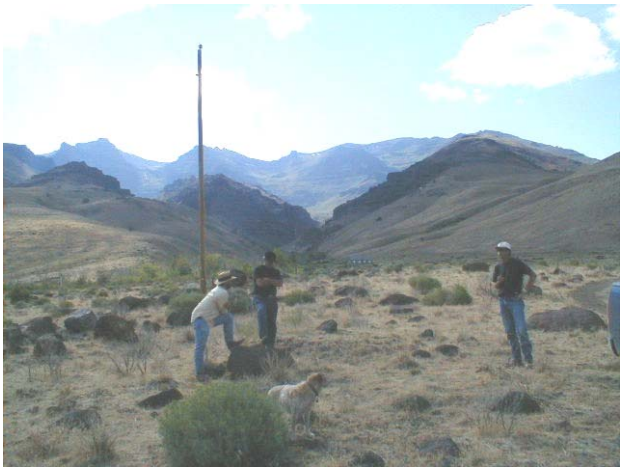
# APPENDIX A: WATER QUALITY MANAGEMENT PLAN






# A.1 INTRODUCTION

This document is intended to describe strategies for how the Alvord Lake Subbasin Total Maximum Daily Loads (TMDLs) will be implemented and, ultimately, achieved. The subbasin TMDLs cover approximately 2,150 square miles within the Malheur Lake Basin. The main body has been prepared by the Oregon Department of Environmental Quality (ODEQ) and includes a description of activities, programs, legal authorities, and other measures for which ODEQ and the designated management agencies (DMAs) have regulatory responsibilities. This Water Quality Management Plan (WQMP) is the overall framework describing the management efforts to implement TMDLs in the subbasin. The DMA-specific Implementation Plans which describe each DMA's existing or planned efforts to implement their portion of the TMDLs are represented schematically in **Figure A-1**, below.

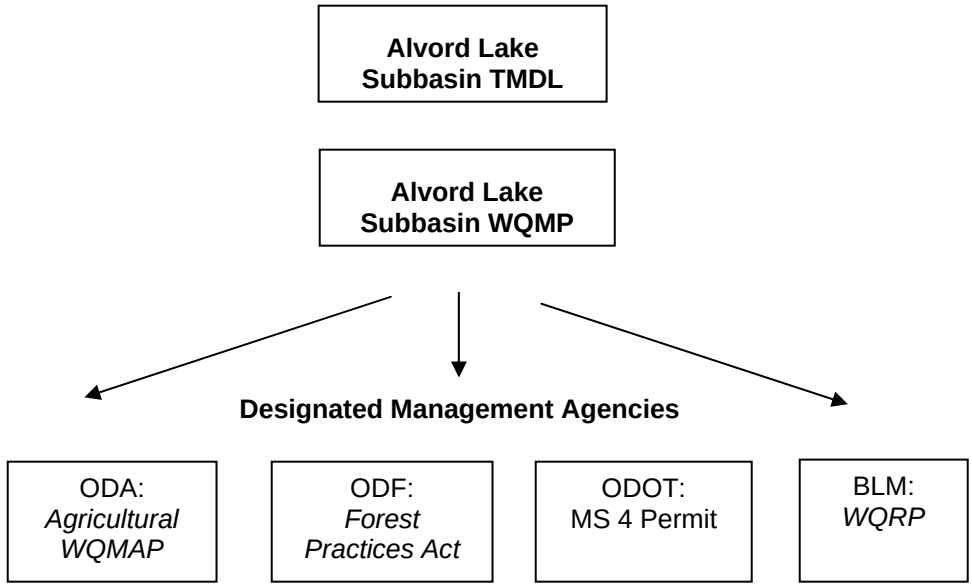



**Figure A-1. TMDL/WQMP/Implementation Plan Schematic**

The Implementation Plans, when complete, are expected to fully describe DMA efforts to achieve their appropriate allocations, and ultimately, water quality standards. Since the DMAs will require some time to fully develop these Implementation Plans once the TMDLs are finalized, the first iteration of the Implementation Plans are not expected to completely describe management efforts. A further discussion and evaluation of the Implementation Plans for each of the DMAs listed above is provided in **Section A.3.8** below.

ODEQ recognizes that TMDL implementation is critical to the attainment of water quality standards. Additionally, the support of DMAs in TMDL implementation is essential. In instances where ODEQ has no direct authority for implementation, it will work with DMAs on implementation to ensure attainment of the TMDL allocations and, ultimately, water quality standards. Where ODEQ has direct authority, it will use that authority to ensure attainment of the TMDL allocations (and water quality standards).

This document is the first iteration of the Water Quality Management Plan (WQMP) for the TMDLs. As explained in **Section A.3.9** of this document, DMA-specific Implementation Plans will be more fully developed once the current TMDLs are submitted to the U. S. Environmental Protection Agency (EPA) and approved. This WQMP will establish proposed timelines (following final TMDL approval) to develop full Implementation Plans. ODEQ and the DMAs will work cooperatively in the development of the TMDL Implementation Plans and ODEQ will assure that the plans adequately address the elements described below under "TMDL Water Quality Management Plan Guidance". In short, this document is a starting point and foundation for the WQMP elements being developed by ODEQ and the DMAs.

# A.2 ADAPTIVE MANAGEMENT

The goal of the Clean Water Act and associated Oregon Administrative Rules (OARs) is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in many watersheds, particularly where nonpoint sources are the main concern. To achieve this goal, implementation must commence as soon as possible.

Alvord Lake Subbasin TMDLs are numerical loadings that are set to limit pollutant levels such that in-stream water quality standards are met. ODEQ recognizes that TMDLs are values calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical and biological processes. TMDLs for the subbasin were developed using the available data and associated pollutant loading estimates available at the time. Models and techniques are simplifications of these complex processes and, as such, are unlikely to produce an exact prediction of how stream systems will respond to the application of various management measures.

WQMPs are plans designed to reduce pollutant loads to meet TMDLs. ODEQ recognizes that it may take several decades after full implementation before management practices identified in a WQMP become fully effective in reducing and controlling pollution. In addition, ODEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques. It is possible that after application of all reasonable best management practices, some TMDLs or their associated surrogates cannot be achieved as originally established. **Figure A-2** is a graphical representation of this adaptive management concept.

ODEQ also recognizes that, despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated surrogates. Such events could be, but are not limited to, floods, fire, insect infestations, and drought.

In the Alvord Lake Subbasin TMDLs, a pollutant surrogate (percent effective shade) has been defined as an alternative target for meeting the TMDLs for temperature and dissolved oxygen. The purpose of a surrogate is not to bar or eliminate human activity in the basin. It is the expectation, however, that this WQMP and the associated DMA-specific Implementation Plans will address how human activities will be managed to achieve the surrogate. It is also recognized that full attainment of pollutant surrogates (*system potential* vegetation, for example) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, the Implementation Plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. For instance, at this time, the existing location of a road or highway may preclude attainment of *system potential* vegetation due to safety considerations. In the future, however, should the road be expanded or upgraded, consideration should be given to designs that support TMDL load allocations and pollutant surrogates such as *system potential* vegetation.

The TMDL establishes a maximum thermal loading capacity at which the temperature standard will be met. ODEQ's analysis indicates that the temperature criterion for salmonid rearing (64$^{o}$F) may not be achieved at all times even after all human caused heating influences have been reduced to the point where they can not be measured. This means that there is no thermal load that may be allocated to human caused activities. Implementation of a TMDL with zero allocations for nonpoint sources, however, should not be construed to mean that human activity must be removed from riparian or other areas that might impact water quality. It does mean that human activities should create no measurable increase in surface water temperatures of the water body. ODEQ expects that management activities to reduce and minimize stream heating will be specified in an approved water quality management or restoration plan. Specified management activities should allow riparian vegetative communities to grow and propagate, and natural fluvial processes such a flood plain formation and bank stabilization to occur.

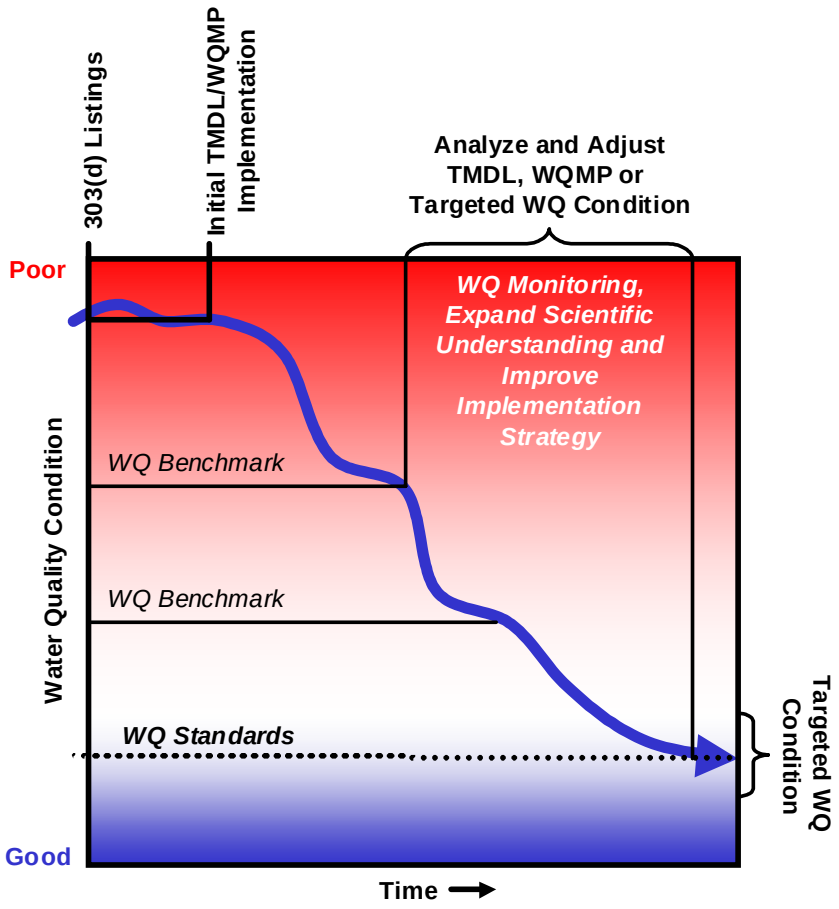



**Figure A-2. Adaptive Management - Schematic Diagram**

The implementation of TMDLs and the associated plans and regulations is generally enforceable by ODEQ, other State agencies and local government. However, it is envisioned that sufficient initiative exists to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers to overcome impediments to progress through education, technical support or enforcement. Enforcement may be necessary in instances of insufficient action towards progress. This could occur first through direct intervention from land management agencies (e.g. ODF, ODA, counties and cities), and secondarily through ODEQ. The latter may be based on departmental orders to implement management goals leading to water quality standards.

In employing an adaptive management approach to the TMDLs and the WQMP, ODEQ has the following expectations and intentions:

- Subject to available resources, on a five-year basis, ODEQ intends to review the progress of the TMDLs and the WQMP.
- In conducting this review, ODEQ will evaluate the progress towards achieving the TMDLs (and water quality standards) and the success of implementing the WQMP.
- ODEQ expects that each DMA will also monitor and document its progress in implementing the provisions of its Implementation Plan. This information will be provided to ODEQ for its use in reviewing the TMDL.
- As implementation of the WQMP and the associated Implementation Plans proceeds, ODEQ expects that DMAs will develop benchmarks for attainment of TMDL surrogates, which can then be used to measure progress. It is anticipated that benchmarks will consist of parameters such as system

potential vegetation communities and associated shade values provided in **Sections 2.4.3.1** and **2.7.2** of the Stream Temperature TMDL.

- Where implementation of the Implementation Plans or effectiveness of management techniques are found to be inadequate, ODEQ expects management agencies to revise the components of their Implementation Plan to address these deficiencies.

If a nonpoint source that is covered by the TMDLs complies with its finalized Implementation Plan or applicable forest practice rules, it will be considered in compliance with the TMDLs. If and when ODEQ determines that the WQMP has been fully implemented, that all feasible management practices have reached maximum expected effectiveness and a TMDL or its interim targets have not been achieved, ODEQ shall reopen the TMDL and adjust it or its interim targets and the associated water quality standard(s) as necessary.

# A.3 TMDL WATER QUALITY MANAGEMENT PLAN GUIDANCE

On December 12, 2002, the State of Oregon's Environmental Quality Commission (EQC) adopted OAR 340-042 which establishes the procedures for developing, issuing and implementing TMDLs as required by the Federal Clean Water Act. Included in this rule is a discussion of the elements required in a WQMP. These elements, as outlined below, will serve as the framework for this WQMP.

**WQMP Elements**

1. Condition assessment and problem description
2. Goals and objectives
3. Proposed management strategies
4. Timeline for implementing management strategies
5. Relationship of management strategies to attainment of water quality standards
6. Timeline for attainment of water quality standards
7. Identification of responsible participants or DMAs
8. Identification of sector-specific implementation plans
9. Schedule for preparation and submission of implementation plans
10. Reasonable assurance
11. Monitoring and evaluation
12. Public involvement
13. Planned efforts to maintain management strategies over time
14. Costs and funding
15. Citation to legal authorities
16. Identification of voluntary programs/incentives to implement management strategies

This WQMP is organized around these plan elements and is intended to fulfill the requirement for a management plan contained in OAR 340-042.

## A.3.1 Condition Assessment and Problem Description

A detailed Condition Assessment and Problem Description are provided above in **Chapters I** through **IV** of the Alvord Lake Subbasin TMDL. A summary of this information, particularly as it relates to future land management through Implementation Plans, is provided below.

Pursuant to the federal Clean Water Act, a TMDL is required for any waterbody that is listed pursuant to Section 303d of the Act. The TMDL is expected to establish the maximum pollutant load that can be allowed to meet the water quality standard. Therefore the TMDLs presented in this document are established for streams in the Alvord Lake Subbasin that are listed on the 2002 303(d) list (http://www.ODEQ.state.or.us/). For temperature, the TMDLs also apply on streams that are tributaries to

streams identified on the 303(d) list or on streams that contain salmonid fish or that are tributaries to streams that contain salmonid fish. This is to ensure protection of salmonid fish that reside in streams that are not listed on the 303d list. **Table A-1** identifies those streams or tributaries where the temperature TMDL applies based on these criteria. The TMDL for dissolved oxygen applies on Willow Creek in the Trout Creek Mountains.

## A.3.1.1 Temperature

Riparian vegetation, stream morphology, hydrology, climate, and geographic location influence stream temperature. In the Alvord Lake Subbasin, climate and geographic location (aspect, elevation, etc.) play a significant role in determining the amount of water available from snow pack for late season runoff during the warmer summer months. Water availability influences the volume of peak and base flows, the longitudinal extent of plant community distribution, and corresponding water temperatures in this desert region. While climate and geographic location are outside of human control, the condition of the riparian area, channel morphology, and hydrology are also affected by land use activities such as grazing management, road management, recreation activities, excessive upland sediment loading, irrigation and crop production. Specifically, elevated summertime stream temperatures attributed to human caused sources may result from the following factors affecting stream temperature within the subbasin:

1. Riparian vegetation disturbance that reduces stream surface shading, riparian vegetation height, and riparian vegetation density (shade is commonly measured as percent effective shade) and seral status;
2. Channel disturbance including widening (increased width to depth ratios) due to factors such as loss of riparian vegetation that increases the stream surface area exposed to energy processes, namely solar radiation and can disconnect the stream from the floodplain, preventing/reducing groundwater discharge into the river; and,
3. Reduced flow volumes from irrigation and natural subsurface underflow (lose-gain phenomenon) increases stream temperatures.

A more detailed description of the factors affecting stream temperature specific to the Alvord Lake Subbasin is presented below.

#### *A.3.1.1.1 Riparian Vegetation*

When a stream is exposed to solar radiation, large quantities of heat energy will be delivered to the stream system, usually resulting in an increase in water temperature. Riparian vegetation can play a significant role in reducing this exposure and the resulting increase in temperature. An assessment was performed by ODEQ and the BLM to delineate existing shade conditions on select streams and approach consensus on vegetative *system potential*. Aerial photos and field reconnaissance were used to quantify shade values as well as the potential for recovery. To determine the amount of shade reaching the stream surface, shade curves were developed by ODEQ using the Heat Source model (see **Section 2.4** of the TMDL and **Chapter V** for a further discussion of this methodology). Input variables to develop shade curves used for analysis include low flow wetted stream width, riparian tree height, shade density, and stream orientation.

Effective shade is used as a surrogate measure for a daily heat energy load (e.g. BTU/$ft^2$/day) in the TMDLs. This surrogate measure targets the establishment of a *system potential* riparian community under which human activities are not measurably contributing to the heating of the stream. The *system potential* riparian community provides thermal buffering in the form of shade as well as providing: (1) stream bank stabilization which results in a reduction in sediment inputs and subsequent decreases in channel width; and, (2) reconnection of the floodplain which restores function, channel stability, and water storage and release as hyporheic, or subsurface flows, during the warmer summer months. Although the TMDLs focus on the surrogate measure of effective shade, ODEQ recognizes there are factors other than shade that contribute to the rate at which streams warm.

**Table A-1. Streams or Stream Segments where the Alvord Lake Subbasin Temperature TMDL Applies (repeat of Table 2-1 in the TMDL)**

| Stream | Basis for TMDL | "Bottom" of Stream |
|---|---|---|
| **East Steens Mountain** | | |
| Big Alvord Creek | Salmonid bearing* | Fields-Denio Highway |
| Buena Vista Creek | Salmonid bearing | Confluence with Mosquito Creek |
| Cottonwood Creek | Salmonid bearing | ~200 yards above old county road (42.715278/-118.49194) |
| Little Alvord Creek | Salmonid bearing | Fields-Denio Highway |
| Little McCoy Creek | Salmonid bearing | End of USGS perennial delineation on Quad map (42.71214/-118.472881) |
| Little Wildhorse Creek | Salmonid bearing, 303(d) list | Confluence with Wildhorse Creek |
| Mann Creek | Salmonid bearing | 42.73365/118.4838 |
| Mosquito Creek | Salmonid bearing | Fields-Denio Highway (new road alignment constructed in 2003) |
| Pike Creek | Salmonid bearing | Fields-Denio Highway |
| Wildhorse Creek | Salmonid bearing, connected to 303(d) listed stream | 42.51917/-118.59523 |
| Willow Creek | Salmonid bearing, 303(d) list | Lower BLM Boundary |
| **Pueblo Mountains** | | |
| Denio Creek | Salmonid bearing, 303(d) list | Fields-Denio Highway |
| Van Horn Creek | Salmonid bearing, 303(d) list | Fields-Denio Highway |
| **Trout Creek Mountains** | | |
| Big Trout Creek | Salmonid bearing, 303(d) list | Confluence with Little Trout Creek |
| East Fork Big Trout Creek | Salmonid bearing, connected to 303(d) listed stream | Confluence with Big Trout Creek |
| Little Trout Creek | Salmonid bearing, connected to 303(d) listed stream | Confluence with Big Trout Creek |
| Trout Creek | Salmonid bearing, connected to 303(d) listed stream | 3.4 miles below Whitehorse Ranch Rd, confluence with South Branch (42.1565/-118.4987) |
| Unnamed tributary to Trout Creek at RM 13.8 | Salmonid bearing | Confluence with Big Trout Creek |
| **Willow/Whitehorse** | | |
| Antelope Creek | Salmonid bearing | End of USGS perennial delineation on Quad map (42.36516/-118.15150) |
| Cottonwood Creek | Salmonid bearing | Confluence with Whitehorse Creek |
| Doolittle Creek | Salmonid bearing | Confluence with Whitehorse Creek |
| Fifteenmile Creek | Salmonid bearing | Confluence with Whitehorse Creek |
| Little Whitehorse Creek | Salmonid bearing | Confluence with Whitehorse Creek |
| Whitehorse Creek | Salmonid bearing | End of USGS perennial delineation on Quad map (42.283656/-118.201586) |
| Sheepline Creek | Salmonid bearing | Confluence with Whitehore Creek |
| Willow Creek | Salmonid bearing, 303(d) list | End of USGS perennial delineation on Quad map (42.32626/-118.26991) |
| Jawbone Creek | Salmonid bearing, connected to 303(d) listed stream (called unnamed creek) | Confluence with Willow Creek |
| Unnamed tributary to Little Whitehorse Creek near headwaters | Salmonid bearing | Confluence with Little Whitehorse Creek |
| Unnamed tributary to Jawbone Creek | Salmonid bearing | Confluence with Jawbone Creek |
| *Note: Salmonid bearing streams determined by ODFW ; Hanson, M., W. Bowers, and R. Perkins. 1993. Lahontan Subbasins Fish Management Plan. Oregon Department of Fish and Wildlife. | | |

## Seral Stage

The seral status, or development state, of plant communities across the subbasin varies by individual watershed. The subbasin is ecologically diverse with four distinct Ecological Provinces where dominant plant communities differ between each region. These provinces include: East Steens Mountain; Pueblo Mountains; Trout Creek Mountains; and the Willow-Whitehorse region (**Figure A-3**). The *system potential* communities associated with each Ecological Province were presented in **Section 2.4.3.1.3** of the TMDL and are repeated in this Appendix in **Section A.4**. The dominant factors that influence seral stage are a combination of water availability, historic and current land use activities and fire regime. For the purpose of this TMDL, a comprehensive assessment of vegetative conditions was performed on public lands during 2002 by the ODEQ and resource managers from the Burns District Office of the Bureau of Land Management. Vegetative conditions on private lands were assessed by the ODEQ with the cooperation of landowners.

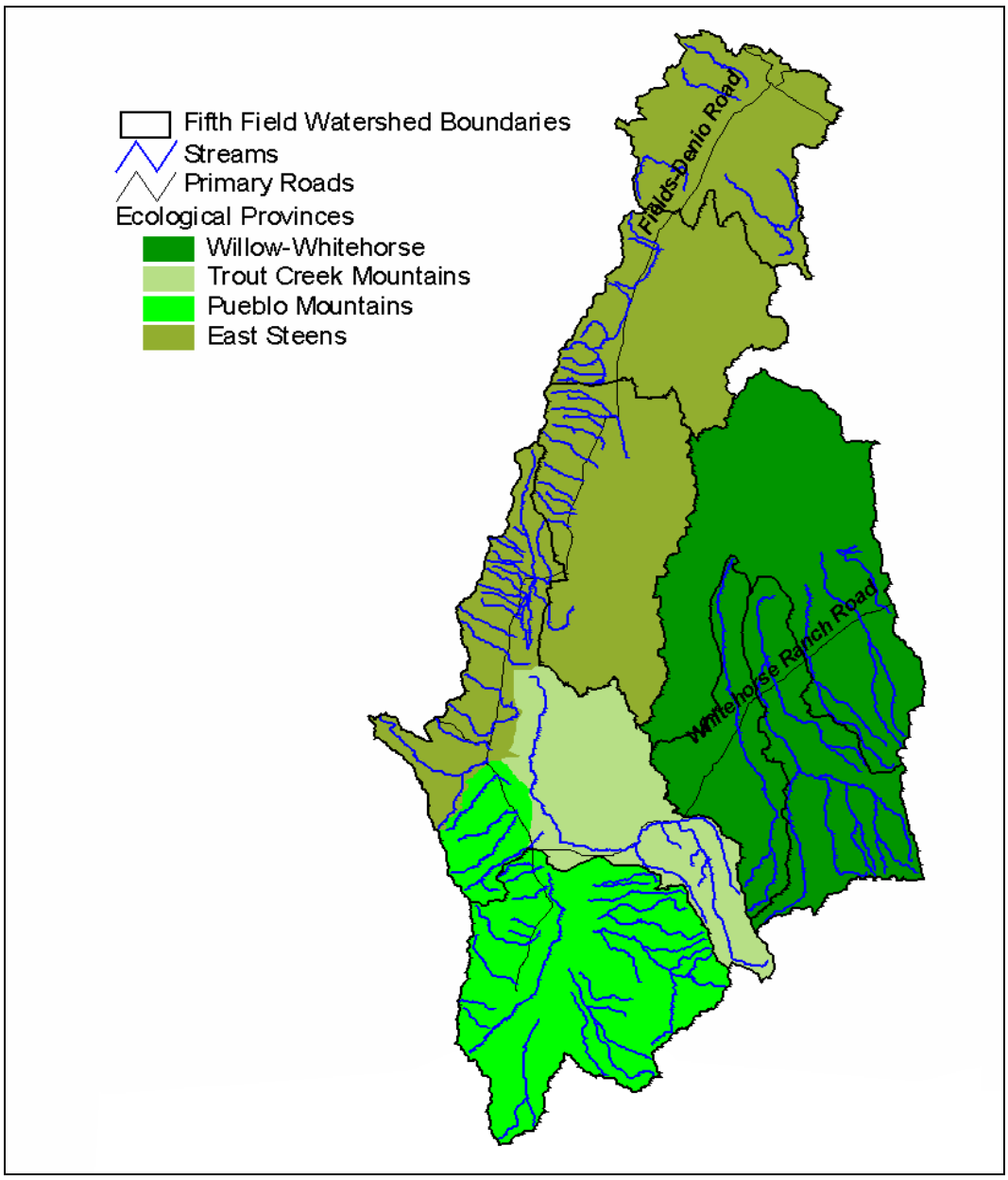



**Figure A-3. Ecological Provinces in the Alvord Lake Subbasin (repeat of Figure 2-23)**

While the descriptions of the vegetation communities in the Ecological Provinces generally describe the stream conditions observed during TMDL field assessments, ODEQ recognizes that there may be instances where the Ecological Province communities do not adequately describe *system potential* conditions for a given stream or stream reach. For example, based on preliminary information provided by the BLM, the upper reaches of Denio Creek in the Pueblo Mountains Ecological Province may in fact have a *system potential* community more similar to the mesic graminoid community described for the headwaters areas in the Trout Creek Mountains. As further field inventory information becomes available for streams not surveyed during the TMDL data collection efforts, ODEQ will work with local natural resources managers to determine stream-specific *system potential* target communities, as time and resources allow.

Generally, the highest elevation headwater reaches are considered at or near *system potential* with deciduous or mesic graminoid plant communities. This translates to native grasses/sage in the uplands, and the following communities in the riparian buffers: black cottonwood/willow in the East Steens Ecological Province; aspen/alder/willow in the Pueblo Mountains Ecological Province; mesic graminoid/willow in the highest headwaters and aspen/willow a little lower down (willow/alder/aspen) in the Trout Creek Mountains Ecological Province, and aspen in the Willow-Whitehorse Ecological. The natural factors that influence seral status include cooler summer temperatures in the high elevations and available water for plants throughout the growing season. The human-related factors include reduced grazing pressure due to limited access to rugged terrain and a restricted season of use. The recurrence interval, or frequency, of wildfires in these headwater reaches tends to occur on 15-25 year intervals in the mountain big sage upland community type and 60-90 year intervals in riparian areas. In contrast, in disturbed riparian areas, wildfires recur much more frequently at 15-25 year return intervals. The reduced fire frequency for undisturbed areas allows plant communities to grow and prosper to a state of dynamic equilibrium.

The seral status of plant communities at lower elevations is not at *system potential* for most streams; however many of these reaches are at or near riparian vegetation community potential, yet lack potential structure (maturity) and/or longitudinal distribution. The vegetative trend is advancing in seral stage rather than declining. These lower elevation reaches experience natural and human caused factors that influence community development. The natural factors influencing seral status include a limited supply of available water after spring runoff; hydraulic disturbance from extreme runoff events, particularly from the East Steens Mountain region; and, an increased frequency of wildfire recurrence due to high winds, low relative humidity, and arid upland conditions. Exacerbating the risk of wildfire is the presence of non-native cheatgrass often related to land management. The colonization of cheatgrass can increase fuel continuity in the Wyoming big sagebrush community and function to carry fire more readily than areas without cheatgrass. The human caused factors affecting plant community development are related to historic, or legacy, livestock management practices. These practices altered upland community types from fire-adapted native plant species to exotic species, de-stabilized stream channels, and denuded riparian areas of vegetation that provide shade. While the effects of past practices exist today, there is an obvious trend toward improvement in land management and the corresponding health of riparian areas and channel stability.

***The management emphasis for improving riparian buffers should be to: (1) maintain existing reaches currently at system potential vegetation, and (2) implement management measures to actively and passively restore reaches currently not at potential to their system potential.*** Additional time and a continuing trend of improving management will be necessary to achieve the advanced seral status needed to comply with the TMDL. Shade curves were presented in **Section 2.7.2** of the TMDL for each Ecological Province to help guide land management (**Figures 2-29** to **2-39**). These curves are repeated in the WQMP in **Section A.4** along with the tables describing the *system potential* community expected for each elevation zone in the Ecological Provinces. The shade curves represent the general relationship between *system potential* shade and stream bankfull width. While these curves don't provide specific shade or in-stream temperature targets for individual streams, they do provide a quick and accurate estimate of the amount of shade needed to ensure that there is no measurable increase in in-stream temperatures resulting from human caused activities. It is ODEQ's expectation that implementation plans will target the *system potential* shade identified in these Ecological Province shade curves, where practicable.

#### *A.3.1.1.2 Channel Stability*

A stream that is wide and shallow will potentially be subject to greater solar heating than one that is narrow and deep. The removal of streamside vegetation reduces bank stability leading to increased sediment loads and a wider stream channel.

An assessment of channel stability was performed on representative streams within the Alvord Lake Subbasin using Rosgen's Level II & III Departure Analysis. The objective of these surveys was to determine if the stream channels were stable and capable of delivering sediment at bankfull or greater flows. The parameters used to determine morphological characteristics include valley type, bankfull width and depths, width/depth ratio, flood prone width, entrenchment, sinuosity and others. If a particular stream or segment indicated an unstable channel form such as type 'A3', 'G' or 'F', additional surveys were performed on that stream to complete the Level III stability analysis (Pfankuch, Channel Stability Evaluation and Stream Classification Summary).

The majority of streams surveyed in the subbasin are considered morphologically stable. That is, the channel types are a stable form ('B', 'C', 'E'), stream characteristics (dimension, pattern, and profile) are consistent with valley types, the streams are not aggrading or degrading beyond normal channel adjustments, and sensitive indicators like width/depth ratios are relatively low (mean w/d ratios 12). There are exceptions, however: Willow Creek in the Trout Creek Mountains, and Willow Creek in the East Steens Mountain.

The 1998 Level III fluvial geomorphology survey of Willow Creek (Trout Creek Mountains) revealed a 12.6' headcut or 'G' channel type, and an unstable channel condition in the lowest reach below the Whitehorse Ranch Road. The headcut or head ward advance has terminated at a basalt formation where it is considered stable from further migration. Unfortunately, the headcut serves as a permanent fish passage barrier for fish migrating upstream. The source of the headcut is unknown. The unstable channel conditions below the Whitehorse Ranch Road are directly attributed to the current management of livestock and wild horses. The 2001 survey of Willow Creek indicates the headcut remains stable but the disequilibrium associated with the lower reach continues as evidenced by aggradations or deposition of fine sediment (D50 1.7 mm) and highly unstable banks. The removal of streamside vegetation has reduced bank stability leading to increased sediment loads and a wider stream channel. ***This issue needs to be addressed in the Water Quality Restoration Plan as a management concern.***

Willow Creek and other streams located in the East Steens Mountain region experience deposition of boulder-to-cobble size material in the mid-to-lower reaches as a result of hydraulic disturbance. Willow Creek originates high in the Steens Mountain at a peak elevation of approximately 9500 feet. The elevation change from the peak of the rim to the valley floor is a 5000 feet drop over 4.6 miles (21% average slope). This energy gradient provides a high capacity for sediment transport (stream power) during runoff events. Peak flows transport large particles of alluvial materials downstream to the point where transport power diminishes and deposition occurs as a function of gradient (roughly mid-elevation). Two phenomena take place where sediment is deposited: sediment disequilibria resulting in avulsion (channel shift or redistribution), or anastomosis (multiple thread channels); and, the creation of a porous coarse-grained alluvial fan that allows surface water to drain sub-surface to ground water or as hyporheic underflow. As a result, the perennial flows in Willow Creek reach only about 50% of its total channel length. The stream below the deposition feature is dry most of the year starting in July. The ODEQ considers this natural event that has been occurring over geologic time and unrelated to human caused activities.

The surrogate measure developed in the temperature TMDLs provides for the establishment of a *system potential* riparian community. The *system potential* riparian community will not only provide shade but will also stabilize stream banks, resulting in a reduction in sediment inputs and subsequent decreases in channel width. Therefore the surrogate measures established for temperature will benefit channel width and sediments as well.

#### *A.3.1.1.3 Flow*

The temperature change produced by a given amount of heat is inversely proportional to the volume of water heated or, in other words, a stream with less flow will heat faster than a stream with more flow given all other channel and riparian characteristics are the same (Brown 1983).

Summer base flows in the lower reaches of Alvord Lake Subbasin streams are reduced by water withdrawals for irrigation and lose-gain phenomenon in some streams. The out-of-stream beneficial uses of the water from these streams are primarily irrigation and domestic uses. The subbasin has dedicated water rights for irrigation and other uses. There are in-stream water rights appropriated to ODFW for the protection of fish in the Alvord Lake Subbasin in Trout Creek, Little Trout Creek, and East Fork of Big Trout Creek. Although water withdrawal affects stream temperature, this TMDL recognizes irrigation withdrawals as a legitimate use.

## A.3.2 Goals and Objectives

The overall goal of the WQMP is to achieve compliance with water quality standards for each of the 303(d) listed parameters and streams in the subbasin. The WQMP describes all DMA plans or processes that are or will be in place to address the load allocations in the TMDL. The specific goal of this WQMP is to describe a strategy for reducing solar loading from nonpoint sources to the level of the load allocations described in the TMDL. As discussed above, this plan is preliminary in nature and is designed to be adaptive as more information is gained regarding the pollutants, allocations, management measures, and other related areas. In order for the WQMP to meet its goal, ODEQ expects DMAs to fulfill the following objectives:

- Develop and implement Best Management Practices (BMPs) or other management measures to achieve Load Allocations.
- Give reasonable assurance that management measures will meet load allocations through both quantitative and qualitative analysis of management measures.
- Adhere to measurable milestones for progress.
- Develop a timeline for implementation, with reference to costs and funding.
- Develop a monitoring plan to determine if:
  (a) BMPs are being implemented
  (b) Individual BMPs are effective
  (c) Load allocations are being met
  (d) Water quality standards are being met

## A.3.3 Proposed Management Strategies

This section of the plan outlines the proposed management measures that are designed to meet the load allocations of each TMDL. ODEQ has assembled an initial listing of management categories that are to be considered by DMAs as they develop implementation plans (**Table A-2**). The following listing is not meant to be comprehensive, but to allow DMAs maximum local flexibility with source assessment or development of local management strategies. DMAs may need to develop other source categories and management strategies to meet their specific situations. ODEQ does expect that Implementation Plans will address how human activities will be managed to improve water quality with appropriate management strategies. In addition, ODEQ will provide guidance to assist DMAs with developing TMDL Implementation Plans.

**Table A-2. Management Categories and Measures for Controlling In-stream Temperature**

| |
|---|
| Public Awareness/Education |
| General and Targeted Outreach |
| New Development and Construction |
| Planning Procedures |
| Permitting/Design |
| Construction and Post-construction Control Activities |
| Subbasin-wide Riparian Area Management |
| Revegetation |
| Streambank Stabilization |
| General and Targeted Outreach |
| Federal Land Management |
| Riparian Area Management |
| Targeted Outreach |
| Streambank Stabilization |
| Wildfire Prevention/Suppression |
| Season of Use |
| Borax Lake Geothermal Sources |
| Uplands Management |
| Exotic Plants Impacting Riparian Communities |
| BMP Monitoring and Evaluation |
| Instream Monitoring |
| BMP Implementation Monitoring |
| Agricultural Practices |
| Streambank Stabilization |
| Riparian Area Management |
| General and Targeted Outreach |
| Season of Use |
| Uplands Management |
| BMP Monitoring and Evaluation |
| Instream Monitoring |
| BMP Implementation Monitoring |
| Forest Practices |
| Riparian Area Management |
| Season of Use |
| BMP Monitoring and Evaluation |
| Transportation |
| Road Construction/ Maintenance/Repair |

## A.3.4 Timeline for Implementing Management Strategies

DMA-specific Implementation Plans are designed to reduce pollutant loads from sources to meet TMDLs, associated loads and water quality standards. ***Individual Implementation Plans are referenced in this document and are not attached as appendices***. It is expected that, if they are not already doing so, DMAs will begin implementation of management strategies in 2004 (see **Section A.3.9**). Each DMA-specific Implementation Plan will include a timeline for implementation. Timelines should be as specific as possible and should include a schedule for BMP installation and/or evaluation, monitoring schedules, reporting dates and milestones for evaluating progress.

## A.3.5 Relationship of Management Strategies to Attainment of Water Quality Standards

**Section A.3.1** provides and extensive discussion on how riparian vegetation and channel morphology management measures can affect temperature. In addition, **Section 2.4.3** of the TMDL (the discussion of

nonpoint sources of heat for the Alvord Lake Subbasin) and **Section 3.4.3.4** of the TMDL (the results of the Willow Creek thermal response simulations) together provide a clear explanation of how implementing riparian area management strategies will result in attainment of water quality standards. In addition, it is expected that, in the Implementation Plans, management measures should be directly linked with their effectiveness at reducing pollutant loading contributions and attainment of water quality standards.

## A.3.6 Timeline for Attainment of Water Quality Standards

Implementation Plans are designed to reduce pollutant loads to meet TMDLs. ODEQ recognizes that it may take several decades after full implementation before management practices identified in a WQMP become fully effective in reducing and controlling instream temperatures. In addition, ODEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques. It is possible that after application of all reasonable best management practices, some TMDLs or their associated surrogates cannot be achieved as originally established. However, ODEQ does expect that water quality standards will be attained as soon as reasonably feasible given technical, political, and economic constraints.

## A.3.7 Identification of Responsible Participants or DMAs

The purpose of this element is to identify the organizations responsible for the implementation of the plan and to list the major responsibilities of each organization. A more detailed discussion of each organization's responsibilities is provided in **Section A.3.8**. The following list is not intended to be an exhaustive list of every participant that bears some responsibility for improving water quality in the Alvord Lake Subbasin. Because this is a community wide effort, a complete listing would have to include every business, every industry, every farm, and ultimately every citizen living or working within subbasin.

**Oregon Department of Environmental Quality**
- NPDES Permitting and Enforcement
- WPCF Permitting and Enforcement
- Technical Assistance
- Financial Assistance

**Oregon Department of Agriculture**
- Agricultural Water Quality Management Area Plan Development and Implementation
- Area Rule Enforcement
- CAFO Permitting and Enforcement
- Technical Assistance
- Revise Agricultural WQMAP
- Rules under Senate Bill (SB) 1010 to clearly address TMDL and Load Allocations as necessary.
- Conservation Reserve Enhancement Program
- Riparian area management

**Oregon Department of Forestry**
- Forest Practices Act (FPA) Implementation
- Revise statewide FPA rules and/or adopt subbasin specific rules as necessary.
- Riparian area management

**Oregon Department of Transportation**
- Routine Road Maintenance, Water Quality and Habitat Guide Best Management Practices
- Pollution Control Plan and Erosion Control Plan
- Design and Construction

**Federal Land Management Agencies** (BLM)
- Implementation of Federal Land Policy and Management Act

- Development of Water Quality Restoration Plans (WQRPs) on 303 (d) listed streams
- Following standards and Guidance listed in INFISH

**Table A-3**, below, shows stream segments where the Alvord Lake Subbasin TMDLs apply along with the responsible DMAs. The TMDLs are established for streams in the Alvord Lake Subbasin that are either listed on the 2002 303(d) list (http://www.deq.state.or.us/) or are tributaries to streams identified on the 303(d) list. To ensure protection of salmonid fish that reside in streams that are not listed on the 303d list, it is also established for those unlisted streams that contain salmonid fish or that are tributaries to streams that contain salmonid fish.

**Table A-3. Geographic Coverage of Designated Management Agencies**

| Stream | TMDL Parameters | Designated Management Agencies |
|---|---|---|
| **East Steens Mountain** | | |
| Big Alvord Creek | Temperature | BLM, ODA, ODF |
| Buena Vista Creek | Temperature | BLM, ODA, ODF |
| Cottonwood Creek | Temperature | BLM, ODA, ODF |
| Little Alvord Creek | Temperature | BLM, ODA, ODF |
| Little McCoy Creek | Temperature | BLM, ODA, ODF |
| Little Wildhorse Creek | Temperature | BLM, ODA, ODF |
| Mann Creek | Temperature | BLM, ODA, ODF |
| Mosquito Creek | Temperature | BLM, ODA, ODF |
| Pike Creek | Temperature | BLM, ODA, ODF |
| Wildhorse Creek | Temperature | BLM, ODA, ODF |
| Willow Creek | Temperature | BLM, ODA, ODF |
| **Pueblo Mountains** | | |
| Denio Creek | Temperature | BLM, ODA, ODF |
| Van Horn Creek | Temperature | BLM, ODA, ODF |
| **Trout Creek Mountains** | | |
| Big Trout Creek | Temperature | BLM, ODA, ODF |
| East Fork Big Trout Creek | Temperature | BLM, ODA, ODF |
| Little Trout Creek | Temperature | BLM, ODA, ODF |
| Trout Creek | Temperature | BLM, ODA, ODF, ODOT |
| Unnamed tributary to Trout Creek at RM 13.8 | Temperature | BLM, ODA, ODF |
| **Willow/Whitehorse** | | |
| Antelope Creek | Temperature | BLM, ODA, ODF |
| Cottonwood Creek | Temperature | BLM, ODA, ODF |
| Doolittle Creek | Temperature | BLM, ODA, ODF |
| Fifteenmile Creek | Temperature | BLM, ODA, ODF |
| Little Whitehorse Creek | Temperature | BLM, ODA, ODF |
| Whitehorse Creek | Temperature | BLM, ODA, ODF |
| Sheepline Creek | Temperature | BLM, ODA, ODF |
| Willow Creek | Temperature, Dissolved Oxygen | BLM, ODA, ODF, ODOT |
| Jawbone Creek | Temperature, Dissolved Oxygen | BLM, ODA, ODF |
| Unnamed tributary to Little Whitehorse Creek near headwaters | Temperature | BLM, ODA, ODF |
| Unnamed tributary to Jawbone Creek | Temperature, Dissolved Oxygen | BLM, ODA, ODF |
| BLM=Bureau of Land Management, ODA=Oregon Dept. of Agriculture, ODF=Oregon Dept. of Forestry, ODOT=Oregon Dept. of Transportation | | |

# A.3.8 Identification of Sector-specific Implementation Plans

The following identifies the status of sector-specific or source specific implementation plans as of the writing of this document.

## A.3.8.1 NPDES and WPCF Permit Programs

The ODEQ administers two different types of wastewater permits in implementing Oregon Revised Statute (ORS) 468B.050. These are: the National Pollutant Discharge Elimination System (NPDES) permits for surface water discharge; and Water Pollution Control Facilities (WPCF) permits for onsite (land) disposal. The NPDES permit is also a Federal permit, which is required under the Clean Water Act for discharge of waste into waters of the United States. ODEQ has been delegated authority to issue NPDES permits by the EPA. The WPCF permit is unique to the State of Oregon.

There are presently no NPDES or WPCF permits in the Alvord Lake Subbasin. If any new permits are issued, they will be written to insure that all 303(d) related issues are addressed in the permit.

## A.3.8.2 Nonpoint Sources

### *A.3.8.2.1 State Forestry*

The Oregon Department of Forestry (ODF) is the designated management agency for regulation of water quality on non-federal forestlands. The Oregon Board of Forestry (BOF), in consultation with the Environmental Quality Commission (EQC), establish best management practices (BMPs) and other rules to ensure that, to the maximum extent practicable, non-point source pollution resulting from forest operations does not impair the attainment of water quality standards. The Board of Forestry has adopted water protection rules, including but not limited to OAR Chapter 629, Divisions 635-660, which describe BMPs for forest operations. These rules are implemented and enforced by ODF and monitored to assure their effectiveness**.**

By statute, forest operators conducting operations in accordance with the BMPs are considered to be in compliance with Oregon's water quality standards. ODF provides on the ground field administration of the Forest Practices Act (FPA). For each administrative rule, guidance is provided to field administrators to insure proper, uniform and consistent application of the Statutes and Rules. The FPA requires penalties, both civil and criminal, for violation of Statutes and Rules. Additionally, whenever a violation occurs, the responsible party is obligated to repair the damage.

ODF and ODEQ are involved in several statewide efforts to analyze the existing FPA measures and to better define the relationship between the TMDL load allocations and the FPA measures designed to protect water quality. How water quality parameters are affected, as established through the TMDL process, as well as other monitoring data, will be an important part of the body of information used in determining the adequacy of the FPA.

As the DMA for water quality management on nonfederal forestlands, the ODF has recently completed working with the ODEQ through a memorandum of understanding (MOU) signed in April of 1998. This MOU was designed to improve the coordination between the ODF and the ODEQ in evaluating and proposing possible changes to the forest practice rules as part of the Total Maximum Daily Load process. The purpose of the MOU was also to guide coordination between the ODF and ODEQ regarding water quality limited streams on the 303d list. An evaluation of rule adequacy has been conducted (also referred to as the "Sufficiency Analysis") through the analysis of water quality parameters that can potentially be affected by forest practices.

This statewide demonstration of forest practices rule effectiveness in the protection of water quality addressed the following specific parameters:

1) Temperature
2) Sediment
3) Turbidity

4) Aquatic habitat modification
5) Bio-criteria

The Sufficiency Analysis final report has been externally reviewed by peers and other interested parties. The report was designed, in part, to provide background information and assessments of BMP effectiveness in meeting water quality standards. The report demonstrates overall FPA adequacy at the statewide scale with due consideration to regional and local variation in effects. Achieving the goals and objectives of the FPA will ensure the achievement and maintenance of water quality goals. The report offers recommendations to highlight general areas where current practices could be improved in order to better meet the FPA goals and objectives and in turn provide added assurance of meeting water quality standards. The Board of Forestry will consider these recommendations, along with the FPAC recommendations, in their on-going review of the FPA in order to determine whether revisions and/or additional voluntary approaches are necessary consistent with ORS 527.710 and ORS 527.714. The final Sufficiency Analysis is available for viewing at: http://www.deq.state.or.us/wq/nonpoint/nonpoint.htm

ODF and ODEQ statutes and rules include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, ORS 183.310, OAR 340-041-0026, OAR 629-635-110, and OAR 340-041-0120.

Overall, it is anticipated that forestry-related activities on private lands in the Alvord Lake Subbasin will be nominal due to limited availability of commercial species such as ponderosa pine. The mostly likely harvesting scenario involving ODF would involve juniper removal on uplands of 120 acres or greater in size.

#### *A.3.8.2.2 Agriculture*

It is the Oregon Department of Agriculture's (ODA) statutory responsibility to develop Agricultural Water Quality Management Area Plans (AWQMAP) and enforce rules that address water quality issues on agricultural lands. The AWQMA Act directs ODA to work with local farmers and ranchers to develop AWQMAPs for specific watersheds that have been identified as violating water quality standards. The AWQMAPs identify problems in the watershed that need to be addressed and outline ways to correct those problems. The plans are developed at the local level and reviewed by the State Board of Agriculture. The accompanying regulations are then adopted into the Oregon Administrative Rules. It is the intent that these plans focus on education, technical assistance, and flexibility in addressing agriculture water quality issues. These plans and rules will be developed or modified to achieve water quality standards and will address the load allocations identified in the TMDL. In those cases when an operator refuses to take action, the law allows ODA to take enforcement action. ODEQ will work with ODA to ensure that rules and plans meet load allocations.

The ODA drafted an AWQMAP for the Greater Harney Basin (which includes the Alvord Lake Subbasin) in 2003. The plan was adopted by the Board of Agriculture for adoption in September, 2003. The Plan and Rules are available from ODA's website at http://www.oda.state.or.us/nrd/water_quality/areapr.html. Recognizing the adopted rules need to be quantitatively evaluated in terms of load allocations in the TMDL and pursuant to the June 1998 Memorandum of Agreement between ODA and ODEQ, the agencies will conduct a technical evaluation commencing 2005. The agencies will establish the relationship between the plan and its implementing rules and the load allocations in the TMDL to determine if the rules provide reasonable assurance that the TMDLs will be achieved. The Local Advisory Committee (LAC) for the Greater Harney Basin Agricultural Water Quality Management Area will be apprised and consulted during this evaluation. This adaptive management process provides for review of the management plan to determine if any changes are needed to the current rules specific to the subbasin.

#### *A.3.8.2.3 Transportation*

The Oregon Department of Transportation (ODOT) has been issued a statewide NPDES MS4 waste discharge permit. Included with ODOT's application for the permit was a surface water management plan which has been approved by ODEQ and which addresses the requirements of a Total Maximum Daily Load (TMDL) allocation for pollutants associated with the ODOT system. Both ODOT and ODEQ agree that the provisions of the permit and the surface water management plan will apply to ODOT's statewide system.

This statewide approach for an ODOT TMDL watershed management plan addresses specific pollutants, but not specific watersheds. Instead, this plan demonstrates how ODOT will incorporate water quality protection into project development, construction, and operations and maintenance of the state and federal transportation system that is managed by ODOT, thereby meeting the elements of the National Pollutant Discharge Elimination System (NPDES) program, and the TMDL requirements.

**The MS4 permit and the plan:**

- Streamlines the evaluation and approval process for the watershed management plans
- Provides consistency to the ODOT highway management practices in all TMDL watersheds.
- Eliminates duplicative paperwork and staff time developing and participating in the numerous TMDL management plans.

Temperature and sediment are the primary concerns for pollutants associated with ODOT systems that impair the waters of the state. ODEQ is still in the process of developing the TMDL water bodies and determining pollutant levels that limit their beneficial uses. As TMDL allocations are established by watershed, rather than by pollutants, ODOT is aware that individual watersheds may have pollutants that may require additional consideration as part of the ODOT watershed management plan. When these circumstances arise, ODOT will work with ODEQ to incorporate these concerns into the statewide plan.

#### *A.3.8.2.4 Federal Lands*

All management activities on federal lands managed by the Bureau of Land Management must follow standards and guidelines (S&Gs) as listed in the respective Land Use Resource Management Plans (RMPs), as amended, for the specific land management units.

In response to environmental concerns and litigation related to timber harvest and other operations on Federal Lands, the Bureau of Land Management (BLM) commissioned the Forest Ecosystem Management Assessment Team (FEMAT) to formulate and assess the consequences of management options. The assessment emphasizes producing management alternatives that comply with existing laws and maintaining the highest contribution of economic and social well being. The foundation of ecosystem management rest on a network of late-successional forests and interim and long-term schemes that protect aquatic and associated riparian habitats and provide for *threatened species* and *at risk species*.

ODEQ and BLM signed a Memorandum of Agreement (MOA) in July, 2003 that defines the process by which the agencies will cooperatively meet State and Federal water quality rules and regulations. This agreement recognizes the BLM as the DMA for BLM-administered lands in Oregon and identifies Water Quality Restoration Plans (WQRPs) as the TMDL implementation plan for BLM-administered lands. The WQRPs are anticipated to outline BMPs necessary to achieve water quality standards and to address the nonpoint load allocations. The U.S. Forest Service and BLM have developed a protocol to be used to guide the development of WQRPs (USFS 1999).

The Alvord Lake Subbasin is administered by the Burns District and Vale Districts of BLM. The Burns District Office administers the area covered by the East Steens Mountain, Pueblo Mountains, and Trout Creek Mountains Ecological Provinces. The Vale District Office administers the Willow-Whitehorse Ecological Province. It is expected that each office will develop a WQRP for their respective management areas. A draft of the WQRP developed by the Burns District Office was reviewed by ODEQ in May, 2003 and a final is expected by early 2004. The Vale District Office is conducting an assessment of riparian and upland conditions in a larger geographic area which includes the Willow-Whitehorse Ecological Province. Information gathered from that assessment will be used to develop a WQRP for that area. The WQRP is expected to be complete by the end of 2004.

#### *A.3.8.2.4 Rural Sources*

Oregon cities and counties have authority to regulate land use activities through local comprehensive plans and related development regulations. Every county is required to have a comprehensive plan and accompanying development ordinances to be in compliance with state land use planning goals. Many of the goals have a direct connection to water quality, particularly Goals 5 and 6. While the comprehensive

plan must serve to implement the statewide planning goals mandated by state law, counties have a wide degree of local control over how resource protection is addressed in their community.

At this time, ODEQ does not consider either Malheur or Harney County to be a DMA. It is unlikely that either Harney or Malheur County would have regulatory responsibilities over activities that would significantly influence stream temperature. Given the extremely rural character of the Alvord Lake Subbasin, riparian activities on private land would either be managed under the Agricultural Water Quality Management Area Plan or under the Forest Practices Act.

## A.3.9 Schedule for Preparation and Submission of Implementation Plans

The purpose of this element of the WQMP is to demonstrate a strategy for implementing and maintaining the plan and the resulting water quality improvements over the long term. Included in this section are timelines for the implementation of ODEQ activities and the preparation and submission of implementation plans by DMAs.

ODEQ intends to regularly review progress of the Implementation Plans. The plans, this overall WQMP, and the TMDLs are part of an adaptive management process. Review of the TMDLs, WQMP and Implementation Plans are expected to occur approximately five years after the final approval of the TMDLs, as resources allow or whenever deemed necessary by ODEQ. **Table A-4** below, gives the timeline for activities related to the WQMP and associated DMA Implementation Plans.

**Table A-4. Water Quality Management Plan Timeline**

| Activity | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | | 2008 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMA Development and Submittal of Implementation and Monitoring Plans | ■ | ■ | ■ | ■ | | | | | | | | |
| DMA Implementation of Plans | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| DMA Submittal of Implementation Reports | | | | | | | | | | | ■ | ■ |
| ODEQ/DMA/Public Review of TMDL and WQMP | ■ | ■ | | | | | | | | | ■ | ■ |

## A.3.10 Reasonable Assurance

This section of the WQMP is intended to provide reasonable assurance that the WQMP (along with the associated DMA-specific Implementation Plans) will be implemented and that the TMDL and associated allocations will be met.

There are several programs that are either already in place or will be put in place to help assure that this WQMP will be implemented. Some of these are traditional regulatory programs such as specific requirements under NPDES discharge permits. Other programs address nonpoint sources under the auspices of State law (for forested and agricultural lands) and voluntary efforts. The status of these different programs in the Alvord Lake Subbasin was summarized in **Section A.3.8**.

Upon approval of the TMDLs, it is ODEQ's expectation that the identified, responsible participants will develop, submit to ODEQ, and implement individual Implementation Plans that will achieve the load allocations established by the TMDLs. These activities will be accomplished by the responsible participants in accordance with the schedule outlined in **Section A.3.9**. Where not already codified in a sector-specific plan or process, the DMA specific water quality management plans must address the following items:

1) Proposed management measures tied to attainment of the load allocations and/or established surrogates of the TMDLs, such as vegetative *system potential* for example.
2) Timeline for implementation.
3) Timeline for attainment of load allocations.
4) Identification of responsible participants demonstrating who is responsible for implementing the various measures.
5) Reasonable assurance of implementation.
6) Monitoring and evaluation, including identification of participants responsible for implementation of monitoring, and a plan and schedule for revision of implementation plan.
7) Public involvement.
8) Maintenance effort over time.
9) Discussion of cost and funding.
10) Citation of legal authority under which the implementation will be conducted.

Should any responsible participant fail to comply with their obligations under this WQMP, ODEQ will take all necessary action to seek compliance. Such action will first include negotiation, but could evolve to issuance of Department or Commission Orders and other enforcement mechanisms.

## A.3.11 Monitoring and Evaluation

Monitoring and evaluation has two basic components: 1) implementation of DMA specific water quality management plans identified in this document; and, 2) assessment of physical, chemical and biological parameters for water quality and specific management measures. This information will provide information on progress being made toward achieving TMDL allocations and achieving water quality standards and to use to evaluate progress as described under Adaptive Management in **Section A.2**.

The information generated by each of the agencies/entities gathering data in the subbasin will be pooled and used to determine whether management actions are having the desired effects or if changes in management actions and/or TMDLs are needed. This detailed evaluation will typically occur on a five year cycle. If progress is not occurring then the appropriate management agency will be contacted with a request for action.

The objectives of this monitoring effort are to demonstrate long-term recovery, better understand natural variability, track implementation of projects and BMPs, and track effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the “reasonable assurance of implementation” for the Alvord Lake Subbasin WQMP.

Because the majority of the land in the Alvord Lake Subbasin is either owned by BLM or managed for private agriculture, it is anticipated that monitoring efforts will primarily occur as described in the AWQMA plan for agriculture and the WQRPs for BLM lands. Although these plans have not yet been developed in response to an approved TMDL, it is anticipated that monitoring efforts will consist of some of the following types of activities:

- Reports on the numbers, types and locations of projects, BMPs and educational activities completed
- In-stream temperature monitoring to track progress towards achieving water quality numeric criteria
- Landscape scale monitoring to assess upland and riparian conditions
- Monitoring riparian vegetation communities and shade to assess progress towards achieving system potential targets established in the TMDL

## A.3.12 Public Involvement

To be successful at improving water quality a TMDL WQMP must include a process to involve interested and affected stakeholders in both the development and the implementation of the plan. In addition to the ODEQ public notice policy and public comment periods associated with TMDLs, future TMDL public

involvement efforts will focus specifically on agricultural and BLM activities. DMA-specific public involvement efforts will be detailed within their Implementation Plans.

Public involvement is also enhanced through direct association and contact with existing public groups that work toward restoration and environmental protection. The Harney County Watershed Council, the Local Advisory Committee for the Greater Harney Basin Agricultural Water Quality Management Area, the Harney County Soil and Water Conservation District, BLM and ODFW will all continue to play an important role in development and implementation of TMDLs and WQMPs in the Alvord Lake Subbasin.

## A.3.13 Planned Efforts to Maintain Management Strategies over Time

In response to Alvord Lake Subbasin TMDLs, each DMA will need to develop an Implementation Plan to address the TMDL parameters and load allocations affecting their jurisdiction. The Implementation Plan will describe the management strategies needed to achieve water quality standards within each jurisdiction. ODEQ will review and approve each plan. Each DMA will need to submit a report describing the implementation efforts underway and noting changes in water quality every five years. ODEQ will review these plans and recommend changes to individual Implementation Plans if necessary.

## A.3.14 Costs and Funding

The purpose of this element is to describe estimated costs and demonstrate there is sufficient funding available to begin implementation of the WQMP. Another purpose is to identify potential future funding sources for project implementation. There are many natural resource enhancement efforts and projects occurring in the subbasin which are relevant to the goals of the plan. These efforts, in addition to proposed future actions are described in the Management Measurers element of this Plan. DMAs will be expected to provide a fiscal analysis of the resources needed to develop, execute and maintain the programs described in their Implementation Plans.

**Potential Sources of Project Funding**
Funding is essential to implementing projects associated with this WQMP. There are many sources of local, state, and federal funds. The following is a partial list of assistance programs available in the subbasin.

| Program | Agency/Source |
|---|---|
| Oregon Plan for Salmon and Watersheds | OWEB |
| Environmental Quality Incentives Program | USDA-NRCS |
| Wetland Reserve Program | USDA-NRCS |
| Conservation Reserve Enhancement Program | USDA-NRCS |
| Stewardship Incentive Program | ODF |
| Access and Habitat Program | ODFW |
| Partners for Wildlife Program | USDI-FSA |
| Conservation Implementation Grants | ODA |
| Water Projects | WRD |
| Nonpoint Source Water Quality Control (EPA 319) | ODEQ-EPA |
| Riparian Protection/Enhancement | COE |
| Oregon Community Foundation | OCF |

Grant funds are available for improvement projects on a competitive basis. Field agency personnel assist landowners in identifying, designing, and submitting eligible projects for these grant funds. For private landowners, the recipient and administrator of these grants is generally the local Soil and Water Conservation District. Grant fund sources include:

**Oregon Watershed Enhancement Board (OWEB)** funds watershed improvement projects with State money. This is an important piece in the implementation of Oregon's Salmon Plan. Current and past

projects have included road relocation/closure/improvement projects, in-stream structure work, riparian fencing and re-vegetation, off stream water developments, and other management practices.

## A.3.15 Citation to Legal Authorities

### A.3.15.1 Clean Water Act Section 303(d)

Section 303(d) of the 1972 Federal Clean Water Act as amended requires states to develop a list of rivers, streams and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. Waters that need this additional help are referred to as "water quality limited". Water quality limited waterbodies must be identified by the Environmental Protection Agency (EPA) or by a state agency which has been delegated this responsibility by EPA. In Oregon, this responsibility rests with ODEQ. ODEQ updates the list of water quality limited waters every two years. The list is referred to as the 303(d) list. Section 303 of the Clean Water Act further requires that Total Maximum Daily Loads (TMDLs) be developed for all waters on the 303(d) list. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. A WQMP is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL, which is designed to restore the water quality and result in compliance with the water quality standards. In this way, the designated beneficial uses of the water will be protected for all citizens.

### A.3.15.2 Oregon Revised Statute

The Oregon Department of Environmental Quality is authorized by law to prevent and abate water pollution within the State of Oregon pursuant to the following statute:

ORS 468B.020 Prevention of pollution (1) Pollution of any of the waters of the state is declared to be not a reasonable or natural use of such waters and to be contrary to the public policy of the State or Oregon, as set forth in ORS 468B.015.

(2) In order to carry out the public policy set forth in ORS 468B.015, the department shall take such action as is necessary for the prevention of new pollution and the abatement of existing pollution by:

(a) Fostering and encouraging the cooperation of the people, industry, cities and counties, in order to prevent, control and reduce pollution of the waters of the State; and
(b) Requiring the use of all available and reasonable methods necessary to achieve the purposes of ORS 468B.015 and to conform to the standards of water quality and purity established under ORS 468B.048.

### A.3.15.3 Oregon Administrative Rules

The following Oregon Administrative Rules provide numeric and narrative criteria for parameters of concern in the subbasin:

TMDL Parameter: Temperature
Applicable Rules: OAR 340-41-026(3)(a)(D)
OAR 340-41-006(54) and (55)
OAR 340-41-0885 (2) (b)

TMDL Parameter: Dissolved Oxygen
Applicable Rules: OAR 340-041-0885 (2) (a)

### A.3.15.4 Oregon Forest Practices Act

The Oregon Department of Forestry (ODF) is the designated management agency for regulation of water quality on non-federal forest lands. The Board of Forestry has adopted water protection rules, including but

not limited to OAR Chapter 629, Divisions 635-660, which describes BMPs for forest operations. The Environmental Quality Commission (EQC), Board of Forestry, ODEQ and ODF have agreed that these pollution control measurers will be relied upon to result in achievement of state water quality standards.

ODF and ODEQ statutes and rules also include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, ORS 183.310, OAR 340-041-0026, OAR 629-635-110, and OAR 340-041-0120.

### A.3.15.5 Senate Bill 1010

The Oregon Department of Agriculture has primary responsibility for control of pollution from agriculture sources. This is accomplished through the Agriculture Water Quality Management Area (AWQMA) program authorities granted ODA under Senate Bill 1010 Adopted by the Oregon State Legislature in 1993 (ORS 569.000 through 568.933) and under Senate Bill 502 adopted in 1995 (ORS 561.191). The AWQMA Act directs the ODA to work with local farmers and ranchers to develop water quality management plans for specific watersheds that have been identified as violating water quality standards and have agriculture water pollution contributions. The agriculture water quality management area plans are expected to identify problems in the watershed that need to be addressed and outline ways to correct the problems. The plans are accompanied by regulations in OAR 603-90 and portions of OAR 603-95, which are enforceable by ODA.

### A.3.15.6 Oregon Department of Transportation

The Oregon Department of Transportation (ODOT) has been issued an NPDES MS4 waste discharge permit. Included with ODOT's application for the permit was a surface water management plan which has been approved by ODEQ and which addresses the requirements of a Total Maximum Daily Load (TMDL) allocation for pollutants associated with the ODOT system. Both ODOT and ODEQ agree that the provisions of the permit and the surface water management plan will apply to ODOT's statewide system. This statewide approach for an ODOT TMDL watershed management plan addresses specific pollutants, but not specific watersheds. Instead, this plan demonstrates how ODOT will incorporate water quality protection into project development, construction, and operations and maintenance of the state and federal transportation system that is managed by ODOT, thereby meeting the elements of the National Pollutant Discharge Elimination System (NPDES) program, and the TMDL requirements.

### A.3.15.7 Bureau of Land Management

ODEQ and BLM have a Memorandum of Agreement (MOA) that was signed in July, 2003 which defines the process by which the agencies will cooperatively meet State and Federal water quality rules and regulations. This agreement recognizes the BLM as the DMA for BLM-administered lands in Oregon and identifies Water Quality Restoration Plans (WQRPs) as the TMDL implementation plan for BLM-administered lands. The WQRPs are anticipated to outline BMPs necessary to achieve water quality standards and to address the nonpoint load allocations.

### A.3.15.8 Local Ordinances

Within the Implementation Plans, the DMAs are expected to describe their specific legal authorities to carry out the management measures they choose to meet the TMDL allocations. Legal authority to enforce the provisions of a City's NPDES permit would be a specific example of legal authority to carry out management measures.

## A.3.16 Identification of Voluntary Programs/Incentives to Implement Management Strategies

The Oregon Plan for Salmon and Watersheds represents a major effort, unique to Oregon, to improve watersheds and restore endangered fish species.

The Plan consists of four essential elements:

**(1) Coordinated Agency Programs:** Many state and federal agencies administer laws, policies, and management programs that have an impact on salmonids and water quality. These agencies are responsible for fishery harvest management, production of hatchery fish, water quality, water quantity, and a wide variety of habitat protection, alteration, and restoration activities. Previously, agencies conducted business independently. Water quality and salmon suffered because they were affected by the actions of all the agencies, but no single agency was responsible for comprehensive, life-cycle management. Under the Oregon Plan, all government agencies that impact salmon are accountable for coordinated programs in a manner that is consistent with conservation and restoration efforts.

**(2) Community-Based Action:** Government, alone, cannot conserve and restore salmon across the landscape. The Oregon Plan recognizes that actions to conserve and restore salmon must be worked out by communities and landowners, with local knowledge of problems and ownership in solutions. Watershed councils, soil and water conservation districts, and other grassroots efforts are vehicles for getting the work done. Government programs will provide regulatory and technical support to these efforts, but local people will do the bulk of the work to conserve and restore watersheds. Education is a fundamental part of the community based action. People must understand the needs of salmon in order to make informed decisions about how to make changes to their way of life that will accommodate clean water and the needs of fish.

**(3) Monitoring:** The monitoring program combines an annual appraisal of work accomplished and results achieved. Work plans will be used to determine whether agencies meet their goals as promised. Biological and physical sampling will be conducted to determine whether water quality and salmon habitats and populations respond as expected to conservation and restoration efforts.

**(4) Appropriate Corrective Measures:** The Oregon Plan includes an explicit process for learning from experience, discussing alternative approaches, and making changes to current programs. The Plan emphasizes improving compliance with existing laws rather than arbitrarily establishing new protective laws. Compliance will be achieved through a combination of education and prioritized enforcement of laws that are expected to yield the greatest benefits for salmon.

*Voluntary Measures*. There are voluntary, non-regulatory, watershed improvement programs (Actions) that are in place and are addressing water quality concerns in the subbasin. Both technical expertise and partial funding are provided through these programs. Examples of activities promoted and accomplished through these programs include: planting of conifers, hardwoods, shrubs, grasses and forbs along streams; relocating legacy roads that may be detrimental to water quality; replacing problem culverts with adequately sized structures, and improvement/ maintenance of legacy roads known to cause water quality problems. These activities have been and are being implemented to improve watersheds and enhance water quality. Many of these efforts are helping resolve water quality related legacy issues.

*Landowner Assistance Programs*. A variety of grants and incentive programs are available to landowners in the subbasin. These incentive programs are aimed at improving the health of the watershed, particularly on private lands. They include technical and financial assistance, provided through a mix of state and federal funding. Local natural resource agencies administer this assistance, including the Oregon Department of Forestry, the Oregon Department of Fish and Wildlife, ODEQ, and the National Resources Conservation Service.

Field staff from the administrative agencies provides technical assistance and advice to individual landowners, watershed councils, local governments, and organizations interested in enhancing the subbasin. These services include on-site evaluations, technical project design, stewardship/conservation plans, and referrals for funding as appropriate. This assistance and funding is further assurance of implementation of the TMDL WQMP.

Financial assistance is provided through a mix of cost-share, tax credit, and grant funded incentive programs designed to improve on-the-ground watershed conditions. Some of these programs, due to

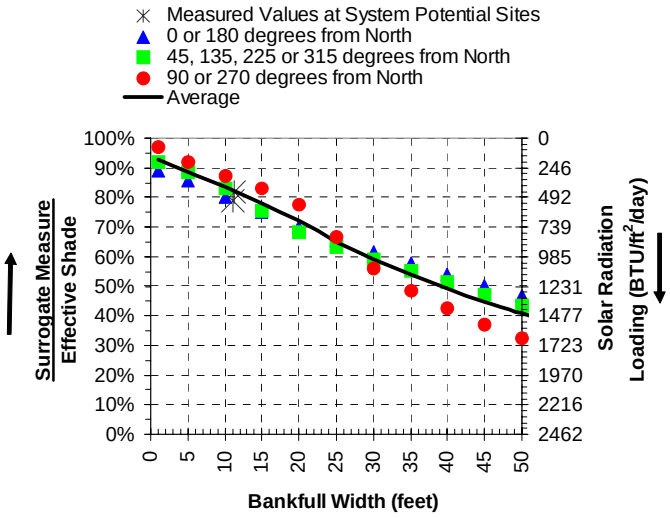
source of funds, have specific qualifying factors and priorities. Cost share programs include the Forestry Incentive Program (FIP), Stewardship Incentive Program (SIP), Environmental Quality Incentives Program (EQIP), and the Wildlife Habitat Incentive Program (WHIP).

# A.4 ECOLOGICAL PROVINCES

The tables (**Tables 2-9** to **2-12**) and figures (**Figures 2-29** to **2-39**) developed in **Section 2.4.3.1.3** of the TMDL for each of the Ecological Provinces are repeated here for ease of use by land managers (**Tables A-5** to A-**8** and **Figures A-4** to A-**14**). They are referenced in **Section A.3.1** of the WQMP where the Condition Assessment is described.

**Table A-5. *System Potential* Conditions for the East Steens Ecological Province (repeat of Table 2-9** in the TMDL**)**

| East Steens Mountain Region | | Potential Near Stream Conditions | | |
|---|---|---|---|---|
| **Vegetation Zone** | **Stream Reach** | **Vegetation Community *System Potential*** / **Channel Morphology *System Potential*** | **Overstory Vegetation Height (feet)** | **Average Canopy Density** |
| Black Cottonwood-Pacific Willow | Headwaters 6800'-5200' | **Community Type**: Co-dominant cottonwood-willow community w/ minor aspen<br><br>**Individual Plant types**:<br>Black Cottonwood<br>Pacific Willow<br>Quaking Aspen<br>Salix ssp.<br>Scouler willow<br>Common Snowberry<br>**Dominant Channel Type**: Rosgen A-B channel types with variable flood prone width within structurally controlled valley | 40' average canopy height<br><br><br><br>48'<br>24'<br>40'<br>18'<br>22'<br>6' | 80% |
| Pacific Willow-Black Cottonwood - Aspen | Mid-Elevation 5200'-4260' | **Community Type**: Co-dominant willow-cottonwood community w/ minor aspen<br><br>**Individual Plant types**:<br>Pacific Willow<br>Black Cottonwood<br>Salix ssp.<br>Quaking Aspen<br>**Dominant Channel Type**: Rosgen B channel type Flood prone width: 30' | 25' average canopy height<br><br><br><br>24'<br>28'<br>18'<br>30' | 65% |
| Willow Mix | Low- Elevation 4260'-4100' | **Community Type**: Dominant Pacific Willow-Coyote Willow mix<br><br>**Individual Plant types**:<br>Pacific Willow<br>Coyote Willow<br>Salix ssp.<br>Black Cottonwood<br>**Dominant Channel Type**: Rosgen B-C channel type Flood prone width within entrenched section 43' (C within relic F between 4500'-4300' elevation), otherwise 33' flood prone area | 20' average canopy height<br><br><br><br>24'<br>16'<br>18'<br>15' | 50% |




**Black Cottonwood-Pacific Willow Community**

Average Canopy Height: 40 feet
Average Canopy Density: 80%

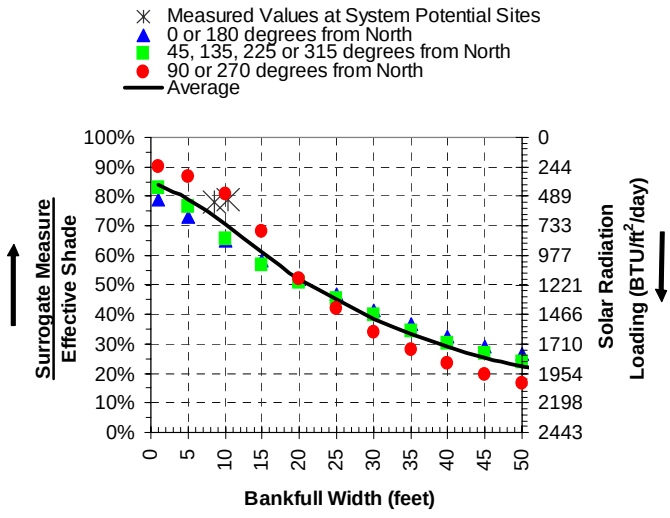
Dominant Plant Species

- Black Cottonwood
- Pacific Willow
- Quaking Aspen
- Salix ssp.
- Scoulers Willow
- Common Snowberry

Dominant Channel Type

- Rosgen A-B channel types
- Variable flood prone width within structurally controlled valley

**Figure A-4. Shade Curves–East Steens Headwaters Ecological Province (6800' – 5200')**




**Pacific Willow-Black Cottonwood-Aspen Community**

Average Canopy Height: 25 feet
Average Canopy Density: 65%

Dominant Plant Species

- Pacific Willow
- Black Cottonwood
- Salix ssp.
- Quaking Aspen

Dominant Channel Type

- Rosgen B channel type
- Flood prone width: 30 feet

**Figure A-5. Shade Curves–East Steens Mid Elevation Ecological Province (5200' – 4260')**

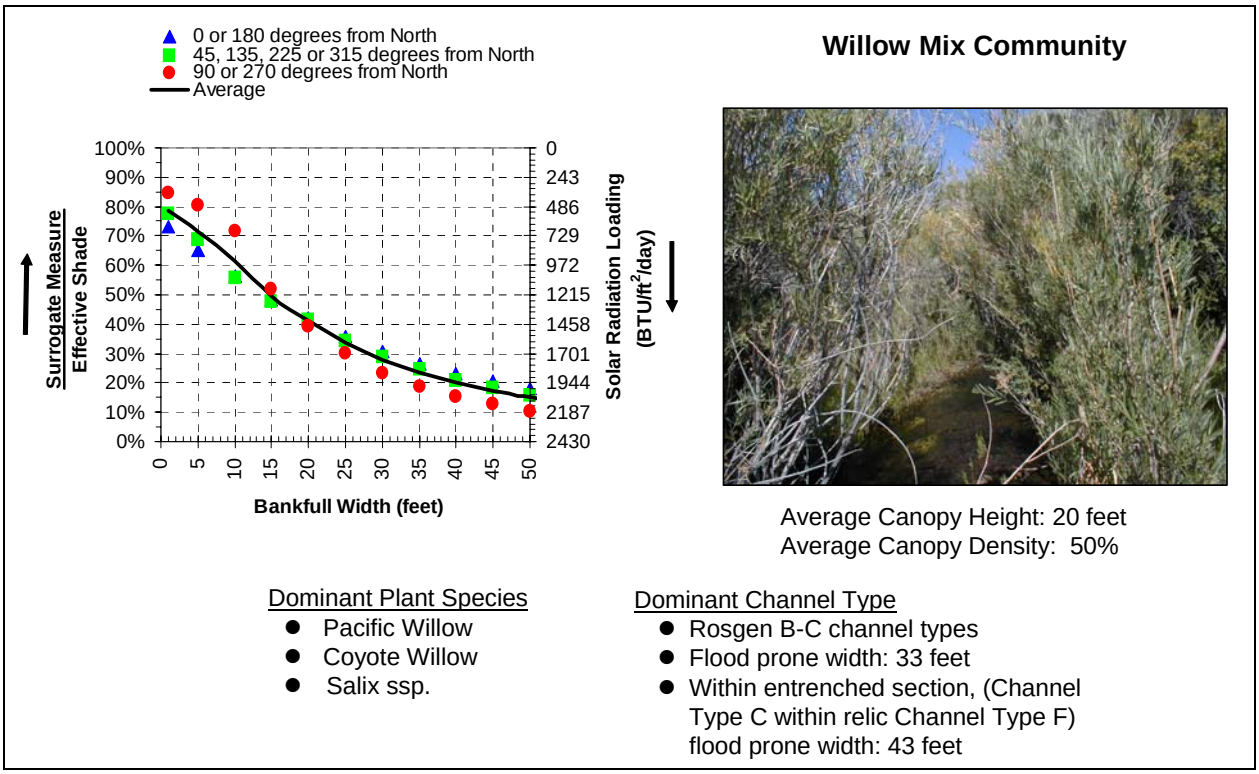
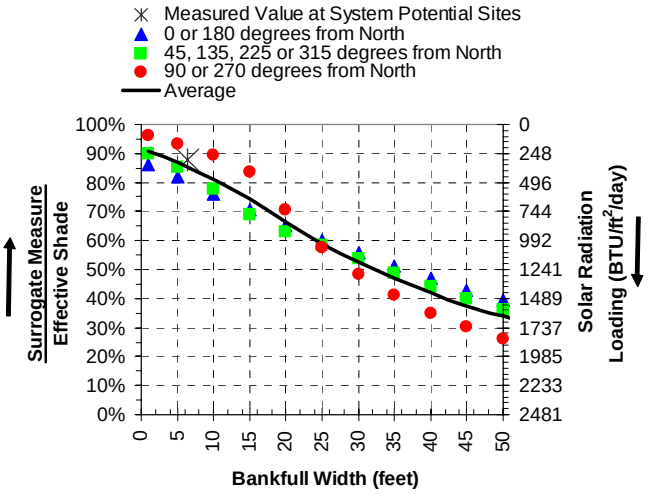



**Figure A-6. Shade Curves–East Steens Low Elevation Ecological Province (4260' – 4100')**

**Table A-6. *System Potential* Conditions for the Pueblo Mountains Ecological Province (repeat of Table 2-10** in the TMDL**)**

| **Pueblo Mountains Region** | | **Potential Near Stream Conditions** | | |
|---|---|---|---|---|
| **Vegetation Zone** | **Stream Reach** | **Vegetation Community *System Potential*** / **Channel Morphology *System Potential*** | **Overstory Vegetation Height (feet)** | **Average Canopy Density** |
| Aspen-Alder-Willow | Headwaters 6400'-6100' | **Community Type**: Co-dominant Quaking Aspen-Alder-Scouler Willow<br><br>**Individual Plant types**:<br>Quaking Aspen<br>Alder<br>Scouler willow<br>Salix ssp.<br><br>**Dominant Channel Type**: Rosgen A-B channel types with variable flood prone width within structurally controlled valley | 33' average canopy height<br><br><br><br>40'<br>28'<br>22'<br>18' | 85% |
| Alder-Cottonwood-Willow | Mid-Low Elevation 6100'-4300' | **Community Type**: Co-dominant Alder-Black Cottonwood-Salix ssp.<br><br>**Individual Plant types**:<br>Alder<br>Black Cottonwood<br>Salix ssp.<br>Scouler Willow<br>Lemon Willow<br>Cherry<br>Red Osier Dogwood<br><br>**Dominant Channel Type**: Rosgen A-B channel type Flood prone width: 13-20' | 28' average canopy height<br><br><br><br>28'<br>40'<br>18'<br>22'<br>16'<br>22'<br>12' | 75% |
| Willow mix | Lowest-Elevation 4300'-4248 | **Community Type**: Salix ssp. Mix<br><br>**Individual Plant types**:<br>Salix ssp. mix<br>Coyote Willow<br><br>**Dominant Channel Type**: Rosgen B-C channel type Flood prone width: 20' | 14' average canopy height<br><br><br>12'<br>16' | 50% |



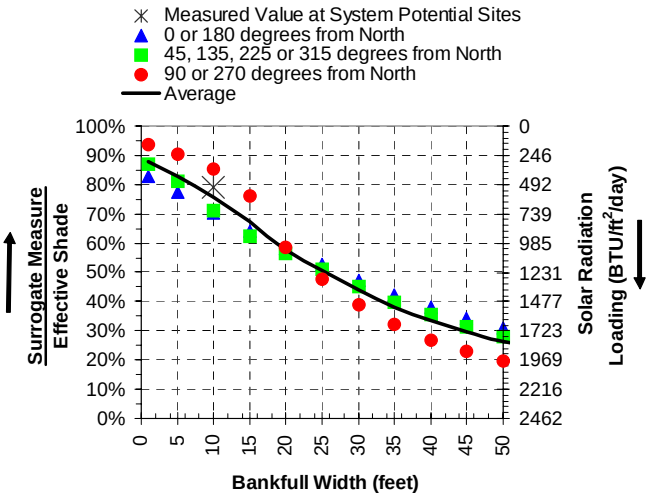

**Quaking Aspen–Alder–Scouler Willow Community**

Average Canopy Height: 33 feet
Average Canopy Density: 85%

Dominant Plant Species
- Quaking Aspen
- Alder
- Scouler Willow
- Salix ssp.

Dominant Channel Type
- Rosgen A-B channel types
- Variable flood prone width within structurally controlled valley

**Figure A-7. Shade Curves–Pueblo Mountains Headwaters Ecological Province (6400'-6100')**




**Alder-Black Cottonwood-Willow Mix Community**

Average Canopy Height: 28 feet
Average Canopy Density: 75%

Dominant Plant Species
- Alder
- Black Cottonwood
- Salix ssp.
- Scouler Willow
- Lemon Willow
- Cherry
- Quaking Aspen

Dominant Channel Type
- Rosgen A-B channel type
- Flood prone width: 13-20 feet

**Figure A-8. Shade Curves–Pueblo Mts Mid-Low Elevation Ecological Province (6100'-4300')**

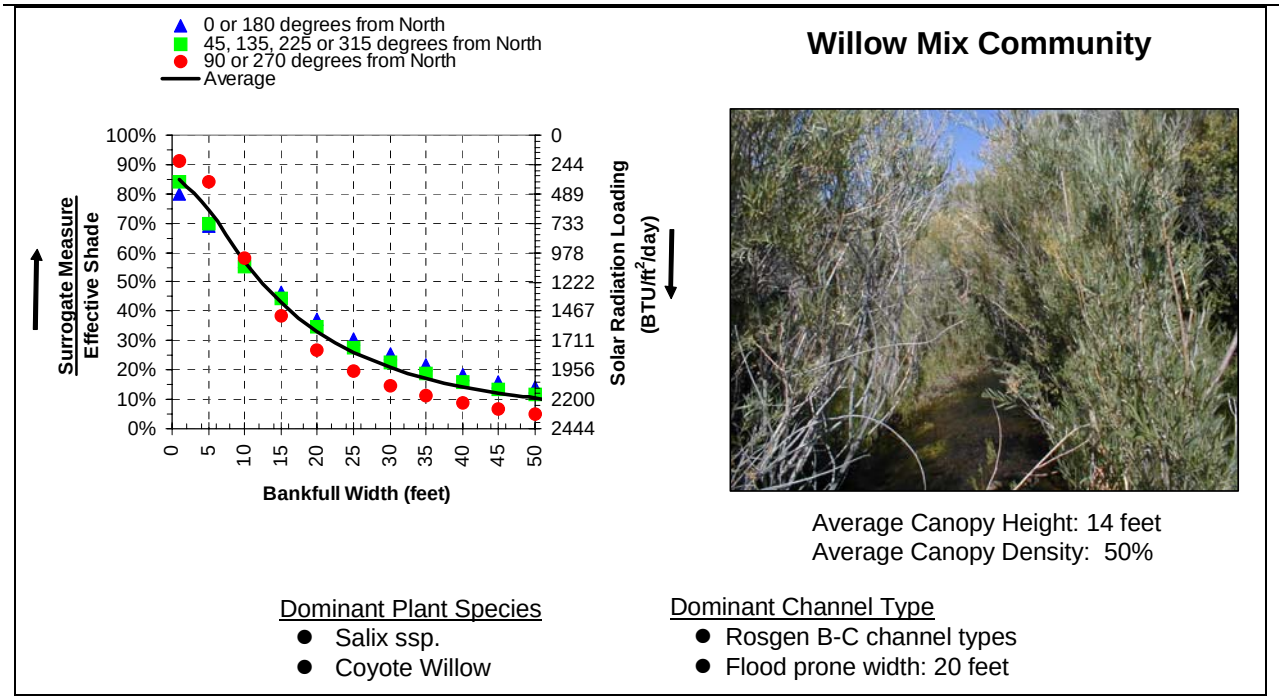



**Figure A-9. Shade Curves–Pueblo Mountains Lowest Elevation Ecological Province (4300'-4248')**

**Table A-7. *System Potential* Conditions for the Trout Creek Mountains Ecological Province (repeat of Table 2-11** in the TMDL)

| Trout Creek Mountains Region | | Potential Near Stream Conditions | | |
|---|---|---|---|---|
| **Vegetation Zone** | **Stream Reach** | **Vegetation Community *System Potential*** / **Channel Morphology *System Potential*** | **Overstory Vegetation Height (feet)** | **Average Canopy Density** |
| Mesic Graminoid-Willow | Headwaters >7218' | **Community Type**: Co-dominant mesic graminoid-willow<br><br>**Individual Plant types**:<br>Lemon Willow<br>Graminoid<br>**Dominant Channel Type**: Rosgen B-E channel types with variable flood prone width. Mesic community 36' flood prone area | 8.5' average canopy height<br><br>16'<br>1' | 10% |
| Aspen-Willow | High Elevation 7218'-6562' | **Community Type**: Co-dominant aspen-willow<br><br>**Individual Plant types**:<br>Quaking Aspen<br>Pacific Willow<br>Geyer Willow<br>Lemon Willow<br>**Dominant Channel Type**: Rosgen B channel type Flood prone width: 25' | 29' average canopy height<br><br>40'<br>24'<br>15'<br>16' | 90% |
| Willow-Alder | Mid Elevation 6562'-4500' | **Community Type**: Co-dominant willow-alder (1:1)<br><br>**Individual Plant types**:<br>Mountain Alder<br>Pacific Willow<br>Lemon Willow<br>Scouler Willow<br>**Dominant Channel Type**: Rosgen B-C channel type Flood prone width: 55' | 24' average canopy height<br><br>28'<br>24'<br>16'<br>22' | 75% |
| Willow | Low Elevation 4500'-4240' | **Community Type**: Dominant willow<br><br>**Individual Plant types**:<br>Coyote Willow<br>Yellow Willow<br>Pacific Willow<br>**Dominant Channel Type**: Rosgen C dominant (B canyon) channel type Flood prone width: 70' average | 18' average canopy height<br><br>16'<br>18'<br>24' | 60% |

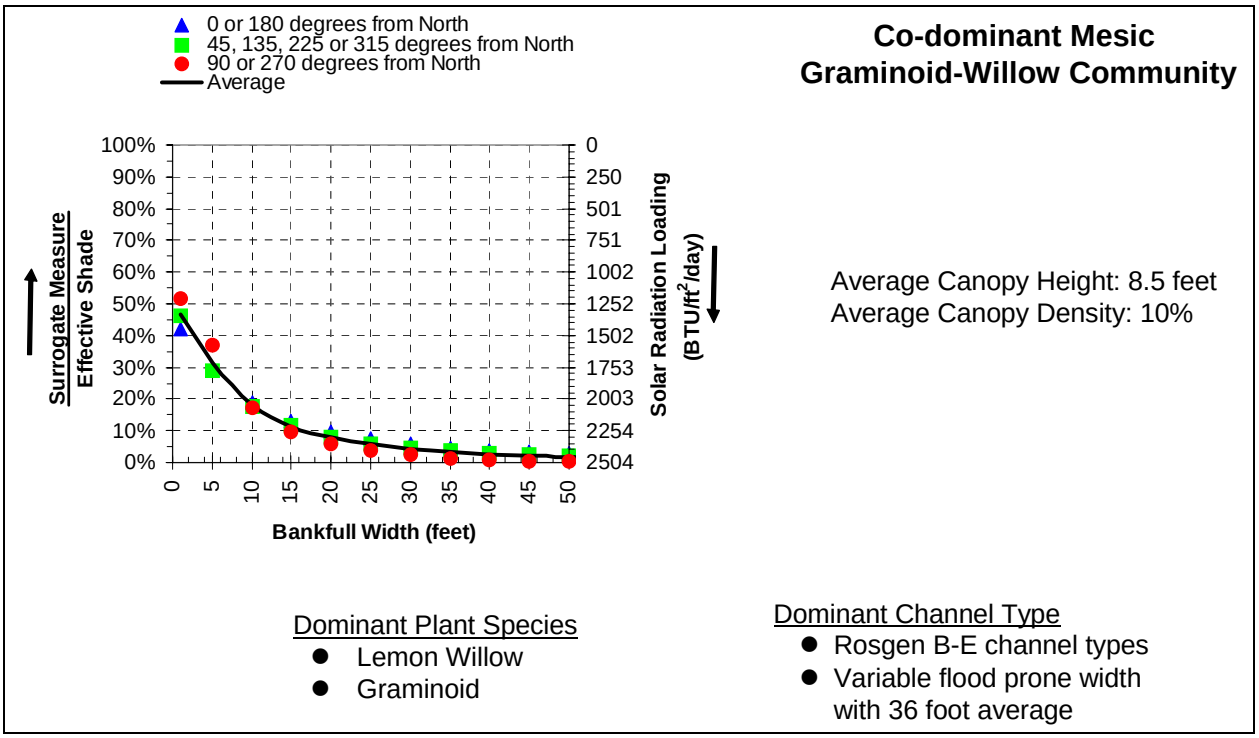



**Figure A-10. Shade Curves–Trout Creek Mountains Headwaters Ecological Province (>7218')**

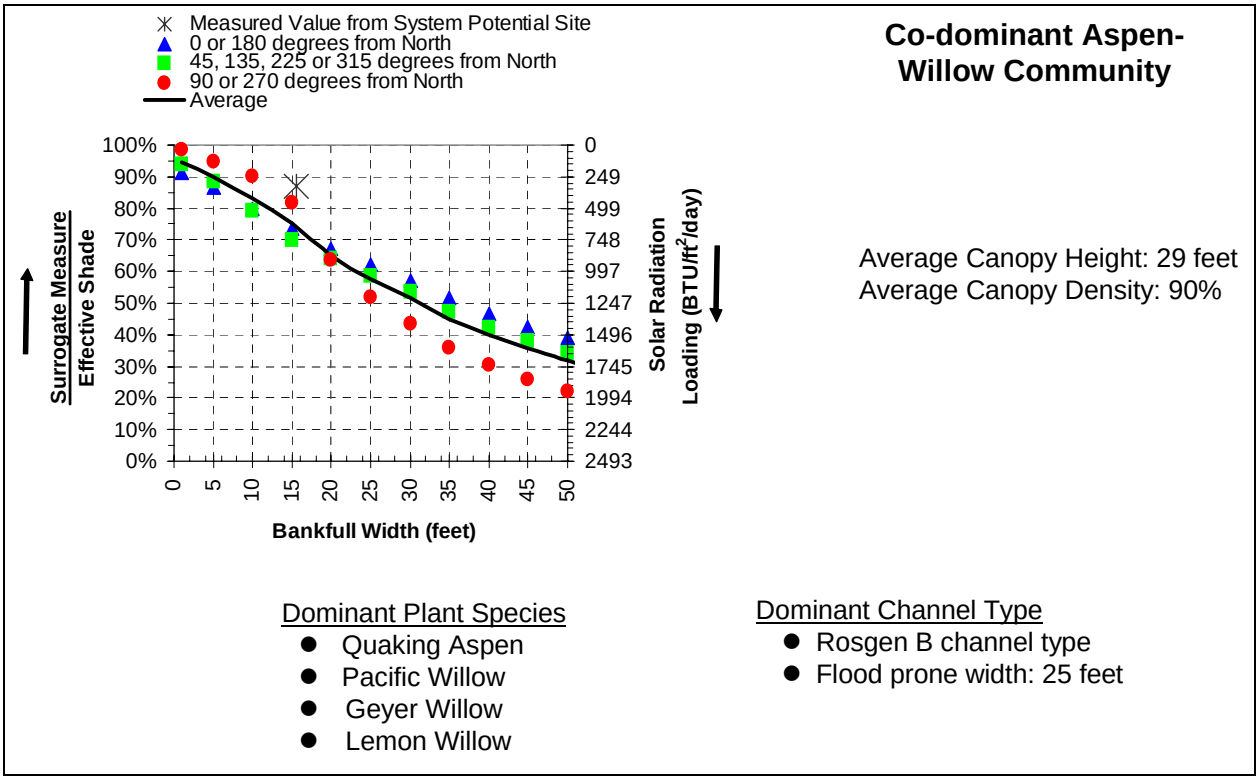



**Figure A-11. Shade Curves–Trout Creek Mts High Elevation Ecological Province (7218'-6562')**

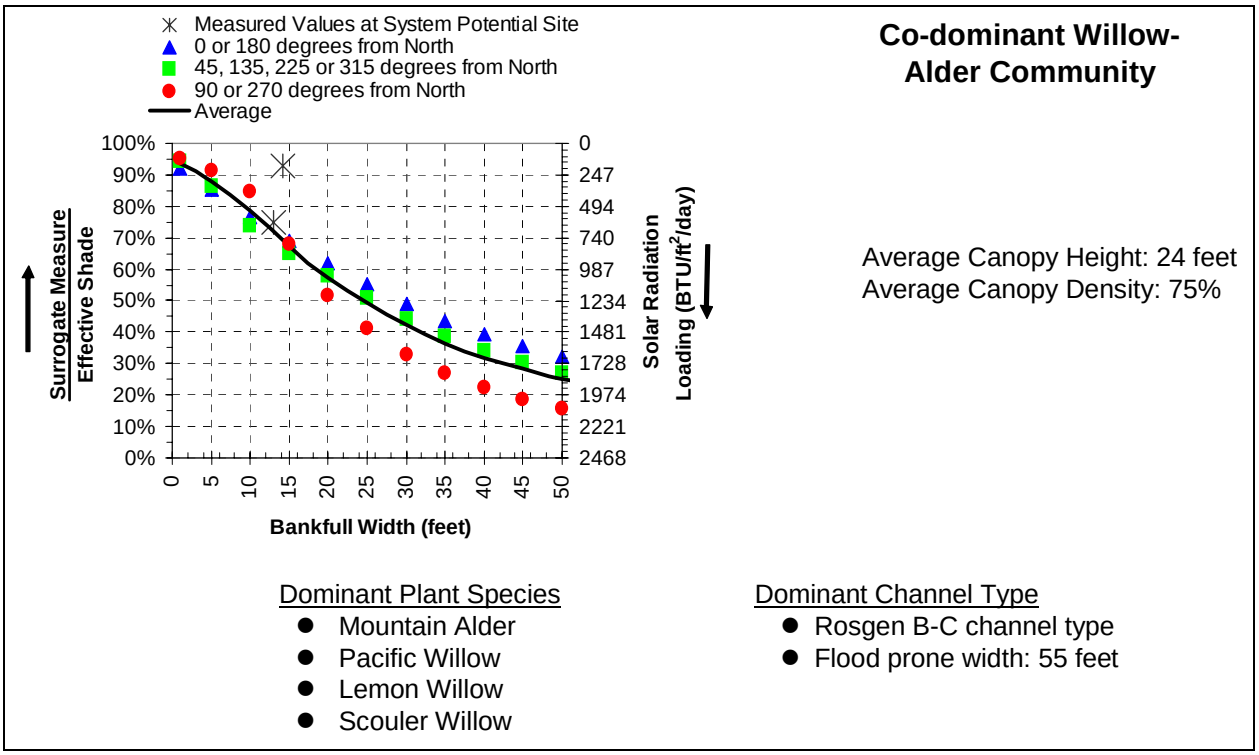



**Figure A-12. Shade Curves–Trout Creek Mts Mid Elevation Ecological Province (6562'-4500')**

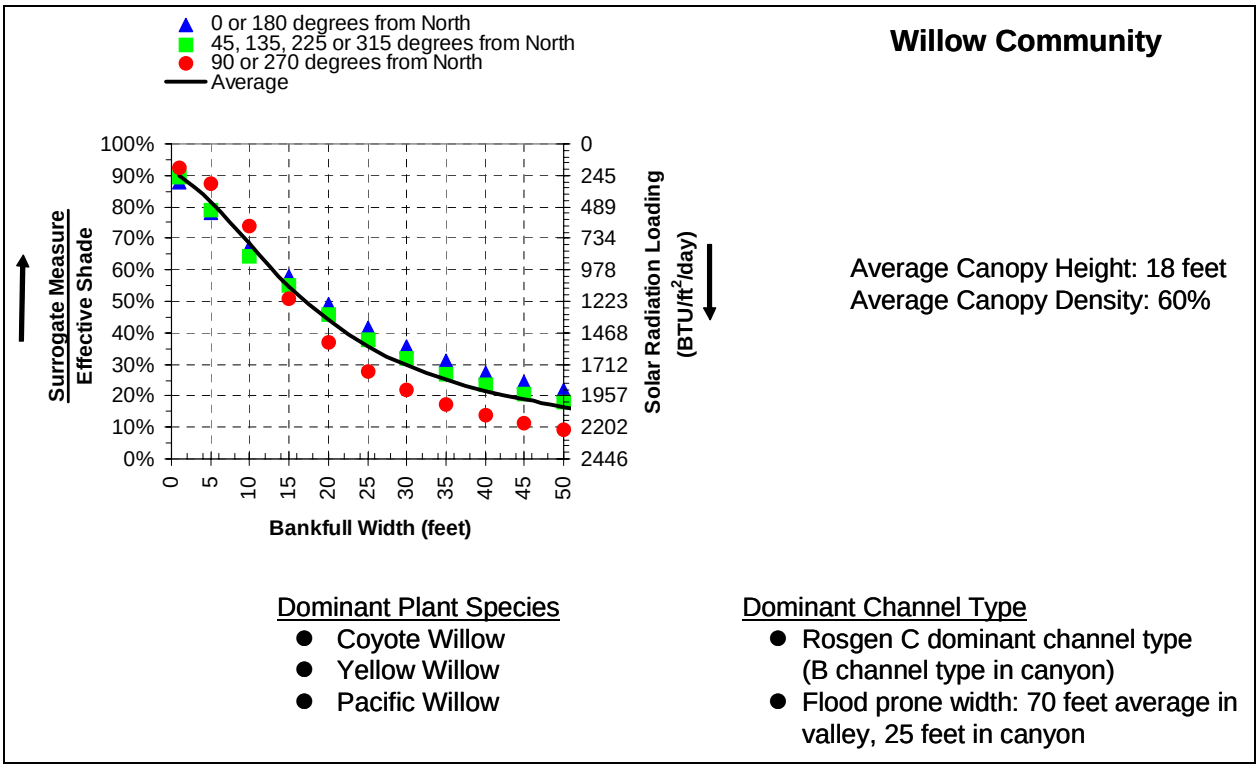


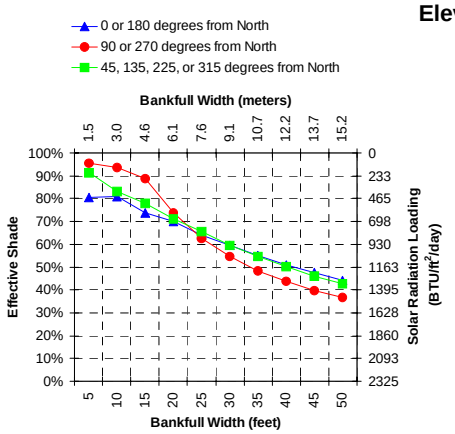

**Figure A-13. Shade Curves–Trout Creek Mts Low Elevation Ecological Province (4500'-4240')**

**Table A-8. *System Potential* Conditions for the Willow-Whitehorse Ecological Province* (repeat of Table 2-12** in the TMDL**)**

| Willow-Whitehorse Region | | Potential Near Stream Conditions | | |
|---|---|---|---|---|
| **Vegetation Zone** | **Stream Reach** | **Average Height (feet)** | **Average Canopy Density** | **Riparian Buffer Width (feet)** |
| Aspen | 7000'-5800' | 30 | 30% | 20 |
| Mountain Alder | 5800'-5000' | 25 | 30% | 30 |
| Willow | 5000'-4780' | 18 | 30% | 40 |
| Willow | 4780'-4460' | 18 | 30% | 55 |
| Willow | 4460'-4360' | 18 | 30% | 60 |

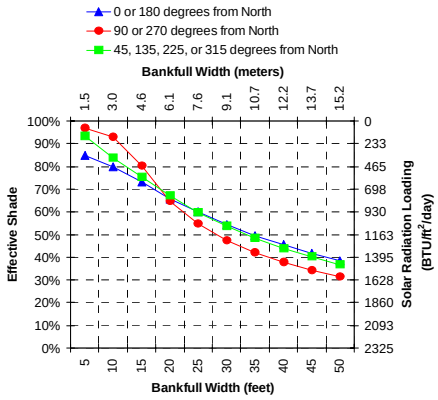
* Note: The *system potential* conditions for the Willow-Whitehorse Ecological Province were determined from the earlier TMDL work done for Willow Creek in 1999. More details are provided in Chapter III. The width of the potential riparian buffer was determined by Rosgen's protocols for calculating and measuring the flood prone area for each stream reach (Rosgen 1994). The flood prone area represents the maximum potential area in which riparian plant species can be established and maintained. Available moisture and annual disturbance within the flood prone area are key components of plant succession, from early colonization to late seral stages.

**Aspen Community**
**Elevation 7000' – 5800'**



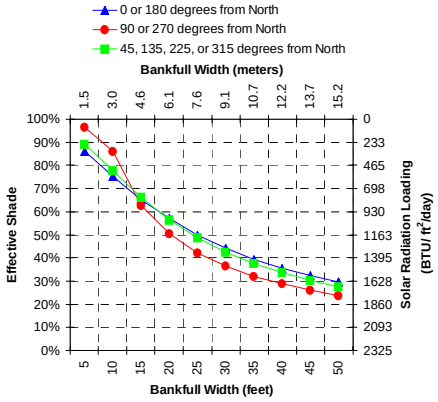

Average Canopy Height: 30 feet
Average Canopy Density: 30%
Average Riparian Buffer Width: 20 feet
Dominant Rosgen Channel Type: Type A

**Mountain Alder Community**
**Elevation 5800' – 5000'**



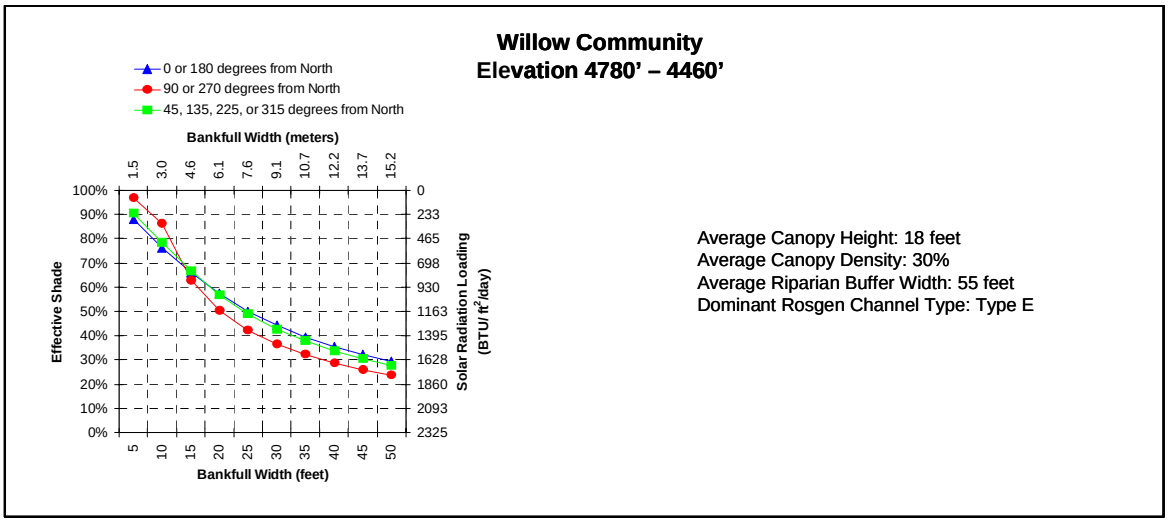

Average Canopy Height: 25 feet
Average Canopy Density: 30%
Average Riparian Buffer Width: 30 feet
Dominant Rosgen Channel Type: Type B

**Willow Community**
**Elevation 5000' – 4780'**




Average Canopy Height: 18 feet
Average Canopy Density: 30%
Average Riparian Buffer Width: 40 feet
Dominant Rosgen Channel Type: Type E

**Figure A-14. Shade Curves–Willow-Whitehorse Ecological Province**



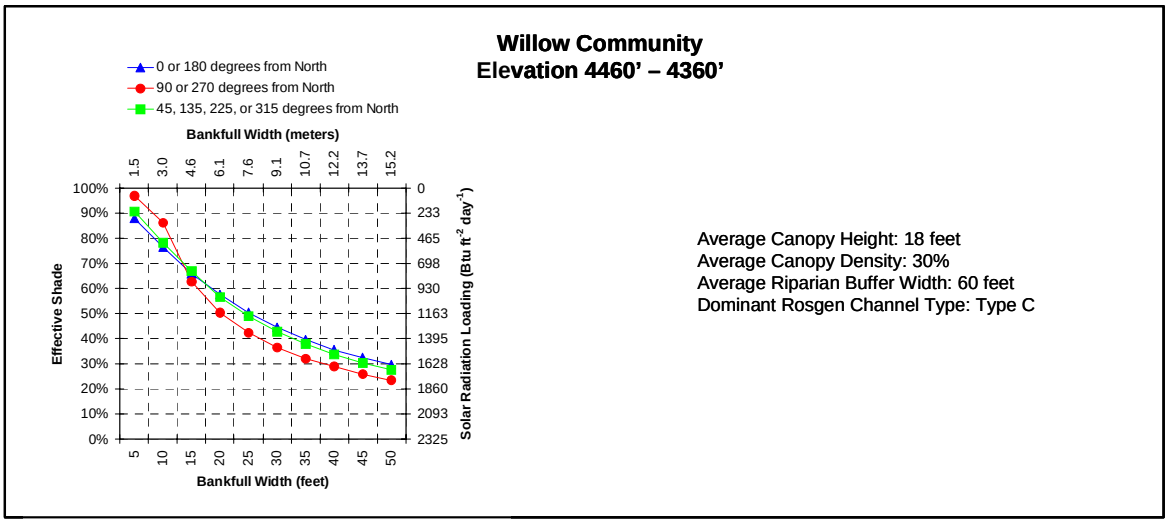




**Figure A-14 (continued). Shade Curves–Willow-Whitehorse Ecological Province**