

Appendix B

Goose & Summer Lakes Basin Report

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1 Basin Description

The Goose and Summer Lakes Basin, located in south-central Oregon, includes four closed subbasins (Summer Lake, Lake Abert, Goose Lake, and Warner Lake), and encompasses approximately 7,700 square miles including the communities of Fort Rock, Christmas Valley, Silver Lake, Summer Lake, Paisley, Valley Falls, Lakeview, Plush, and Adel. The Basin is located mostly in Lake County, but extends into small portions of Harney, Klamath and Deschutes County.

With a total population of approximately 7,500 people, the Basin is very sparsely populated, with less than one person per square mile. Lumber, government, and agriculture form the economic base. Agriculture is primarily hay, forage and small grain, along with cattle and horses. Less than one quarter of the Basin is privately owned. Nearly three quarters of the land is managed by the Federal government (Bureau of Land Management, US Forest Service and US Fish and Wildlife Service), and the state of Oregon owns 74,000 acres, some of which comprise the Summer Lake Wildlife Management Area.

Almost three-quarters of the basin is classified as rangeland. Native vegetation consists primarily of low sagebrush, big sagebrush, blue bunch wheatgrass, and Sandberg bluegrass. Some areas of higher elevation support Ponderosa pine and white fir, lodge pole pine, quaking aspen, antelope bitterbrush, and Idaho fescue. Less than four percent of the land is cultivated.

Elevations in the Basin range from 4,147' at Summer Lake to 8,456' on Crane Mountain east of Lakeview. The Basin is semiarid with average annual precipitation ranging from 5" in some of the eastern valleys to over 30" at higher elevations, most of which falls during the winter as snow. During the summer season, an average of 2" of rain falls annually at lower elevations. Freezing temperatures can occur at any time during the year, and maximum temperatures can exceed 100°F for a few weeks during the summer.

The two largest rivers in the Basin are the Ana River and the Chewacan. These rivers have numerous smaller tributary streams that support Redband trout, a rainbow trout adapted to arid forest and desert environments.

Local geology in the Basin is characterized by ancient deposits from large Pleistocene lakes that filled the Summer, Goose, Warner, and Fort Rock valleys. As time passed, most of the lakes evaporated and the present-day lakes and playas are all that remain. With no surface outlets, saline concentrations have risen until now most lake waters in the basin are alkaline and saline, too salty for domestic or irrigation use. The lakes in the Basin are predominantly closed drainages with no defined outlet. Lakes in the Basin include Silver, Summer, Goose, Crump, Alkali, Hart, Flagstaff, Campbell and Bluejoint Lakes and Lake Abert, and Drews Reservoir (some are dry playas in the summer and during drought seasons). The southern end of Goose Lake is the only point at which surface water historically flowed out of the Basin. Groundwater may flow north from the Fort Rock area into the Deschutes River Basin.

The major water use in the basin is irrigation. The oldest water rights date back to 1867. There are rights to irrigate over 183,000 acres. Prior to 1960, most of the irrigation in the Basin was from surface water. Since then, the use of groundwater for irrigation has expanded dramatically. Flood irrigation, using high spring flows is a common practice in the Basin. Much of the high flow not used for flood irrigation enters the large shallow lakes and some is lost to evaporation.

Table B-1: 2011 Land use and land cover for each subbasin in the Goose & Summer Lakes.

Subbasin	Watershed Area (km2)	% Urban/Roads	% Forest	% Cultivated	% Range/Forest Disturbance	%Other
Goose Lake	1876279	1.1	42.7	12.1	33.5	10.6
Lake Abert	2670779	0.6	25.1	1.5	63.7	8.9
Summer Lake	10708533	1.0	14.2	2.7	74.2	7.9
Warner Lakes	4443738	0.3	9.2	0.6	81.6	8.3

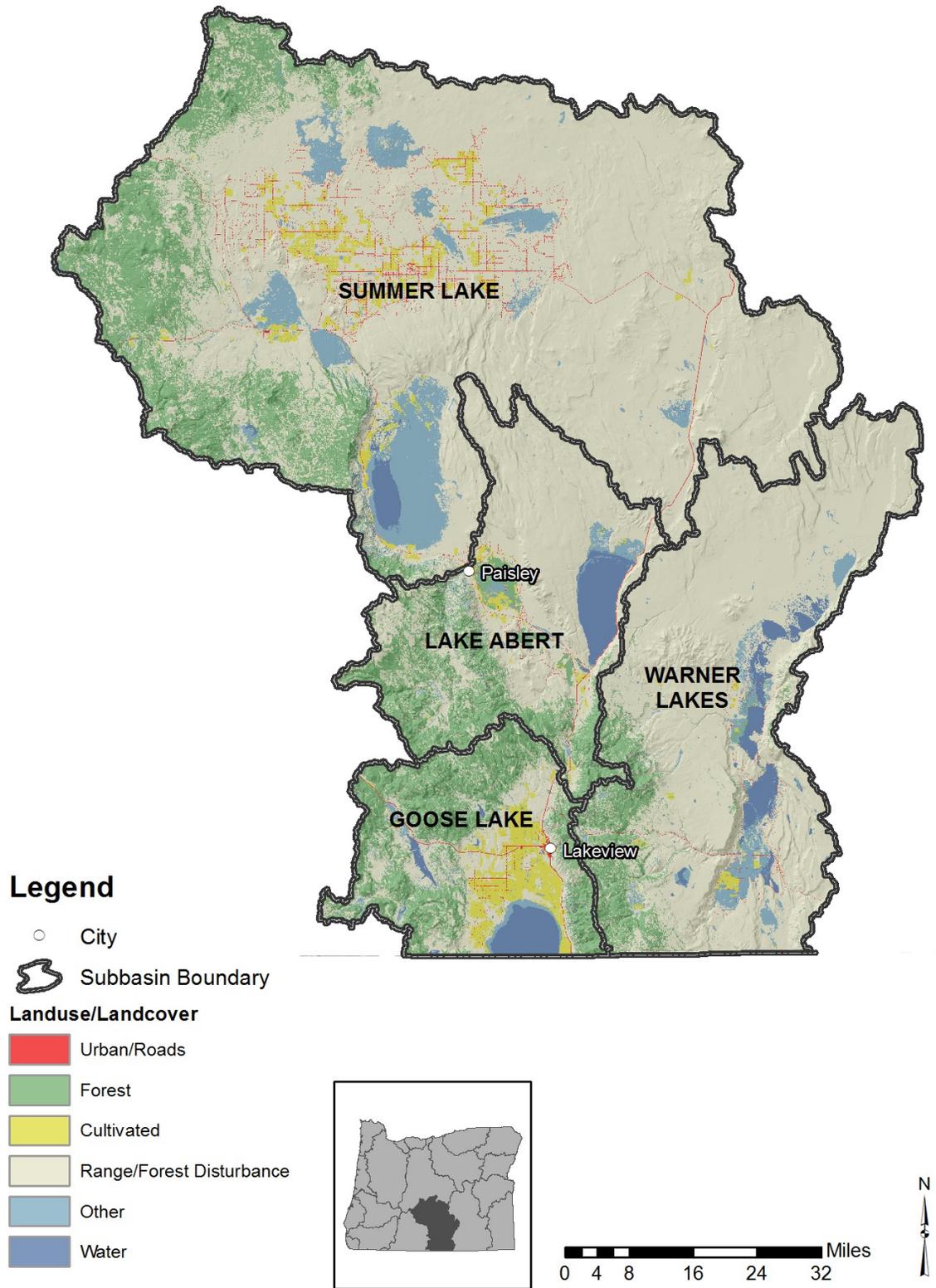


Figure B-1: Landuse in the the Goose & Summer Lakes administrative basin.

1.1 Basin Contacts

Table B-2: Oregon DEQ basin contact.

Administrative Area	DEQ Basin Coordinator
Goose and Summer Lakes	Eric Nigg: 541-633-2035: nigg.eric@deq.state.or.us

2 Water Quality Impairments and TMDLs

2.1 Water Quality Impaired Stream Segments

Under section 303(d) of the Clean Water Act, states, territories and authorized tribes must submit lists of impaired waters. Impaired waters are those that do not attain water quality standards or support all designated uses. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs) for these waters. Table B-3 identifies the number of Goose & Summer Lakes Basin waterbody segments impaired by parameter from the 2012 Integrated Report and the number of segments with approved TMDLs. Sources: [ODEQ](#), [USEPA](#)

Table B-3: Number of impaired stream segments with and without a TMDL as identified in Oregon's 2012 Integrated Report and Assessment database

Parameter	Segments without a TMDL	Segments with a TMDL
Arsenic	3	0
Biological Criteria	4	0
Dissolved Oxygen	2	0
Iron	2	0
pH	1	0
Silver	3	0
Temperature	42	0
Thallium	3	0

2.2 Total Maximum Daily Load Watershed Plans

The federal Clean Water Act requires that water pollutant reduction plans, called Total Maximum Daily Loads (TMDLs), be developed for water bodies that are listed in Category 5 of the Integrated Report (303(d) List). TMDLs describe the maximum amount of pollutants that can enter the river or stream and still meet water quality standards.

TMDLs take into account the pollution from major sources including discharges from industry and sewage treatment facilities, runoff from farms, forests and urban areas, and natural sources. TMDLs include a margin of safety to account for uncertainty, and may include a reserve capacity that allows for future discharges to a river or stream. DEQ typically develops TMDLs on a watershed, subbasin, or basin level and occasionally at the reach level depending on the type and extent of impairments.

The Water Quality Management Plan (WQMP) is the framework for TMDL implementation that is issued by Oregon along with the TMDL (Oregon Administrative Rules 340-042-0040(1)). The TMDL and WQMP serve as a multi-sector plan and provides the blueprint for TMDL related implementation activities.

- **Currently there are no TMDLs in the Goose & Summer Lakes Basin.**

3 Implementation Highlights

3.1 Section 319 Grants

Federal Section 319(h) funds are provided annually through the EPA to states for the development and implementation of each state's Nonpoint Source Management Program. In Oregon a portion of 319 grant funding is "passed through" to support community or partner projects that address Oregon's nonpoint source program priorities. Generally, DEQ requires grantees to report annually on the progress made implementing their grant project. This section highlights those outputs and accomplishments reported to DEQ in 2017. Note this section does not identify or include projects proposed and awarded a grant in 2017. Outputs and accomplishments for those projects will be reported to DEQ in future years once they have been implemented. For a listing of projects proposed and awarded a grant in 2017 see Section 3.6.2 of the main report.

In 2017 there were no 319 projects with reported outputs in the Goose & Summer Lakes.

3.2 Clean Water State Revolving Fund (CWSRF)

The Clean Water State Revolving Fund loan program provides below market rate loans to public agencies for the planning, design and construction of various projects that prevent or mitigate water pollution. Eligible agencies include federally recognized Indian tribal governments, cities, counties, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and intergovernmental entities. DEQ partners with Oregon communities to implement projects that attain and maintain water quality standards, and are necessary to protect beneficial uses. This section highlights the ongoing projects and the outputs and accomplishments reported to DEQ in 2017.

In 2017 there were no nonpoint source related Clean Water State Revolving Fund projects with reported outputs in the Goose & Summer Lakes.

3.3 Source Water Protection Grants

The Oregon Health Authority regulates drinking water under state law and the Safe Drinking Water Act and works cooperatively with DEQ on source water protection efforts. Using the Drinking Water Revolving Loan Fund, OHA funds Source Water Protection Grants (up to \$30,000 per public water system) for source water protection activities, monitoring, and planning in Drinking Water Source Areas. In addition, loans are available for improving drinking water treatment, source water protection activities, or land acquisition in source areas. Oregon's Infrastructure Finance Authority is responsible for administering these projects. The loan fund set-asides also fund five Drinking Water Protection positions at DEQ that provide technical assistance to public water systems and communities while they develop and implement strategies that reduce the risk within the delineated source water areas. This section highlights the ongoing projects and the outputs and accomplishments reported to DEQ in 2017.

In 2017 there were no nonpoint source related Safe Drinking Water State Revolving Fund projects with reported outputs in the Goose & Summer Lakes.

3.4 Drinking Water Provider Partnership Grants

Oregon DEQ participates in the Drinking Water Providers Partnership (DWPP) with USDA Forest Service Region 6, EPA Region 10, the U.S. Bureau of Land Management OR/WA Office, the Washington Department of Health, Geos Institute and WildEarth Guardians. Together, these partners coordinate a competitive grant solicitation and award program for environmental conservation and restoration projects in municipal watersheds across the Northwest. The Drinking Water Providers Partnership made the first of the annual awards in 2016 and most projects have a focus on nonpoint sources of pollution. The goal of the Partnership and the funding is to develop and support local partnerships to restore and protect the health of watersheds which communities depend upon for drinking water while also benefiting aquatic and riparian ecosystems, including the native fish that inhabit them. This section highlights the ongoing projects and the outputs and accomplishments reported to the DWPP in 2017.

In 2017 there were no active Drinking Water Providers Partnership projects with reported outputs in the Goose & Summer Lakes.

3.5 OWEB Grant Funded Projects

The Oregon Watershed Enhancement Board (OWEB) is a state agency that provides grants to help Oregonians take care of local streams, rivers, wetlands, and natural areas. These grant projects often address nonpoint sources of pollution and are thus included in this report.

Based on the most recent data available in OWEB's Oregon Watershed Restoration Inventory (OWRI) database, there were eight OWEB funded projects completed in 2016 with a total cash and inkind budget of \$430,952. The bar graph in Figure B-2 shows the total cash and inkind budget for the different project types in each Goose & Summer Lakes subbasin. Table B-4 describes the projects and the reported outputs.

Learn more about OWEB grant programs at <https://www.oregon.gov/OWEB/grants/Pages/grant-programs.aspx>.

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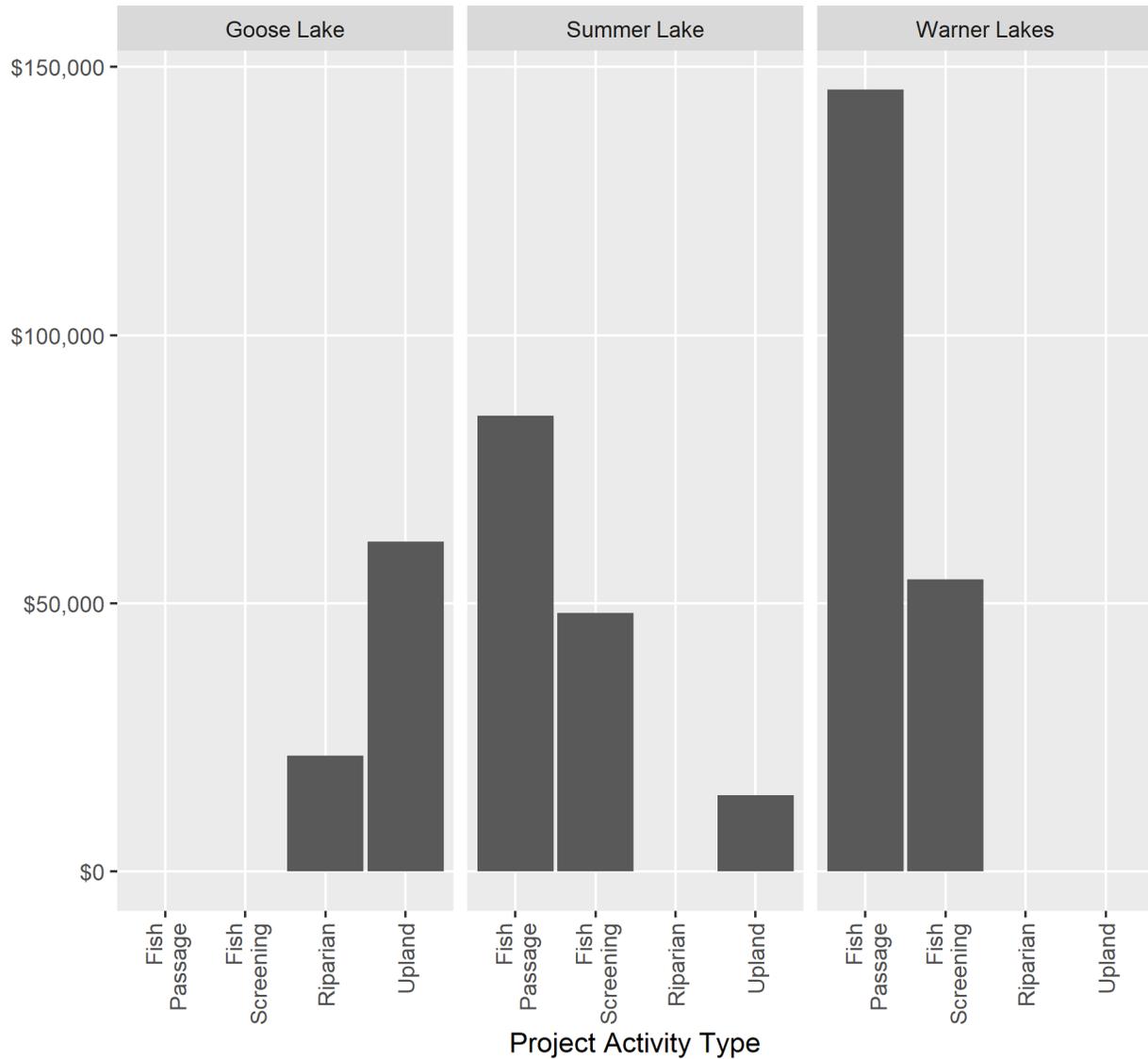


Figure B-2: Cash and in-kind dollars spent in each subbasin for different project types completed in 2016, the most recent year data is available in OWEB's OWRI database.

Table B-4: OWEB grant funded projects completed in 2016, the most recent year data is available in the OWEB OWRI database.

Subbasin	Project Name	Project Type	Project Description	Participants	Reported Outputs
Goose Lake	Flock Riparian Fencing	Riparian	Riparian fencing	Lake County Umbrella Watershed Council, OWEB, Private Landowners	10 acres treated (riparian activities), 0.5 linear stream miles treated (riparian activities)

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Subbasin	Project Name	Project Type	Project Description	Participants	Reported Outputs
Goose Lake	Lakeview School District Water Gap/Livestock Crossing	Riparian	Water gap constructed	Lake County Cooperative Weed Management Area, Lake County Umbrella Watershed Council, OWEB, Private Landowners	0.12 acres treated (riparian activities), 0.01 linear stream miles treated (riparian activities)
Goose Lake	Feldkamp Upland Enhancement	Upland	Upland treated for juniper by clearing, burning, thinning, or removal	Lake County Umbrella Watershed Council, ODFW, OWEB, Private Landowners, USFWS	70 acres treated (upland activities)
Goose Lake	Griffith Ranch Juniper Cut	Upland	Upland treated for juniper by clearing, burning, thinning, or removal	Griffith Livestock, Lakeview SWCD, OWEB	84 acres treated (upland activities)
Goose Lake	Shine Ranch Juniper Treatment Phase II	Upland	Upland treated for juniper by clearing, burning, thinning, or removal	Lake County Umbrella Watershed Council, ODFW, OWEB, Private Landowners	47 acres treated (upland activities)
Summer Lake	Christman Diversion Replacement	Fish Screening, Fish Passage	Fish ladders improved; New fish screens installed on diversions (where no screen had existed previously)	Ducks Unlimited, Inc., Fort Rock/Silver Lake SWCD, OWEB, Private Landowners	2 flow rate of water diverted by screens, 18 miles of habitat opened- previously inaccessible for both adults and juveniles, 1 non-road crossing barriers improved for fish passage, 18 miles of fish habitat made accessible by the removal of barriers other than at road/stream crossings

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Subbasin	Project Name	Project Type	Project Description	Participants	Reported Outputs
Summer Lake	Fern Juniper Cut	Upland	Upland treated for juniper by clearing, burning, thinning, or removal	Fort Rock/Silver Lake SWCD, OWEB, Private Landowners	75 acres treated (upland activities)
Warner Lakes	Rookerey Diversion	Fish Screening, Fish Passage	Engineered barrier bypass or fishway installed (other than fish ladders); New fish screens installed on diversions (where no screen had existed previously)	Lakeview SWCD, ODFW, OWEB, Private Landowners	10 flow rate of water diverted by screens, 0.5 miles of habitat opened-previously inaccessible for both adults and juveniles, 0.5 miles of fish habitat made accessible by the removal of barriers other than at road/stream crossings, 1 non-road crossing barriers improved for fish passage