private and NF lands have contributed to this condition along with two major floods and the subsequent cleanout. Based on these factors the ID Team concluded that the Greenwater River and associated tributaries in the AZ are in an unacceptable condition.

POTENTIAL FUTURE IMPACTS:

A recovery process is underway but this will take at least 2 decades. Natural landslide and bank erosion will continue. Road failures and sedimentation will continue but at a reduced rate. Some of the timber remaining to be harvested and the few roads remaining to build are in very steep, unstable areas and hold a greater risk.

Instream structure work will continue. Most of the available private lands have been harvested so that these impacts will be reduced over time. Several roads will be put to bed and revegetation will occur. Several slides will be proposed for rehab work.

The recommended harvest level was developed after considering past harvest rates and current stream conditions. During the 1960's, 2400 acres of the private and NF land were harvested. Considering the effect of this harvest level on the mainstem, it was apparent the even at this level of harvest there was a detrimental effect on the Greenwater River. In addition, the factors mentioned above are still affecting the stream condition. For this reason, the ID team established an MR level at approximately one-half of the 60's historic level of harvest to provide for a recovery period, including the effects of significant private land harvest. This is approximately 650 acres or 4.4% of the tentatively suitable area. This is an appropriate level to project for the first decade because of the need for recovery.

The MR level can be increased after the 1st decade based on the assumption that private harvest is basically finished for the next 30 years in the drainage and the impact will be minimum. The only impact still to be realized from private logging could be from two units harvested in 1988 along the Greenwater River and in the upper watershed of Pyramid Creek, both of which are sensitive areas. We expect that there will be a partial recovery (within the overall Greenwater system) in the 1990's that would allow for some increase in harvest beginning in the second decade, because of using improved BMPs (such as no riparian area harvest), natural recovery, and stream rehabilitation. Based on these factor the ID team concluded that the 2nd decade harvest level of 880 acres could be sustained without resource damage.

Assuming that the recovery will be complete by the end of the second decade, the ID team concluded that harvest could be increased to 1320 (Approx. 9% of tentatively suitable) for the 3rd and 4th decades

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE _X_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 650 ACRES
2: 880 ACRES
3: 1320 ACRES
4: 1320 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Lower Reach, White River - AZ 85
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS IOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

A small resident population of cutthroat trout resides in the lower reaches of the 2nd order stream channels in this AZ. Downstream, outside the AZ, Slippery Creek is the water supply for a small, private "u-fish" trout pond enterprise. The in-channel stability of the 1st and 2nd order channels of Slippery and East Twin Creeks is poor. There is a low number of pools present and only a few isolated pieces of LWD exist in these channels. These channels are unstable due to sediment and bedload deposition. At present, the ID Team concludes that Slippery and East Twin Creeks are in an unacceptable watershed condition. Past heavy roading and harvesting on Private and NF lands have contributed to this condition.

POTENTIAL FUTURE IMPACTS:

A recovery process is underway but is expected to be lengthy. The natural erosional processes will continue. Road failures and sedimentation will also continue, but at a reduced rate. Timber remaining to be harvested and the few roads remaining to build are in very steep, unstable areas and hold a greater risk of impact.

Instream structure work and watershed rehabilitation will be planned, but funding is not approved at this time. Most of the available private lands have been harvested so that these impacts will be reduced over time. Private roads will continue to recover and revegetation will occur, but at a very slow rate since active rehabilitation efforts are not anticipated.

During the 1960's, 100 acres of the AZ was harvested, (all private). No observable watershed impacts were apparent at this level of harvest. In the 1970's, the harvest rate increased to approximately 1100 acres on NF and private lands. This amounts to 25% of the entire AZ. It was apparent that this level of harvest had a severe detrimental effect on in-channel conditions in the AZ. Most of this observable impact came from roading. During the 1980's, the harvest rate increased to over 1600 acres which caused additional resource damage to occur. In consideration of these factors and the unacceptable rating of the AZ, the ID team recommends a NF harvest rate of 250 acres per decade (11.6% of the tentatively suitable) for the 4 decade period as the MR. To sustain this harvest level will require strict adherence to BMP's (for streamside protection and road construction), natural recovery, and continuation of instream structure work and watershed rehabilitation until the time that the AZ has reached a fully acceptable condition.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: ___ACCEPTABLE XX_UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 250 ACRES
2: 250 ACRES
3: 250 ACRES
4: 250 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Clearwater - AZ 86

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This small AZ covers the upper half of Milky Creek. Presently, this stream supports a small population of cutthroat trout. Due to the remoteness and access to this stream system, there is very little or no sport fishing pressure. The present habitat conditions support this existing population.

A chronology of events within the watershed was analyzed using a series of aerial photos starting in 1950 through 1985. The analysis weighs the impacts of past activities such as roads, timber cutting, naturally occurring debris avalanches and earth flows, on water quality within the planning area and downstream. Unstable areas which were observable on the 1952 aerial photos were monitored for change through time. Since this drainage was entered for the initial harvest in the late 1960's, it is possible to compare pre and post harvest photos in terms of impact from roads, and clearcut units. None of the observable slides or unstable areas have changed in size since activity began in the drainage. None of the roads or clearcuts units within the drainage are actively impacting the stream at this time and no evidence of historic impact is present.

There has been obvious downcutting and scouring in the past and it continues to present. However, this seems to be significant in short sections only. Quality of pools generally seems to be good. Frequency could be improved, but pool/riffle ratios can be rated as moderate. There are some serious streambank stability problems in certain areas such as reaches of Milky Creek. However, large amounts of woody debris exist throughout the system with almost all channels having ability for recruitment. The LWD that is in place is relatively stable. For these reasons, the ID team concluded that the AZ is in an acceptable condition.

The ID team wishes to qualify this acceptable rating. The main stem of Milky Creek has been severely degraded by natural events in the past but still maintains some habitat for resident fisheries. Therefore, we have given this AZ an acceptable rating because the impact of man's activities to the watershed seem to be minimal. However, this would require the practice of stringent protection measures along the streamside zones.

Four hundred and seven acres (12.3% of the AZ) were harvested on National Forest land during the 1960's in the AZ. This historic rate of harvest did not

have any detectable long-term impacts to the watershed. Private lands outside of the Forest boundary was harvested at a 20 to 30% rate per decade which has had a significant impact on the downstream sections of Milky Cr. and the Clearwater R. The ID team concluded that by using state-of-the-art BMP's, the harvest rate of 407 acres per decade can be sustained without degrading the acceptable level of the AZ.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 407 ACRES
2: 407 ACRES
3: 407 ACRES
4: 407 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Huckleberry Creek - AZ 90

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This drainage has had very little impact from road building and harvest efforts. Stability in general is fairly high even on steep slopes. Areas that are still to be harvested may have higher levels of unstable soil inclusions but are still stable overall. Future impacts are anticipated to be similar to past impacts and relatively insignificant. The major impact to Huckleberry Creek was the massive cleanout effort that occurred in the late 1970's after two major floods. This activity reduced the LWD in the system to almost nil. This in turn caused an initial aggradation in certain reaches and then an armoring of the substrate. The resultant habitat was and still is low in pool quantity and quality, backwater and quiet areas for juvenile rearing and a very limited amount of quality spawning gravels.

Since this flood cleanout work in the late 1970's, natural channel recovery in addition to intensive stream rehab and fish habitat improvement work has begun to restore the former high quality anadromous and resident fish habitat.

The past harvest levels ranged from 54 acres in the 1940's to 1257 acres in the 1980's. The effects of the 1960's harvest level of 1091 acres was not judged to have negatively impacted the watershed by the ID team. We made the assumption that the 1257 acres of harvest will not have a negative impact either. Because of these reasons plus the continued application of new BMPs, and additional emphasis on channel rehabilitation and fish habitat improvement, the ID team recommended a MR of 1300 acres/decade (14% of the tentatively suitable) as the

harvest rate and still maintain the acceptable watershed condition in the AZ. This would suffice through Decade 4.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 1300 ACRES
2: 1300 ACRES
3: 1300 ACRES
4: 1300 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

West Fork White River - AZ 91

Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

The West Fork of the White River and the lower reaches of a few of the tributaries serve as current or potential habitat for chinook, coho salmon, and steelhead trout. These channel areas also support populations of resident trout (rainbow/cutthroat). The habitat conditions to support these populations are improving from the past damage done by flood events and follow-up flood cleanup work. Natural recovery combined with past and future fish habitat rehabilitation work is restoring high quality pools, installing LWD structures, and stabilizing streambanks. Based on these improving in-channel conditions, the ID team determined the AZ to be in an acceptable condition.

Most of the roads exist that will be needed in this drainage although some of the future roads may be located in more unstable locations. Impacts from past harvest activities have been low with some exceptions. Heavy harvesting of the flood plain appears to have contributed to channel widening. The active channel width has been increasing as a percentage of the total floodplain width since 1970. The harvest rates of 2061 acres in the 1960's and 2242 acres in the 1970's seemed to be at or slightly above the level at which impacts to the watershed were discernible. Some of the impacts were due to a higher rate of harvesting in sub-basins such as, Jim Creek and Dinner Creek. For these reasons, the ID team concluded that the average harvest rate for the past 4 decades would be the MR for this AZ. The average per decade harvest since 1940 has been approximately 2000 ac. per decade, (13% of the tentatively suitable).

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: _X_ACCEPTABLE ___UNACCEPTABLE

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES:

1: 2000 ACRES
2: 2000 ACRES
3: 2000 ACRES
4: 2000 ACRES

This expression becomes the watershed constraint to meet water quality and riparian MR's, to be considered in all alternatives in the FEIS.

Carbon and Puyallup Rivers - AZ 93
Summary Statement That Ties the Evaluation of Instream and Upslope Factors Together and Logically Leads to Watershed Constraint

SUMMARY STATEMENT THAT TIES THE EVALUATION OF INSTREAM AND UPSLOPE FACTORS TOGETHER AND LOGICALLY LEADS TO WATERSHED CONSTRAINT:

This AZ includes a portion of the Carbon River and its major tributaries of Tolmie, Evans, Chenuis, and Cayada Creeks. The AZ also includes portions of South Prairie Creek. Anadromous fish habitat is only found within the Carbon River. The remaining streams in this AZ contain only resident trout. Fair to moderate numbers of rainbow and/or cutthroat trout exist in these streams. The present habitat is capable of supporting these populations. These trout populations receive only a low amount of recreational fishing pressure. The existing in-channel conditions in these streams, except for Tolmie Creek, have set up fair habitat conditions. Overall, a fair amount of pools exist in most streams and there are moderate amounts of LWD. Bedload deposition is fairly stable in some of these systems.

South Prairie, Evans, Cayada, and Tolmie Creeks have been severely impacted in the past. A large percentage of these areas were railroad logged and have recovered at least to the point of stream bank vegetation and having the potential for LWD input. At present, only Tolmie Cr. drainage would be considered unacceptable. Within 10 years, this area should be recovered to a point where it is also considered acceptable.

Only 30+ % of the remaining area has tentatively suitable mature sawtimber. The past levels of harvest within this AZ ranges from approximately 525 acres (3%) to 3862 acres (18%) per decade including private harvest. The impacts were primarily from railroad logging although subsequent harvest in the 1960's slowed down the recovery process.

The average harvest per decade since 1960 is 1210 acres (NF and Private). Based on past harvest and the overall acceptable conditions of the AZ, the ID team concluded that 1150 acres per decade (8% of tentatively suitable) would maintain the acceptable watershed condition and allow recovery to take place in Tolmie Creek.

OVERALL RATING OF ALLOCATION ZONE BASED ON INSTREAM, UPSLOPE, AND ANY OTHER CONSIDERATIONS: X ACCEPTABLE ___UNACCEPTABLE

Pacific Northwest Region

June 1990

Final Environmental Impact Statement

Land and Resource Management Plan

Appendix H - Hydrologic Cumulative Effects Assessment

Mt. Baker-Snoqualmie National Forest

MAXIMUM TENTATIVELY SUITABLE HARVEST OF NATIONAL FOREST ACRES FOR DECADES: