

UPPER DESCHUTES AGRICULTURAL WATER QUALITY MANAGEMENT AREA PLAN

3rd Revision

March 2013

Developed by the

**UPPER DESCHUTES
LOCAL ADVISORY COMMITTEE**

with assistance from

OREGON DEPARTMENT OF AGRICULTURE

and

DESCHUTES SOIL AND WATER CONSERVATION DISTRICT

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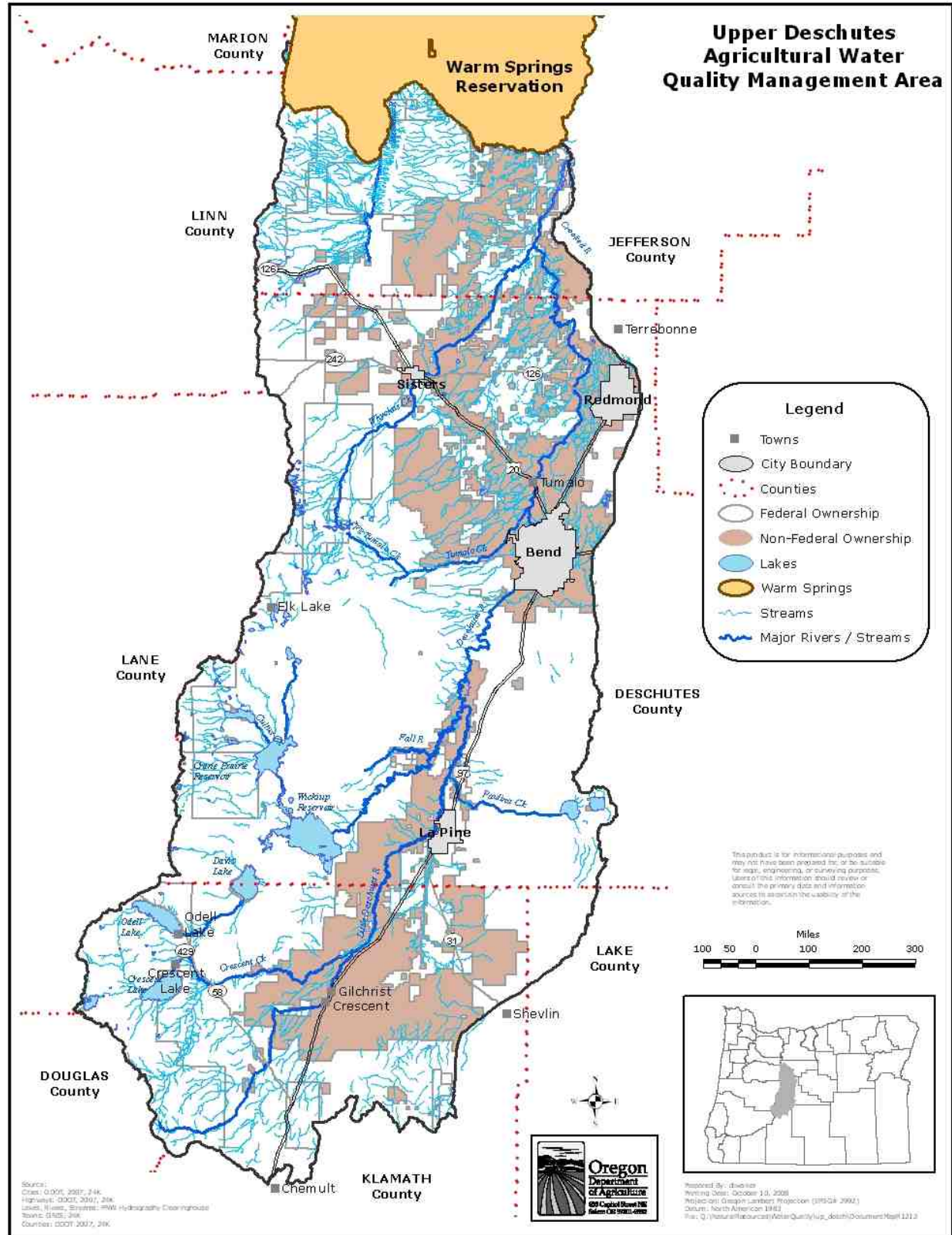
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ACRONYMS AND ABBREVIATIONS

Area Plan - Upper Deschutes Agricultural Water Quality Management Area Plan
Area Rules - Oregon Administrative Rules 603-095-3000 through 603-095-3060
BOR - US Bureau of Reclamation
CAFO – Confined Animal Feeding Operation
CCRP – Continuous Conservation Reserve Program
cfs - cubic feet per second
Corps – Army Corps of Engineers
CRP - Conservation Reserve Program
CREP - Conservation Reserve Enhancement Program
CRWC – Crooked River Watershed Council
DBLT – Deschutes Basin Land Trust
DEQ - Oregon Department of Environmental Quality
DMA – Designated Management Agency
DO - dissolved oxygen
DSL – Department of State Lands
EPA - Environmental Protection Agency
EQIP – Environmental Quality Incentive Program
FSA – Farm Service Agency
LAC - Upper Deschutes Local Advisory Committee
LMA – Local Management Agency
LWD - large woody debris
Management Area - Upper Deschutes Agricultural Water Quality Management Area
NTU - Nephelometric Turbidity Unit (measure of the cloudiness of water)
NRCS - USDA Natural Resources Conservation Service
OAR - Oregon Administrative Rules
ODA - Oregon Department of Agriculture
ODFW - Oregon Department of Fish and Wildlife
ORS - Oregon Revised Statutes
OSU - Oregon State University Extension Service
OWEB – Oregon Watershed Enhancement Board
R & E – ODFW Fish Restoration and Enhancement Board
SWCD - Soil and Water Conservation District
TID – Tumalo Irrigation District
TFWT – The Fresh Water Trust
TMDL - Total Maximum Daily Load
UDWC – Upper Deschutes Watershed Council
USDA - United States Department of Agriculture
WRD – Oregon Water Resources Department

MAP: MANAGEMENT AREA



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FOREWORD

UPPER DESCHUTES AGRICULTURAL WATER QUALITY MANAGEMENT AREA PLAN

This Upper Deschutes Agricultural Water Quality Management Area Plan (Area Plan) and associated Upper Deschutes Agricultural Water Quality Management Area Rules (Area Rules) address water quality and water's designated beneficial uses in the Upper Deschutes Management Area (Management Area) that must be protected. The Area Plan and Rules address temperature, sediment, turbidity, chlorophyll, pH, dissolved oxygen, biological criteria, mercury, aquatic weeds/algae, and bacteria concerns related to agricultural activities on private lands in the Management Area. All these parameters are on DEQ's 2012 303(d) list of "water quality limited" streams in the Management Area. Inadequate fish habitat and low streamflows are also concerns. Total Maximum Daily Loads (TMDLs) have not yet been developed for any of these listings in the Management Area.

The goal of the Area Plan is to prevent and control water pollution from agricultural activities and soil erosion through voluntary activities by landowners, aided by information and technical and financial assistance from local, state, and federal agencies, and other sources.

Water quality standards for surface water are not designed to provide water of sufficient purity for direct human consumption or food preparation. It may be hazardous to human health to use agricultural water for direct human consumption.

This Area Plan addresses conditions resulting from agricultural management that may affect water quality. These activities include, but are not limited to, the management of:

- Streambanks
- Cultivated lands
- Nutrients, farm chemicals, and pesticides
- Livestock
- Agricultural wastes
- Irrigation water and surface drainage
- Invasive plants (noxious weeds)

The Area Plan is voluntary and can help landowners comply with the Area Rules. The Area Rules (Oregon Administrative Rules (OARs) 603-095-3000 through 603-095-3060) contain required conditions to protect water quality. When voluntary approaches do not adequately achieve those conditions, as a last resort, the Oregon Department of Agriculture (ODA) exercises its enforcement authority under the Area Rules.

The Upper Deschutes Local Advisory Committee (LAC) helped develop the Area Plan and Rules and participates in biennial reviews of the Area Plan and Rules. The LAC is assisted by the Deschutes Soil and Water Conservation District (SWCD) and ODA. LAC members represent the interests of local landowners, irrigation districts, conservationists, and the Deschutes SWCD:

Marc Thalacker , Chair: Three Sisters Irrigation District Rex Barber, Vice Chair : Lower Bridge, irrigated farm, Deschutes SWCD Gordon DeArmond : Crescent, citizen: Bill Grafton : Bend, irrigation district & small farm	Terry Penhollow : Sunriver, pasture management Larry Roofener : Central Oregon Irrigation District, Deschutes SWCD Dan Sherwin : Deschutes County Weed Program
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APPLICABLE LAWS AND REGULATIONS

Federal Clean Water Act of 1972

The **Federal Clean Water Act** requires states to protect the quality of their waters, including rivers, streams, and lakes. Each state must determine the quality of its waters, identify those with poor quality, and address water quality problems. In Oregon, the Department of Environmental Quality (DEQ) is the lead agency responsible for implementing the Clean Water Act.

To support water quality assessment, states designate **beneficial uses** of the water that must be protected, select water quality parameters most directly related to those beneficial uses, and set standards for those parameters to ensure that the beneficial uses are being met.

Oregon's beneficial uses are defined in the OARs for each basin. Commonly, designated beneficial uses include drinking water, cold-water fisheries, industrial water supply, recreation, agricultural uses, and other activities. When there are multiple beneficial uses in a river or stream, federal law requires DEQ to protect the most sensitive, in terms of its susceptibility to pollution, which would result in the protection of all the beneficial uses.

States must select **parameters** that define and contribute to water quality and are related to the beneficial uses. These water quality parameters include, but are not limited to: bacteria, pH, turbidity, dissolved oxygen, temperature, total dissolved gas, certain toxic and carcinogenic compounds, and aquatic weeds or algae. Also, each state must establish **standards** for each parameter to determine whether or not the parameter is, or is not, contributing to limitations in the quality of the water body. Finally, the state must monitor water quality and review available data and information to determine if the standards are being met.

Section 303(d) of the Clean Water Act requires each state to develop a list of **Water Quality Limited waterbodies** that do not meet standards and to submit an updated list of noncompliant waterbodies to the federal Environmental Protection Agency (EPA) every two years. The most recent **303(d)** list was completed in 2010. The list is designed to identify water quality concerns only and not their causes. DEQ follows federal criteria, state water quality standards and scientific protocols to assess water quality and determine which waterbodies should be on the 303(d) list. Oregon, like most states, has information on many, but not all, of its waterbodies.

Section 303(d) also requires that each state establish TMDLs for any water quality limited waterbodies. TMDLs set maximum limits on the amount of pollutants allowed to enter state waters and still meet water quality standards. When establishing TMDLs, DEQ reviews existing data and collects additional data as needed to determine the location, amount, and source of pollutants. A TMDL consists of both **load allocations** and a strategy that will ensure that waterbodies will attain and maintain water quality standards.

Load allocations are limits assigned by DEQ to the different sources or sectors that contribute to the water quality problem. Load allocations may include such things as a required reduction in sediment expressed in tons/acre/year, or required shade targets that must be met to reduce water temperatures. Land use types such as agriculture, private forest lands, federal lands, and urban areas in each TMDL area will be assigned a load allocation as appropriate.

The strategy for achieving load allocations consists of area **water quality management plans** developed by the Designated Management Agencies (DMAs) responsible for the various land use types (e.g. ODA for agriculture). Each DMA will develop a pollution control plan and programs designed to meet the load allocations.

The management plans are sent to DEQ. DEQ submits the TMDL to EPA for approval. DEQ will continue to evaluate waterbodies to ensure that management plans are being implemented, are adequate, and water quality standards are achieved.

Oregon Revised Statute (ORS) Chapter 468B

ORS 468B.010 to 468B.050 lays out a broad framework under which **water pollution is defined and controlled** to protect beneficial uses of water. State water quality standards (e.g. temperature and *Escherichia coli* (*E. coli*) bacteria) are set at levels sufficient to protect beneficial uses.

DEQ is responsible for enforcement of ORS 468B, except as provided below under ORS 561.191 for agricultural practices that affect water quality.

ORS 568.900 – 568.933 (Agricultural Water Quality Management Act)

In 1993, the State Legislature passed the Agricultural Water Quality Management Act, which was codified into ORS 568.900-568.933. OARs Chapter 603 Division 090 was subsequently adopted to clarify the requirements of the law and ODA's authority under the Act. ORS 568.900-568.933 gave ODA the authority to develop **agricultural water quality management area plans and rules** where required by federal or state law. The statute and administrative rules outline the process for the development and implementation of agricultural water quality management area plans to help prevent and control water pollution resulting from agricultural activities and soil erosion. The process includes the formation of a **LAC** that consists primarily of landowners in the management area to assist ODA in the development of the area plan and rules.

ORS 561.191 (Senate Bill 502)

In 1995, the Oregon legislature recognized potential confusing authorities that belonged to both ODA and DEQ regarding the enforcement of water quality statutes. To clarify authorities granted to ODA in the Agricultural Water Quality Management Act, the state legislature passed Senate Bill 502, which was codified into ORS 561.191. This statute states that ODA shall develop and implement any program or rules that directly regulate farming practices that are for the purpose of protecting water quality. ODA has the statutory responsibility to regulate agriculturally related water pollution.

APPLICABILITY

MANAGEMENT AREA

The Management Area consists of the Upper and Little Deschutes Subbasins, as defined by the state of Oregon. Additionally, it includes lands in the Crooked River drainage south of the Crooked River and west of the range line between R12E and R13E in T14S WM to include the entire Crooked River Ranch subdivision. The Management Area consists of the drainage of the Deschutes River and all its tributaries upstream of and inclusive of the Metolius River, and a fraction of the Crooked River (see map). Major tributaries include the Metolius River, Whychus Creek (formerly Squaw Creek), Tumalo Creek, and the Little Deschutes River and its tributaries. Additionally, the Management Area includes the communities of Crooked River Ranch, Sisters, Redmond, Bend, La Pine, and Crescent.

TYPES OF ACTIVITIES COVERED

The Area Plan applies to both commercial and noncommercial agricultural activities, including those within urban growth boundaries. For example, it applies to activities involved in maintaining a horse in a pasture within city limits.

The Area Plan applies to agricultural activities on all agricultural, rural, and forested lands within the Management Area except those owned by the federal government and those held in Tribal Trust for the Confederated Tribes of the Warm Springs Reservation. The Area Plan applies to agricultural lands in current use, those lying idle or on which management has been deferred, and lands (like private roads) not strictly in agricultural use but that support agricultural activities.

Agricultural use consists of "the use of land for the raising or production of livestock or livestock products, poultry or poultry products, milk or milk products, fur-bearing animals, or for the growing of crops such as, but not limited to, Christmas trees, grains, small grains, fruit, vegetables, forage grains, nursery products; or any other agricultural or horticultural use or animal husbandry or any combination thereof. Wetlands, pasture, and woodlands accompanying land in agricultural use are also defined as agricultural use areas" (OAR 603-95-0010 (4)).

Activities governed by the Forest Practices Act are outside the jurisdiction of this Area Plan.

Pesticide use is governed by the Pesticide Control Act (ORS 634); this law is administered by the ODA Pesticides Division. DEQ has not identified pesticide use as a water quality problem in the Management Area.

1: MISSION, GOALS, AND OBJECTIVES

LAC MISSION

Promote voluntary agricultural practices that improve and protect water quality while sustaining a healthy agricultural economy

The LAC used the following guiding principles to develop the Area Plan:

- Protect beneficial uses of the water in the Management Area,
- Control pollution as close to its source as possible,
- Base recommended actions on best available scientific information,
- Develop cost-effective, practical, flexible, and realistic site-specific solutions that work,
- Recognize that landowners are not responsible for naturally occurring water quality conditions that violate state standards.

PLAN GOAL

Prevent and control water pollution from agricultural activities and soil erosion and help achieve water quality standards

OBJECTIVES

1. Maintain adequate streamside vegetation,
2. Minimize streambank erosion,
3. Minimize runoff to ground or surface water that contains potential pollutants,
4. Minimize soil erosion on uplands,
5. Use irrigation water efficiently.

Achieving the following land conditions on agricultural lands throughout the Management Area will contribute to good water quality.

- Sufficient streamside vegetation to stabilize streambanks, filter overland flow, and moderate solar heating,
- Minimal sediment from irrigation return flows enters streams,
- Minimal bare areas of significant size within 50 feet of streams on agricultural lands,
- Livestock do not access canals or ditches that convey water to neighbors,
- Livestock manure is managed to minimize risk to surface and groundwater,
- Irrigation water is used efficiently on agricultural lands.

The following milestones will be fleshed out in 2017 after results of baseline assessments are reviewed by the LAC. Assessment methods will be determined by the 2015 biennial review. While the goal is to achieve 100% compliance with the Area Rules, it may not be realistic to document this.

1. Streambank conditions
 - By 2030, __% of streamside areas will comply with the riparian rule. Compliance is expected to consist of a 20+ foot wide riparian buffer or sufficiently vegetated

buffer to prevent solar heating and streambank erosion and to filter pollutants from overland flows.

- By 20__, 90% of streamside areas will comply with the riparian rule.
- By 20__, 90% of streamside areas provide the riparian functions of providing shade, stabilizing streambanks, and filtering overland flows, based on site capability.

2. Potential pollutants

- By 2017, the following will be identified:
 - Irrigation drains that contribute sediment to the Deschutes River or its tributaries,
 - Focus areas with significant numbers of livestock operations that likely contribute sufficient sediment, *E. coli* or nitrates to ground or surface water to cause pollution. The SWCD and ODA are currently focusing on the rural La Pine area in south Deschutes County and may expand into Klamath County via agreement with the Klamath County SWCD. Due to the types of crops, fertilizer is not considered a likely contributor of nutrients.
- By 2030, __% of livestock operations will comply with the Waste Rule,
- By 2030, __% of irrigation water return flows to streams will comply with the Waste Rule.
- By 20__, 90% of livestock operations will comply with the Waste Rule,
- By 20__, 90% of irrigation water return flows to streams will comply with the Waste Rule.

3. Irrigation Water Management

- Continue efforts to increase stream flows.
- Track increases in stream flow.

STRATEGIES

1. **Education:** create a high level of awareness and understanding of water quality issues related to agriculture.
2. **Voluntary conservation practices:** increase the voluntary adoption of agricultural practices to improve water quality.
3. **Funding:** secure funding for administration and successful implementation of the Area Plan.
4. **Evaluation:** conduct periodic reviews of the Area Plan and implementation activities by the LAC and other interested parties.

2: WATER QUALITY CONCERNS

The Clean Water Act requires that each state designate beneficial uses of the water that must be protected, select water quality parameters most directly related to the beneficial uses, and set standards for those parameters. It then requires that the beneficial uses be met. The state allocates pollution limits (TMDLs) for streams that violate water quality standards; agriculture will receive a load allocation that must be met. Streams that don't meet water quality standards are designated as 'water quality limited' and are placed by DEQ on a 303(d) list. This list is updated every 2-4 years. Water quality standards are also reviewed periodically and changed as needed.

BENEFICIAL USES

Beneficial uses of water in the Management Area include domestic and industrial water supplies, crop irrigation, livestock watering, aquatic life, recreation, aesthetics, and hydropower. Of these, 'domestic water supply', 'fish and aquatic life', and 'water contact recreation' are the most sensitive uses. Bacterial contamination is the greatest concern for swimming and other types of human water contact; drinking water is affected primarily by toxics and nitrates. However, aquatic life is affected by temperature, sedimentation, turbidity, toxics, nutrients, pH, and dissolved oxygen.

MOST SENSITIVE BENEFICIAL USE: SALMONIDS

Migratory (anadromous) fish were eliminated from the Management Area following construction of the Pelton-Round Butte Hydropower complex⁹. Anadromous fish species in the Management Area were spring Chinook salmon, summer steelhead, and sockeye salmon. These species were found in the Metolius River, Deschutes River upstream to Big Falls, the Crooked River, and tributaries to these rivers. Whychus Creek and the Crooked River were especially important for steelhead production, while the majority of Chinook salmon production occurred in the Metolius River. Sockeye salmon were found in the Metolius and used Suttle Lake as part of their life history requirement for lake rearing.

Anadromous fish are currently being reintroduced. Releases of summer steelhead fry began in 2007 and will continue with annual spring releases into Whychus Creek and the lower Crooked River. Spring Chinook salmon fry releases were initiated in 2008 and will continue annually into the Metolius River, Whychus Creek and the lower Crooked River. The Mid-Columbia summer steelhead population is listed as threatened under the Federal Endangered Species Act. The goal of the reintroduction effort is to have naturally producing, self-sustaining populations of all three species.

Resident fish species in the Management Area were redband trout, bull trout, mountain whitefish, and other non-game species. Bull trout were eliminated from most of the area due to increased water temperatures from reservoir management, increased passage barriers resulting from human activities, and harvest. Bull trout currently are found in the Deschutes River between Lake Billy Chinook and Big Falls (below Lower Bridge), the Lower Crooked River

below Opal Springs Dam, the Metolius River and tributaries, Odell Lake and some tributaries, and rarely in Davis Lake. This population of bull trout, along with the rest of the Columbia River Basin populations, was listed as threatened under the Federal Endangered Species Act in 1998.

Lake Billy Chinook supports one of the healthiest bull trout populations in the state. The trout migrate to the reservoir from the tributaries and feed on the reservoir fish. These bull trout are fluvial fish (i.e. live in rivers) that have adapted to reservoir life and become adfluvial (i.e. live in rivers and lakes). They depend on the clean, cold waters of the Metolius River and its tributaries, which contain ample gravel suitable for spawning. Currently, Lake Billy Chinook and the Metolius River are the only bull trout fisheries allowed within the state. The Endangered Species Act allows for a limited fishery to continue for species under a threatened status, provided these actions do not threaten recovery of the species and are consistent with state law. Consequently, a signed agreement between Oregon and the US Fish and Wildlife Service provides for a limited bull trout harvest to continue within Lake Billy Chinook.

WATER QUALITY ISSUES

In September 2011, DEQ published the Deschutes Basin Water Quality Status and Action Plan.

It discussed water quality concerns and emphasized the following actions related to agriculture:

1. Surface Water Actions

- Reduce temperatures, improve flow volume and patterns, and improve habitat through:
 - *Better land management and conservation*
 - *Increasing native, streamside vegetation*
 - *Improved water conservation*
 - *Increased instream flows*
 - *Channel restoration*
 - *Juniper reduction*
 - *Combating invasive weeds*
- Reduce erosion and nutrient and pesticide levels in water through better land and crop management

2. Groundwater Actions

- Minimize nitrate contamination from...agriculture
- Assess effects of groundwater pumping and irrigation efficiency projects on stream flows
- Assess cause, extent and magnitude of risks associated with bacteria...in groundwater

The following water bodies have been designated by DEQ as water quality limited in the Management Area. In addition, East Lake has been listed for mercury.

Table 1. Water-quality limited waters in the Upper Deschutes Management Area. Source: 2010 303(d) list.							
Stream Segment	<i>Water Quality Parameters</i>						
	Temperature	pH	Dissolved Oxygen	Chlorophyll a or Algae	Biological Criteria	<i>E. coli</i>	Sediment &/or Turbidity
Deschutes River/Lake Billy Chinook (River Mile 110.1–118.7)		X		X			
Deschutes River; Lake Billy Chinook to Steelhead Falls (116-126.4)	X		X				
Deschutes River: Steelhead Falls to Central Oregon Canal (126.4-168.2)	X	X	X				
Deschutes River: Central Oregon Canal to Little Deschutes River (168.2-189.4)	X		X	X			X
Deschutes River: Little Deschutes River to Wickiup Reservoir (189.4-222.2)	X		X				X
Deschutes River: Wickiup Reservoir to Crane Prairie Reservoir (223.3-244.8)	X						
Deschutes River/Wickiup Reservoir (222.2-229.7)				X			
Deschutes River/Crane Prairie Reservoir (230.57-235.6)				X			
Abbot Creek (0-7.4)							X
Crystal Creek (0-2.8)			X				
Fall River (0.5-11.2)	X						
First Creek (3.6-12.1)	X						
Indian Ford (0-12.3)	X						
Lake Creek (0-5.9)	X						
Lake Creek, Middle Fork, South Fork (0-1.7)	X						
Lake Creek, Middle Fork (0-2.2)	X						
Lava Lake			X				
Link Creek (0-2.5)	X						
Metolius River (8.5-39.6)	X						
Odell Creek (3.4-16.3)	X		X				
Odell Lake /Odell Creek (0-16.3)		X	X	X			
Rosary Creek (-)-1.9)			X				
Tumalo Creek (0-12.5)	X						
Whychus Creek (0-40.3)	X						
LITTLE DESCHUTES SUBBASIN							
Big Marsh Creek (0-15.6)	X						
Crescent Creek (0-30/1)	X						
Hemlock Creek (0-5.9)	X						
Little Deschutes River (0-92.4)	X						
Little Deschutes River (0-73.6)			X				
Paulina Creek to Paulina Lake (0-15)	X				X		
Paulina Lake				X			
CROOKED RIVER SUBBASIN							
Crooked River/Lake Billy Chinook (0-5)				X			
Crooked River to High Bridge (1-18)	X	X	X		X	X	

1. **Water temperatures** are critical to salmonid growth and survival at all life stages, and to other aquatic life. Warm stream temperatures increase stress and disease, raise metabolism, lower growth rates, and enhance conditions for introduced non-native predators. Temperature affects the dissolved oxygen potential in water - the warmer the water, the less dissolved oxygen it can hold.

Biologically-based numeric **temperature** criteria support the different life stages and species of salmonid fish (<http://www.deq.state.or.us/wq/standards/temperature.htm>). The standard includes maps that designate the water body and time of year where the criteria apply.

2. Excessive aquatic plant or **algal growth** can harm fish and other aquatic life by creating extremes in water **pH** and low levels of **dissolved oxygen**. These conditions can be stimulated by the availability of nutrients, warm temperatures, and light, which in turn are often caused by low stream flow and lack of protective vegetative cover. Excessive algal growth can also result in the posting of health advisories for people and pets.
3. **“Biological Criteria”** listings indicate waters that don’t adequately support aquatic insects and similar invertebrates (benthic macroinvertebrates). These organisms are important as the basis of the food chain and are very sensitive to changes in water quality. To assess a stream’s biological health, the community of benthic macroinvertebrates is sampled and compared to the community expected if the stream were in good shape (“reference community”). If the difference is too great, the stream section is designated as ‘water quality limited’. This designation does not identify the actually limiting factor (e.g. sediment, excessive nutrients, temperature).
4. **Sediments** carried in basin streams can adversely affect aquatic life by reducing light penetration and visibility, reducing water infiltration through stream substrate (harming incubating fish eggs), and irritating gill filaments. **Turbidity** is a measure of the cloudiness of water and is often used as a surrogate measure for suspended sediment.

Turbidity in the Deschutes River between Wickiup Reservoir and the Central Oregon Canal increases as much as 300 percent (from < 1 to 31 Nephelometric Turbidity Unit (NTUs) when irrigation water is released from Wickiup Reservoir in early spring and remains to twice background until late July. The State standard allows only a 10 percent increase in turbidity.

5. **Bacteria** numbers exceeded State standards in the Crooked River, but at a sampling point about four miles upstream of the Management Area. Crooked River Ranch is the only portion of the Management Area that drains into the Crooked River. Crooked River Ranch consists mostly of unirrigated, five-acre lots, with a few horses. The lack of significant agricultural activities in Crooked River Ranch makes this area an unlikely contributor to agriculture-related water quality problems in the Crooked River. According to Bonnie Lamb at DEQ, DEQ sampled the Crooked River for *E. coli* near Crooked River Ranch in 2005 and the highest measurement was 15.8 organisms, well below the *E. coli* standard. Bacteria sampling in the Upper Deschutes drainage has not warranted 303(d) listing.

Bacteria from livestock manure are a source of pollution to some canals and groundwater.

Nitrate levels are increasing in drinking water in wells in the rural area around La Pine in southern Deschutes and northern Klamath Counties and around Redmond. According DEQ's Deschutes Basin Watershed Analysis, nitrate contamination of groundwater is one of the most widespread groundwater issues in the Management Area. The primary source appears to be contamination from septic tanks.

Stream flows have been modified throughout the Management Area, primarily related to irrigation diversions. Low flows contribute to warmer water, increased pH, reduced dissolved oxygen, a general reduction in available habitat, and, in extreme cases, interferes with fish migration. Instream leasing programs have helped increase flows in reaches of the Deschutes River and its tributaries.

Modification of physical habitat can directly harm aquatic life. Channelization reduces both the amount and complexity of habitat. Loss of streamside vegetation often destabilizes streambanks, resulting in increased erosion, and decreases shade that could help reduce stream temperatures.

Adequate riparian vegetation helps:

- Minimize streambank erosion by increasing the cohesiveness and structural strength of streambanks and by reducing flow velocities,
- Reduce increases in summer water temperature,
- Maintain late season flows by increasing the ability of the adjacent soils to store water during runoff seasons,
- Moderate winter stream temperatures through the inflows of relatively warmer groundwater from adjacent soils,
- Filter out and process excess nutrients, bacteria, and sediment in runoff that could pollute adjacent streams.

The LAC has the following recommendations regarding water quality assessment:

- Continue monitoring water quality at permanent sampling stations,
- Determine what stream reaches are naturally warmer than water quality temperature criteria,
- Determine whether Oregon's turbidity standard is meaningful when natural turbidities run less than five Nephelometric Turbidity Units (NTUs), which is the case for the Deschutes River,
- Determine what flows (in cubic feet per second (cfs)) would be needed to meet water quality standards,

3: RECOMMENDED CONSERVATION PRACTICES

To help achieve water quality standards in the Management Area, an effective strategy should:

- Maintain adequate streamside vegetation,
- Minimize streambank erosion,
- Minimize runoff to ground and surface water that contains potential pollutants.

The following conservation practices (Table 1) address the objectives of the Area Plan and help improve and protect water quality while being economical and practical. Widespread adoption of these practices addresses the water quality parameters of concern in the Management Area. These practices should also maintain the economic viability of agriculture in the area. While recommended, they are not required.

Table 1. Some recommended conservation practices for the Upper Deschutes Agricultural Water Quality Management Area.		
MANAGEMENT	OBJECTIVES	RECOMMENDED CONSERVATION PRACTICES
STREAMS	<i>Achieve adequate riparian vegetation</i> <i>Reduce streambank erosion</i> <i>Minimize stream temperature extremes beyond natural variation</i> <i>Minimize pollutants from surface runoff</i>	• Encourage plants that 1) provide shade, 2) trap or filter out excess nutrients, bacteria, and sediment in overland or shallow subsurface flow, 3) provide vegetative cover to protect the streambank during high flows, and 4) have root masses that will stabilize streambanks • Stabilize streambanks, preferably with bioengineering techniques • Maintain vegetative buffer: continuous Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), riparian buffers, weed control (see below) • Manage livestock (see below) • Properly place, design, and maintain roads, culverts, bridges, and crossings. Use heavy equipment in streamside areas at appropriate times of year; contact Oregon Department of Fish and Wildlife (ODFW) for sensitive locations and seasons • Leave large woody debris (LWD) in streams. If it must be removed, don't destabilize the streambank. Time the removal of LWD to minimize disturbance to stream and streambank • Contact ODFW for timing and technical assistance for instream activities. Oregon's Department of State Lands and the federal government require permits for some types of fill or removal activities. Deschutes County requires a fill and removal permit for removal or placement of any instream materials, including LWD. Oregon's Parks and Recreation Department administers activities in the scenic waterway

LIVESTOCK	<i>Reduce soil erosion</i> <i>Limit nutrients and bacteria in surface runoff</i> <i>Achieve adequate riparian and upland vegetation</i>	• Improve riparian buffers • Harrow pastures at least once per year • Clean manure out of irrigation ditches before receive irrigation water that will continue off property to another user • Install adequate waste management systems: clean out water diversions; collect, store, and utilize wastes; properly operate and maintain facilities • Control runoff from concentrated feeding areas and irrigated pastures • Control livestock access to water that flows off-property: - manage the timing and intensity of livestock access to streams by using a grazing strategy that addresses livestock distribution and the duration and season of riparian area use - provide off-stream drinking water (stock tanks, nose pumps, etc.) - place salt licks and supplemental feeding stations away from streams or ditches - provide shade and shelter for livestock away from the stream - install fencing (temporary, exclusion, etc.) - use a herder to encourage livestock to use uplands on large properties - pipe irrigation water conveyances
WEEDS	<i>Minimize soil erosion</i> <i>Improve riparian and upland vegetation</i>	• Remove existing weeds; replace with desirable vegetation. An integrated vegetation plan may include: grazing, mowing, bio-control, cultivating, or pulling • Control the spread of weeds near moving water; weeds are transported by water • Seed areas susceptible to weeds with desirable competitors • Use weed-free hay for forage and mulch • Wash equipment to remove weed seeds • Apply herbicides at appropriate rates and locations; follow the pesticide label
IRRIGATION	<i>Reduce unnatural fluctuations in stream flows</i> <i>Reduce runoff</i> <i>Minimize pollutants</i> <i>Reduce soil erosion</i>	• Inform irrigation districts of water needs in a timely manner so appropriate amount of water can be provided • Schedule irrigation based on crop needs, soil type, climate, topography, infiltration rates • Improve irrigation efficiency through sprinkler conversion, pressurized delivery, gated pipe, rotating pooling agreements • Minimize return flows through the use of cover crops, straw mulch, grass filter strips • Grade and slope property to retain runoff • Line ponds to minimize water loss from seepage • Pipe or line surface water delivery systems • Manage tailwater • Lease water rights for instream use

CROP NUTRIENTS & FARM CHEMICALS	<i>Reduce potential for surface and groundwater pollution</i> <i>Reduce runoff</i>	• Develop nutrient application plans (“nutrient budgets”) based on water and soil testing, tissue testing, plant needs • Apply appropriate amounts at proper times; dispose of containers properly • Avoid potential spills and their effects: have clean-up plan, store tanks away from water, check valves on delivery trucks • Apply non-farm chemicals appropriately on landscaping and lawns
WASTES	<i>Reduce potential for water pollution</i>	• Store and manage waste hay, chemicals, compost, or organic wastes away from streams or flowing waters • Compost or use organic wastes • Don’t pump wastes into dry wells

Contact your local SWCD (Attachment A) for guidance on selecting appropriate management practices or for assistance with developing a voluntary, individual conservation plan.

Landowners who are implementing conservation plans approved by their SWCD likely are meeting the Area Plan goal and likely are in compliance with the Area Rules. They may wish, however, to have their conservation plan periodically reviewed by their local SWCD to ensure that no additional changes to the conservation plan are necessary.

4: STRATEGIES TO ACHIEVE OBJECTIVES

The appropriate SWCD works with landowners, agribusiness, commodity and volunteer organizations, and other agencies to implement this Area Plan. These SWCD activities are delineated in Memoranda of Agreement with ODA. The success of the Area Plan relies on landowners voluntarily using conservation measures that reduce pollution from agricultural lands.

OBJECTIVE 1: EDUCATION

Create a high level of awareness and understanding of water quality issues related to agriculture.

SWCDs coordinate the education efforts and work with partners such as ODA, Natural Resources Conservation Service (NRCS), Oregon State University (OSU) Extension Service, watershed councils, agribusiness partners, and other interested parties to carry out these education strategies. The focus of the educational effort is on:

- Water quality: current conditions and ways to improve water quality where necessary,
- Prevention of water pollution from agricultural activities,
- Regulations related to water quality,
- Conservation practices,
- Watershed restoration and enhancement,
- Available programs and project funds.

Strategies include:

1. Hold educational programs -
 - Hold workshops on water quality issues and the agricultural practices that help improve water quality,
 - Encourage demonstration projects to showcase successful conservation practices and systems,
 - Work with others to organize tours of demonstration projects for agricultural managers and producers,
 - Produce and distribute brochures about water quality issues.
2. Conduct a media program -
 - Submit news articles and public service announcements to area newspapers, radio stations, and newsletters,
 - Invite media to conservation tours and workshops.
3. Involve the agricultural community in conservation education -
 - Create and maintain a list of experienced agricultural operators willing to share their conservation practices with other interested people by speaking, leading tours, and providing tour sites.
4. Build partnerships with agribusiness to promote conservation -
 - Co-sponsor workshops and tours between the SWCDs and agribusinesses,

- Share education materials with agribusiness field representatives,
- Develop educational materials in conjunction with agribusinesses and commodity and volunteer organizations.

OBJECTIVE 2: VOLUNTARY CONSERVATION PRACTICES

Increase the voluntary adoption of conservation practices to improve water quality.

Landowners have flexibility in choosing management approaches and practices to address water quality issues on their lands. Landowners may choose to develop management systems to address problems on their own, or they may choose to work with specialists (see Attachment A) to develop a voluntary conservation plan. The LAC recommends that landowners develop a conservation plan so that they can both resolve current problems and avoid future ones. A conservation plan is a comprehensive management plan that addresses site-specific concerns through the selection of individual management practices or systems of practices. To adequately address water quality issues, conservation plans should outline specific measures necessary to enhance water quality and limit soil erosion from agricultural activities.

Landowners may seek planning and financial assistance from any agency or a consultant. Landowners are encouraged to ask their local SWCD for assistance with developing a conservation plan or reviewing an existing one. Conservation plans may enable producers to apply to a variety of funding programs (see Objective 3).

Conservation plans may contain any of the following elements or additional elements not listed here, depending on the site and the condition for which preventive or corrective measures are being implemented:

- Soil erosion and sediment control
- Streamside area management
- Livestock management
- Waste management
- Nutrient and farm chemical management
- Irrigation management

Strategies include:

1. Encourage agricultural producers to develop and implement conservation plans -
 - Promote the benefits of having an individual farm conservation plan that incorporates conservation practices.
 - Provide assistance in planning and implementation from the SWCDs, NRCS, and partner organizations.
 - Showcase positive and effective conservation practices through workshops and tours of demonstration projects.
2. Identify conservation practices that will protect and improve water quality in the Management Area -
 - Develop and distribute a list of conservation practices.
 - Access ongoing research into effective conservation practices.
 - Obtain practical knowledge from agricultural producers.

OBJECTIVE 3: FUNDING

Secure funding for administration and successful implementation of the Area Plan

Landowners may need financial assistance to meet Area Plan objectives and area rule requirements. Cost-sharing assistance for certain management practices may be available through current USDA conservation programs such as the Environmental Quality Incentive Program (EQIP) and CREP. Other potential funding sources include, but are not limited to, Oregon Watershed Enhancement Board (OWEB), EPA Section 319 grants, Bonneville Power Administration, Deschutes River Conservancy, Deschutes Basin Land Trust, and Freshwater Trust (Attachment A).

SWCDs and watershed councils provide direction and help seek funding to implement the Area Plan. Funding is necessary for:

- a. Education – to fund education programs such as workshops, tours, and development of published materials.
- b. Technical assistance – to hire staff to help agricultural producers develop and implement voluntary conservation plans.
- c. Implementation assistance – to provide cost-share dollars to assist producers in implementing the Area Plan.

Strategies include:

1. Obtain financial assistance for implementation of conservation practices; and funding for conservation planning assistance and conservation education.
 - Submit grant proposals to ODA, OWEB, USDA, US EPA, DEQ, and other agencies and private organizations.
 - Submit ongoing reports of successes to granting agencies.
 - Form partnerships with the business sector for additional funding.
 - Promote USDA incentive-based cost-share programs to assist producers with conservation plan implementation.
2. Ensure adequate administration of the Area Plan.
 - Include implementation of the Area Plan in the annual and long-range work plans of the appropriate SWCDs.

OBJECTIVE 4: EVALUATION

Conduct periodic reviews of the Area Plan by the LAC and other interested parties

The LAC works with ODA, DEQ, SWCDs, watershed councils, and others to establish ways to measure Area Plan success.

Progress and implementation efforts will be assessed through determination of necessary changes in land management systems, measurement of water quality and/or landscape condition improvements over time, and evaluation of educational techniques and technical and financial tools.

Every two years, ODA, in cooperation with the local management agency (LMA), LAC, and DEQ assess the progress of Area Plan implementation toward achievement of plan goals and objectives.

As part of the reviews, ODA, the LMA and the LAC discuss the following questions.

- Are all of our plan objectives measurable?
- Have we met the goals and objectives in the plan?
- Were the strategies identified during the last biennial review completed?
- Were all violations that were found during ODA compliance inspections resolved or are they in the process of being resolved?
- What are water quality conditions and trends at agriculturally influenced monitoring sites?
- What are conditions and trends in agricultural land conditions that affect water quality?
- Are additional data needed to understand water quality and land conditions and trends?
- What do assessment and monitoring results tell us about where work should be focused for the next two years?
- How is the implementation strategy of focused work in small areas working? What changes have taken place in land conditions in the small areas?
- How can the LAC help make the small area implementation strategy work better or help accelerate implementation of the area plan?

Biennial reviews include:

- A review of projects, demonstrations, and tours used to showcase successful management practices and systems;
- An evaluation of outreach and education programs designed to provide public awareness and understanding of water quality issues;
- An evaluation of the effectiveness of technical and financial assistance sources available to the agricultural community;
- Documentation of violations of the Area Rules and subsequent corrections;
- An evaluation of available current water quality monitoring data and sources of pollution in the Management Area; and
- A review of load allocations as found in any completed TMDL for the Management Area and the anticipated effectiveness of this plan in meeting the load allocations as described in that TMDL.

In addition, many of ODA's current efforts are focused on evaluating program effectiveness through the priority area concept. Priority areas are relatively small watersheds identified within an agricultural water quality management area. ODA water quality staff work with LMAs to select priority areas, based on land condition and water quality concerns. ODA and the LMAs develop action plans with identified milestones and corresponding timelines to improve streamside vegetation and/or other land conditions. A reporting mechanism is identified in the action plan, which includes assessments provided to LACs at their biennial reviews.

Focus Areas assessments include:

- Baseline and two-year post-baseline conditions with respect to parameters of concern identified in the priority area.
- A report on the level of progress that was made in land condition changes through voluntary outreach, education, and technical assistance.
- Evaluation of changes in water quality in the priority area, if appropriate and if data are available.

Based on the results of this discussion, the LAC, SWCD, ODA and other partners will discuss needed modifications to the area plan and rules.

2011-2012 Accomplishments

	Projects	Outreach/Education	Monitoring	Demonstrating Progress
Streamside conditions	• Black Butte fencing • Ranch at the Canyons • Nurre juniper removal • Leithauser vegetation project	• Booth at Upper Deschutes River Coalition • 12 Site visits to assess streamside vegetation		Draft Assessment Plan for south county
Potential pollutants	Arnold Irrigation project	• Booth at Home & Garden Show, 4-H Fair, & Swalley Irrigation District annual meeting • Weed Wagon @ Deschutes County Fair • Tips of the month • 2 on-farm workshops near La Pine • 27 site visits to assess wq issues • 132 landowner contacts relating to WQ issues • Distribution of RLH		Draft Assessment Plan for manure in south county
Irrigation efficiency	Farm Plans- Deschutes River Ranch & Ranch at the Canyons	• Booth at Farm Fair, Living on a Few Acres • Participation in the IWM Group • 2 IWM workshops		

2013-2016 Activities Planned by the SWCD

The SWCD plans to assess vegetation along the Little Deschutes and Deschutes Rivers south of Sunriver. In addition, they plan to evaluate drylots in the La Pine area for proper management of livestock manure. They will then follow up with individual landowners as needed.

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5: RESPONSIBILITIES

TOTAL MAXIMUM DAILY LOADS

The Oregon DEQ implements the federal Clean Water Act in Oregon. As part of its responsibilities, it establishes “TMDLs” for pollutants on the 303(d) list.

DEQ began TMDL development for the Upper and Little Deschutes Subbasins in early 2012, under the guidance of a local Technical Advisory Committee. Due to litigation filed by Northwest Environmental Advocates against EPA in early 2012, completion of these TMDLs has been delayed indefinitely. The Area Plan will serve as the implementation plan for agriculture’s load allocations in the Management Area once TMDLs are completed.

AREA PLAN DEVELOPMENT AND IMPLEMENTATION

ODA is the Designated Management Agency for controlling pollution from agricultural activities on agricultural, rural, and forestry lands in the Management Area. ODA is authorized to develop and carry out a water quality management plan for any agricultural or rural lands, where state or federal law requires a water quality management plan.

The Deschutes SWCD is the LMA for development of the Area Plan. It assists with administration, outreach, and providing technical assistance to landowners. The Deschutes SWCD coordinates with the Jefferson County and Klamath SWCDs to provide assistance to landowners outside of Deschutes County.

The director of ODA appointed the LAC to assist with development and implementation of this Area Plan and Rules. The LAC represents local agricultural producers, local landowners, irrigation districts, the city of Bend, and the Deschutes SWCD. The LAC reconvenes biennially to review Area Plan implementation and to review the Area Plan and Rules and amend them as necessary. Area Plan and Rule revisions will address load allocations assigned to agriculture in future TMDLs for this Management Area.

The day-to-day implementation of this Area Plan is accomplished through Memoranda of Agreement between Jefferson County, Deschutes and Klamath SWCDs, and ODA. Under such agreements, the Deschutes SWCD acts as the primary LMA.

As resources allow, staff from the SWCDs, USDA NRCS, Deschutes County Weed/Vegetation Program, OSU Cooperative Extension, and Central Oregon Agricultural Research Center can help landowners evaluate the effectiveness of conservation practices for reducing soil erosion and runoff. Personnel in these offices also design and assist with implementation of practices, and assist in identifying any sources of cost-sharing funds for the construction and/or use of some of these practices. Implementation priorities are established on a periodic basis through annual work plans developed jointly by the SWCDs and ODA.

ODA and the SWCDs provide presentations to interested groups on an ongoing basis. They also meet individually with landowners to explain the Area Plan and Rules and to provide site-specific educational reviews of land conditions relative to water quality.

Any actions related to determination of noncompliance with Area Rules or enforcement are taken up directly by ODA, as outlined in OARs 603-090-0000 through 603-090-0120.

6: AREA RULES

The **Area Rules** are enforceable by ODA and are cited here for your information. The **Area Plan** is not enforceable. The Area Plan and Rules complement each other. The Area Plan provides an overall proactive strategy for meeting water quality objectives and for complying with the Area Rules.

All landowners conducting agricultural activities on non-federal and non-Tribal Trust lands must comply with the Area Rules (OAR 603-095-3000 through 603-095 3060). ‘Landowner’ includes any landowner, land occupier or operator (OAR 603-095 0010(24)). The landowner’s responsibility is to implement measures that ensure compliance with these Area Rules. ODA can levy sanctions if a landowner is out of compliance with the Area Rules.

Activities governed by the Forest Practices Act are outside the jurisdiction of this Area Plan. Pesticide use is governed by the Pesticide Control Act (Attachment F); those laws are administered by the ODA Pesticides Program.

The LAC will reconvene within 60 days of DEQ’s Notice for Public Comment on the draft Upper Deschutes TMDL to assess the effect of the TMDL on the Area Plan and Rules.

Rule #1: Limitations

OAR 603-95-3040(1)

Landowners must comply with OAR 603-95-3040(2) through (3) within the following limitations:

- (a) A landowner is responsible for only those conditions resulting from activities controllable by the landowner. A landowner is not responsible for conditions resulting from activities on other lands.**

Rule #2: Streamside Vegetation

OAR 603-95-3040(2)

- (a) Effective January 1, 2005, agricultural activities must allow the establishment and development of appropriate vegetation along natural and channelized streams, consistent with site capability. Noxious weeds are not appropriate. Vegetation must be adequate to prevent unnatural streambank erosion, moderate water temperature, and filter sediment and nutrients from surface runoff.**
- (b) Part (a) does not apply to irrigation water conveyance systems, including but not limited to irrigation canals, ditches, and laterals.**

Rule #2 addresses stream temperature, sediment, nutrients, and bacteria.

Rule #2 addresses the moderation of water temperature. Riparian vegetation can help reduce water temperatures in the summer and increase water temperatures in the winter.

Any type of vegetation other than noxious weeds qualifies as long as it assists the functions required in the Rule. The Rule does not specify any activities that must cease and does not require any particular activity to take place. Landowners are not responsible for the destruction of vegetation by wildlife browsing and grazing.

Rule #2 also does not require that all sediment be kept out of streams. This Rule refers to the filtration of sediment caused by agricultural activities, not sediment resulting from natural processes. Sufficient vegetation to filter out sediment also helps reduce the amount of bacteria and nutrients entering streams; nutrients can bind to sediments and can be carried into waterways in greater proportions than by water flow without sediments.

Rule #3: ODA Authority to Control Water Pollution

OAR 603-95-3040(3)

(a) Effective on rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

Rule #3 references current State Law (ORS 468B.025 and ORS 468B.050). ORS 468B.025 states that no person shall:

- (1)(a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.
- (b) Discharge any wastes into the waters of the state if the discharge reduces the quality of such waters below the water quality standards established by rule for such waters by the Environmental Quality Commission.
- (2) Violate the conditions of any waste discharge permit issued under ORS 468B or ORS 568.

ORS 468B.050 refers to situations when permits are required, such as certain confined animal feeding operations (CAFOs).

Compliance with Rule #3 ensures that concentrated nutrients, pathogens associated with high animal density areas, high sediment concentrations in run-off, toxics, or other potential pollutants are not readily transported to waters of the state.

Livestock wastes can include manure from pastures draining to or bisected by irrigation ditches and any other situations not already covered by Oregon's CAFO laws. Indicators of potential noncompliance include: 1) runoff flowing through areas of livestock usage and entering waters of the state, 2) livestock waste located in drainage ditches or areas of flooding, or 3) *E. coli* counts that exceed State water quality standards. Livestock facilities located near streams must employ an adequate runoff control and waste management system.

Wastes can also include excess sediment discharges. Indicators of potential noncompliance with Rule #3 include: 1) visible active erosion scars, 2) sediment-laden runoff, or 3) obvious deposits of sediment on the stream or canal bottom that can be traced to a specific source.

Definitions:

Wastes include manure, commercial fertilizers, soil amendments, composts, vegetative materials, *or any other substances* that will or may cause water pollution (ODA's OAR 603-095-0010(53)). Therefore, 'wastes' also include sediment.

Waste discharge means the discharge of waste, either directly or indirectly, into waters of the state (ODA's OAR 603-095-0010(54)).

Water pollution means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof (State statute for water quality: ORS 468B.005(7)).

Waters of the state include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, marshes, inlets, canals, and all other bodies of surface or underground waters, natural or artificial, public or private (except those private waters which do not connect to natural surface or underground waters) within Oregon (from state statute for water quality: ORS 468B.005(8)).

Complaints and Investigations

The following Area Rules provide for resolution of complaints.

Complaints and Investigations (OAR 603-095-3060)

- (1) When the department receives notice of an alleged occurrence of agricultural pollution through a written complaint, its own observation, through notification by another agency, or by other means, the department may conduct an investigation. The department may, at its discretion, coordinate inspection activities with the appropriate Local Management Agency.**
- (2) Each notice of an alleged occurrence of agricultural pollution will be evaluated in accordance with the criteria in ORS 568.900 to 568.933 or any rules adopted thereunder to determine whether an investigation is warranted.**
- (3) Any person allegedly being damaged or otherwise adversely affected by agricultural pollution or alleging any violation of ORS 568.900 to 568.933 or any rules adopted thereunder may file a complaint with the department.**

- (4) The department will evaluate or investigate a complaint filed by a person under section OAR 603-095-3060(3) if the complaint is in writing, signed and dated by the complainant and indicates the location and description of:
 - (a) The waters of the state allegedly being damaged or impacted; and**
 - (b) The property allegedly being managed under conditions violating criteria described in ORS 568.900 to 568.933 or any rules adopted thereunder.****
- (5) As used in section OAR 603-095-3060(4), “person” does not include any local, state or federal agency.**
- (6) Notwithstanding OAR 603-095-3060, the department may investigate at any time any complaint if the department determines that the violation alleged in the complaint may present an immediate threat to the public health or safety.**
- (7) If the department determines that a violation of ORS 568.900 to 568.933 or any rules adopted thereunder has occurred, the landowner may be subject to the enforcement procedures of the department outlined in OARs 603-090-0060 through 603-090-0120.**

BACKGROUND INFORMATION

GEOGRAPHIC AREA and PHYSICAL SETTING

Location and Physical Setting (map)

The Management Area encompasses approximately 3,200 square miles in central Oregon, consisting of the Upper and Little Deschutes Subbasins, as defined by the state of Oregon. Additionally, it includes lands in the Crooked River drainage south of the Crooked River and west of the range line between R12E and R13E in T14S WM to include the entire Crooked River Ranch subdivision. It is bounded to the west by the crest of the Cascades, to the south by the Klamath drainage, to the east by the Crooked River drainage, and to the north by the Reservation of the Confederated Tribes of the Warm Springs and by the Middle Deschutes Agricultural Water Quality Management Area.

The Management Area consists of the drainage of the Deschutes River and all its tributaries upstream of and inclusive of the Metolius River, and a fraction of the Crooked River. Major tributaries include the Metolius River, Whychus Creek, Tumalo Creek, and the Little Deschutes River and its tributaries.

The pristine nature of the area has been recognized through federal and state designations of numerous wilderness areas and the establishment of wild, scenic, and recreational river stretches on the Deschutes River, Little Deschutes River, Crescent Creek and Whychus Creek. Several stretches of the Deschutes River around Bend have been designated Oregon Scenic Waterways.

Additionally, the Management Area includes the communities of Crooked River Ranch, Sisters, Redmond, Bend, La Pine, and Crescent. The Management Area includes half of Deschutes County and portions of Jefferson, Klamath, and Lake counties.

Approximately one-third of the land is state- or privately-owned. The remaining lands are federally owned; almost all are managed by the US Forest Service.

Climate

The Management Area is characterized by moderate days and cool nights. Typical summers are dry and hot; winters tend to be relatively dry and cold. Most precipitation falls in the winter.

Rain or snow events above 3,500 feet can cause very high peak flows in the streams and rivers, resulting in severe erosion¹. The likelihood of flooding increases when warm “Chinook winds” arrive in the spring. Rapid snowmelt can result from these warm, southwest winds and, when accompanied by rainfall, flooding can become severe.

Geology and Soils

The Management Area consists primarily of a long, wide-plain ranging in elevation from 2,700 feet at the confluence of the Crooked and Deschutes Rivers in the north to 4,300 feet in the south. Volcanic peaks on the western boundary exceed 10,000 feet.

The geology is complex due to several periods of volcanism, faulting, and erosion dating back at least 40 million years¹. More than 500 large volcanoes, cinder cones, or volcanic vents have been identified in Deschutes County alone. The four major periods of mountain building and river moving activities have been interspersed with periods of erosion and sedimentation associated with glaciation and stream runoff. The general permeability of volcanic rock allows rain and melting snow to trickle into the ground to the water table where underlying sediments play a primary role in natural spring occurrence. Groundwater flowing through adjacent volcanic rocks is forced to the surface due to much older and complex geologic structures of low permeability, creating springs.

Soils in the Upper Deschutes watershed are largely from volcanic materials, including volcanic ash, pumice and cinders¹. Most of the soils are uniform over large areas and cover buried soils formed of hard basalt and andesite, tuff, breccia, glacial till and outwash gravel. Because of the relatively recent volcanic activity, soils have not had time to develop and mature³. In many areas of the basin, the soil horizon is only a few feet to a few inches thick leaving much of the basalt flows, pumice fragments, and cinders exposed at the surface as if you were looking at a lava flow only a few days old.

Volcanic soils are naturally high in phosphorus⁴. Data from the Metolius drainage suggest that natural background levels of phosphorus in the water vary between 0.05 and 0.15 mg/L.

Detailed information on soil types is found in the Upper Deschutes soil survey at <http://www.or.nrcs.usda.gov/soil/mlra.html>.

Hydrology³

The Deschutes River and its western tributaries start high in the Cascade Mountains. The head of the Deschutes River is formed by overflow from Little Lava Lake when there is abundant water, but during dry years the source consists of large springs in Blue Pool. Along its 132-mile course to Lake Billy Chinook, the Deschutes is fed by some of the largest springs in the United States. Cultus River, Quinn River, Snow Creek, Browns Creek, Fall River, Spring River, Alder Springs, and some unnamed springs near Lake Billy Chinook are all springs that discharge the abundant groundwater that has infiltrated high in the pumice rich soils and rocks of the Cascade Mountains. Flows of many springs in the upper watershed peak in summer because of the time delay and distance from when and where the water enters the ground and where it discharges to the surface again; springs at lower elevations tend to have more constant flows. The Deschutes River is so dominated by springs that a US Geological Survey concluded in 1914 that the Deschutes River at Bend was the most even-flowing river for its size of any river in the United States.

Whychus Creek and Tumalo Creek are quite a contrast to the spring-fed tributaries to the Deschutes River. Their source is very high in the Cascade Mountains at the toes of glaciers around Broken Top and the Three Sisters mountains. These two creeks typically peak at the height of snowmelt, usually in May and June, and then reach minimum flows in late fall and winter. When there is a moderate to heavy snowpack and a warm Chinook wind, these creeks can increase in flow 20 times over in one day. These streams are also a good source of cold water to the Deschutes River.

To increase the supply of water for irrigation, several reservoirs (Crane Prairie, Crescent Lake, and Wickiup Reservoir) were built high in the headwaters of the Deschutes River. All together, these three reservoirs store 341,050 acre-feet for irrigation of approximately 105,000 acres.

The flow regime of the Deschutes River changed dramatically below Wickiup Reservoir after the dam was built. During very dry years, the river is reduced to 20 to 30 cfs in the winter and in the summer time during the height of irrigation season, the flow has been increased to 2,000 cfs. Presently, the maximum is around 1,700 cfs.

The water released from the reservoir travels down the Deschutes to Bend where nearly all of it is diverted into six major canals. The flow below these canals during the summer is very low. Until recently, the lowest flow in dry years was around 30 cfs. Recent instream transfers and conservation work has brought that minimum to approximately 130 cfs. The canals themselves are mostly unlined and were dug through the very recent volcanic lava flows and leak a substantial amount of water. Some estimates have put the overall transmission losses at 50 percent. Some of the irrigation districts in the Management Area are working on lining and piping projects to conserve water. For example, North Unit Irrigation District has lined the first twelve miles of its canal to prevent this seepage so that the irrigators can use the saved water on their farms.

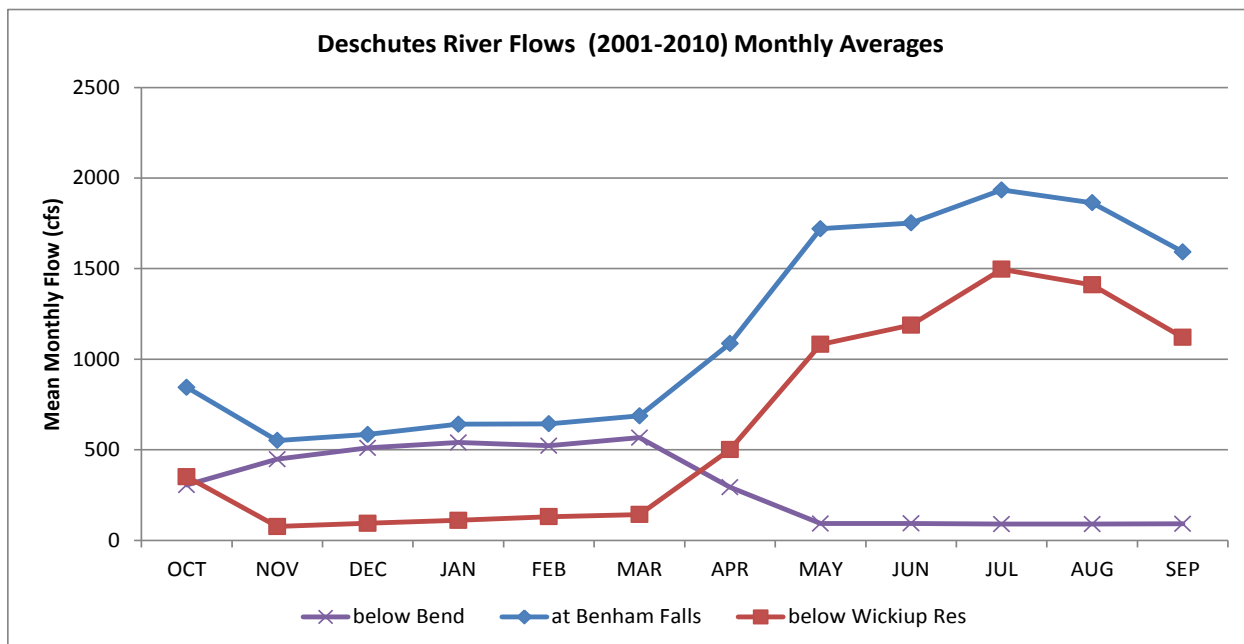
The vast majority of water diverted from the Deschutes River is taken out by the irrigation districts (Table 3). All other private diversions add up to less than 100 cfs.

Table 3. Irrigation District diversions and flow rates in the Management Area^k.		
Canal	Maximum Water Right (cfs)	Usual Maximum (cfs)
Arnold	150	95
Central Oregon and North Canal	1,385	1,000
Bend Feed	150	135
North Unit Main	1,100	800
Swalley	120	105
Tumalo Feed	230	180
Three Sisters	185	150
Crooked River Feed	400	180

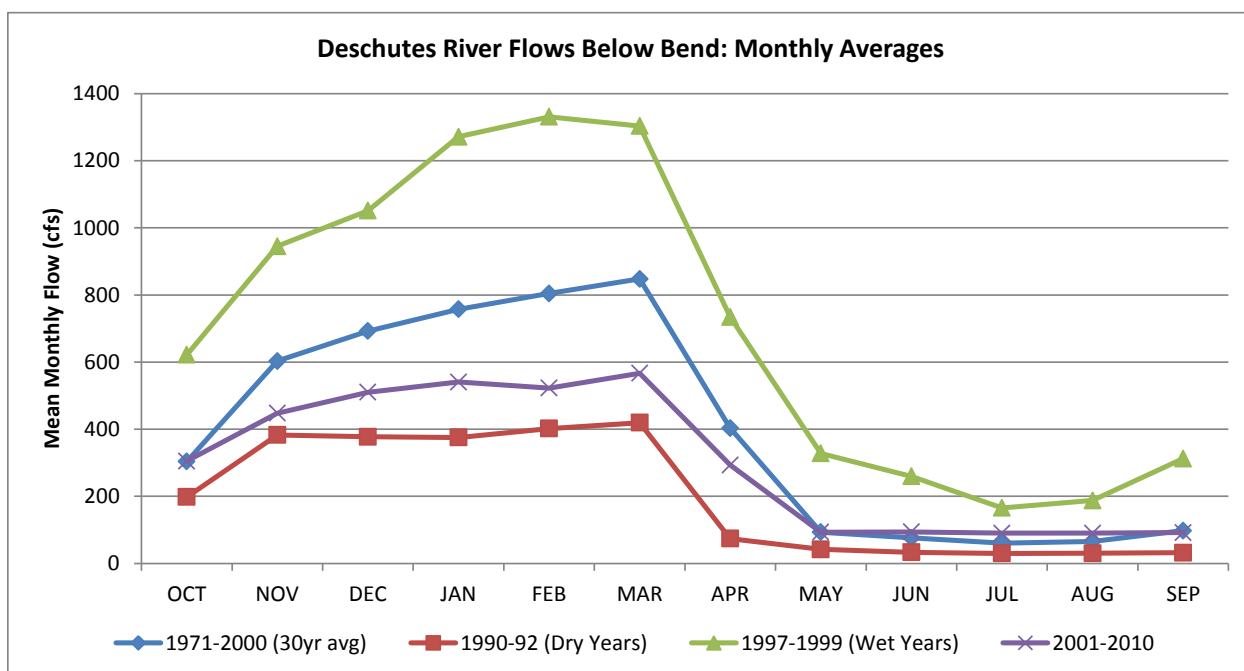
The following graphs illustrate the major flow regime of the Deschutes River. Wickiup Reservoir is managed to provide stored water and live flow to users downstream. Lowest flows below Wickiup Dam are in the fall and winter, while the reservoir fills; greatest releases are during the spring and summer irrigation season (graph 1). Flows at Benham Falls (44 miles downstream from Wickiup) reflect the addition of the tributaries Fall River and Spring River, which are unregulated and have relatively stable flows due to being spring-fed. Contributions from the Little Deschutes also add flow to the river above Benham Falls. Streamflow from the Little Deschutes is snow-melt/runoff driven, but also reflects storage releases from Crescent Lake for Tumalo Irrigation District, which diverts water in Bend. Flows measured below Bend are downstream of the irrigation district diversions and reflect summer diversions to the irrigation district delivery systems (graph 1). The flows below Bend (graph 2) reflect both streamflow

improvements in the summer due to conservation efforts over the last decade (2001-2010) and supply variability throughout the year due to wet (1997-1999) and dry (1990-1992) climate periods compared to a 30 year based period (1971-2000).

Graph 1



Graph 2



Tumalo Creek has one major diversion now, aside from the city of Bend diversion high in the drainage on Bridge Creek. The Tumalo Irrigation District (TID) diverts water through the Tumalo Feed Canal at River Mile 2.5. Tumalo Creek below the Feed Canal had been dry during late summer nearly every year from 1913 to 1992. However, conservation efforts by the Tumalo Irrigation District restored 2.5 cfs between this diversion and the mouth between 1992 and 2005. In 2005, the state approved a senior instream water right for 5.82 cfs from the Feed Canal to the mouth. More recently, with several large conserved water projects, the flow below the Feed Canal can be as high as 15 cfs of protectable water (i.e. water flow with a water right priority date).

The Little Deschutes River above Crescent Creek is unregulated and, with few irrigation withdrawals, resembles as close to a natural stream as any in the basin. Crescent Lake is a natural lake, but its depth has been increased and its outflow regulated by the TID. This management has little effect on winter flows in the Little Deschutes River. The average summertime flows exceed natural flows, but are significantly lower than the average runoff, high flows that would occur naturally during April, May and June. The stored water released from Crescent Lake actually benefits the flows in the Little Deschutes River in that summer flows generally are higher than they would be naturally, yet peak flows have been reduced by 75 percent.

Whychus Creek is used heavily for irrigation and consequently suffers low flows between the Three Sisters Irrigation District canal (River Mile 23.5) and where the springs near Camp Polk Road contribute about 7 cfs (River Mile 17). In the lower reach of Whychus Creek, Alder Springs (River Mile 2) contribute about 20 cfs, and at the mouth nearly 100 cfs discharges to the Deschutes River because of groundwater springs. Until 1998, the stream through town used to dry up. With the work of the Upper Deschutes Watershed Council, Deschutes River Conservancy, and Three Sisters Irrigation District, flows can exceed 15 cfs during the summer time through a segment that frequently was dry.

Crooked River is a very flashy stream and contrasts significantly to the Deschutes River due to the clay rich soils and differing geology. The river is used heavily for irrigation. In the very lowest stretch of the Crooked River, large springs contribute 1,100 cfs in flow just before it enters Lake Billy Chinook. Two reservoirs authorized for flood control and irrigation are located on Ochoco Creek and Crooked River. Those two reservoirs provide cool consistent flows throughout the summer time when historically flows were low through the Prineville Valley during summer. They also protect the town from devastating floods during the winter when flood flows into the reservoirs can easily be triple what the outflows are held at.

Vegetation

Vegetation is dominated by mixed conifer stands of ponderosa and lodgepole pine, fir, juniper, grasses, and shrubs¹. Forest habitat is characterized by ponderosa pine with old-growth characteristics, interspersed with dense lodgepole thickets of old and new growth characteristics and thinned young pine/ponderosa stands. Meadows comprised of dry bunch grass, primarily Idaho fescue, needle grasses, or sedges, are scattered throughout the forest understory.

The west to east transition shifts from ponderosa pine/bitterbrush/manzanita to juniper/sage/bitterbrush/Idaho fescue plant communities¹. Numerous rare plant species are

scattered throughout the area; several are candidates for listing as Endangered or Sensitive species.

Fire exclusion has significantly modified vegetation¹. Junipers, once limited to areas not burned by fire under natural conditions, now crowd and displace conifers and rangeland vegetation, while other shrubs displace native grasses and forbs.

Noxious weeds are on the rise and have become a serious management issue⁵. Within the past 20 years, periodic drought cycles, the lack of a coordinated control and abatement program in the Deschutes Basin, and expanding commercial and residential development have fostered an explosion of invasive noxious weeds. Riparian and agricultural lands within the Management Area are rapidly transforming from diverse native plant communities and productive farmlands to weed-choked monocultures. Purple loosestrife is showing up in irrigation ditches. Areas infested with spotted and diffuse knapweed; bull, Canada, and/or Russian thistle; Dalmatian toadflax; and other unwelcome species contribute to higher soil erosion and runoff from agricultural and riparian lands, thereby boosting levels of sedimentation, turbidity and other water quality-limiting parameters in the Management Area.

The Deschutes County Weed Board has developed a comprehensive vegetation management plan to control and eliminate weed infestations and restore those areas to native species.

LAND USE

Most of the Management Area is comprised of federal forest and rangelands. The US Forest Service manages the majority of Paulina Creek land, all the lands in the headwaters of the Deschutes River and its western tributaries, and lands surrounding montane lakes and reservoirs. The Bureau of Land Management manages primarily small, sporadic areas directly adjacent to the waterways.

Approximately one quarter of the Management Area is privately owned¹. Private owners manage the majority of the land adjacent to the Deschutes and Little Deschutes Rivers and over half of the lands adjacent to Tumalo and Whychus Creeks. Use of agricultural lands varies throughout the Management Area⁶. Most grazed timberland and subirrigated pasture is around La Pine. Irrigated cropland is concentrated around Lower Bridge. Irrigated pastures and haylands occur throughout the Management Area.

In the late 1800s and early 1900s, settlers realized the Deschutes River and its tributaries could irrigate thousands of acres if the water could be diverted from the river and onto potential farmland. Many of the canals that presently divert water from the Deschutes River at Bend were dug within the first few years of the 20th century by irrigation companies. Most of these companies were subsequently reorganized into irrigation districts.

Forage, cereals, and seed crops comprise the majority of crops grown on irrigated lands, with irrigated pasture and alfalfa accounting for most of the consumptive use of water¹. The subdivision of large farms and ranches into “hobby” farms has resulted in increased livestock

numbers. Livestock include llamas, horses, beef and breeding cattle, poultry, sheep, goats, and a few dairy cows.

Approximately 20,239 acres were harvested in Deschutes County in 2011, of which 18,950 acres consisted of hay and pasture⁷. Cropland production in 2011 in Deschutes County was valued at \$13,135,000; nursery crops brought in \$2,700,000 and livestock brought in \$11,360,000. Most of the livestock income accrued from cattle.

The population of Deschutes County in 1980 was 62,142, and grew to 74,958 by 1990¹. By 2010, 157,733 individuals resided in the county⁸. Deschutes County is one of the fastest growing counties in Oregon.

The Management Area continues to undergo changes in its social and economic character. Historically, agriculture and timber sectors played a major role, but they have been replaced by an urban economy based on service, trade, and government.

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- ³ Kyle Gorman and Jeremy Giffin, Oregon Water Resources Department, Bend. Personal communications.
- ⁴ *Restoring Oregon's Deschutes River. Developing Partnerships and Economic Incentives to Improve Water Quality and Instream Flows*. Deborah Moore, Zach Willey, and Adam Diamant. Environmental Defense Fund. 1995.
- ⁵ Dan Sherwin, Deschutes County Weed Program Manager. Personal communication.
- ⁶ Todd Peplin, USDA Natural Resources Conservation Service, Redmond. Personal communication.
- ⁷ Oregon State University Extension Service, Oregon Agricultural Information Network. <http://oain.oregonstate.edu/SignIn.asp>
- ⁸ Population Research Center – Portland State University. <http://www.pdx.edu/prc/oregon-census-state-data-center>
- ⁹ Brett Hodgson, Oregon Department of Fish and Wildlife Biologist, Bend. Personal communication.
- ¹⁰ *Oregon's 2010 Section 303(d) List of Water Quality Limited Waterbodies*. Oregon Department of Environmental Quality. 2012.

ATTACHMENT A: Technical and Financial Assistance

Watershed councils and SWCDs are primary resources for technical and financial assistance. The following agencies or groups provide cost-share, grants, and other incentives on a case-specific basis to improve water quality on public and private lands.

Soil and Water Conservation District (SWCD)

Prepares management plans and helps implement them by coordinating with other technical experts in natural resources. <http://www.oacd.org/districts.html>

Jefferson County: 541-923-8018
Deschutes County: 541-923-2204
Klamath County: 541-883-6932 x3

Irrigation districts in the Management Area

Provide information in such areas as water management, irrigation practices and procedures, and basic (first-level) irrigation water rights laws and responsibilities. They also generally provide further contacts for resources such as irrigation easements, water right holder's responsibilities, and basic irrigation system education and design.

Arnold:	541-382-7664	http://www.owrc.org/basins/arnold.htm
Central Oregon:	541-548-6047	http://www.coid.org
Three Sisters:	541-549-8815	http://www.tsidweb.org
Swalley:	541-388-0658	http://www.swalley.com
Tumalo:	541-382-3053	http://www.tumalo.org

Deschutes County Weed/Vegetation Program

The Weed/Vegetation Division is under the Deschutes County Road Department. The division is responsible for educating the general public about noxious weed control. The integrated vegetation plan includes all aspects of weed control such as cultural, mechanical, biological, and chemical. The division also helps implement re-vegetation plans for landowners.

Bend: 541-322-7135 <http://www.deschutes.org/go/government/departments/road-department/citizen-involvement/noxious-weeds>

USDA – Natural Resources Conservation Service (NRCS)

Provides information on soil types, soils mapping, and interpretation. Administers and provides assistance in developing plans for Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Wetland Reserve Program (WRP), and other cost-share programs. Prepares management plans. Makes technical determinations on wetlands and highly erodible land. <http://www.or.nrcs.usda.gov>

Jefferson and Deschutes counties: 541-923-4358 x3
Klamath County: 541-883-6932 x3

USDA – Farm Service Agency (FSA)

Maintains agricultural program records and administers various federal cost-share programs. Their offices also provide up-to-date aerial photography of farm and forestland.

<http://www.fsa.usda.gov/or>

Jefferson & Deschutes counties: 541-923-4358 x2
Klamath County: 541-883-6932 x2

Oregon Department of Agriculture (ODA)

Oversees the agricultural water quality management (Senate Bill 1010) program, issues permits and helps producers comply with confined animal feeding water management programs, and provides support to SWCDs. <http://www.Oregon.gov/ODA/NRD/index.shtml>

Central Oregon Water Quality Planner, Bend: 541-617-0017
Livestock Water Quality Specialist, Bend: 541-617-0055
Noxious Weed Control, Redmond: 541-548-2241
Natural Resources Division, Salem: 503-986-4700

Oregon State University Extension Service

Offers educational programs, seminars, classes, tours, and publications to guide landowners in managing their resources. OSU has been instrumental in the Oregon Cattlemen's extremely successful WEST Program. Since its inception, it has grown into several distinct natural resources related workshops offered to ranchers and farmers free of charge. The WEST Program workshops help ranchers and farmers understand their watersheds and stream function better through assessments and monitoring. OSU has also been providing Proper Functioning Condition (PFC) workshops and assessments with landowners. <http://extension.oregonstate.edu>

Jefferson County: 541-475-3808 Deschutes County: 541-548-6088
Crook County: 541-447-6228 Klamath County: 541-883-7131

Oregon Watershed Enhancement Board (OWEB)

Provides funding for watershed enhancement projects under the general categories of education/public awareness, monitoring, management, and assessment/action planning.

Redmond: 541-923-7353 <http://www.oweb.state.or.us>

Upper Deschutes Watershed Council (UDWC)

Brings diverse interests together to work towards solutions on local natural resource issues in the Upper Deschutes watershed. Conducts watershed assessments, develops and funds watershed enhancement projects, provides educational opportunities, and works with local stakeholders to improve watershed stewardship.

Bend: 541-382-6102 <http://www.restorethedeschutes.org>

Crooked River Watershed Council (CRWC)

Promotes stewardship of the Crooked River Watershed and its natural resources by balancing conservation and economic sustainability. The Council is comprised of local residents and provides technical and financial assistance to landowners or groups willing to engage in voluntary restoration projects. In addition, the Council works with local residents and schools on education and outreach, and also conducts its own research and monitoring in the watershed.

Prineville: 541-447-8567 <http://www.deschutesriver.org>

Department of Environmental Quality (DEQ)

Responsible for protecting and enhancing Oregon's water and air quality, cleaning up spills and releases of hazardous materials, and managing the proper disposal of solid and hazardous wastes. Maintains a list of water quality limited streams, sets TMDL allocations. Provides funding for projects to improve water quality through the Clean Water State Revolving Fund Program and through Nonpoint Source Implementation 319 grants.

Bend: 541-388-6146 <http://www.deq.state.or.us>

Department of State Lands (DSL)

Administers state removal/fill law and provides technical assistance.

Bend: 541-388-6112 <http://www.oregonstatelands.us>

Oregon Water Resources Department (WRD)

Provides technical and educational assistance, water rights permits, and information.

Bend: 541-388-6669 <http://www.wrd.state.or.us>

Oregon Department of Fish and Wildlife (ODFW)

Works with landowners to balance protection of fish and wildlife with economic, social, and recreational needs. Advises on habitat protection. Offers technical and educational assistance for habitat and restoration projects. Provides plan review for special property tax assessment for wildlife habitat projects.

Bend: 541-388-6363

<http://www.dfw.state.or.us>

ODFW Fish Restoration and Enhancement Board (R&E)

Funds habitat restoration and enhancement projects to support recreational or commercial fisheries. Affiliated with ODFW.

Salem: 503-947-6259

<http://www.dfw.state.or.us/fish/RE>

Oregon Department of Forestry (ODF)

Technical advisor for state and federal cost share programs. Provide technical advice on forest management, reforestation, insect and disease problems, Oregon Forest Practices Act, Forest Resource Trust Program, Oregon forest tax programs and forest management plans.

<http://www.dof.state.or.us>

The Dalles: 541-296-4626

Prineville: 541-447-5658

Klamath Falls: 541-883-5693

Deschutes River Conservancy (DRC)

The DRC is a non-profit corporation dedicated to restoring streamflows and improving water quality in the Deschutes Basin through the implementation of on-the-ground projects. The DRC brings together state, federal, Tribal and local government representatives with private stakeholders to carry out basin-wide ecosystem restoration. Opportunities exist for both technical and financial support for watershed restoration and water conservation projects within the Deschutes Basin.

Bend: 541-382-4077

<http://www.deschutesrc.org>

The Fresh Water Trust (TFWT)

Offers lease and buy-out options for water rights. This market-based approach to increasing stream flow may also be used to fund irrigation system changes in watersheds identified as priorities for TFWT.

Portland: 503-222-9091

<http://thereshwatertrust.org>

Deschutes Basin Land Trust (DBLT)

Works cooperatively with landowners and communities to protect special lands in the Deschutes Basin for present and future generations through purchases of land and conservation easements.

Bend: 541-330-0017

<http://www.deschuteslandtrust.org>