Western Oregon Plan Revision
Draft Environmental Impact Statement
EPA Detailed Comments

1.0 WATER QUALITY

EPA is concerned that Alternatives 2 and 3 would result in substantial, long-term impacts to water quality and exacerbate continued exceedances of water quality standards in streams listed as impaired under Section 303(d) of the Clean Water Act (CWA). EPA's concerns are based on a broad body of science related to riparian buffer effectiveness and water quality, information provided in the DEIS, and EPA water quality temperature modeling of the DEIS riparian protection strategy. EPA's analysis of the alternatives' potential impacts related to temperature, sediment and peak flow is provided below. We also provide input on the analytical assumptions underlying the DEIS modeling effort that relate to shade and buffer width.

1.1 SCOPE AND CONTEXT

BLM lands in Western Oregon provide drinking water to over one million Oregonians through 113 community water systems (USDI/USDA, 1996). In addition, there are many Oregonians not served by community water systems that rely on BLM lands for drinking water. There are currently over 900 stream segments on the 303(d) list in the BLM planning area which are impaired by excess temperature, sediment, and other pollutants. These streams do not meet the water quality standards which are deemed to be protective of beneficial uses such as fish and aquatic life and drinking water.

The aquatic conservation strategy (ACS) currently in place on BLM lands is recognized by EPA and the Oregon Department of Environmental Quality (DEQ) as key to the implementation of TMDLs and meeting water quality standards. The ACS is also a critical element of DEQ's conditional approval of BLM's temperature total maximum daily load (TMDL) implementation strategy.

When the Northwest Forest Plan (NWFP) was adopted, studies showed 70 percent of streams on lands administered by the BLM to be out of compliance with CWA standards (FEMAT Report, Chapter V). After 10 years of NWFP implementation, watershed conditions for 57% of the watersheds across the NWFP area have improved and only 3% of the watersheds, primarily in areas that have experienced large scale fires, are on a declining trend (Gallo, et. al., 2005). In an analysis of several hundred research, assessment, and monitoring efforts, investigators found that the level of management in the NWFP is appropriate, stating that there is "no scientific evidence that either the default prescriptions [riparian reserves] or the options for watershed analysis in the Northwest Forest Plan…provide more protection than necessary to meet stated riparian management goals." (Everest et. al., 2006). The overwhelming body of science and the importance of aquatic resources to drinking water and aquatic species strongly support continued application of aquatic protection measures currently in place on BLM lands.

1.2 TEMPERATURE ANALYSIS

EPA has examined the science and assumptions in the DEIS supporting the proposed stream shade target and the proposed riparian management area (RMA) widths for perennial streams. We have concerns about how the information was used to support conclusions in the DEIS. In addition, we have concerns about relying on "natural variability" as a management concept in the analyses. Based on our review and our own modeling efforts, we are concerned that Alternatives 2 and 3 would result in impacts to water temperature and exacerbate continued exceedances of temperature standards in impaired waters.

1.2.1 Shade Target

The DEIS states that 80% effective stream shade "…corresponds to less than a 0.2°F change in stream temperature per mile of stream, which is considered to be within the range of natural variability." (p. 750). This conclusion is based on an interpretation of figure 311 in the DEIS (p. I-1116). Figure 311 was developed as part of the 2005 Northwest Forest Plan Temperature TMDL Implementation Strategy (TMDL Strategy). EPA worked closely with DEQ, the Forest Service and BLM as the TMDL Strategy was developed. We are concerned that individual components of the TMDL Strategy (such as figure 311) have been excised and incorporated into the DEIS in ways that are inconsistent with agreed upon criteria and caveats associated with TMDL Strategy implementation.

The TMDL Strategy was developed to demonstrate the adequacy of existing direction (i.e. the NWFP ACS) to protect and maintain stream shade, and to demonstrate how riparian thinning could benefit long-term achievement of higher shade levels and other riparian functions in site specific cases. It was not intended that an 80% stream shade target would be adopted as a landscape target. Nor was it intended that the site-specific management provisions within the TMDL strategy would be implemented independent of the Northwest Forest Plan and its attendant standards and guidelines.

Under the TMDL Strategy, riparian thinning is limited to projects in dense stands that would benefit from thinning. The Strategy also limits thinning within the RMAs and calls for continued application of the NW Forest Plan ACS. The need to implement the ACS was reiterated by DEQ in their 2005 approval of the temperature TMDL Strategy for use on federal lands within the NWFP area. In addition, DEQ's approval letter calls for continued monitoring, and additional analysis for shade, sediment, and cumulative effects. EPA believes that WOPR alternatives 2 and 3 are not consistent with the TMDL Strategy and do not meet the terms of the DEQ conditional approval.

1.2.2 Riparian Management Area Determination

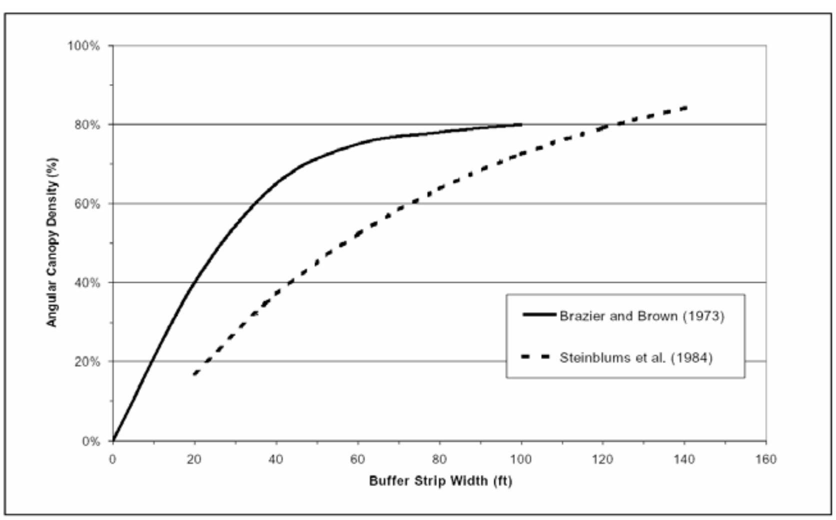
Alternatives 2 and 3 apply a 100-foot Riparian Management Area to perennial streams. The justification for this prescription relies on Figure 5 in Brazier and Brown (1972), which is represented as Figure 98 in the DEIS (p. 367). This figure relates angular canopy density (ACD) to buffer width. There are a number of limitations to the use of the Brazier and Brown study which are not acknowledged in the DEIS. First, this study was done on a small non-random sample of 13 reaches along nine small mountain streams in Oregon bringing into question the extrapolation of the study to a broad scale. Secondly, the relationships identified in the Brazier and Brown study may be subject to artificially high R^2 values.

For example, Figure 3 in Brazier and Brown illustrates the observed relation between buffer strip width and heat blocked. While the calculation behind this figure includes a regression with a high R^2 (0.8749), that high R^2 is achieved by excluding 4 data points and forcing the regression calculation through 0. Recalculating that regression with all 13 data points and without forcing the regression through 0 leads to an R^2 of less than 0.2. This key relationship on which the analysis of buffer width is largely based is much more complex than portrayed in the DEIS.

It is also important to acknowledge that the Brazier and Brown shade study did not account for the likelihood of riparian corridor blow-down, disease, or other factors that reduce angular canopy density. Research has found that in the 1 to 3 years after harvest, windthrow affects, on average, 33% of buffer trees with blowdown exceeding 90% at the high end of the range (Grizzel and Wolff 1998). Other analysis from the west Cascades of Oregon indicates that about 75% of riparian buffers less than 80 feet wide experience greater than 20% blowdown (Pollock et. al. 1998). In 2007, the Washington Department of Ecology compared the Brazier and Brown shade curve with a shade curve derived from a study done by Steinblumes et al. (1984) that accounted for blowdown in the riparian buffer. (WADOE, 2007). The results of that comparison are captured in

Figure 1:

Figure 1. Shade Curve Comparison



As can be seen in Figure 1, the buffer widths needed to achieve a given shade level are wider under the Steinblums curve than are those under the Brazier and Brown curve. For example, to achieve an angular canopy density of 80%, the Steinblums curve suggests that a buffer of at least 120 feet is needed. We also note that the Steinblums curve shows ACD to be still increasing beyond 120 feet. Brosofske et al. (1997) analyzed the relationship between solar radiation received by streams and buffer widths for streams in western Washington. The Brosofske study measured solar radiation directly (using a LI-COR silican pyranometer) as opposed to visually estimating solar radiation (ACD measurement). This study found that 100% of natural shade levels are provided by riparian areas approaching 250 feet wide. These findings are in contrast with the DEIS which states, "There is little shade gained from trees that are more than 100 feet away from a stream's edge" (p. 366).

Based on the information presented above, EPA believes that there are flaws with the analytical assumptions associated with the buffer width model, and that the model therefore significantly underestimates shade levels and the potential temperature responses of alternatives 2 and 3.

1.2.3 Managing to "Natural Variability"

As noted above, the DEIS concludes that maintaining 80% effective shade corresponds roughly to a 0.2^{o}F increase over 1 mile, and that this is "within the range of natural variability" (DEIS, p. 750). EPA is concerned that a 0.2^{o} F increase would be in conflict with TMDL load allocations established for some basins. DEQ's TMDLs generally call for system potential shade (which may be greater or less than 80% shade) and some TMDLs in the planning area have load allocations less than 0.2^{o} F for nonpoint sources (Umpqua basin and Willamette TMDLs). The TMDLs within the planning area include load allocations that represent a threshold protective of both aquatic life and water quality. We recommend that the DEIS use TMDL allocations or other scientifically supported targets at least as protective of stream temperature conditions as TMDLs. Another sound approach would be for the DEIS to commit to and analyze no net increase in stream temperature loading, and propose a system of modeling (and monitoring) at smaller spatial scales.

1.2.4 Temperature Modeling

As noted above, the DEIS bases its conclusion that 80% effective stream shade "…corresponds to less than a 0.2°F change in stream temperature per mile of stream…" (p. 750) largely on figure 311. This approach relies on ***a non reach-specific*** temperature model sensitivity analysis conducted in 1999 as part of the Upper Sucker Creek Temperature TMDL analysis. In this analysis, the model sensitivity analysis was not used to evaluate stream temperature response. The DEIS, however, uses these modeling results to predict temperature response to timber harvest across the plan area. Because this model is not reach-specific and does not consider site specific conditions or seasonal temperature variation, EPA believes this approach does not predict or evaluate stream temperature response to the proposed alternatives in a meaningful way.

Recent modeling efforts and field studies indicate that stream temperature response to buffer width can be highly variable, and sensitive to site-specific conditions. The Washington Department of Ecology (2007) modeled the effects of several riparian buffer widths on stream temperature. Over 1,000 feet of harvest, they documented increases of 1.5, 1.2, and 1.1°F for buffer widths of 30, 50, and 75 feet, respectively. In 2005, Moore considered field studies looking at 30 meter buffers. That publication described temperature responses ranging from 0.5° F (in British Columbia) to 3.6° F in Oregon (Moore 2005, Table 1).

This observed variability and sensitivity to small changes in the riparian zone suggests that application of heat budget models, such as Heat Source[1], should be used to diagnose temperature variations in response to riparian stand treatments and as a tool for confident extrapolation to new management situations. To this end, EPA conducted several temperature model runs for Canton Creek. Canton Creek is a temperature-impaired waterbody located in the Umpqua Basin for which a TMDL was recently completed. We employed the Heat Source model used in development of the Umpqua TMDL to evaluate the temperature change resulting from the application of alternatives 2 and 3. This modeling (included as attachment A) demonstrates that the application of Alternatives 2 and 3 would increase the 7-day average daily maximum (ADM) stream temperatures on Canton Creek over 0.7° F. This is substantially greater than the 0.2° F per mile temperature increase predicted by the DEIS (p. 750). Further, the EPA modeling results indicate that management on BLM lands under Alternatives 2 and 3 would increase instream temperatures on downstream "private" lands along Canton Creek.

In addition, because it can be expected that the narrower riparian buffers under Alternatives 2 and 3 would result in significant blowdown (see blowdown discussion in section 1.2.2), EPA adjusted the Canton Creek model to evaluate the effects of blowdown on stream temperature consistent with appropriate blowdown research. Results showed that the 7-day ADM temperature increases would exceed over 2 degrees F on Canton Creek (see Attachment A).

These modeling results lead us to conclude that the riparian management scenario under Alternatives 2 and 3 would significantly compromise BLM's ability to meet water quality standards for temperature and TMDL load allocations. The impacts would be direct, cumulative and have long-term effects both on and off of BLM lands.

[1] Heat Source is the temperature model used by Oregon Department of Environmental Quality to quantify temperature response to prescribed TMDL allocations. The Heat Source model was review by the Independent Multidisciplinary Science Team (IMST) and they concluded that it is a scientifically sound model and incorporates the major physical factors that determine stream temperature - http://www.fsl.orst.edu/imst/reports/summaries/2004-01es.pdf.

1.3 SEDIMENTATION ANALYSIS

The DEIS states that the increase in the amount of fine sediment delivered to streams from new permanent roads would be less than 1% under each of the alternatives (p. LXI). This appears to be the primary source of management-related sediment considered to impact water quality in the DEIS. EPA is concerned that this conclusion appears to understate the contribution of sediment from the larger road network, land management activities, and management-related debris flow events. EPA recommends that the FEIS further consider the following issues as they relate to Alternatives 2 and 3.

1.3.1 Road Related Sediment

In the DEIS, the analysis of sediment delivery to streams is limited to the portion of BLM roads "within 200' of a stream channel where ditch flow carrying fine sediment could enter streams" (p. 377). DEIS Table 115 projects that approximately 36% of the BLM road miles would likely deliver sediment. This stream-connectivity value is lower than values established by previous research. A 1997 study of channel network extension by forest roads in the western Cascades of Oregon found 57% of roads are hydrologically connected to streams (Wemple et al. 1996). Reid and Dunne (1984) reported 75% road-stream connectivity in the Clearwater basin of Washington. Waterbars, midslope road segments, and cross-drain culverts not associated with stream crossings can also deliver sediment to streams (Skaugset and Allen, 1998). EPA believes the contribution of sediment from a larger portion of the road network is likely and should be considered in analyzing potential sediment impacts.

1.3.2 Harvest Related Sediment

The sediment modeling approach in the DEIS does not account for forestry related activities such as yarding, skidding, site preparation, and canopy removal which have been demonstrated to contribute to surface, gully and large-mass soil movements (Megahan 1972, Karwan et al. 2007). Alternatives 2 and 3 are of particular concern, as they have narrower RMAs on both perennial and intermittent streams and allow extensive timber harvest within and outside of RMAs.

Under Alternatives 2 and 3, harvest of trees within and adjacent to RMAs would decrease both bank stability and canopy-related protection of soils with attendant increases of sediment delivery to streams. Vegetation strongly influences the mode and timing of erosion processes through modifications to soil strength, surface materials, and hydrology. Roots are effective at avoiding progressive bank failure (Thorne 1990) and root networks in forests can lend cohesion to soils of low inherent strength (Schmidt et al. 2001). Shallow landslides in some areas are characteristically located at some distance from the nearest trees (Roering et al. 2003). Forest canopy intercepts precipitation and contributes periodic inputs of organic material to the forest floor reducing the displacement of soils near streams. Sediment inputs from bank disruption tend to be relatively fine-grained, and can increase turbidity during low-flow periods when natural turbidity levels tend to be low. Low-flow inputs can stress aquatic organisms already impacted by low flows or high stream temperatures (Reid 2005).

Alternatives 2 and 3 would allow harvesting of all but 10 - 15 trees per acre (leaving approximately one tree every 115 feet) within the 25-foot RMAs along non-debris flow intermittent streams. These streams constitute a major portion of the stream network, particularly in western Oregon, and have a high probability of excessive erosion from ground disturbing activities where a moderate to high erosion hazard is present. In some watersheds (e.g., Scappoose Bay Watershed) the majority of the intermittent stream network on forested lands has a moderate to high erosion hazard rating (David Evans and Associates, 2000). In addition to extensive harvest next to intermittent streams, removal of 50% of the canopy over a substantial portion of the RMAs within 100 feet of perennial streams would be permitted under alternatives 2 and 3. Clearcutting with no green tree retention would occur directly adjacent to the 25-foot and 100-foot buffers, respectively.

1.3.3 Stream Channel Sediment

The significant reduction of trees within harvested riparian buffers and clearcutting adjacent to RMAs would result in near term and long term reductions of inputs of large wood, particularly for intermittent stream channels. Wood, in both intermittent and perennial streams, serves to route, store, and attenuate the downstream delivery of sediments. Montgomery et.al. (2003) showed that the sediment retained on site behind large downed wood can be fifteen times greater than sediment transported downstream. Large wood also plays an important role in forming and providing habitat for aquatic species.

The ecological impact of reduced large wood inputs has been documented in watersheds with a high proportion of private lands in western Oregon. Oregon Department of Fish and Wildlife surveys on 2,000 miles of streams on private industrial forest lands found that 60% of the surveyed streams were rated as poor for large wood, and large conifer stocking levels on 94% of these streams were rated as poor. The surveys also found elevated sediment levels in smaller streams on private industrial forest lands (Thom et al. 1999). From 1995 - 2004 over $30 million was spent by the Oregon Plan partnership for riparian and instream enhancement projects to address degraded riparian and stream conditions on private lands. Forest Service and BLM lands are frequently the only source of large wood within mixed ownership watersheds for projects on private lands. BLM's proposed RMAs and harvest requirements under Alternatives 2 and 3 have the potential for significant direct and cumulative impacts related to large wood inputs and associated sediment effects, and EPA believes these issues warrant consideration in the FEIS.

1.3.4 Debris Flow Events

"Landsliding, mass failures, and debris torrents" are discussed as potential results of harvest (DEIS, p. 378). However, sediment and large wood delivery related to these processes are marginalized in the DEIS analysis, which assumes "the rate of susceptibility to shallow landsliding from timber harvests…would not increase…because fragile soils that are susceptible to landsliding…would be withdrawn" (DEIS, p. 763). This assumption conflicts with observed landslides on BLM lands not withdrawn from timber harvest. The Timber Production Capability Condition (TPCC) approach BLM used to identify "fragile soils" in the DEIS was developed to identify the land base suitable or unsuitable for harvest, not specifically to predict potential landslide sites. The DEIS indicates that 71% of the 1996 landslides measured on BLM lands were from clearcut harvest units that are still in the land base suitable for harvest (p. 379). Based on the DEIS soils analysis, some areas judged to be of lower risk have failed in the past (p. 797). The DEIS indicates that 89,937 acres of the 2,600,000 acre WOPR area (less than 4% of the land base) are withdrawn from timber harvest via TPCC. Given the observed landslides on BLM harvest units and research demonstrating that clearcut logging on unstable landforms increases landslide frequency (Sidle 1985, Swanston 1991, Robison 1999), we believe that a more conservative approach to classifying and managing landslide prone areas is warranted.

1.3.5 Sediment Modeling

In modeling sediment impacts, the DEIS caps the sediment delivery buffer at 200 feet, and assumes that 25-100 feet of filtering duff and vegetation will prevent most diffuse sources of sediment from reaching streams (p. I-1108). EPA believes that a more conservative transport estimate should be used. Belt and O'Laughlin (1994) conclude that an effective buffer width is 91m (300ft) unless the runoff forms a channel. They also note that sediment-laden runoff in channels can travel through buffers up to 1370m (4500ft). While narrower buffers can be effective at filtering sediment, buffer effectiveness is largely dependent on site specific factors such as soil roughness and structure, hillslope, existing vegetation, and the extent of disturbance. Much of the Oregon Coast Range and many other areas in Western Oregon on BLM lands include steep topography and erosive soils. In the absence of site specific analysis, EPA believes the EIS should employ more conservative assumptions about sediment travel distance.

1.4 PEAK FLOW ANALYSIS

An examination of available literature and the assumptions guiding the modeling approach undertaken in the DEIS indicates that the DEIS underestimates the number of subwatersheds susceptible to peak flow increases; specifically, the DEIS states that only one out of 635 subwatersheds in the rain hydroregion and only three out of 471 subwatersheds in rain-on-snow hydroregion within the Plan Area are currently susceptible to peak flow increases.

1.4.1 Peak Flow Literature and Assumptions

The DEIS cites Grant et. al., 2007 (in review) to conclude there would be no detection of changes in peak flows until the area cut in a drainage basin exceeds 40%. Applying this assumption, the DEIS finds that none of the alternatives would result in increases in peak flows in fifth-field watersheds to a level that would affect fish habitat. Because the Grant et al. article has not yet been published, EPA has not had an opportunity to review it. If this study was designed to determine a threshold cut level, above which peak flow alterations are virtually certain, EPA recommends that the EIS analysis acknowledge this and reassess peak flow impacts using different threshold assumptions. Hypothesis tests designed to minimize Type I errors (false assertion of adverse impacts) are standard and acceptable procedures in scientific research, but they are often inappropriate for assessing alternatives designed to minimize adverse water quality and natural resource impacts. A primary objective in impact analysis is to prevent type II errors in interpretation of data (false assertion of no adverse impact) (McGarvey 2007). Application of this type of statistical equivalence test may require re-analysis or re-interpretation of the cited Grant et al. information to specify a level of cut below which absence of hydrologic alteration is reasonably assured.

In addition, the DEIS relies heavily on this one unpublished citation, while discounting the findings from other published studies on the same topic. For example, Jones and Grant (1996) reported that road construction combined with patch clear-cutting of 10 to 25% of the basin area produced significant, long-term increases in peak discharges. Lewis et al. (2001) found that clearcutting can double the return interval frequency for the largest peak flow. And a study conducted within the planning area (South Umpqua Experimental Forest) found that watersheds treated with partial harvest may be subject to significant peak flow increases (Jones 2000). EPA recommends that the FEIS reanalyze the potential impacts of harvest on erosion rates and stream turbidity levels assuming higher and more frequent peak flow events.

1.4.2 Peak Flow Modeling Approach

On BLM lands, stand establishment structural stage was used as a surrogate for the removal of basal area. For adjacent non-BLM lands areas of less than 10%, crown closure were used as a surrogate for the removal of basal area (DEIS p. 384). Data underlying the peakflow analysis on BLM lands was derived from the OPTIONS model, and data for "other lands" was derived from the 1996 Interagency Vegetation Mapping Project (IVMP). These methods raise a number of issues: 1) the rationale for establishing surrogate measures for the removal of basal area is not provided; 2) the methods employed to evaluate surrogate measures use two different time frames (BLM lands used modeled outputs and non-BLM lands used a 1996 dataset); and 3) the use of 10% crown closure as a surrogate for the removal of basal area may underestimate the actual area which should be included as part of the "surrogate measure".

The 1996 Interagency Vegetation Mapping Project (IVMP) produced several high quality datasets. EPA identified four IVMP datasets that could be used to estimate the canopy cover conditions on non-BLM lands: 1) "Vegetation Canopy Cover" 2) "Conifer Canopy Cover" 3) Harvest History (1972 through 2002) and 4) Size Class (Quadratic Mean Diameter). EPA analyzed each of these IVMP datasets as potential "surrogate measures" for "basal area removal". Our analysis found that the number of 6th field HUCs shown to exceed 40% cut varied depending on the dataset considered (between 0 and 19%). This discrepancy calls into question the DEIS conclusion that only 1 out of 635 subwatersheds in the rain hydroregion (DEIS, p. 385) and only 3 out of 471 subwatersheds in rain-on-snow hydroregion (DEIS, p. 387) within the Plan Area are currently susceptible to peak flow increases. We recommend that the FEIS address this discrepancy, clarify which datasets were used, and provide the rationale for dataset and "surrogate measure" selection (i.e., 10% crown closure).

2.0 SOURCE WATER

EPA is concerned that management within the 5th or 4th hydrologic unit codes (HUCs) upstream from water system intakes do not receive a more protective harvest approach under the proposed action alternatives. In particular, we are concerned that implementation of Alternatives 2 or 3 could result in impacts to drinking water supplies due to increased sediment and harvest related chemical use.

2.1 Management in Source Water Watersheds

As noted above, over 1 million Oregonians in the planning area receive their drinking water from source water watersheds located on BLM land. Under the NWFP a number of these source water watersheds were designated as Tier 2 Key Watersheds in response to concerns over water quality. Within Key Watersheds, management is guided by watershed analysis, road building in inventoried roadless areas is restricted, and priority is given to restoration. These measures have resulted in a higher level of improved watershed conditions than in non-Key watersheds (Gallo et al. 2005). Under the proposed action alternatives, key watershed designations would be removed, riparian protection would be reduced, and a larger proportion of source water watersheds would be managed as part of the timber base.

Given potential water quality impacts from management activities associated with proposed increased harvest, EPA is concerned that source water watersheds would receive insufficient management consideration. Of key concern is increased sediment and harvest related chemical use. Sediment can affect drinking water supplies by causing taste and odor problems, blocking water supply intakes, fouling treatment systems, and filling reservoirs. In addition, higher turbidity levels are often associated with higher levels of disease-causing organisms, such as viruses, parasites and some bacteria. Higher turbidity and associated health problems can result in an acute health threat to the drinking water system users. Many treatment facilities are not designed to deal with turbidity spikes, nor to remove the full spectrum of chemicals from drinking water. The use of fertilizers, herbicides, and other chemicals associated with silvicultural activities is a major concern to many municipalities. Even the best state-of-the-art drinking water treatment facilities cannot fully remove many of the commonly used pesticides and fire retardants (Blomquist, J.D. et al, 2001).

Several Oregon municipalities are currently working to address high turbidity levels in their source water resulting from forest practices on private lands upstream of public water intakes. These turbidity levels can be largely attributed to roads and harvest levels, especially in areas where protection is limited on steep slopes and along intermittent and smaller perennial streams. The RMA boundaries and no cut zones along perennial streams under Alternatives 2 and 3 are similar to prescriptions in place on private lands which EPA, NMFS and USFWS have found are not sufficient to protect water quality and restore salmonid fisheries. (Multi-agency comment letter on 2000 draft report titled *DEQ/ODF Sufficiency Analysis,* dated February 28, 2001). We also note that harvest within RMAs around a large percentage of intermittent streams under alternatives 2 and 3 would allow harvest right up to the streams edge. This is particularly significant because over half of the streams within a watershed may be intermittent.

EPA believes that providing the highest quality water possible to source intakes at the least cost to downstream users should be the management objective on BLM lands within watersheds providing public water supply (see section 6.0 – Socioeconomics). We recommend the proposed action in the FEIS maintain the network of key watersheds as mapped under the no action alternative, and continue to manage those areas consistent with direction obtained from watershed analyses and source water protection plans. Further, we recommend that a more protective harvest approach be adopted for riparian areas within the 5^{th} or 4^{th} code HUCs upstream from water system intakes (see section 3.0 – Recommendations).

3.0 RECOMMENDATIONS TO ADDRESS SOURCE WATER AND WATER QUALITY CONCERNS

In discussions with BLM to date, EPA has identified the need for additional protection measures for aquatic resources within the planning area. We recommend that the following elements be given consideration in the FEIS and be included in the proposed action alternative ultimately selected by BLM in the Record of Decision. EPA's recommendations are strongly supported by research, monitoring, and assessment efforts relevant to protection of water quality, drinking water, and aquatic resources.

- In those watersheds currently meeting water quality standards, and which are not designated for fish recovery or water supply, EPA recommends adoption of RMAs as described in the no action alternative or as described in Alternative 1.
- In watersheds with impaired waters, and watersheds designated for fish recovery or public water supply, we recommend adoption of RMAs as described in the no action alternative.
- Where Key Watersheds have been identified, EPA recommends that they be maintained, and managed consistent with standards and guidelines under the no action alternative or information obtained from watershed analysis and source water protection plans.
- We also recommend that adoption of a requirement for continued watershed analysis and a monitoring and adaptive management program be considered in the final EIS.

4.0 CUMULATIVE EFFECTS

The DEIS repeatedly notes that in western Oregon, BLM is rarely the predominant landowner within a fifth-field watershed, and that the management of the intermingled private lands differs from that of the BLM-administered lands. This creates implications for the management of BLM lands (DEIS p. 184, 189, 196, 233). It remains unclear, however, to what degree conditions on lands outside of BLM ownership were considered in the analysis. This is of particular concern in the context of stream temperature, stream complexity (sediment and large wood), fish and wildlife habitats, source water impacts, and watershed restoration.

4.1 TEMPERATURE

In determining that none of the alternatives would contribute to an increase in temperature, the DEIS shade analysis on page I-1118 only considers shade zones on BLM-managed lands. BLM's analysis does not consider effects from the mixed ownership present in most of the planning area. EPA recommends that reduced shade levels from BLM alternatives be considered at the watershed scale. Given the importance of shade in regulating stream temperature, EPA conducted an analysis of shade at the 5th field watershed scale on four watersheds in the planning area (Scappoose, Upper Alsea, Upper Siuslaw, and Rock Creek) using the RAPID shade model developed by BLM and the Forest Service. Results of this modeling (included as attachment B) demonstrate that in each of the watersheds considered, shading levels on private land are significantly lower than shade levels on BLM land. Stream shade on private land ranged between 41% and 54%, whereas shade levels on BLM land approached 80%. Streams flowing through mixed ownerships will be affected by lower shading levels on private lands. We therefore recommend that this variability be considered within the context of cumulative impacts.

4.2 SEDIMENT AND LARGE WOOD

Thom and Jones (1999) found that private non-industrial lands in western Oregon are characterized by higher fine sediment levels, lower wood volumes and number of key (large) wood pieces, lower densities of deep pools, and lower levels of shading. They also found that on the private lands surveyed, very few stream reaches had high quality habitat largely due to sediment loading. Within this context, federal lands play a key role in terms of providing areas of high quality refugia. Without high quality refugia, moderate quality areas cannot support a large abundance of salmonids through periods of frequent disturbance (Thom and Jones 1999). We recommend that the FEIS fully discuss the ecological role of BLM lands within areas of mixed ownership. This would include an examination of all potential sediment sources, including (as noted above) roads currently excluded from analysis, harvest activity and debris flow. This analysis should also consider the potential for blowdown. As noted previously, riparian buffers experience an average of 33% blowdown in the 2 years following harvest. This has implications for future large wood recruitment, bank stability, sediment delivery, and temperature.

4.3 DRINKING WATER

Many of the source water watersheds in the planning area are also in mixed (checkerboard) ownership. Within these watersheds, land in private ownership is often managed more intensively than is federal land. In these instances, it is often the federal lands which have the large intact blocks able to provide the ecosystem services (temperature regulation, nutrient cycling, filtration, flow attenuation, and storage) necessary to maintain high quality drinking water (see Attachment C – Example Source Water Watershed). Cumulative impacts to drinking water systems should be considered within this context, and EPA believes BLM should consider guidelines directing federal land managers to work closely with drinking water system operators and local watershed groups to ensure that management on federal land will not adversely impact water systems and drinking water quality.

4.4 WATERSHED RESTORATION

EPA believes that the importance of BLM lands to water quality, drinking water, and fish and wildlife habitat is significant from a cumulative impacts perspective where a substantial portion of watersheds consist of private lands. There are approximately 90 local watershed groups in Oregon that have spent tens of millions of dollars to protect and restore watersheds in Western Oregon. Many of the watershed groups have completed watershed assessments outlining science based conservation and restoration strategies that apply watershed wide, to both federal and private lands. EPA believes that proposed reductions of riparian and upland habitat protection under Alternatives 2 and 3, and to a lesser extent Alternative 1, run counter to many of those strategies. For example, the Scappoose Bay Watershed Assessment (David Evans and Associates, 2000) identifies intact habitat areas and potential salmonid refugia within the watershed. While BLM lands make up only about 15% of the total watershed, a disproportionately high amount of intact habitat and refugia areas are found on BLM lands, including intact riparian areas and all of the remaining old growth in the watershed. The Scappoose Bay Watershed Council has worked with BLM spending almost two million dollars to restore habitat and remove barriers to ESA listed steelhead and coho to allow access to salmonid refugia on BLM lands. BLM lands also provide the highest quality habitat in the Scappoose Bay Watershed's municipal water supply catchments. Alternatives 2 and 3 would allow intensive timber harvest that could adversely impact drinking water and salmon recovery efforts in 3 of the 4 highest priority drainages in Scappoose Bay Watershed.

5.0 ECOSYSTEM BASED MANAGEMENT

In developing the NWFP, scientists and managers from NOAA Fisheries, and the U.S. Fish and Wildlife Service Services, land management agencies, and EPA incorporated knowledge about species needs and aquatic systems functions into an ecosystem management framework designed to conserve both terrestrial and aquatic ecosystems. This integrated approach resulted in significant overlap between areas managed for late successional species (late successional reserves or LSRs) and areas managed for other ecosystem functions, such as providing high quality water and refugia for at-risk fish species (Key Watersheds and Riparian Reserves).

Monitoring and assessment efforts indicate that this integrated approach is delivering environmental benefits in areas of key concern to EPA, such as water quality protection, watershed restoration, and protection of public water supply. Assessment of 10 years of NWFP implementation found that 97% of the watersheds where the NWFP has been implemented are on a stable or improving trend, and that 74% of the "key" watersheds targeted for restoration showed improvement (PNW-GTR-647, Gallo et al. 2005). Late Successional Reserves (LSRs) also had higher watershed condition scores than Matrix lands designated for timber harvest. Considering these results, we are concerned that the reductions in LSRs and riparian reserves, and elimination of key watersheds proposed in Alternatives 2 and 3 should be considered within an ecosystem-based context.

5.1 LATE SUCCESSIONAL RESERVES

Beyond providing habitat for late successional and old-growth (LSOG) dependent species, LSRs play an important role protecting and restoring water quality, providing refugia for salmonids, and supplying large wood (NWFP 1994). Monitoring and assessment results indicate that these are performing well with respect to improved LSOG and watershed conditions. In spite of these positive terrestrial and aquatic habitat gains, Alternative 2 reduces the amount of area managed for late successional characteristics by 17%. We recommend that consideration be given to the role played by these areas in terms of providing key ecosystem services beyond LSOG habitat.

5.2 RIPARIAN RESERVES

Riparian protection zones are the primary mechanism for protecting water quality on forest lands. However, in taking an ecosystem approach, the NWFP anticipated that the various land use allocations under the NWFP, including riparian reserves, would serve multiple ecological functions. This assumption has been reinforced by research. Numerous studies have demonstrated the importance of riparian habitats as refugia (Olson et al. 2007), in support of biological and process diversity (Richardson 2000), and as a mediator/corridor for processes and species (Olson et al. 2007).

The DEIS departs from this ecosystem-based approach by looking at one parameter (wood delivery) in establishing buffers around intermittent streams under Alternatives 2 and 3. EPA believes that this approach is inconsistent with current research indicating that navigable waters are significantly influenced by headwater streams through hydrological and ecological connectivity (Wipfli et al. 2007). Although the DEIS provides an analysis of management related impacts to large wood delivery under alternatives 2 and 3, it is not clear what other riparian functions or processes might be lost. Considering that headwaters can comprise 60-80% of drainage networks (Benda et al. 2006), and the recognized importance of these systems (Olson et al. 2007, Johnson and O'Neil 2001), we recommend that the FEIS take a more holistic view of the role played by headwater streams. Specifically, the FEIS should analyze the effects of the

Alternatives on riparian fauna, microclimate, and processes such as flow, nutrient, and sediment regimes.

5.3 KEY WATERSHEDS

A cornerstone of the NWFP strategy was the designation of key watersheds. These watersheds, widely distributed across the landscape, were determined to provide, or expected to provide high quality fish habitat, and high quality water. These watersheds were selected not only for their habitat and water production value, but also for their restoration potential. And as noted above, investment in these areas has proven successful, with 74% of the key watersheds targeted for restoration showing improvement (Gallo et al. 2005). In spite of these successes, the DEIS moves away from the key watershed approach. Instead, areas are prioritized for restoration based on "intrinsic potential." EPA understands that intrinsic potential is an important concept. However, we are concerned that relying solely on intrinsic potential significantly limits the potential for effective BLM restoration efforts, ignores critical salmonid life histories, and does not recognize other key watershed values. As noted on page 339, the percentage of high intrinsic stream miles on BLM land is less than 10% for each of the listed fish stocks. We encourage the BLM to continue to recognize and manage key watersheds according to NWFP standards and guidelines and established watershed analyses. As noted in the FEMAT report (1993), past attempts to recover fish populations were unsuccessful because the problem was not approached from a watershed perspective.

6.0 SOCIOECONOMICS

In our review of the socioeconomic issues in the DEIS, we considered the methodology used to estimate impacts, and sought to review the underlying assumptions and input parameters. As a result of our review, we have concerns about the use of input/output models without complete descriptions of assumptions and limitations, and the treatment of non-market values (such as water quality).

6.1 INPUT/OUTPUT MODELS

Input-Output (I/O) models can be useful tools for estimating economic impacts. As with any model, however, there are limitations that should be acknowledged. Two assumptions of an I/O model are that prices and technology are fixed for the time period being modeled. As a result, I/O models are not able to address flexible supply-demand relationships, and are not able to address consumer and producer surplus and resulting substitutions. We recommend that these limitations be discussed in the FEIS.

In addition, the DEIS uses county level input/output models designed specifically for analysis of this project but does not provide the reviewer with information regarding each county's model assumptions and inputs. This is important since these models are unique to the DEIS. We recommend that the FEIS include specific information about assumptions and input parameters for each model.

6.2 NONMARKET VALUES

Changes in nonmarket values are not well described or quantified in the analysis. These values affect the economic well-being, health, and resiliency of local communities. As an example, clean drinking water is a valuable commodity produced by BLM forests. There are dozens of drinking water systems fed in part by BLM lands (p. I-1120). BLM management in these areas is of key economic importance because as forest cover decreases in a Source Water Protection Area, treatment costs generally increase (Trust for Public Land 2004). More intensive management in source water watersheds may therefore result in increased costs to the water users. This could be due to increased operations and maintenance costs (filtration, monitoring, chemical treatment, etc) or increased capital costs (plant or system upgrades). We recommend that the FEIS examine, and to the extent possible, quantify these costs so they are included in the economic cost/benefit analysis.

7.0 INVASIVE SPECIES

On page 269 the DEIS states that the condition of invasive plant infestations on BLM land in the planning area can be characterized by analyzing a few (11) representative invasive species. The analysis does a good job of discussing the mechanisms of dispersal and relationships to land management activity, light tolerance, and current distribution. We are concerned, however, that these descriptions address the consequences of the presence of these species in a very limited way. For three (Canada Thistle, False Brome, and Leafy Spurge) there is no discussion of the consequences. For six the consequences are limited to crowding out of native species. This absence of a real focus on economic and ecosystem consequences limits the usefulness of this analysis.

In addition, the analysis of the risk of introduction is limited to a 10-year period (p. 611). While this near-term focus is useful, it doesn't correspond to the temporal horizon of the plan analysis, and thus consequences over longer periods should be evaluated.

Finally, a limited set of mitigation measures is offered, but no evidence is offered of the observed potential cost or experienced effectiveness of these measures in either a relative or an absolute sense. In addition, these measures are all oriented towards reducing the risk of introduction – a necessary, but not sufficient emphasis. We recommend that the FEIS also discuss mitigation measures that could be used in the event of an introduction, as well as the ecosystem consequences of those measures.

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ATTACHMENT A – TEMPERATURE ANALYSIS

The calibrated Heat Source 7.0 model, from the recently completed Umpqua Basin TMDL, was used in this modeling effort. The Heat Source model has undergone extensive peer review and has been field calibrated for numerous EPA approved TMDLs in Oregon. Modeling for Canton Creek was calibrated using both field data and remote sensed data. Higher resolution was provided by changing the model distance step from 100 meters to 50 meters. Model Simulations for Canton Creek reflect the time period July 12-31, 2002 and cover 16.95 river kilometers, from the upstream reach of Pass Creek to the mouth of Canton Creek. The EPA modeling delineates three land management categories (Forest Service, Private, and BLM) and five Riparian Management Area (RMA) zones (i.e., 0 to 25 feet, 25 to 60 feet, 60 to 100 feet, 100 to 150 feet, and > 150 feet). Results of the analysis are presented in figures A-1 through A-3.

Figure A-1 - Partial application of the proposed alternatives in which it is assumed that current conditions will be maintained out to 60 feet.

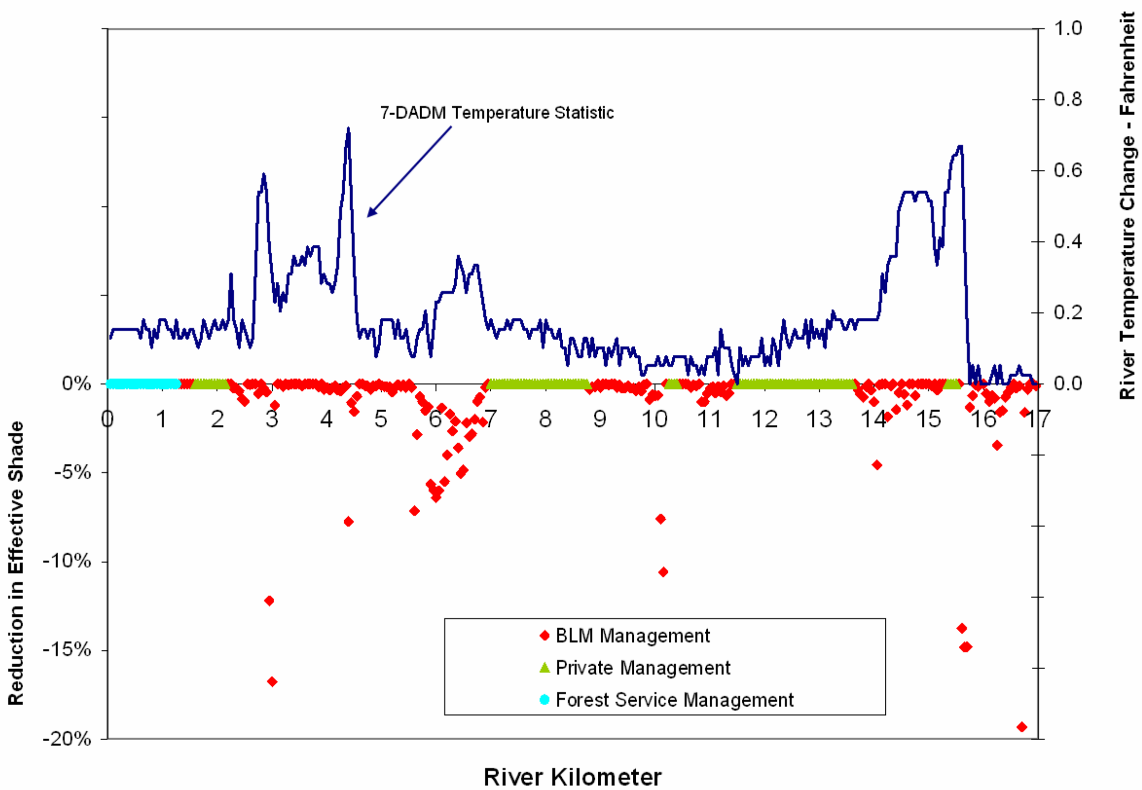


Figure A-2 - Comprehensive application of the proposed alternatives in which the zone from 25-60 feet is assumed to provide 80% shade.

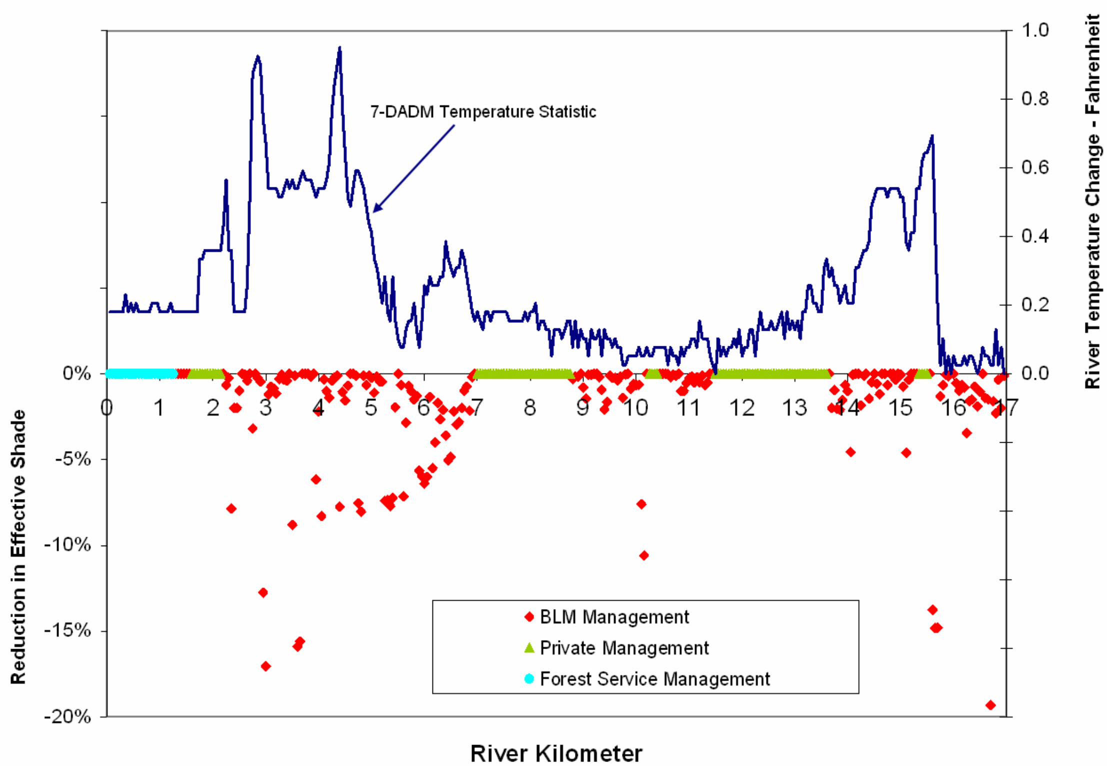
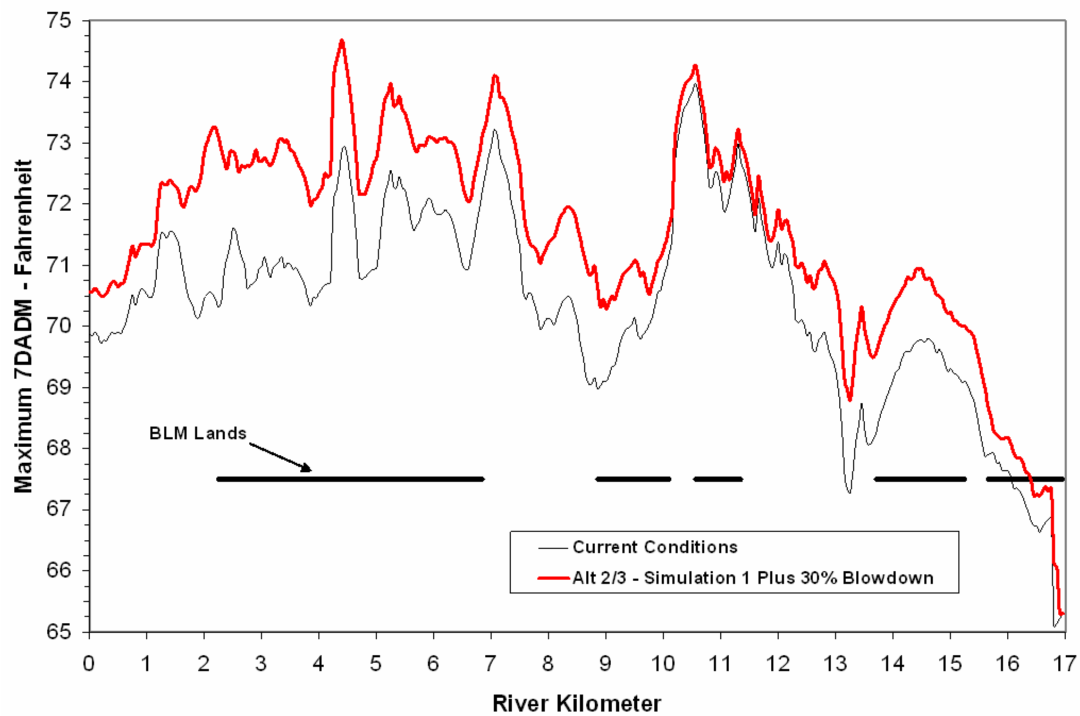


Figure A-3. Temperature change resulting from the application of WOPR Alternatives 2/3, along with 30% windthrow blowdown, to riparian buffers along Canton Creek.



ATTACHMENT B – SHADE ANALYSIS

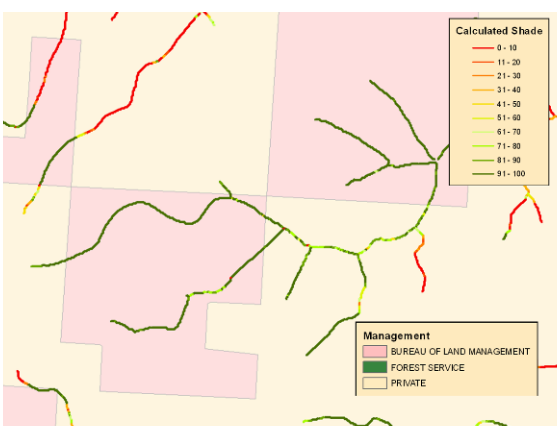
Analysis associated with shade target development for the draft WOPR EIS was obtained from the “Northwest Forest Plan Temperature TMDL Implementation Strategy (TMDL Strategy - USDA, USDI 2005). The “Shadow”” model was the primary tool used to develop the TMDL Strategy. Recently, BLM and the Forest Service, with support from EPA and DEQ, included the algorithms and assumptions associated with the “Shadow” into a watershed scale shade model. That model is now known as the RAPID Shade Model (available at ftp://ftp2.fs.fed.us/incoming/r6/sis/jhawkins/StreamAssessment/)

Using the RAPID Shade Model, EPA conducted an analysis of shade at the 5th field watershed scale on four watersheds in the planning area (Scappoose, Upper Alsea, Upper Siuslaw, and Rock Creek). Default model settings were used during these modeling runs. Results of this modeling can be seen in Table B-1. Figures B-1 and B-2 provide examples of model output for the Scappoose watershed. Overall, shading levels on private land are significantly lower than shade levels on BLM land. Stream shade on private land ranged between 41% and 54%, whereas shade levels on BLM land approached 80%.

Table B-1. Calculated Shade using the RAPID Shade Model for Four Oregon HUCs

	Scappoose	Upper Alsea	Upper Siuslaw	Rock
Entire Basin	47	64	61	62
BLM	79	78	75	74
Forest Service	- -	89	- -	- -
Private	41	50	51	54

Figure B-1. RAPID Shade Model output for the Scappose watershed (red signifies less shade, and green signifies more shade)



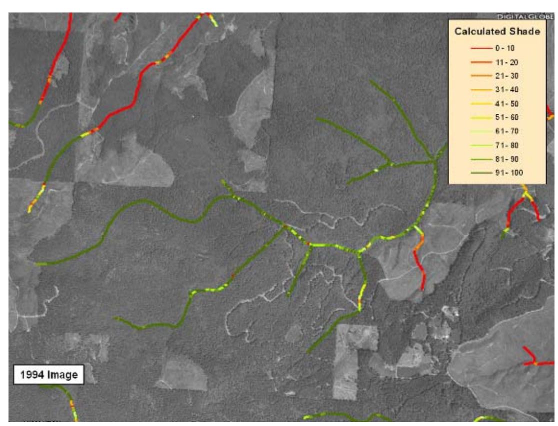
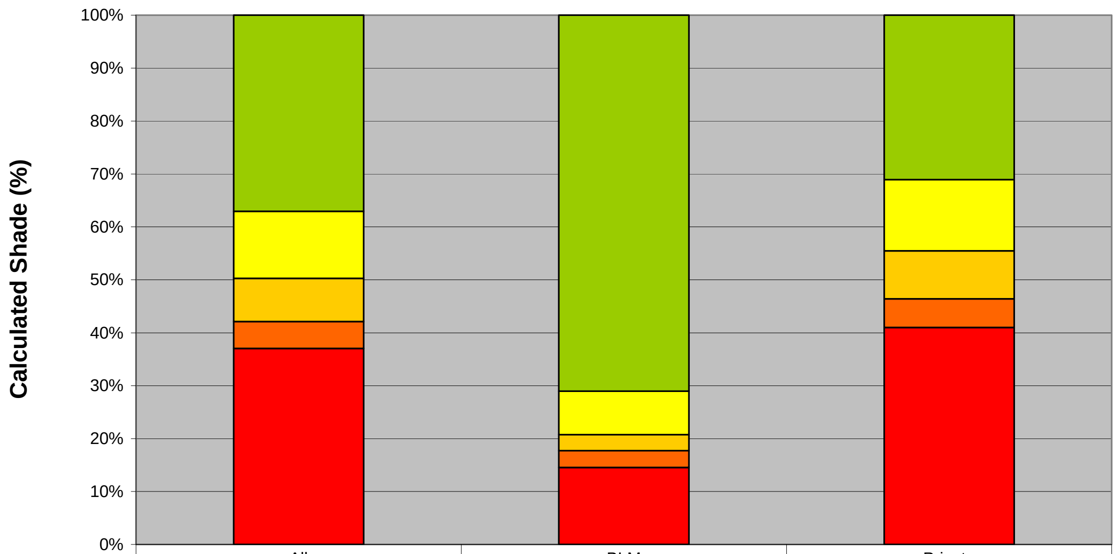


Figure B-2. Calculated Shade Distribution for the Scappoose Watershed



	All	BLM	Private
80 to 100	37%	71%	31%
60 to 79	13%	8%	13%
40 to 59	8%	3%	9%
20 to 39	5%	3%	5%
0 to 19	37%	15%	41%

Land Management Catagories

ATTACHMENT C – EXAMPLE SOURCE WATER WATERSHED

Figure C-1. The area indicated by the red line in the middle of the image is the S. Fork Scappoose Creek Source Water Area for the City of Scappoose (BLM lands are in pink)