Appendix 7 - Hydrology Assessment, Assumptions, and Methodology

Hydrology

Purpose/Key Questions - This section will describe stream flow, channel, and water quality characteristics of the watershed and will relate them to human land management practices, beneficial uses, and the biological communities. The following key questions are addressed in this assessment.

WS7	Is the amount of sediment transported to stream/water sufficient to cause a change in channel, habitat conditions, or beneficial use?
WS8	Changed from: What is the special distribution of channel response types? Changed to: What is the special distribution of channel morphological types?
WS9	What were the historic channel conditions and have management actions altered them?
WS10	Changed from: What are the spatial distributions of channels in proper functioning condition, functioning at risk, or not functioning? Changed to: What is the spatial distribution of channels in which the hydrologic processes are functioning properly?
WS11	What are the watershed conditions influencing hydrologic response?
NEW	What are the hydrologic responses (flow regimes) that influence beneficial uses?
WS13	Are all water quality standards listed in Chapter 340 of the Oregon Administrative Rules being met?
WS14	What are expected maximum summer temperatures for a duration that will affect salmonids?
WS15	What are the beneficial users/uses of water?

Methodology

Flows - The only flow data available for the Wolf Creek watershed are individual flow measurements, reported by the USGS,[1] which were taken twice each year between 1968 and 1974. There were 19 flow measurements that were regressed against the USGS station No. 14307580, on Lake Creek near Deadwood. The linear regression had an R^2 of almost one, the standard error of the Y estimate is 123 and the standard error of the Coefficient is 0.009691. The regression formula is Wolf Creek flow = 2.9 cfs + . Lake Creek flow. In Table 5-7, the columns under "Lake Creek Regression" were calculated using this formula. The columns under USGS formula were calculated using USGS flood frequency equations.[2] The Siuslaw River Data was taken from the USGS Water Resources Data publications. The calculated minimum flow was derived from the above regression formula.

> Confidence - The flow rates expresses in Chapter 5 Table 5-7 are very accurate and can be accepted within 5 percent. This accuracy is due to the high standards of the USGS and the good fit of the regression.

Changes in Flows - Base flow increases were calculated by using changes found in the literature[3&4]. The following assumptions were made:

1. Increase in summer flows last 5 years
2. The Average increase in the 5 years is 25 percent
3. Half of the Acres classified as "Clear cut" in Wolf Creek watershed are 0-5 years old
4. Increases are directly proportional to the amount of clear cut

Percent of Wolf Creek watershed in 0-5 year age class = (acres clear cut acres ÷ 2) ÷ 37891
Present = 9157 ÷ 2 ÷ 37891 = 12.1%
1956 = 1495 ÷ 2 ÷ 37891 = 2.0%
Noncut base flow = present base flow ÷ 1 + (0.25(0.121) = 5.57 ÷ 1.030 = 5.41 cfs

Present Base flow has increased 0.16 cfs or 3%.
1956 base flow was an increase of 5.41(.25(.02 = 0.03 cfs or 0.5%.

> Confidence - Each assumption could be off by 100 percent. Therefore, the results are only accurate within an order of magnitude.

The peak flow increases were calculated using an average increase of 0.014 $m^3/s/km^2$ for each 1 percent difference in the cut area that was reported by Jones and Grant. Because they reported no hydrologic recovery and because the whole watershed has been developed for timber management, 98 percent of the watershed was assumed to have been cut.

> Confidence - Jones and Grant report that they found a statistically positive relation between cumulative harvest area and peak flows in 3 basins ;however, there was great variation and the R^2 was very low. The results are not very accurate and Table 5-8 should be used to understand the type of increases that have occurred. The magnitude of these increases are probably accurate within an order of magnitude.

Channel Morphology - The discussion of channel morphology was based on the parameters discussed in the State of Washington TFW manual. A very small sample was surveyed. The results are given in Table 5-11 and a description of each parameter is given on the back of the table. Stream reaches for the survey were chosen to:

- Represent each of the 6 geomorphic units,
- Be accessible by a road,
- Represent all stream gradients, and
- Represent various stream sizes.

A cross section was chosen at each end of each segment except for mainstem Wolf Creek. At each cross section the width of the inner and outer channels were measured. These measurements were averaged for the reach. A sketch of the cross section was made. The reach was then walked and rated for:

- Permanently flowing, intermittent or channel;
- Bed morphology using TFW definitions, bank conditions, a subjective call, however, all participants agreed ;
- Presence of point bars ;and
- Proper Functioning Condition. The PFC form was taken along.

Channel slope was calculated using digital terrain methods in Arc/info. Confinement was calculated by dividing the measured channel width into the flood plain width. (The flood plain width was measured off a satellite image)

WATER RIGHTS									
SOURCE	PERMIT	NAME	PRIORITY	USE	USE.-LOC.	QUARTER	DIV.-LOC.	QUARTER	CFS
PANTHER CR	5499	PEABODY	6/24/22	28 A/C	19-06-10	NW & SW	19-06-10	SW/NE	0.35
SWAMP	7777	FUR FARM	01/04/27	50	19-06-09	SW & SE	19-06-09	NE/SW	3.0
CABIN	8349	FUR FARM	12/27/27	PONDS	19-06-09	NE/SE	19-06-09	SW/SE	2.0
DEER	10169	FUR FARM	04/02/31	DOM.	19-06-09	SE/SW	19-06-16	NW/NW	0.03
LEWIS/UNN	10514	LEWIS	03/10/32	DOM/1.0	19-06-09	NE/SE	19-06-09	NE& NW	0.04
BEAVER	11166	RUSSELL	12/11/33	DOM/0.5	19-06-09	NE/SE	19-06-09	SE/NE	0.01
UNN	16496	MAIN	08/06/45	DOM/1.3	19-06-02	NE/SW	19-06-02	SE/SW	0.026
UNN	23835	MARSH	10/26/55	4.8	18-06-35	SW/NW	18-06-35	SW/NE	0.06
PANTHER	23836	MARSH	10/26/55	28.2	18-19-35	NW & SW	19-06-02	E/NW	0.35
UNN	24045	THORSTED	02/14/56	11.9	19-06-11	NW/SE	19-06-11	NE/SE	0.12
UNN	26616	THORSTED	02/17/60	4.3	19-06-11	NW/SE	19-06-11	NE/SE	0.05
SPRING	27455	MARSH	06/29/61	DOM	19-06-02	NW/SW	19-06-02	SE/SW	0.005
WOLF	59803	ST.OFORE	07/12/66	INSTREAM	18-08-35	SE	18-08-35	SE	VARIES
PANTHER/UN	32823	HOOKER	08/10/67	10	19-06-02	SW/NE	19-06-02	S/NE	0.125
WOLF	59572	ST.OFORE	03/26/74	INSTREAM	18-08-35	SE	18-08-35	SE	VARIES
SPRING	48447	BELLINGER	04/09/84	DOM/0.5	18-06-35	NE/NW	18-06-35	NW/NE	0.01
SPRING	51118	DAILY	05/17/89	DOM/1.0	19-06-02	SE/NW	19-06-02	NE/NW	0.02

1. U.S. Geological Survey Water-Data reports OR-68 through OR-74

2. USDI Geologic Survey,....

3. Keppeler, E. and R. Zimmer. 1990 Logging Effects on Streamflow: Water Yield and Summer Low Flows at Casper Creek in Northern California. Water Resources Research. Vol 26 No. 7. Pages 1669-1679. July 1990.

4. Harr R.D. 1979. Effects of streamflow in the rain dominated portion of the Pacific Northwest, in Proceedings of workshop on scheduling timber harvest for Hydrologic Concerns, pp 1-45, PNW Portland, USDA For. Serv 1979