Deschutes Basin Water & Wildlife

Deschutes County Planning Commission
February 24, 2022
Bridget Moran, USFWS Field Supervisor, Bend

U.S. Fish & Wildlife Service

- Endangered Species Act implementation
- Bald & Golden Eagle Protection Act implementation
- Wildlife & habitat conservation programs
- Stream restoration programs
- Fish passage programs
- General wildlife technical assistance

Endangered Species Act (ESA)

Activities (new or ongoing) that harm or otherwise "take" protected (*listed*) species are prohibited under section 9 of the ESA.

ESA Compliance Strategies
Habitat Conservation Plans

- Conservation plans that address non-federal actions that adversely affect ESA-listed species
- Designed to provide conservation to offset effects of impacts to species
- Provides legal mechanism to continue otherwise lawful activities
- Spelled out in Section 10 of the Endangered Species Act (ESA)
- Corollary to federal agency consultation process under Section 7 of the ESA

Deschutes Basin HCP

Approved 12/31/2020

30-year permit term

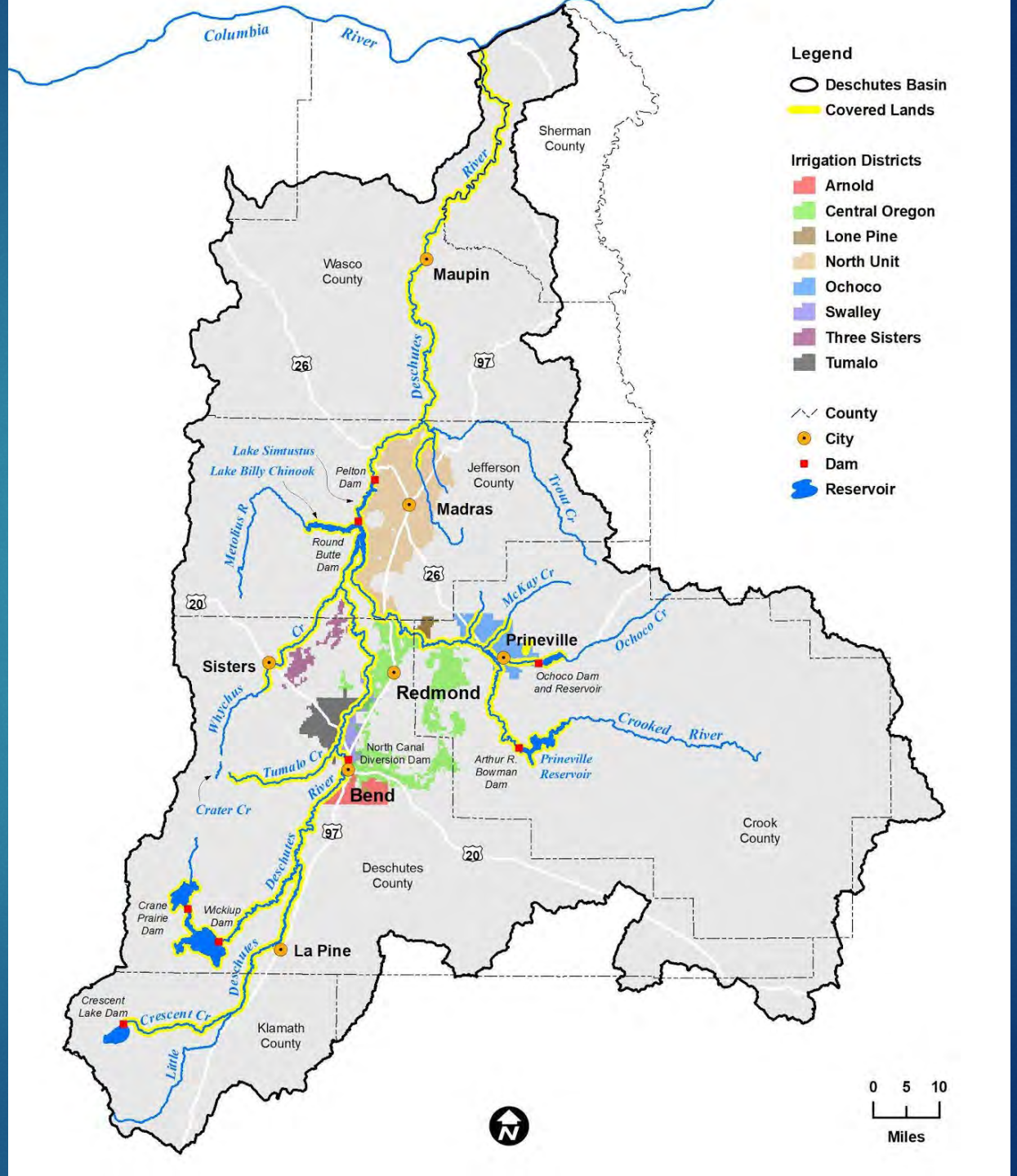
Deschutes Basin reservoirs and streams where ESA-listed species are present

Species included: Oregon spotted frog and bull trout

Permittees: Deschutes Basin Board of Control-member districts and the City of Prineville

Deschutes Basin HCP

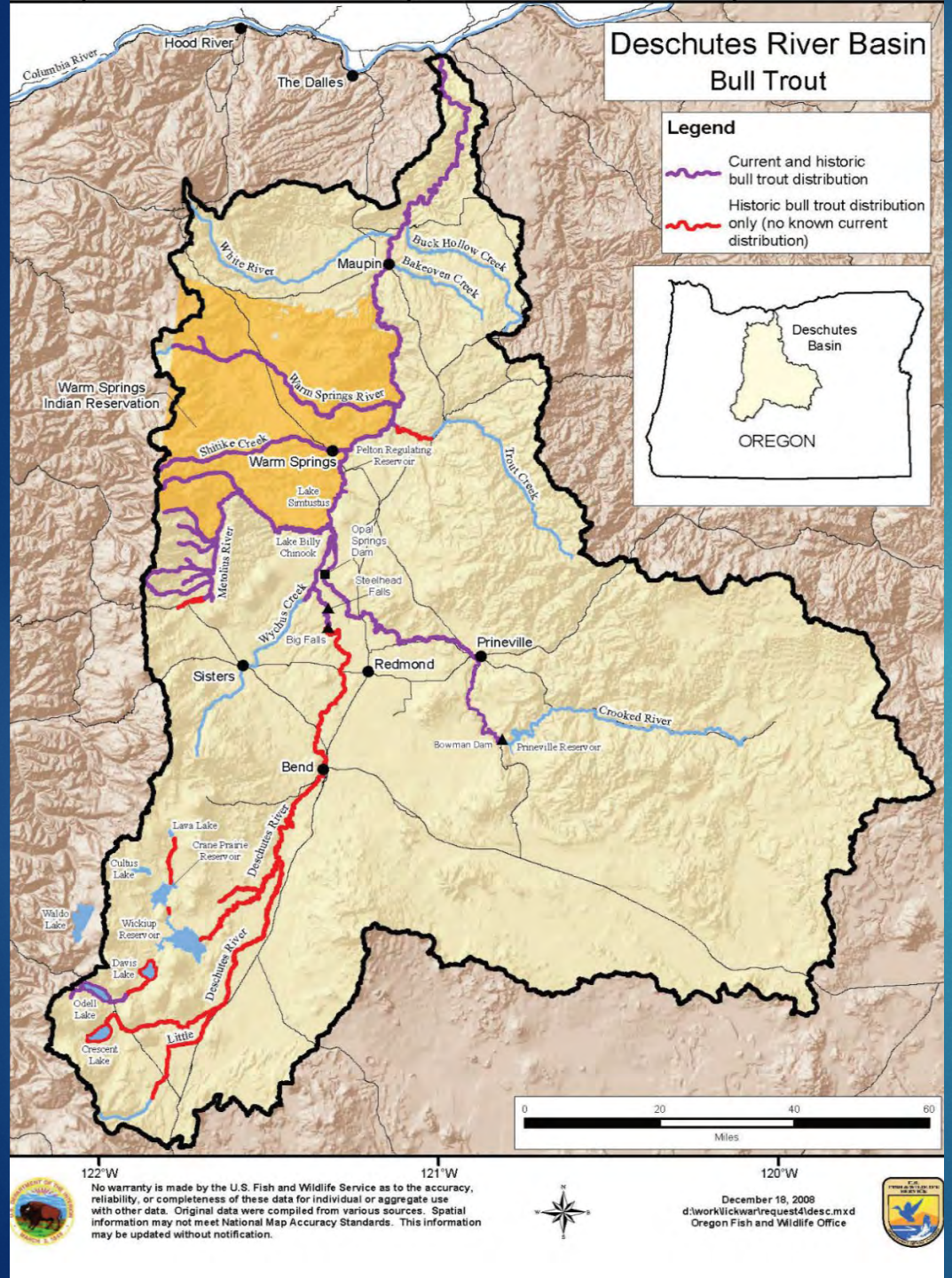
- Arnold Irrigation District
- Central Oregon Irrigation District
- Lone Pine Irrigation District
- North Unit Irrigation District
- Ochoco Irrigation District
- Swalley Irrigation District
- Three Sisters Irrigation District
- Tumalo Irrigation District
- City of Prineville



Oregon spotted frog geography

Upper Deschutes River

Flow requirements from Wickiup Reservoir		
Years	**Winter Minimum**	**Summer Maximum**
1-7	100 cfs	N/A
8-12	300 cfs	1400 cfs
13-30	400-500 cfs	1200 cfs



Current and Historic Bull Trout Distribution

Photo: Joel Satore

Where can I learn more?

HTTPS://WWW.FWS.GOV/OREGONFWO/ARTICLES.CFM?ID=149489716

Kyle Collins

From: GORMAN Kyle G * WRD <Kyle.G.GORMAN@water.oregon.gov>
Sent: Friday, February 25, 2022 7:55 AM
To: Kyle Collins
Subject: RE: Deschutes County February 24 Water Panel - Agenda Framework
Attachments: USGS.442242121405501.115975.72019.00003.20010802.20220223..0..pres.gif

[EXTERNAL EMAIL]

Thank you. I enjoyed talking about the water conditions but I am concerned about the lack of snowpack. I was hoping for a turn around this year.

Here they are:

Wickiup Reservoir
https://www.usbr.gov/pn/hydromet/wygraph.html?list=wic%20af&daily=wic%20af

SNOTEL graph
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assocHUCor_8/upper_deschutes-crooked.html

Drought Page
https://droughtmonitor.unl.edu/

https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?OR

USGS Groundwater level near Black Butte Ranch
https://or.water.usgs.gov/projs_dir/or002cbr/waterlevels/cbr.html

https://waterdata.usgs.gov/or/nwis/dv?referred_module=sw&dd_cd=01_72019_00003&dd_cd=02_72020_00003&format=gif&period=548&site_no=442242121405501

I attached the copy of the well level graph as .gif for your convenience.

OWRD Monitoring well between Bend and Redmond
https://apps.wrd.state.or.us/apps/gw/gw_info/gw_hydrograph/Hydrograph.aspx?gw_logid=DESC0061863

I think that was everything.

Kyle

From: Kyle Collins <Kyle.Collins@deschutes.org>
Sent: Thursday, February 24, 2022 7:09 PM
To: GORMAN Kyle G * WRD <Kyle.G.GORMAN@water.oregon.gov>
Subject: RE: Deschutes County February 24 Water Panel - Agenda Framework

Kyle,

Would you mind sending me a copy of the resources you utilized during your presentation?
Just the web links and any other figures so I can pass them along to the Commissioners and interested members of the public.

Thanks so much again for the discussion!
It was great and I think all the Commissioners appreciated the education.

Kyle Collins | Associate Planner
DESCHUTES COUNTY COMMUNITY DEVELOPMENT
117 NW Lafayette Avenue | Bend, Oregon 97703
PO Box 6005 | Bend, Oregon 97708
Tel: (541) 383-4427 | www.deschutes.org/cd

Let us know how we're doing: ***Customer Feedback Survey***
Disclaimer: Please note that the information in this email is an informal statement made in accordance with DCC 22.20.005 and shall not be deemed to constitute final County action effecting a change in the status of a person's property or conferring any rights, including any reliance rights, on any person.

From: GORMAN Kyle G * WRD <Kyle.G.GORMAN@water.oregon.gov>
Sent: Thursday, February 24, 2022 3:22 PM
To: Kyle Collins <Kyle.Collins@deschutes.org>; 'Moran, Bridget N' <bridget_moran@fws.gov>; 'sbginger@usgs.gov' <sbginger@usgs.gov>
Subject: RE: Deschutes County February 24 Water Panel - Agenda Framework

You don't often get email from kyle.g.gorman@water.oregon.gov. Learn why this is important

[EXTERNAL EMAIL]

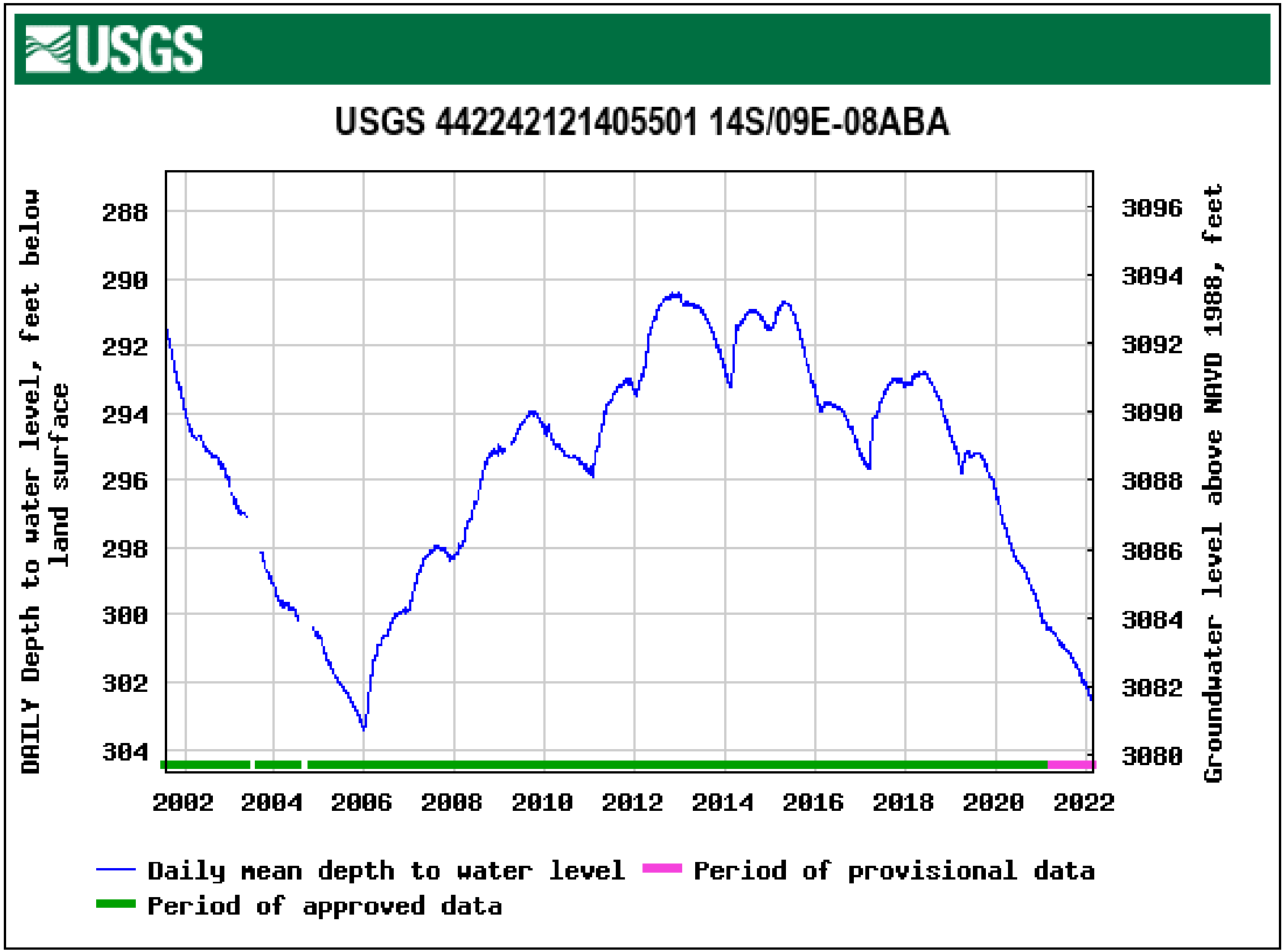
Kyle,

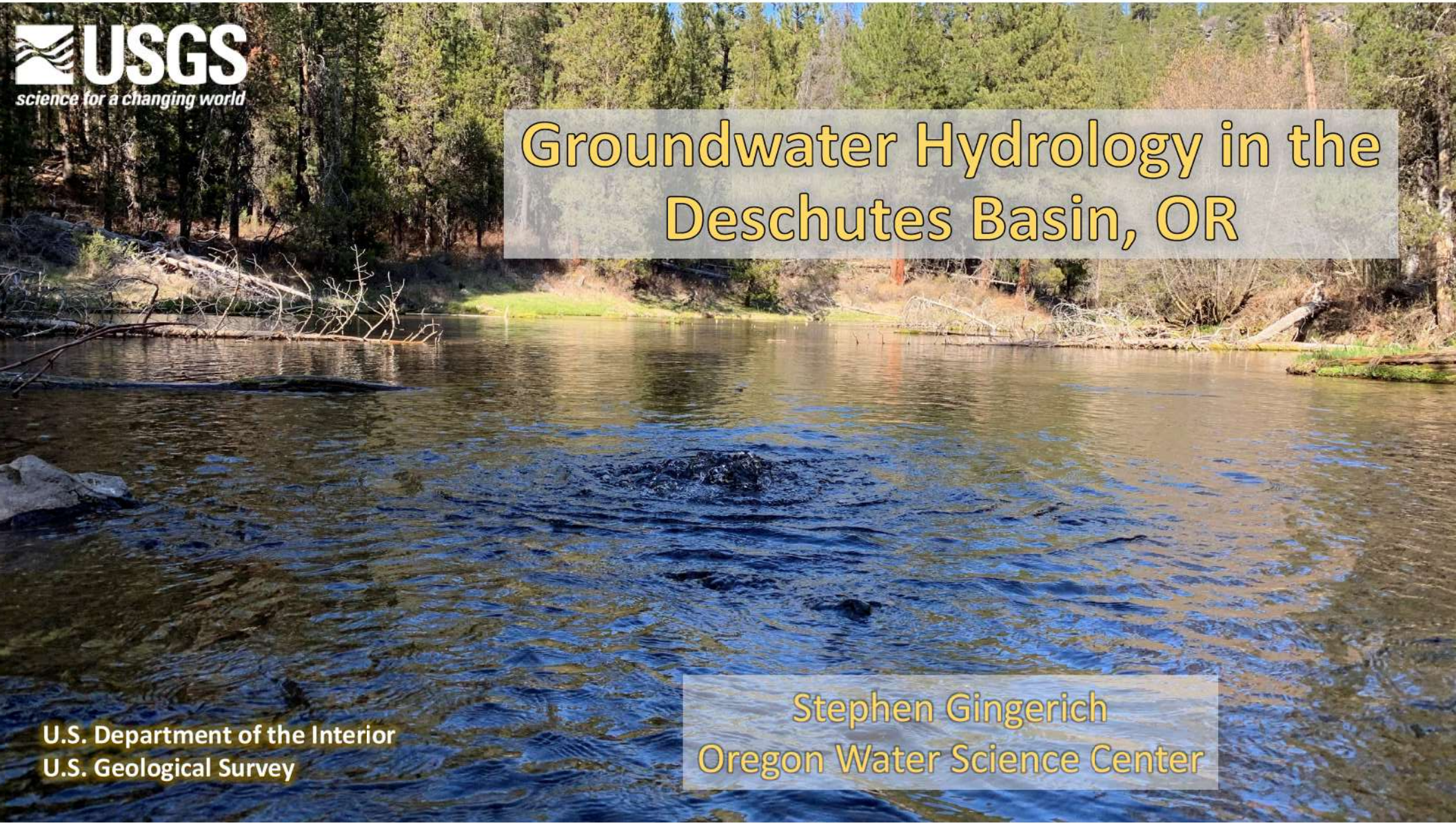
Will see you in a few hours and to confirm that I will be participating via zoom. Thank you.
Kyle

From: Kyle Collins <Kyle.Collins@deschutes.org>
Sent: Friday, February 18, 2022 6:16 PM
To: 'Moran, Bridget N' <bridget_moran@fws.gov>; GORMAN Kyle G * WRD <Kyle.G.GORMAN@water.oregon.gov>; 'sbginger@usgs.gov' <sbginger@usgs.gov>
Subject: RE: Deschutes County February 24 Water Panel - Agenda Framework

Water Panelists,

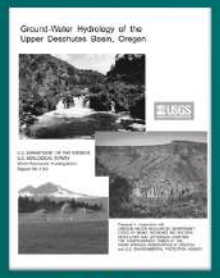
Please see attached for the February 24 Deschutes County Planning Commission meeting packet and below for Zoom info.


USGS
USGS 442242121405501 14S/09E-08ABA
DAILY Depth to water level, feet below land surface
Groundwater level above NAVD 1988, feet
288
290
292
294
296
298
300
302
304
3096
3094
3092
3090
3088
3086
3084
3082
3080
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Daily mean depth to water level
Period of provisional data
Period of approved data


USGS
science for a changing world
Groundwater Hydrology in the Deschutes Basin, OR
U.S. Department of the Interior
U.S. Geological Survey
Stephen Gingerich
Oregon Water Science Center

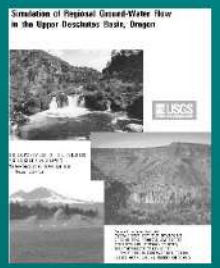
USGS Groundwater Studies in Deschutes Basin

- 1990s: Basic understanding of geologic framework and groundwater hydrology
- 2000s: Groundwater flow model—impacts of pumping, canals, climate
- 2010s: Enhanced surface water/groundwater model—effects of pumping on streams

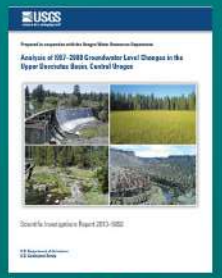


2001

2002

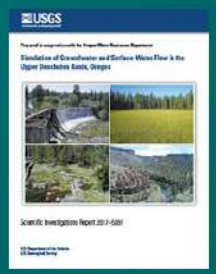


2004



2013


2013

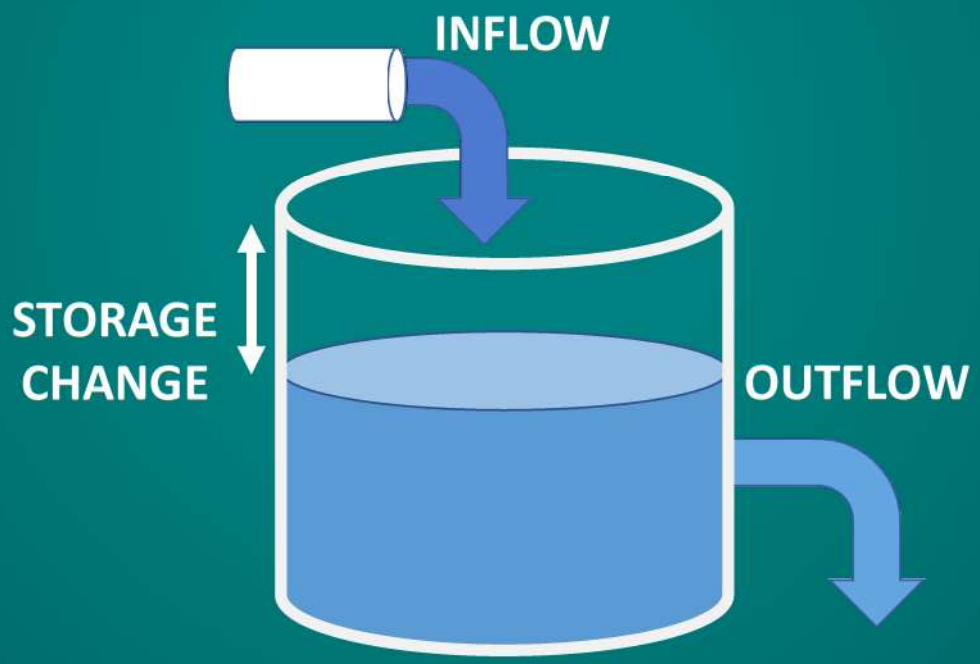


2017

USGS

Basin Groundwater Budget

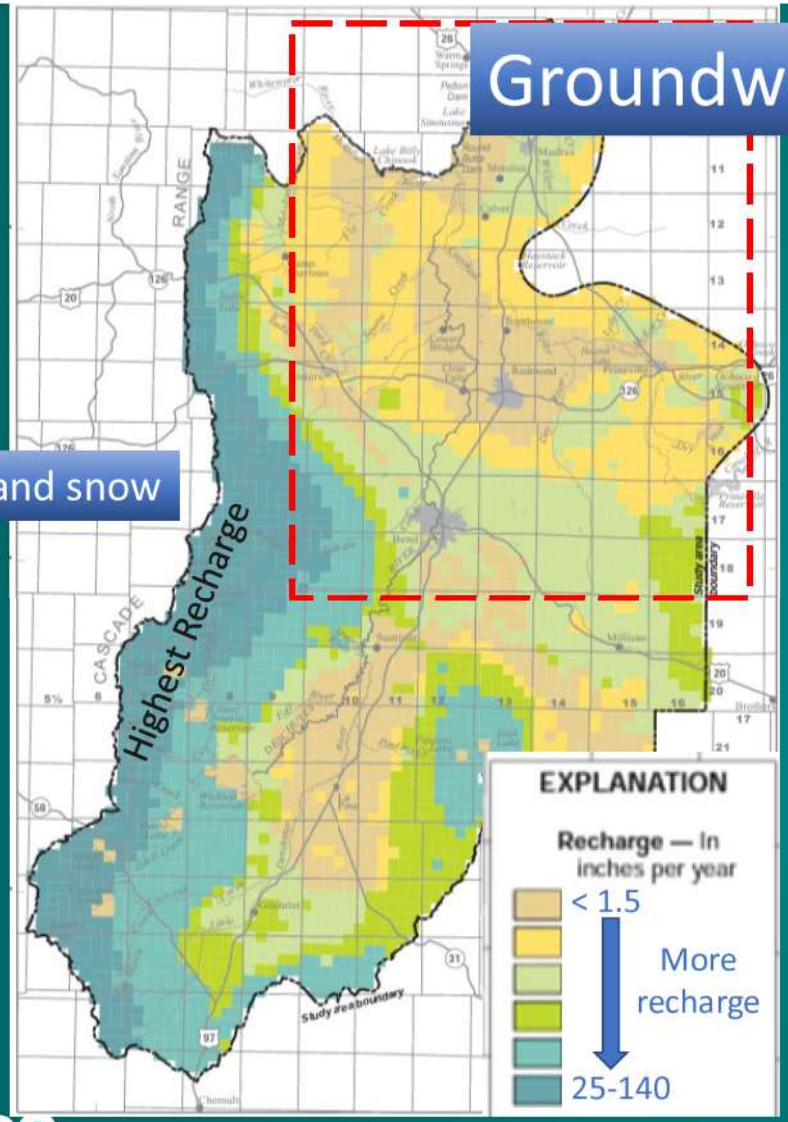
↓INFLOW = ↑OUTFLOW ± CHANGE IN STORAGE



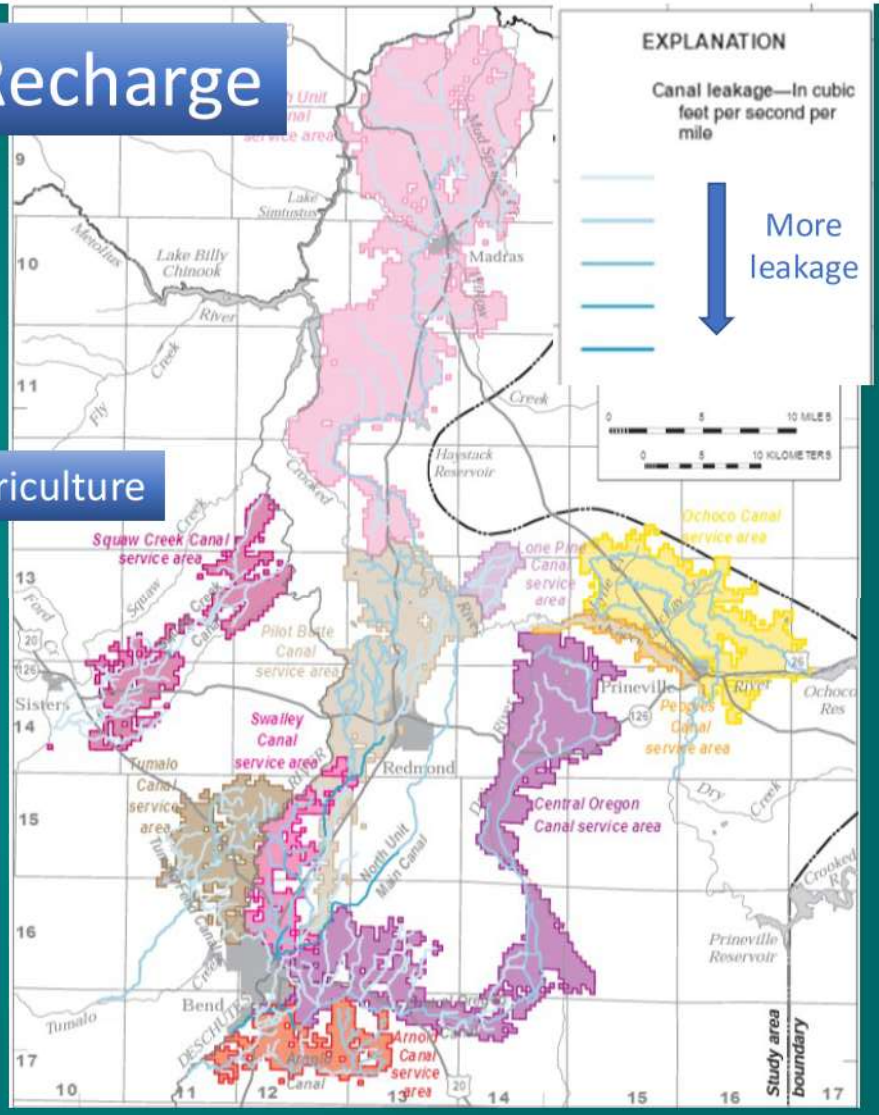
USGS

Groundwater Recharge

Rain and snow



Agriculture

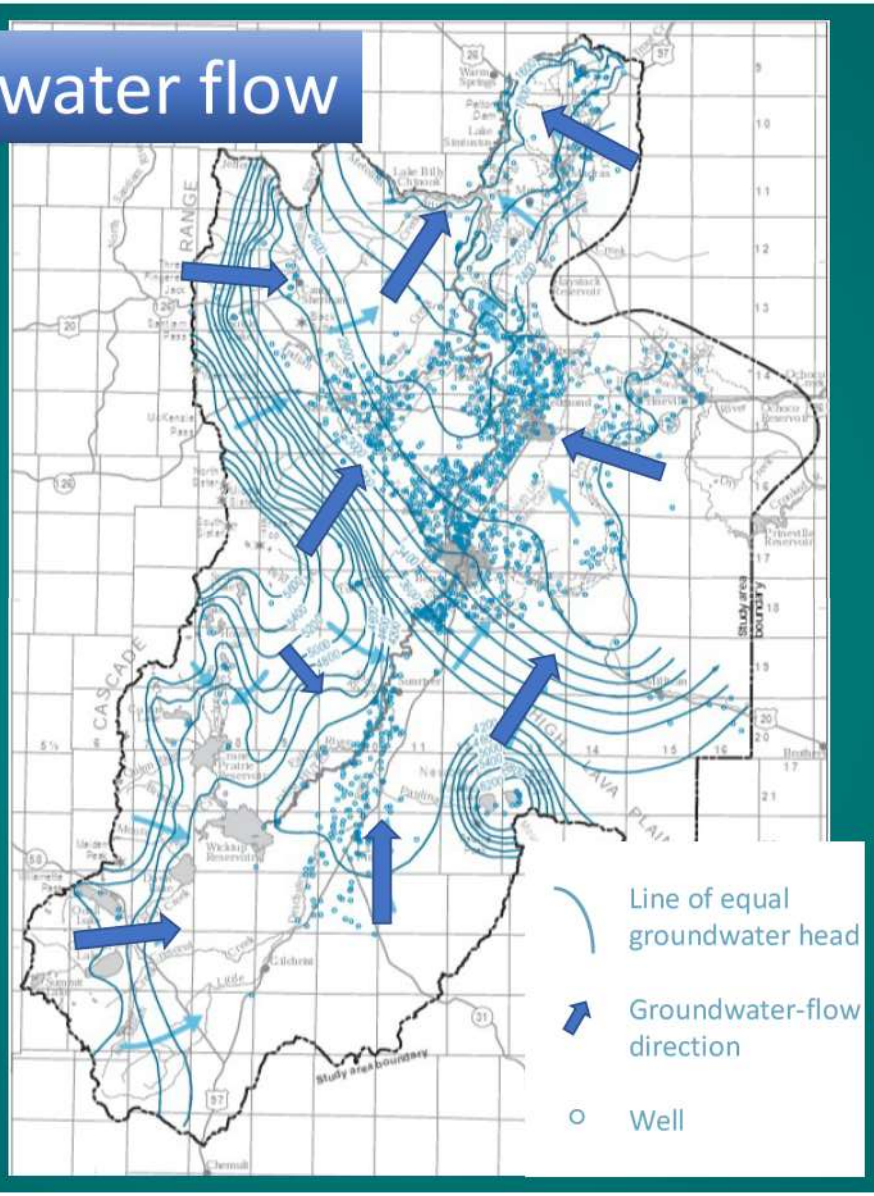


USGS

Gannett and others, 2001

Groundwater flow

A map of groundwater levels shows that groundwater generally flows northward from areas of recharge to discharge along the major streams and rivers



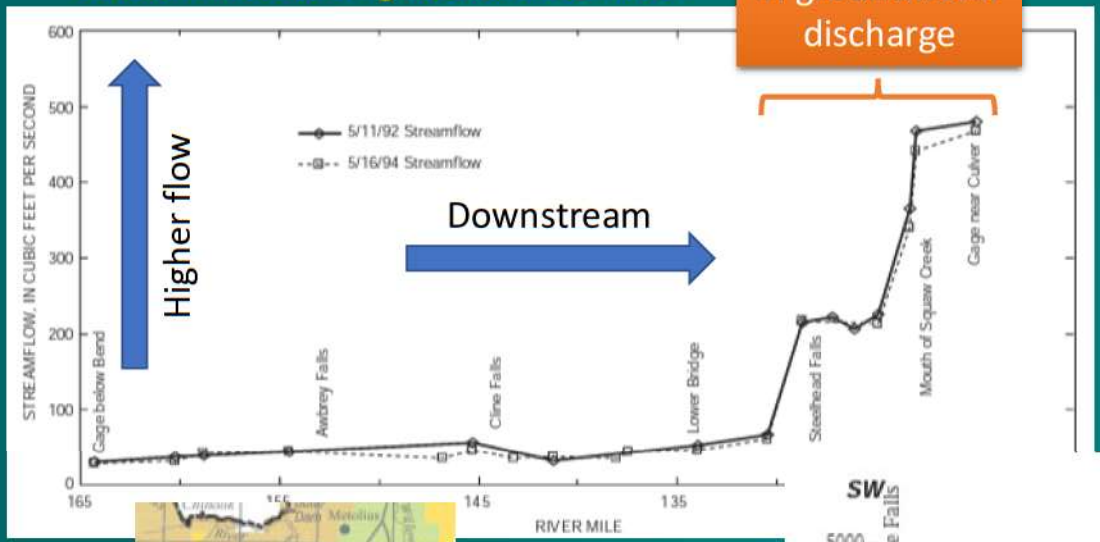
USGS

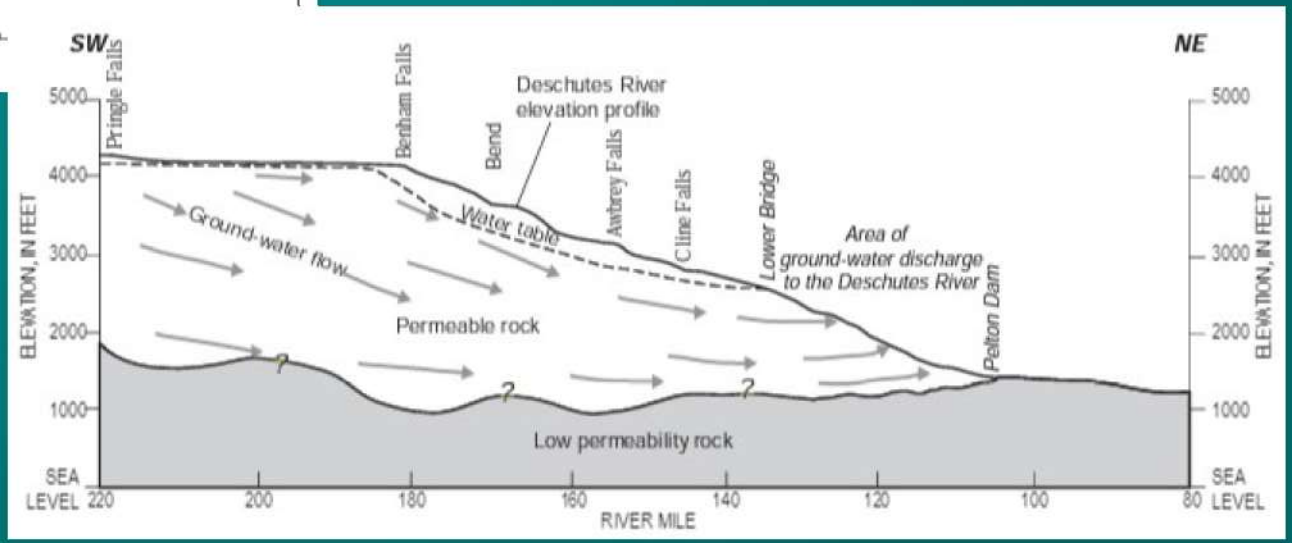
Gannett and others, 2001

Groundwater Discharge

Streamflow measurements and geochemistry help identify groundwater discharge

Streamflow along Deschutes River



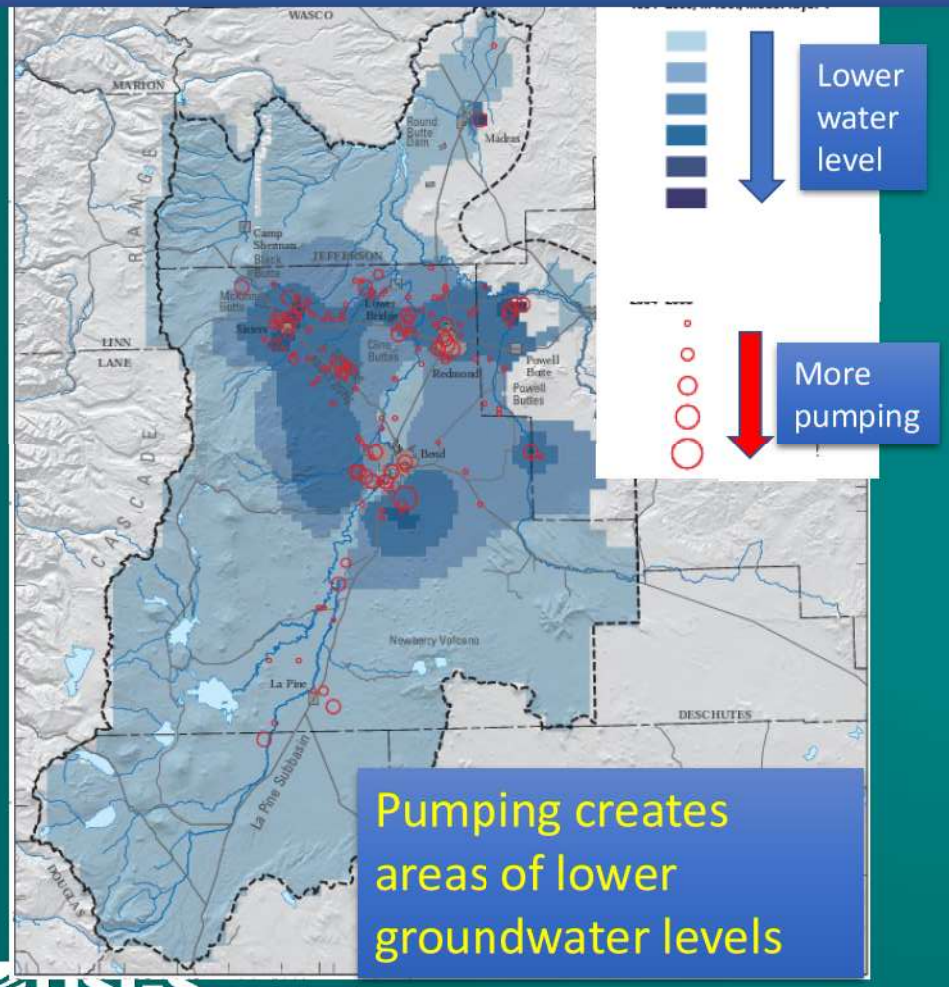


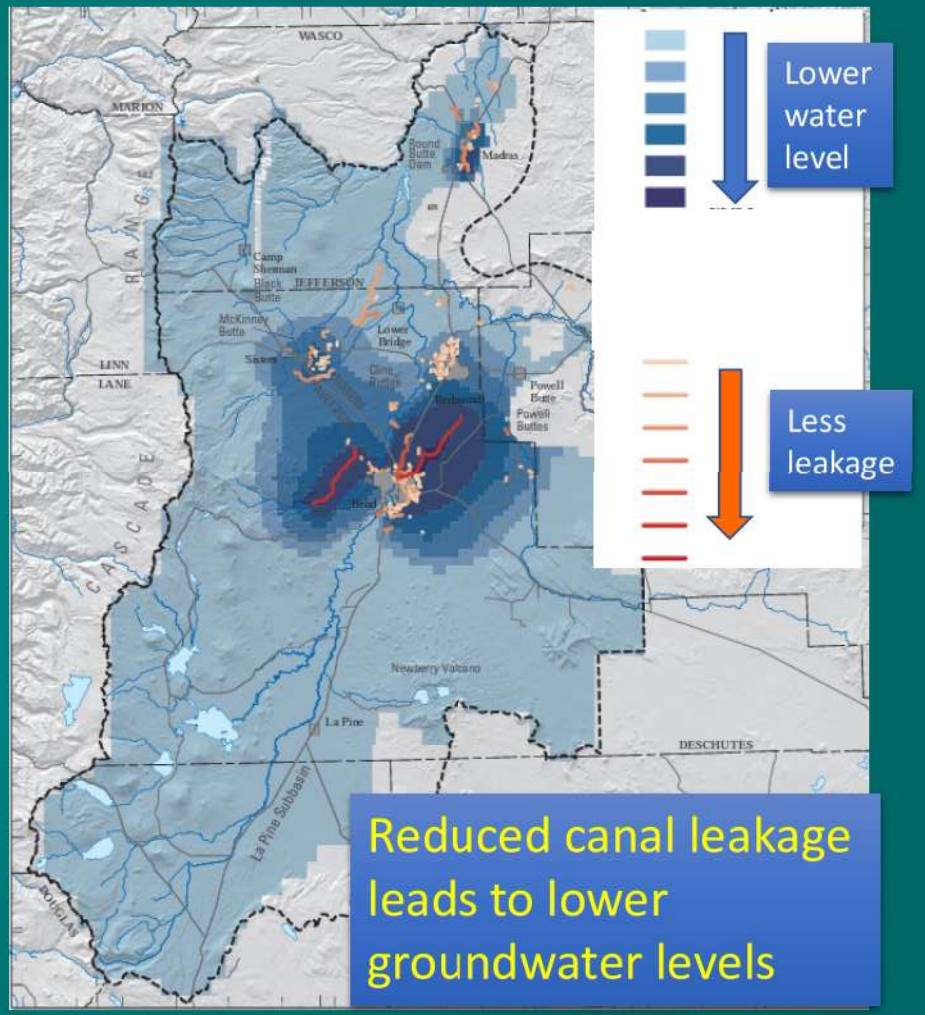
Gannett and others, 2001

Groundwater models help identify the importance of stressors (such as pumping) on the groundwater system

USGS

Change in groundwater storage



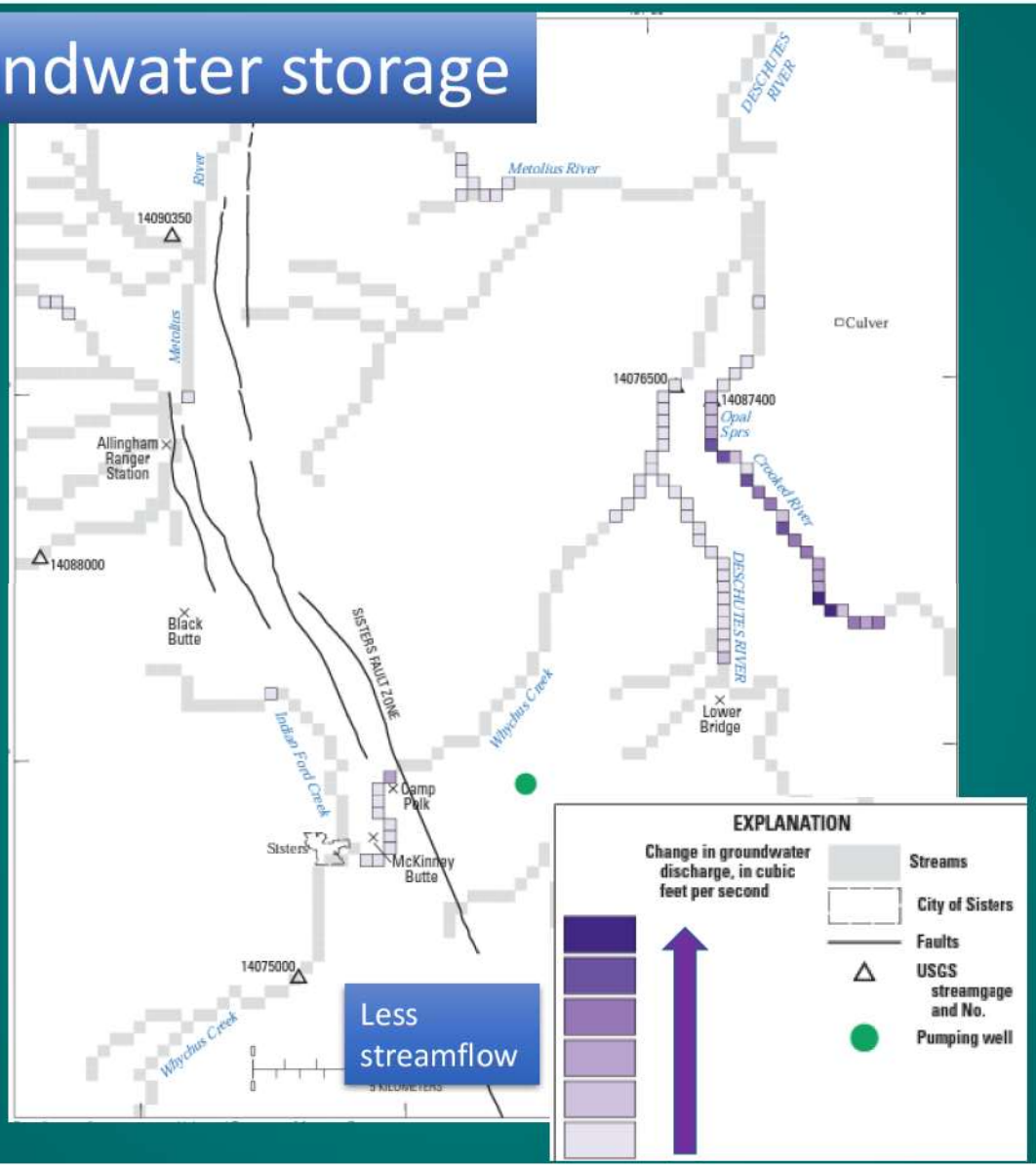


USGS

Gannett and Lite, 2004

Change in groundwater storage

Groundwater pumping can reduce streamflow

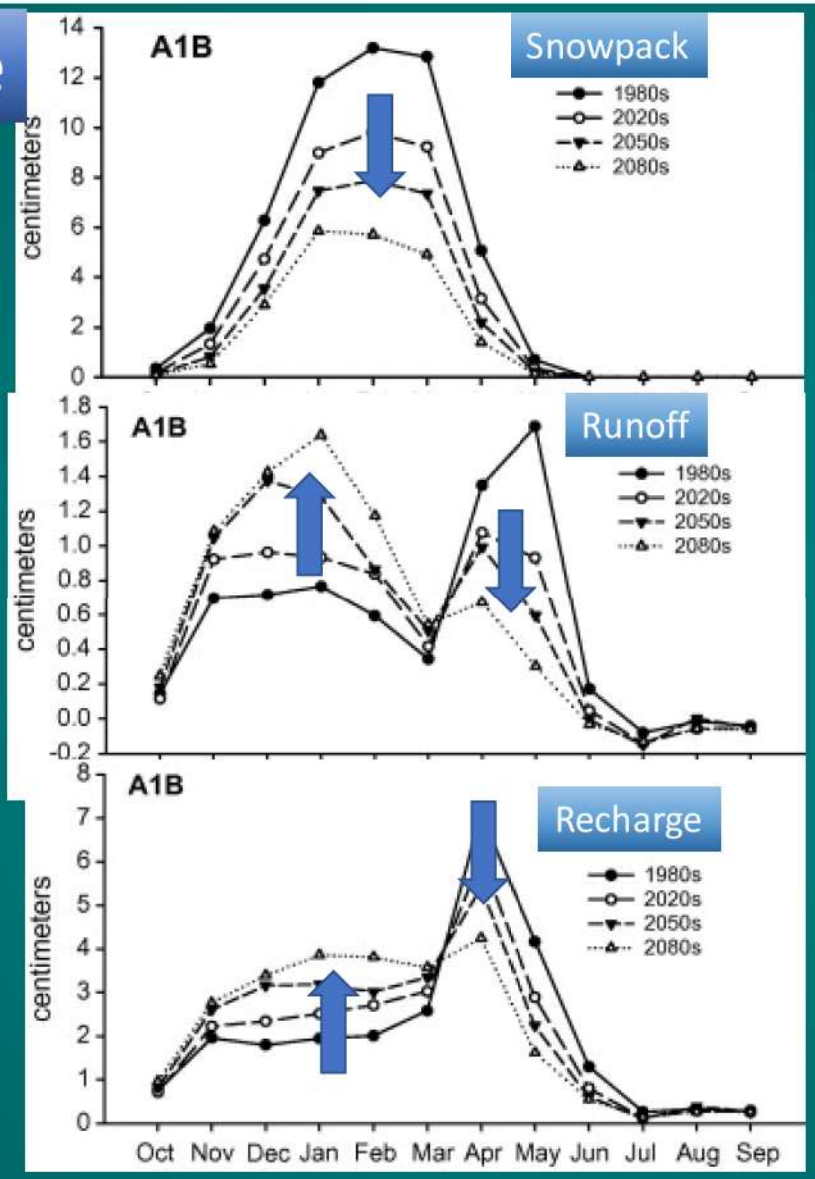


USGS

Gannett and others, 2017

Future recharge

Timing and distribution of future recharge may change



Less snowpack

Earlier runoff

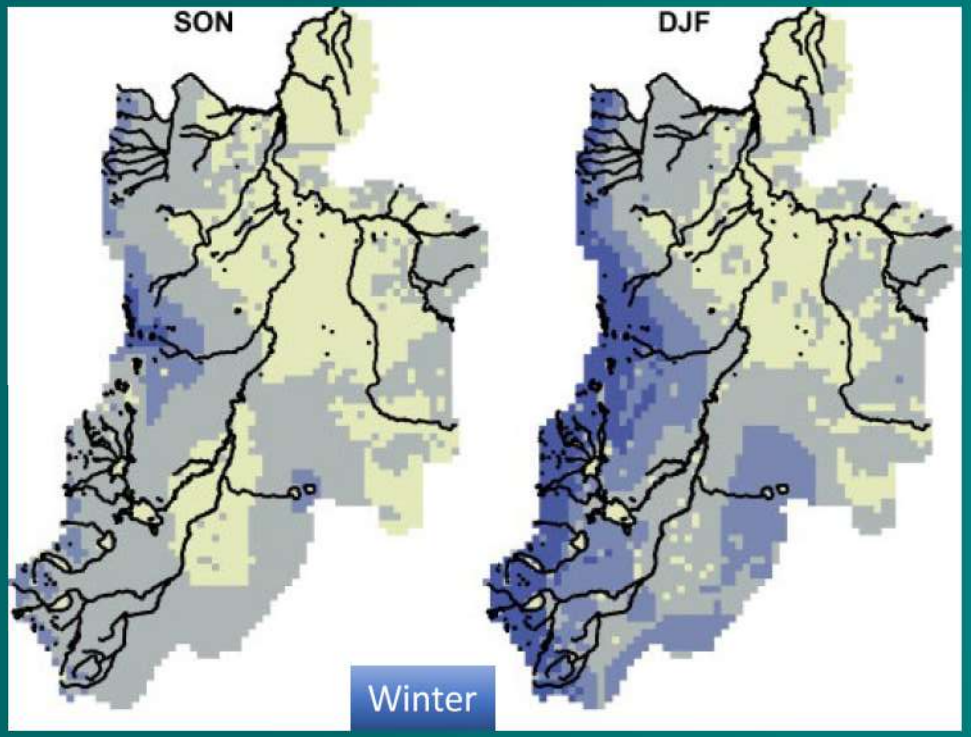
Earlier recharge

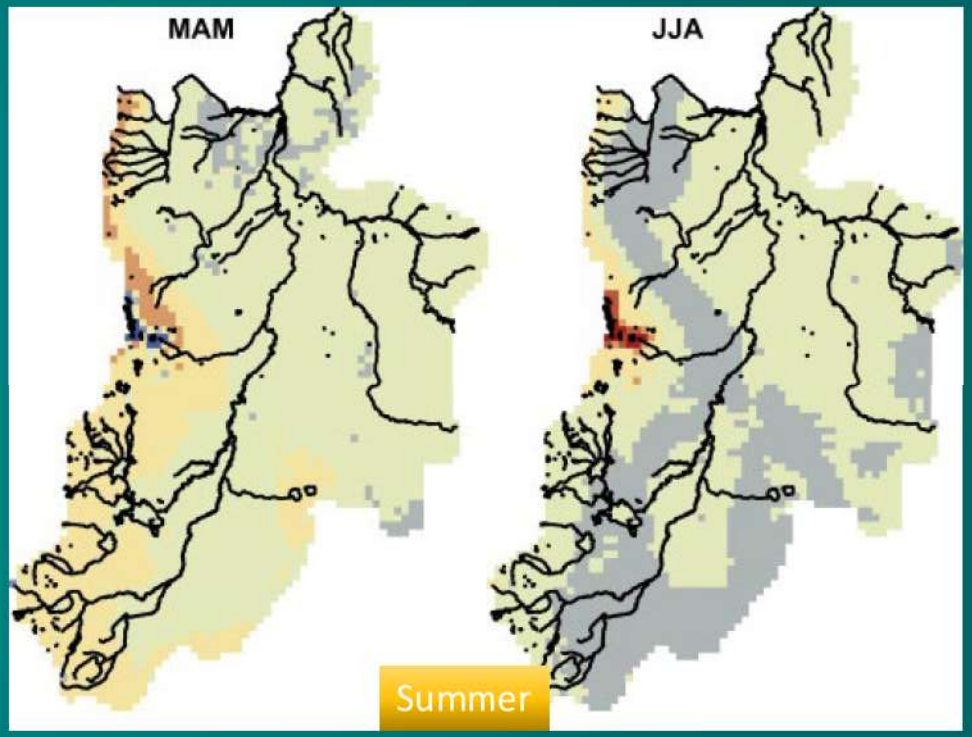
USGS

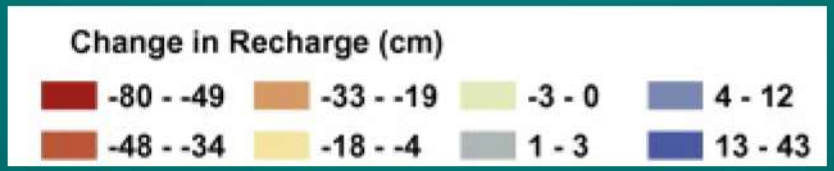
Waibel and others, 2013

Future recharge

Timing and distribution of future recharge may change







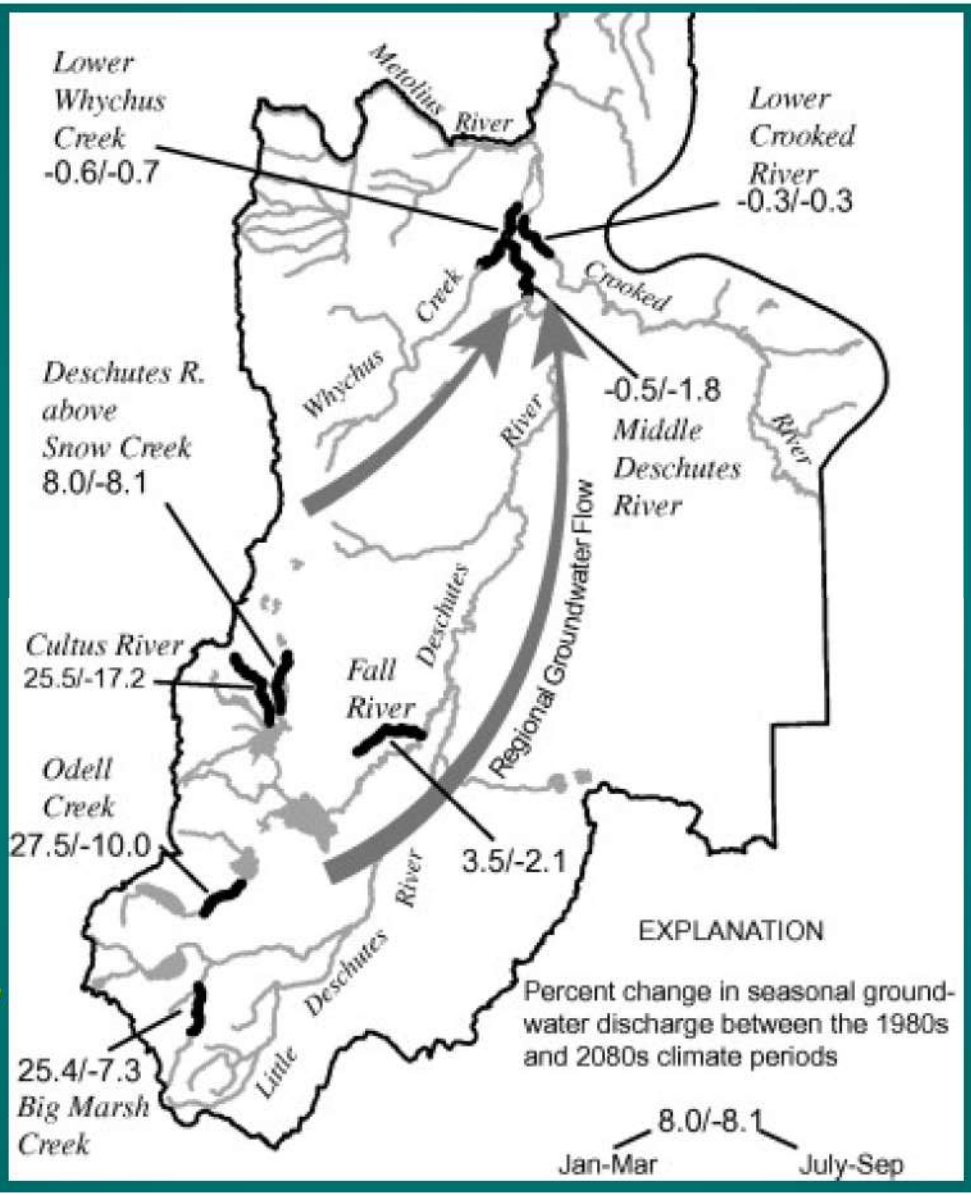
USGS

Waibel and others, 2013

Future recharge

Timing and distribution of future recharge may change

Upper watersheds may have more winter and less summer streamflow



Lower areas may have a more subdued response

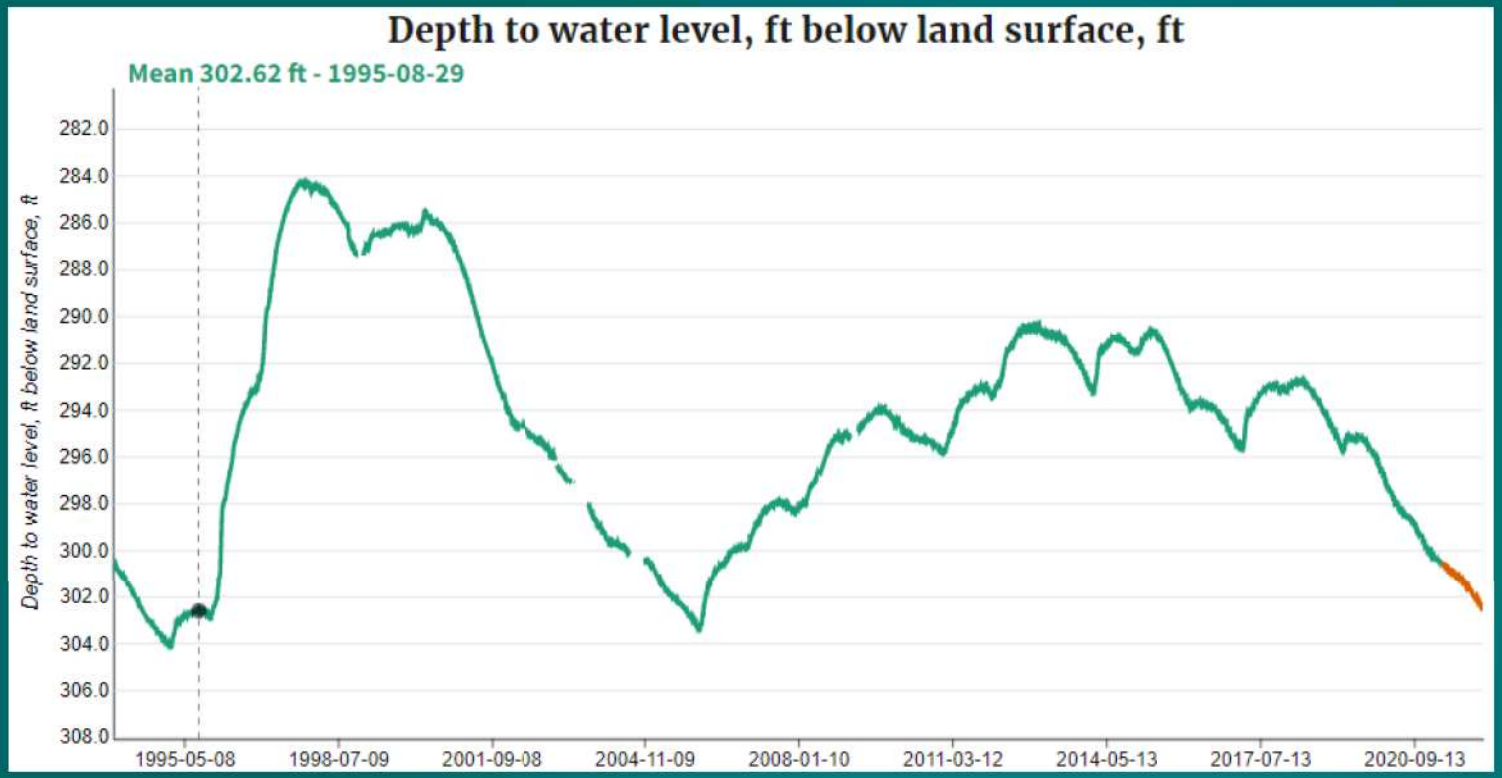
Waibel and others, 2013

USGS

On-going groundwater modeling in the basin

- Development of coupled Bureau of Reclamation MODSIM surface-water routing model with USGS surface water/groundwater model
- OWRD using USGS surface water/groundwater model to evaluate effects of new pumping on streamflow: for example near confluence of Deschutes and Crooked Rivers

USGS



Recent groundwater level in an upland area

https://waterdata.usgs.gov/monitoring-location/442242121405501/#parameterCode=72019&period=P365D

USGS

Recent USGS work in the Deschutes Basin

- Spring persistence study for BLM includes sites in the basin
- Crooked River—Water quality monitoring w/USFWS and BOR
- Bathymetric mapping, stage monitoring in Deschutes River above Bend in support of USFWS Habitat Conservation Plan development
- Whychus Creek restoration monitoring with Upper Deschutes Watershed Council
- Monitored turbidity with Oregon DEQ below Wickiup Dam
- Newberry Volcano geologic map soon to be published
  - Paper on recent gas emissions at East Lake
- City of Sisters flood inundation modeling for dam failure

USGS

References

- Caldwell, R.R., 1998, Chemical study of regional ground-water flow and ground-water/surface-water interaction in the Upper Deschutes Basin, Oregon: U.S. Geological Survey Water-Resources Investigations Report 97-4233, 49 p. https://doi.org/10.3133/wri974233.
- Gannett, M.W., Lite Jr, K.E., Morgan, D.S., and Collins, C.A., 2001, Ground-Water Hydrology of the Upper Deschutes Basin, Oregon: U.S. Geological Survey Water-Resources Investigations Report 2000-4162, 74 p. https://doi.org/10.3133/wri004162.
- Gannett, M.W., and Lite Jr, K.E., 2004, Simulation of regional ground-water flow in the Upper Deschutes Basin, Oregon: U. S. Geological Survey Water-Resources Investigations Report 2003-4195, 95 p. https://doi.org/10.3133/wri034195.
- Gannett, M.W., and Lite Jr, K.E., 2013, Analysis of 1997–2008 groundwater level changes in the upper Deschutes Basin, Central Oregon: U. S. Geological Survey Scientific Investigations Report 2013-5092, 44 p. https://doi.org/10.3133/sir20135092.
- Gannett, M.W., Lite Jr, K.E., Risley, J.C., Pischel, E.M., and La Marche, J.L., 2017, Simulation of groundwater and surface-water flow in the upper Deschutes Basin, Oregon: U. S. Geological Survey Scientific Investigations Report 2017-5097, 80 p. https://doi.org/10.3133/sir20175097.
- Lite Jr, K.E., and Gannett, M.W., 2002, Geologic framework of the regional ground-water flow system in the Upper Deschutes Basin, Oregon: U. S. Geological Survey Water-Resources Investigations Report 2002-4015, 44 p. https://doi.org/10.3133/wri024015.
- Waibel, M.S., Gannett, M.W., Chang, H., and Hulbe, C.L., 2013, Spatial variability of the response to climate change in regional groundwater systems – Examples from simulations in the Deschutes Basin, Oregon: Journal of Hydrology, v. 486, p. 187-201. https://doi.org/https://doi.org/10.1016/j.jhydrol.2013.01.019.

USGS

CENTRAL OREGON

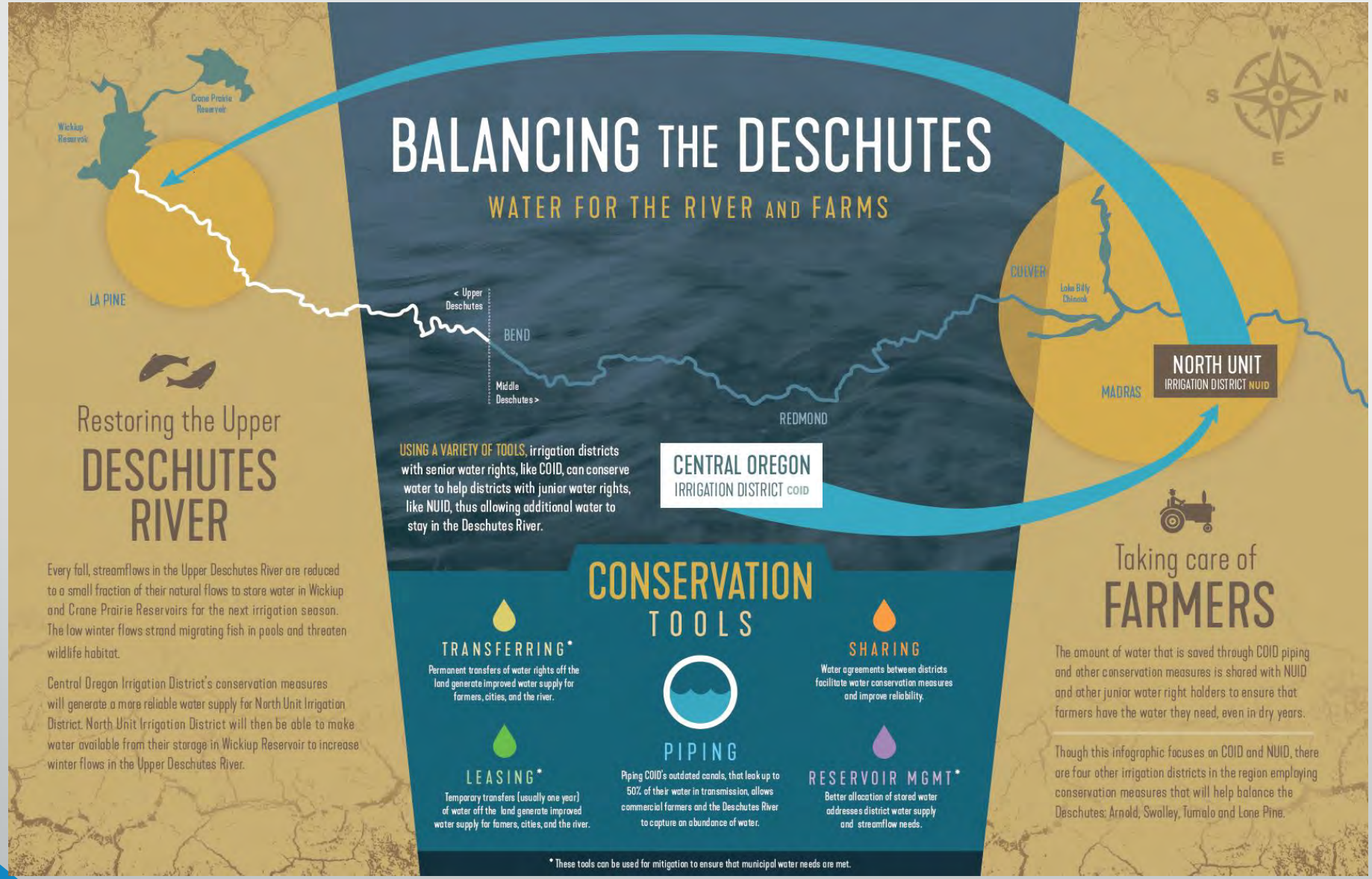
Irrigation

DISTRICT

Since 1918

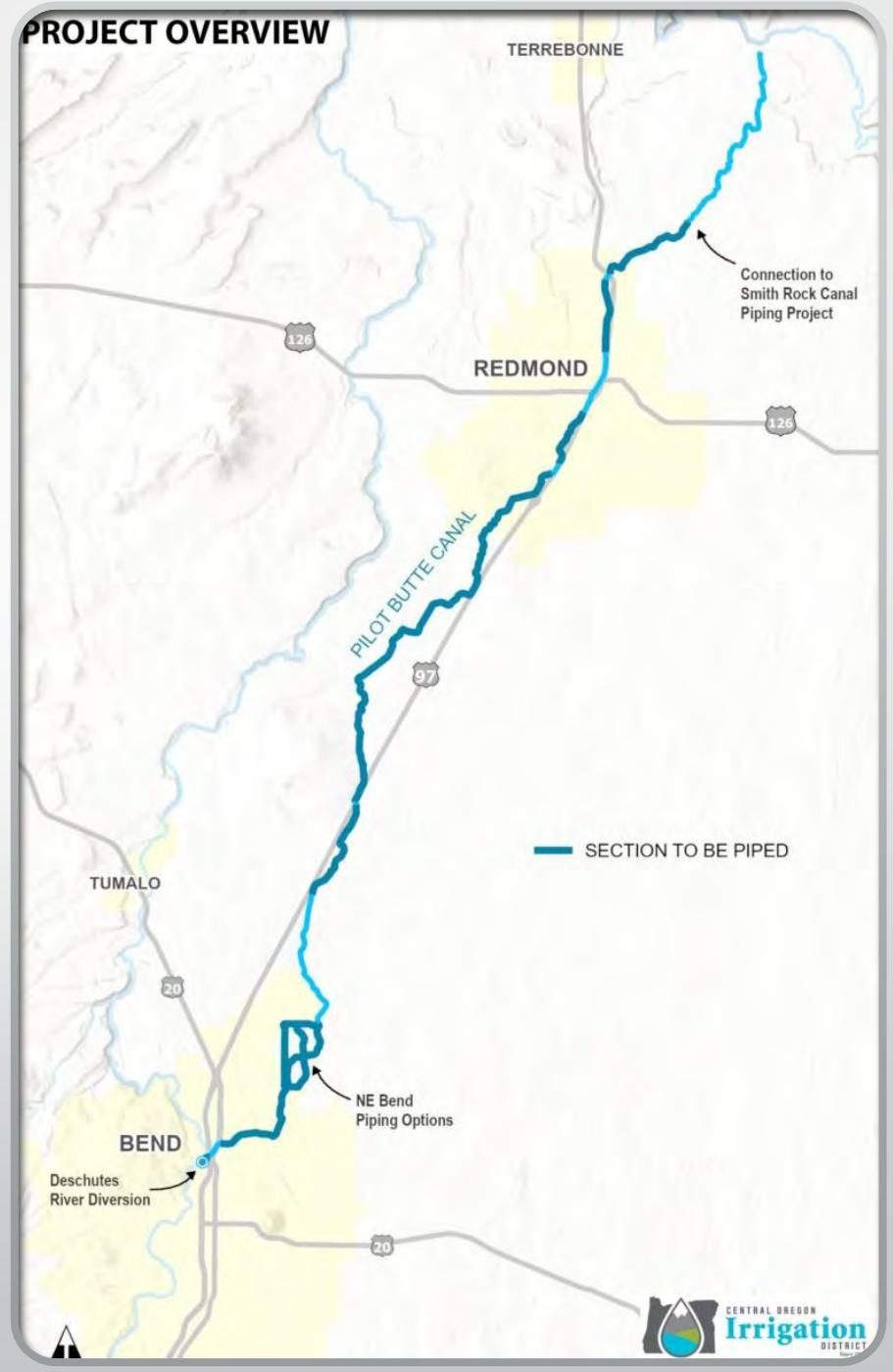
What Happens to COID Water Conserved by Piping?

- 2017 Agreement between COID and North Unit Irrigation District (NUID)
  - Conserved water delivered to NUID during the irrigation season
  - NUID releases an equal volume of water from Wickiup Reservoir during the winter months, improving Deschutes River flows, benefitting ESA and river health


BALANCING THE DESCHUTES
WATER FOR THE RIVER AND FARMS
Crane Prairie Reservoir
Wickiup Reservoir
LA PINE
< Upper Deschutes
BEND
Middle Deschutes >
REDMOND
CULVER
Lake Billy Chinook
MADRAS
NORTH UNIT IRRIGATION DISTRICT NUID
CENTRAL OREGON IRRIGATION DISTRICT COID
USING A VARIETY OF TOOLS, irrigation districts with senior water rights, like COID, can conserve water to help districts with junior water rights, like NUID, thus allowing additional water to stay in the Deschutes River.
Restoring the Upper DESCHUTES RIVER
Every fall, streamflows in the Upper Deschutes River are reduced to a small fraction of their natural flows to store water in Wickiup and Crane Prairie Reservoirs for the next irrigation season. The low winter flows strand migrating fish in pools and threaten wildlife habitat.
Central Oregon Irrigation District's conservation measures will generate a more reliable water supply for North Unit Irrigation District. North Unit Irrigation District will then be able to make water available from their storage in Wickiup Reservoir to increase winter flows in the Upper Deschutes River.
CONSERVATION TOOLS
TRANSFERRING*
Permanent transfers of water rights off the land generate improved water supply for farmers, cities, and the river.
SHARING
Water agreements between districts facilitate water conservation measures and improve reliability.
LEASING*
Temporary transfers (usually one year) of water off the land generate improved water supply for famers, cities, and the river.
PIPING
Piping COID's outdated canals, that leak up to 50% of their water in transmission, allows commercial farmers and the Deschutes River to capture an abundance of water.
RESERVOIR MGMT*
Better allocation of stored water addresses district water supply and streamflow needs.
* These tools can be used for mitigation to ensure that municipal water needs are met.
Taking care of FARMERS
The amount of water that is saved through COID piping and other conservation measures is shared with NUID and other junior water right holders to ensure that farmers have the water they need, even in dry years.
Though this infographic focuses on COID and NUID, there are four other irrigation districts in the region employing conservation measures that will help balance the Deschutes: Arnold, Swalley, Tumalo and Lone Pine.

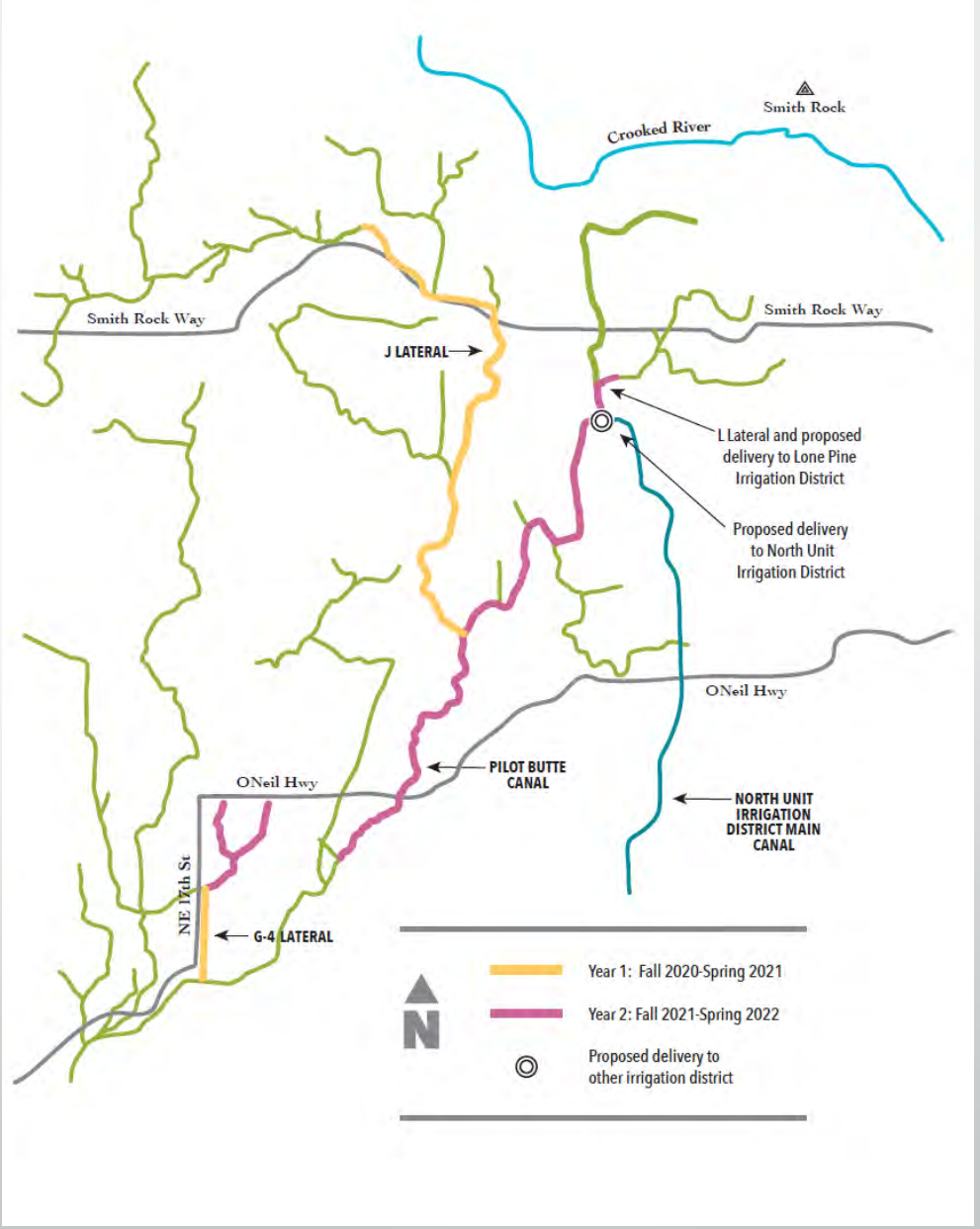
PIPING THE PILOT BUTTE CANAL

- Conveys 17,338 Acres of Water
- 25 Miles Long
- Approximately 156 cfs of Water Will be Saved Through Piping



PHASE I & II October 2020 – March 2022

Piping Smith Rock/King Way 29 cfs of Water Conserved



Installation of 102" Steel Pipe

Senator Merkley and Craig Horrell

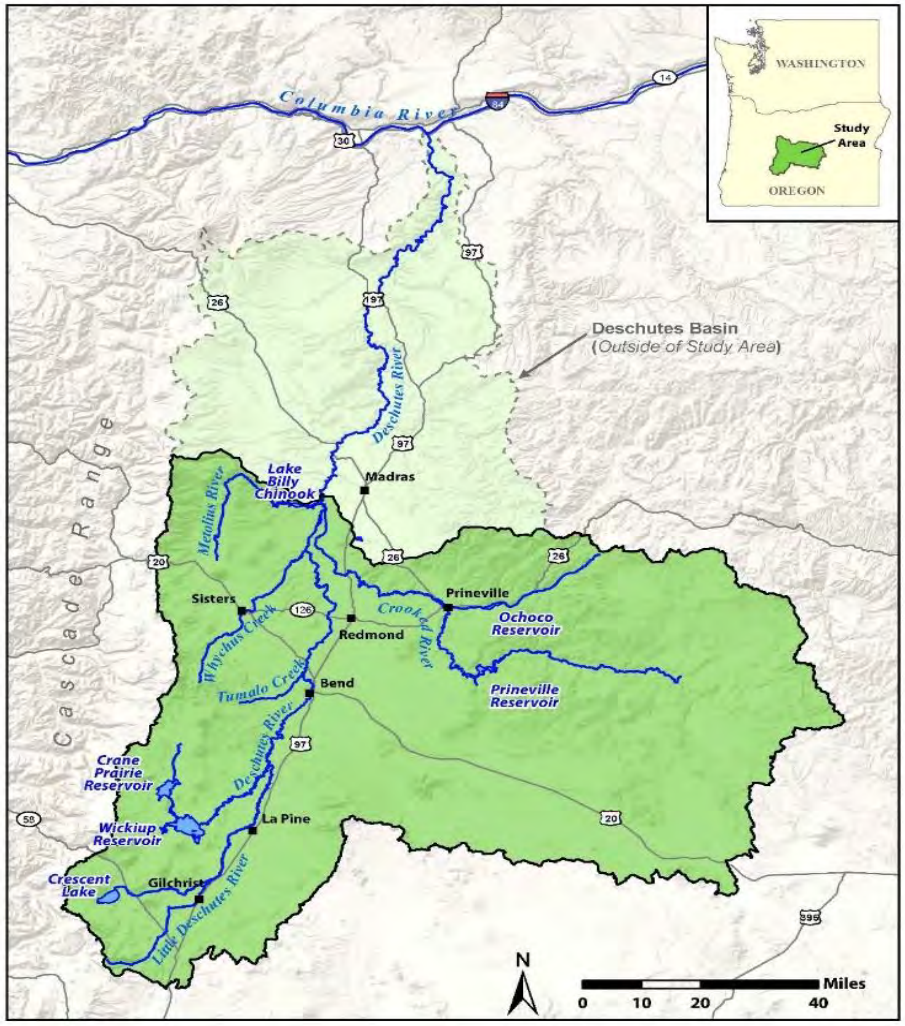
Water in the Deschutes

DESCHUTES RIVER
CONSERVANCY

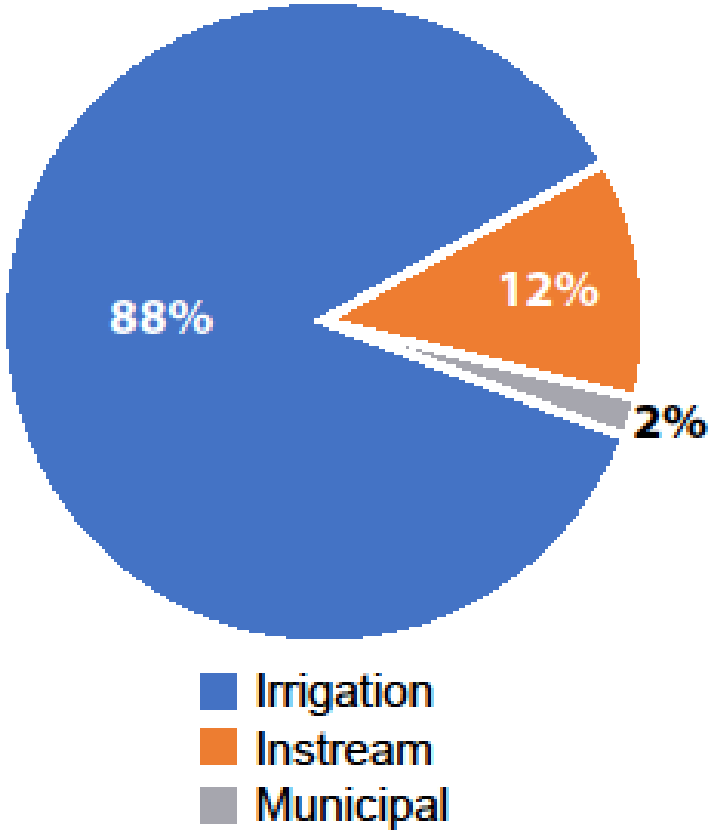
Outline

- Water supply & demand
- DRC role
- Solutions
- Deschutes Basin Water Collaborative

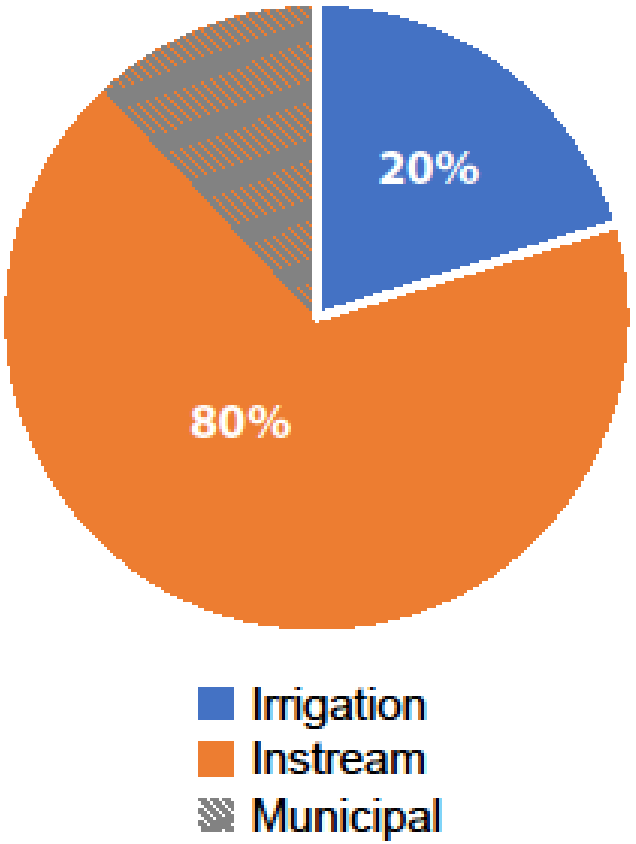
The Deschutes Basin



Basin Water Rights Distribution

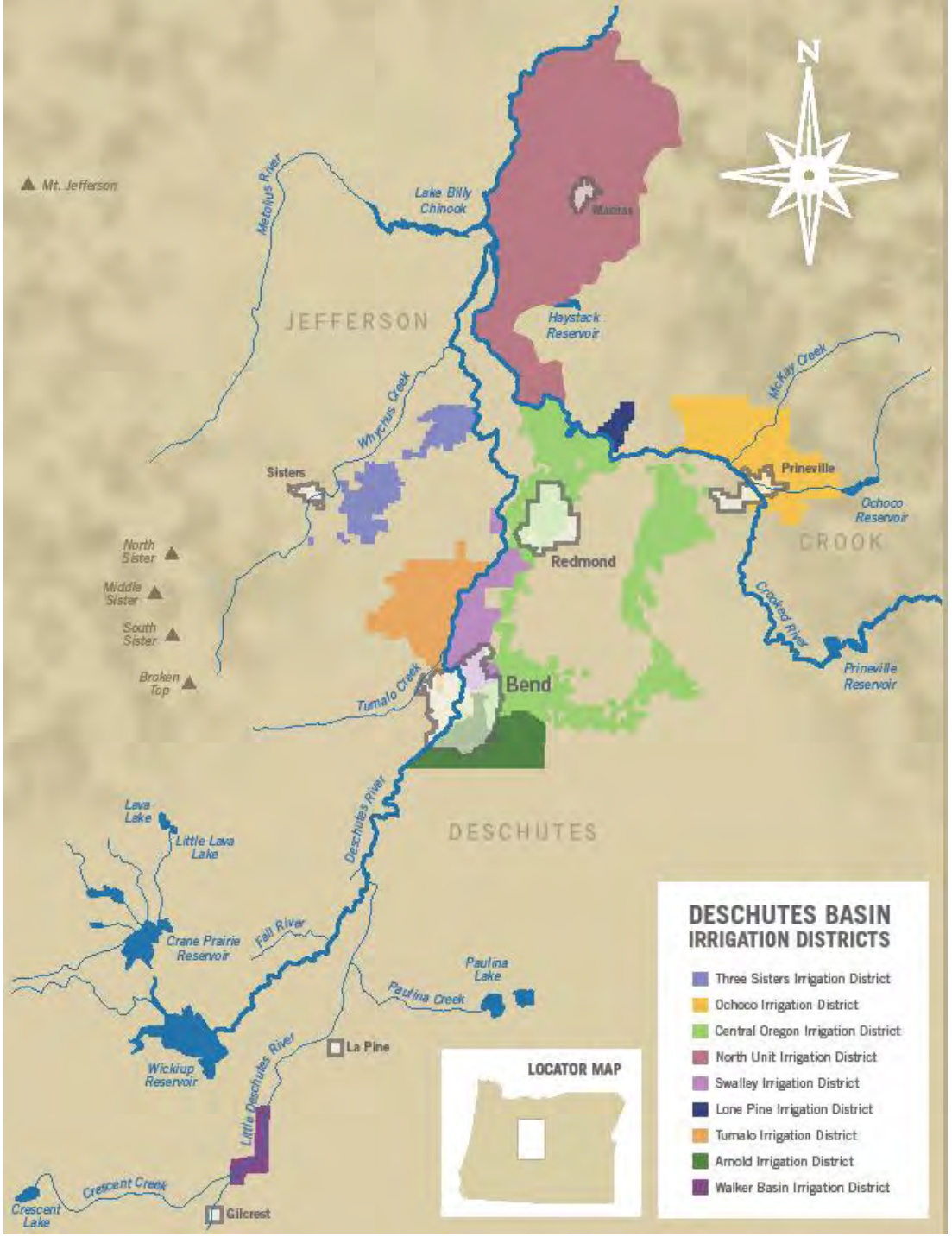


Estimated Supply Shortfalls



Geographic Water Distribution

Upper Deschutes Basin



Legal Distribution - Priority

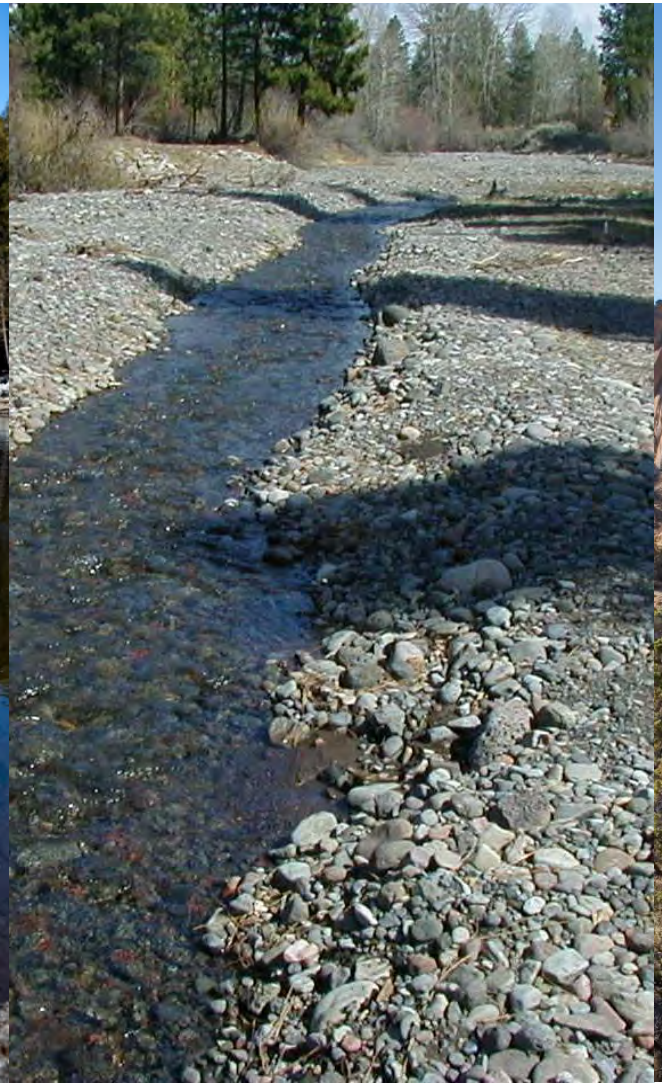
Swalley	1899
Central Oregon	1900, 1907
Lone Pine	1900
Tumalo	1905
Arnold	1905
North Unit	1913
Deschutes River	1983

Deschutes River

98% of flows were diverted for irrigation

Whychus Creek

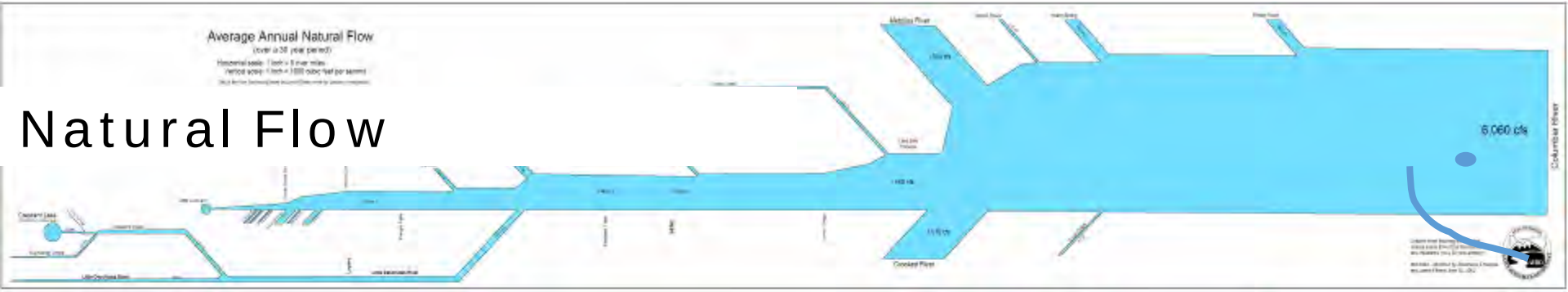
Every 2 out of 3 years, the creek would run dry

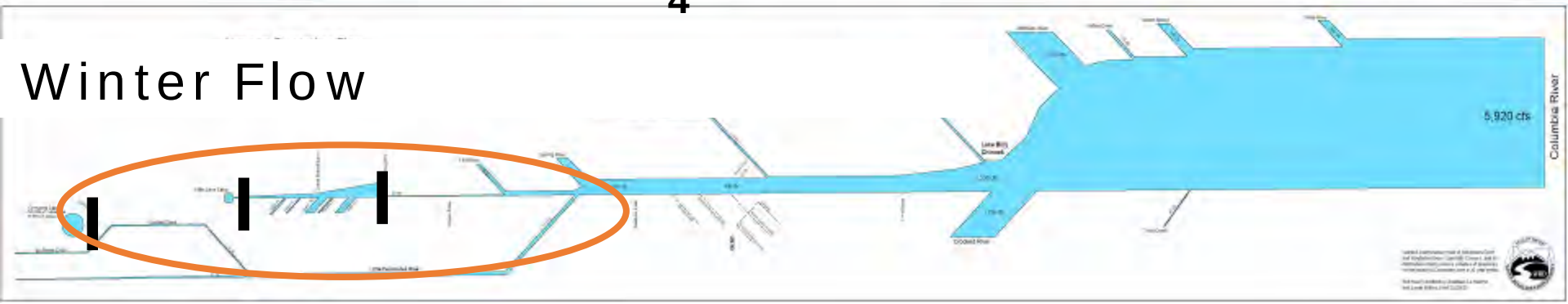


Crooked River

Extensively diverted flows would leave only a trickle of water at Smith Rock

The Blue Whales

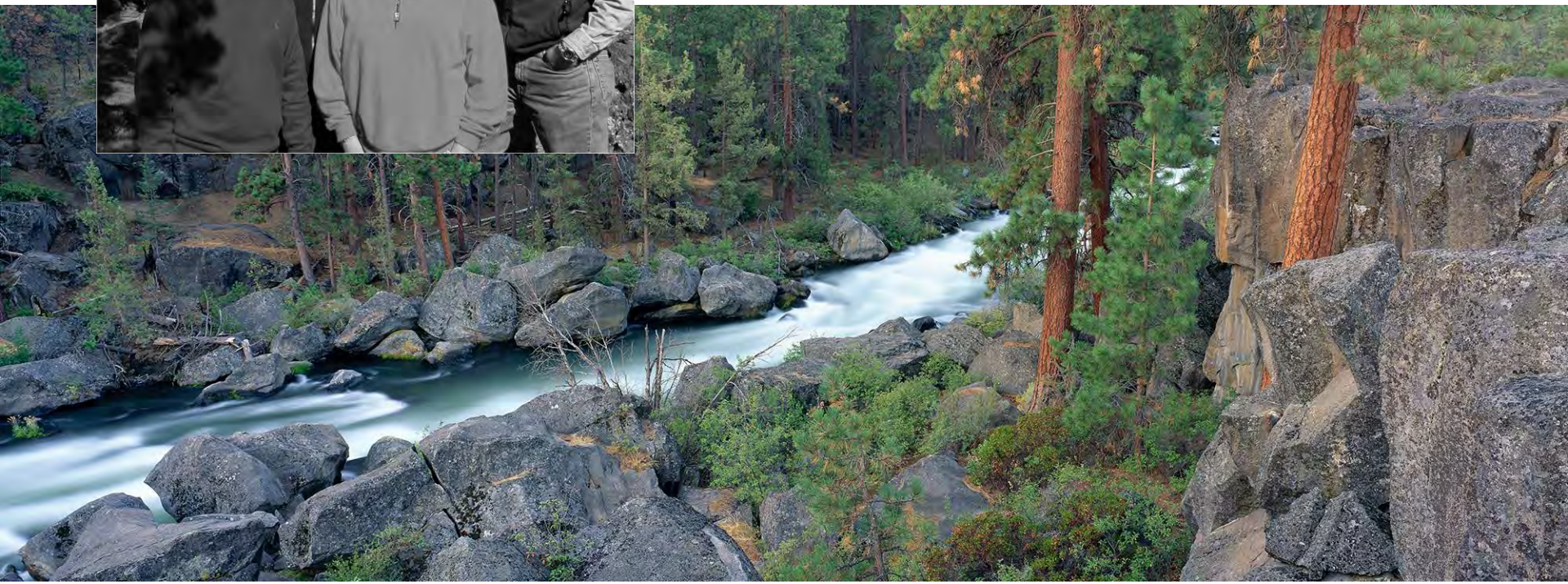




Middle Deschutes below Bend in Summer

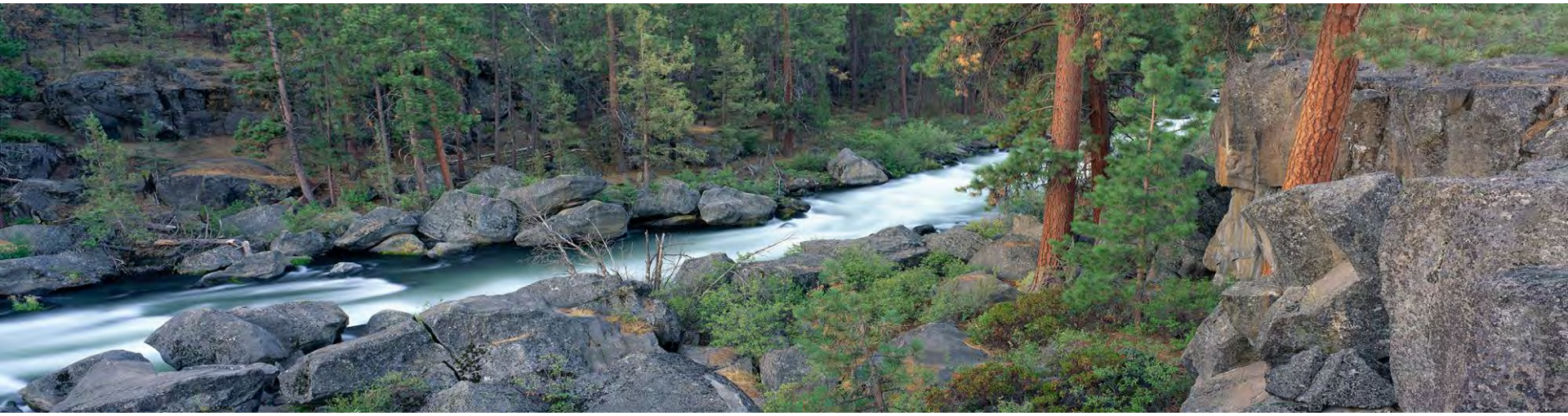
Upper Deschutes below Wickiup in Winter

DESCHUTES RIVER
CONSERVANCY



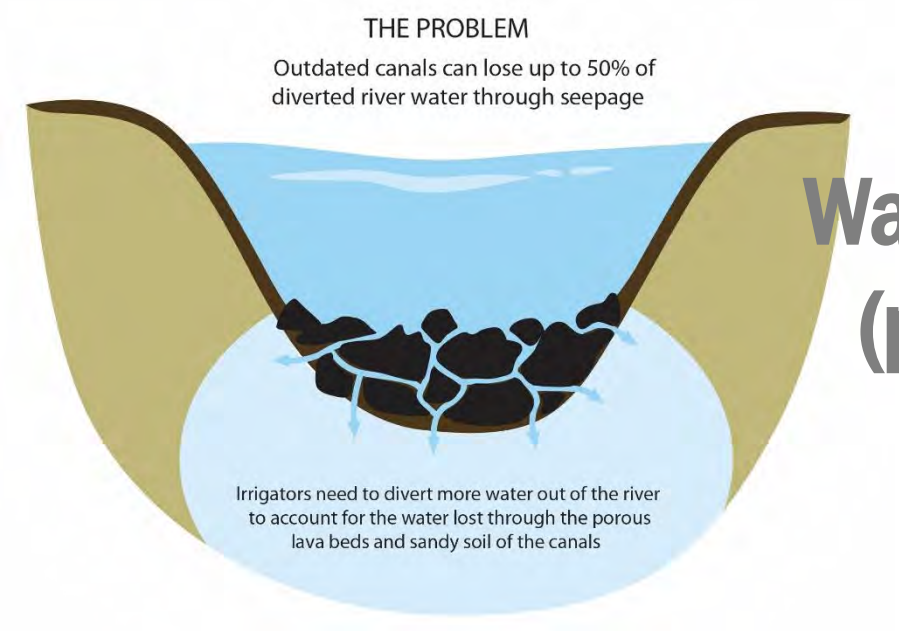
Mission:
To Restore Streamflow and Water Quality in the Deschutes Basin

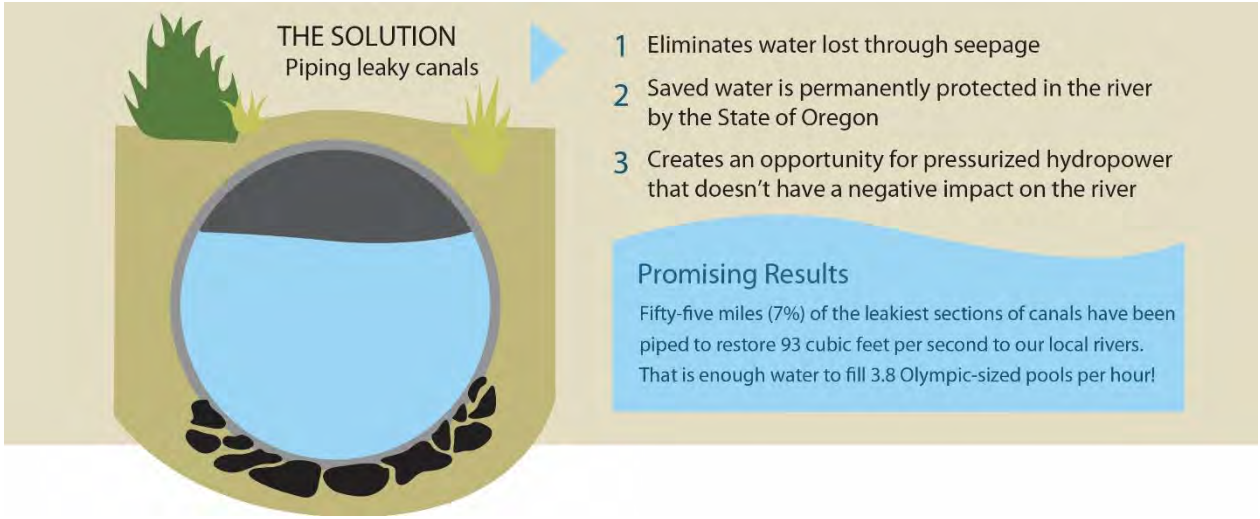
Our Tools



Using Collaboration & Consensus

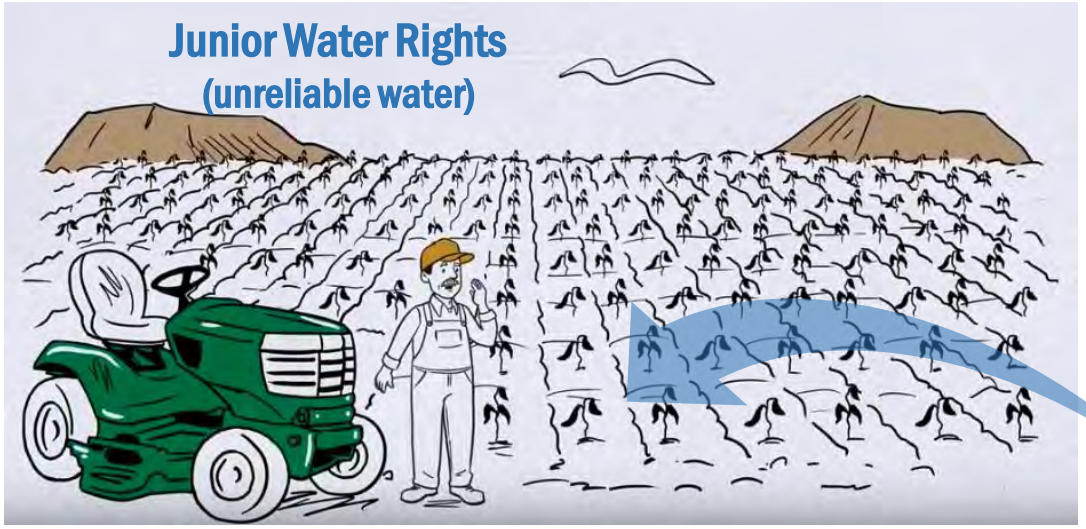
Water Conservation Projects (piping and lining canals)





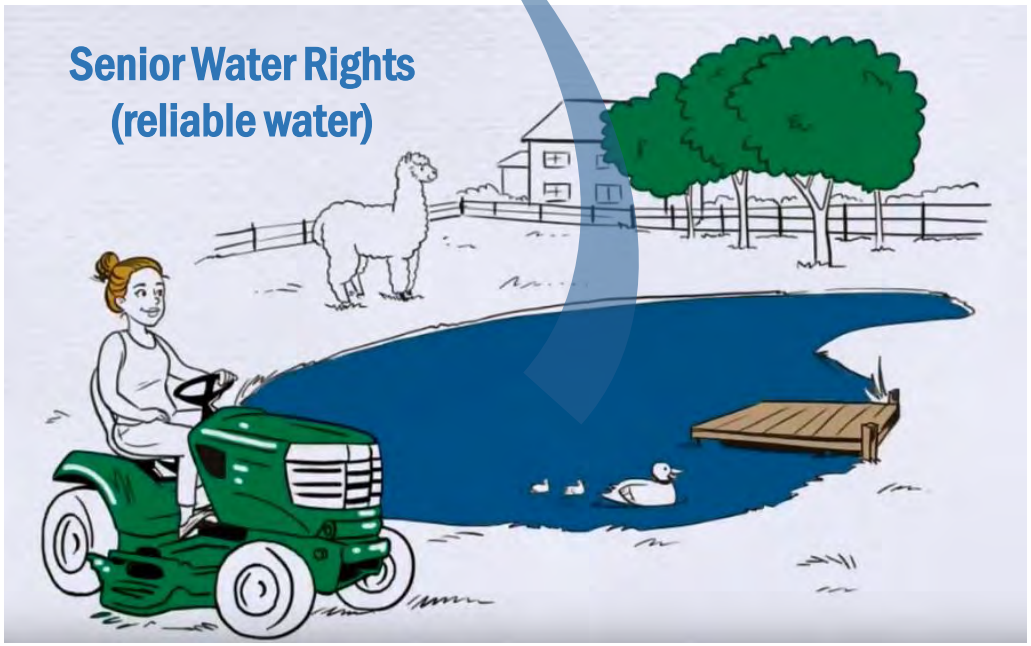
On-Farm Efficiency
Water Conservation Projects

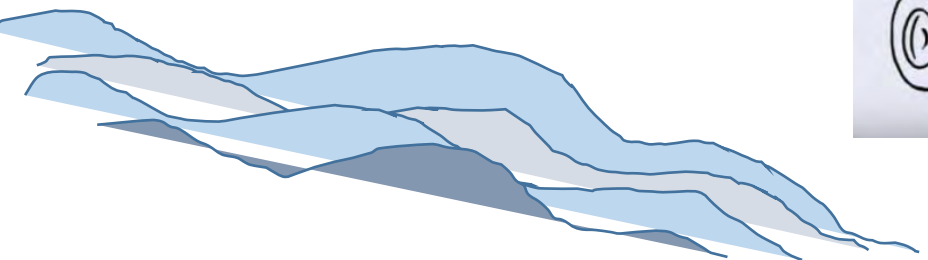
Water Banking



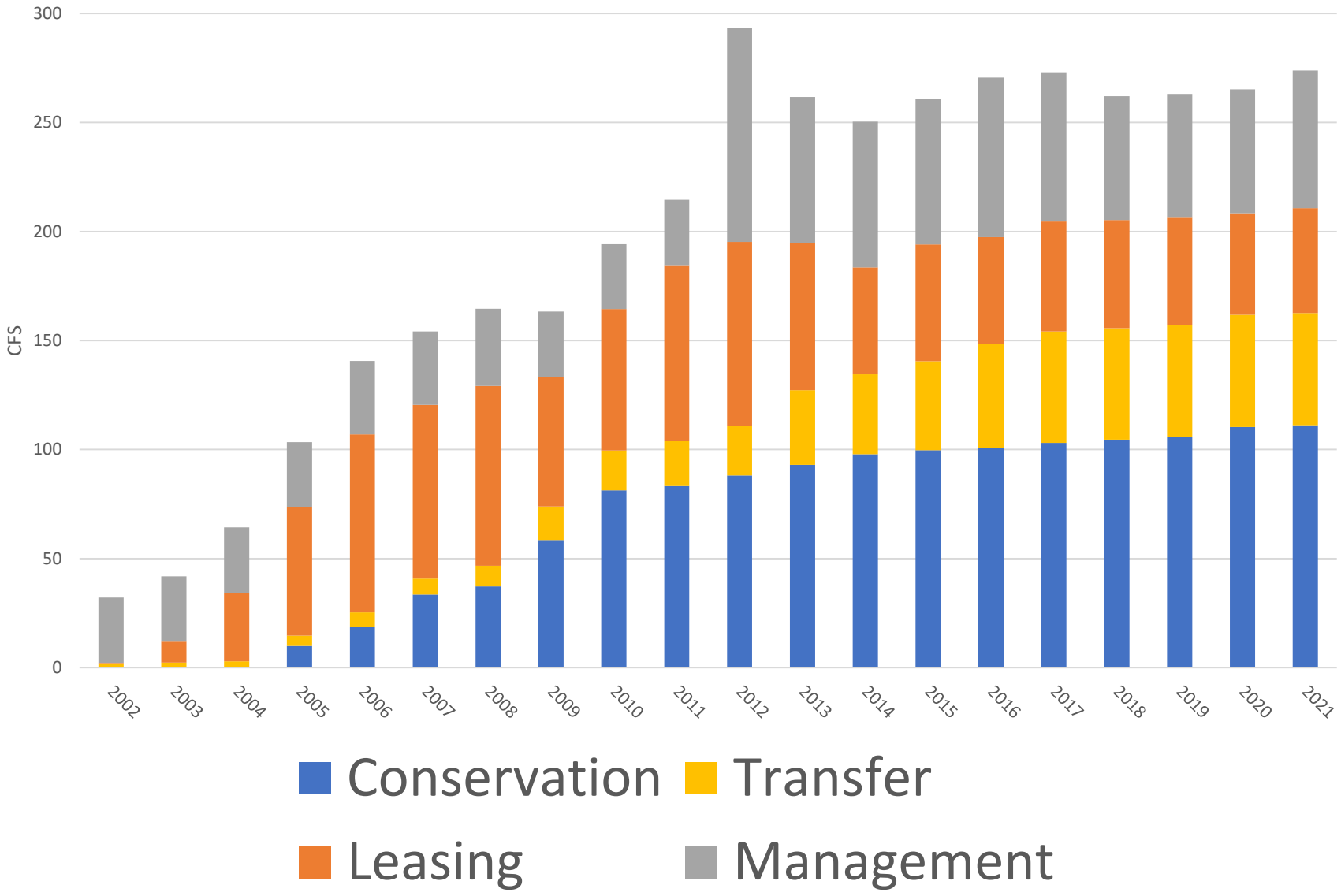
The DRC works with irrigation districts and landowners to **lease water** rights that are not currently being used to **stay instream**.

We are expanding programs to **move water** between irrigators to **benefit farms and flows**.





Flow Results



Flow Restoration Progress

Whychus Creek

0 cfs 20 cfs

Middle Deschutes

30 cfs 125 cfs

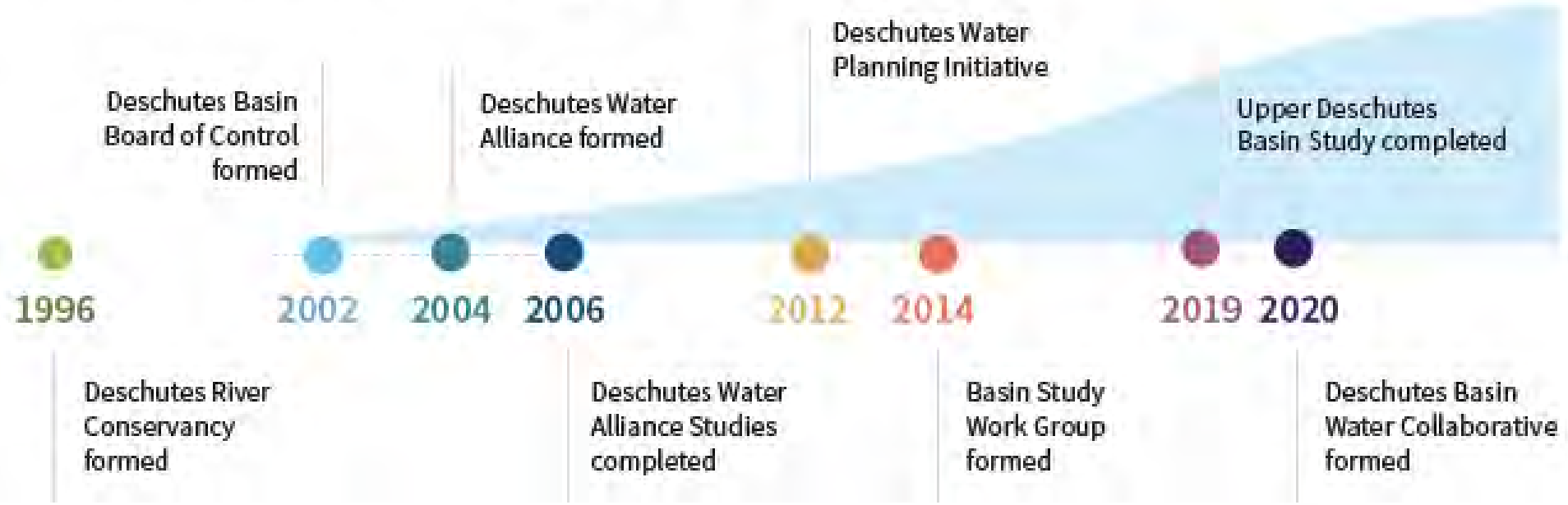
Balanced Results

Key Issues Remain

- Upper Deschutes River flow restoration
- Time-critical ESA issues & risk to agricultural issues
- Ongoing need for reliable groundwater mitigation for municipal water providers
- Extreme & extended drought


NO WATER
NO FARMS
NO FOOD
PERFECTBALANCEUSA.ORG

A HISTORY OF *Working Together*



Deschutes Basin
WATER COLLABORATIVE
Water for Rivers, Agriculture and Communities

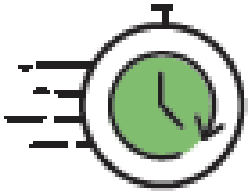
More than 40 member organizations

Deschutes Basin Water Collaborative **Members**

Oregon Governor's Office
Oregon Dept. of Agriculture
Oregon Dept. of Environmental Quality
Oregon Dept. of Fish & Wildlife
Oregon Water Resources Dept.
US Fish & Wildlife Service
US Forest Service
Oregon Environmental Council
Arnold Irrigation District
Central Oregon Irrigation District
Lone Pine Irrigation District
North Unit Irrigation District
Deschutes Soil & Water Conservation District
Central Oregon Intergovernmental Council
Confederated Tribes of Warm Springs
League of Women Voters – Deschutes County
Central Oregon Cities Organization
Avion Water Company
Ochoco Irrigation District
Water for Life
City of Bend
City of La Pine
City of Prineville
City of Redmond
Crook County
Jefferson County
Central Oregon LandWatch
Central Oregon Informed Angler
Crooked River Watershed Council
Deschutes River Conservancy
Great Old Broads for Wilderness
Oregon Natural Desert Association; Sunriver Anglers
Trout Unlimited – Deschutes Redband Chapter
Trout Unlimited (State Office)
Upper Deschutes Watershed Council
WaterWatch of Oregon
Portland General Electric
Coalition for the Deschutes

Deschutes Basin
WATER COLLABORATIVE
Water for Rivers, Agriculture and Communities

DWBC Priority Actions



Accelerate Implementation

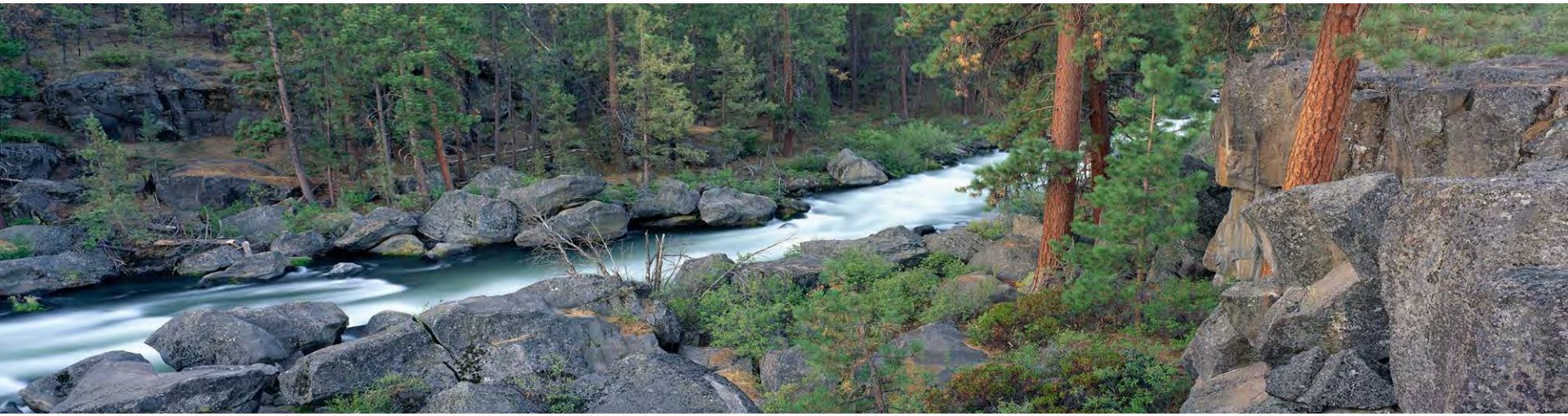
Develop a Comprehensive Water Management Plan

Leverage Funding

Support Policies that Advance DBWC Goals and Consensus Agreements

Moving Forward:
Expand forum to address issues in other river reaches and tributaries

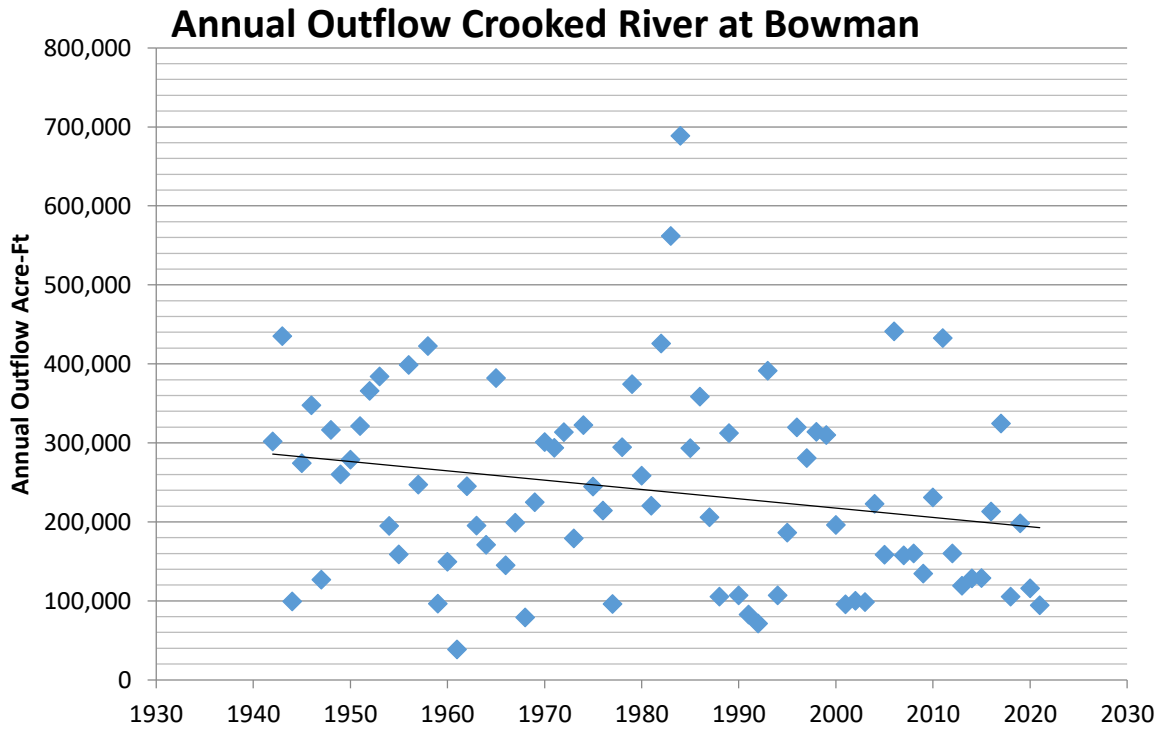
How Deschutes County can be involved



- Continued participation in and support of DBWC
- ARPA investment in helping farmers increase efficiencies—thank you for helping fund this program!
- Integrating water considerations into County planning and decision-making

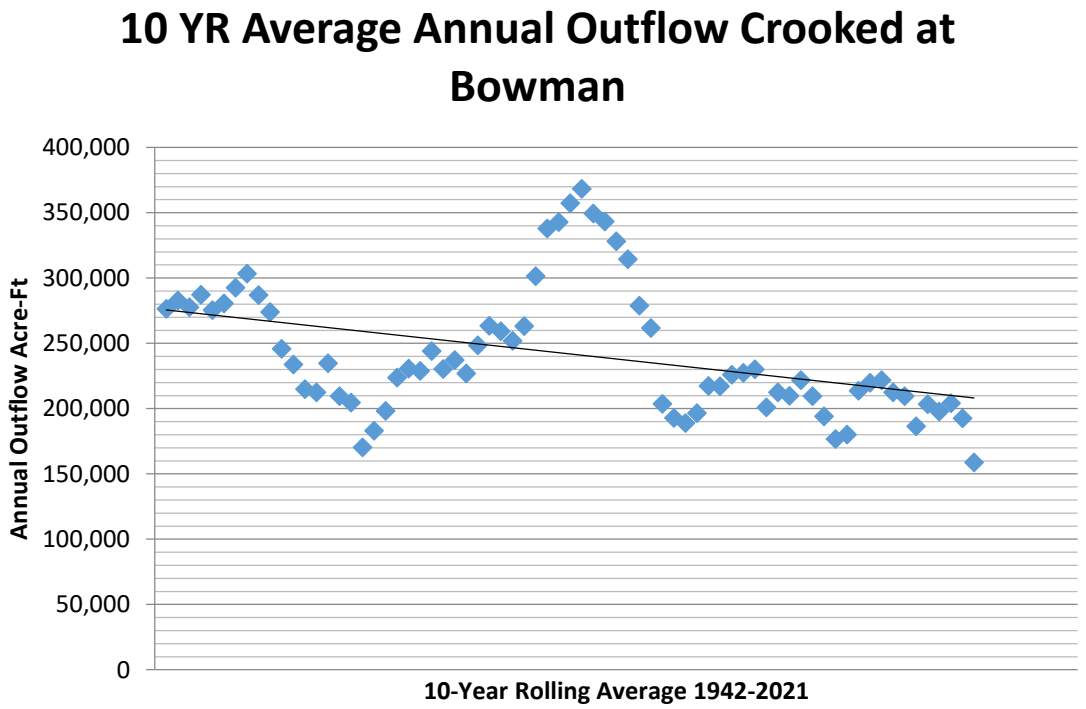
Improve Water Quality & Quantity

- Outflow from the Crooked River has been monitored since 1942
  - Maximum 689,000 acre1ft in 1984
  - Minimum 39,000 acre-ft in 1961
  - Fitted trend line shows a decrease of 85,000 acre-ft per year



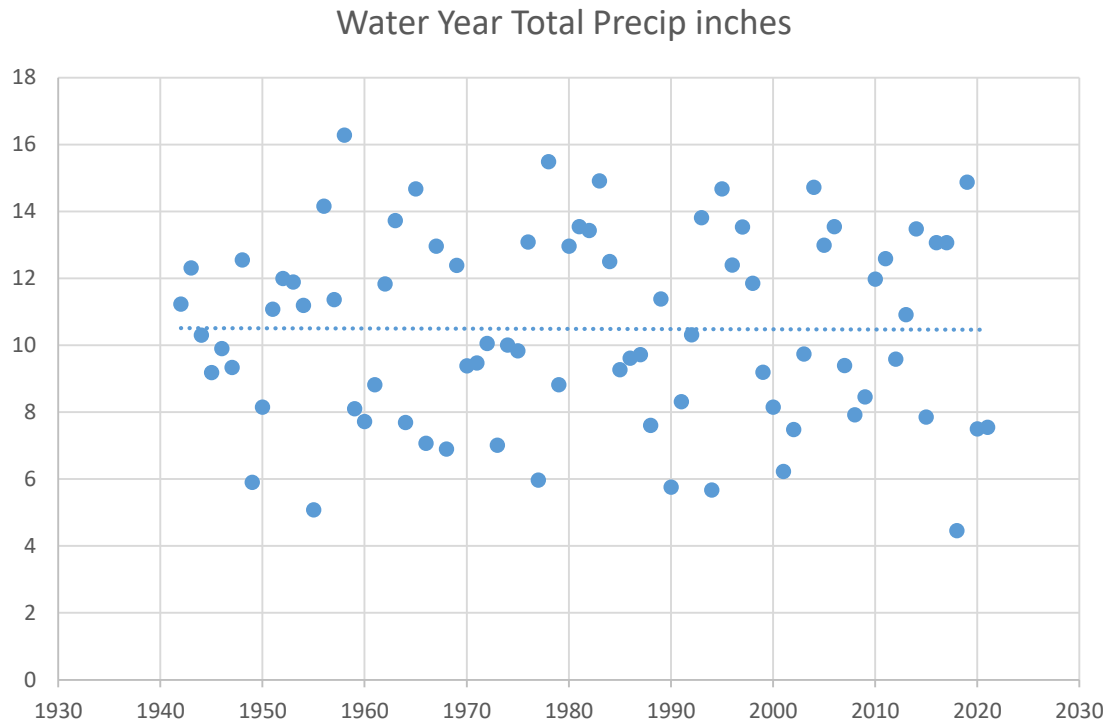
Improve Water Quality & Quantity

- 10 year rolling average is used to smooth the data
  - Cyclical climate patterns emerge
  - Fitted line shows a similar decrease in outflow

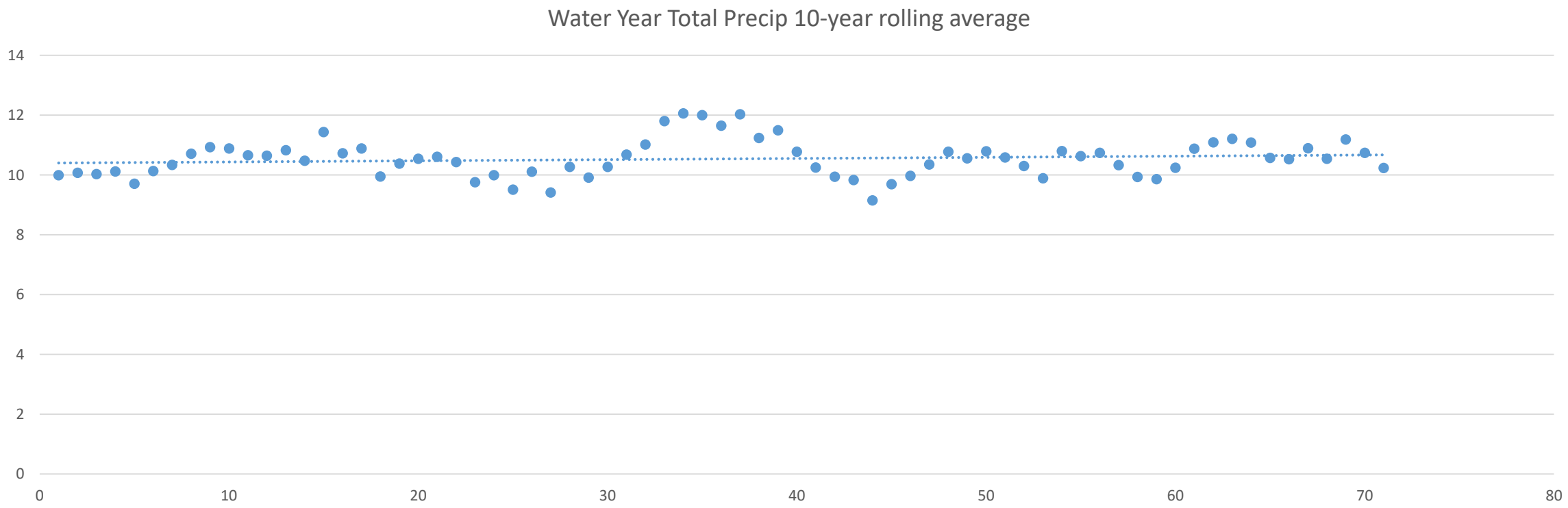


Improve Water Quality & Quantity

- What is the cause of the reduced outflow from the Crooked?
  - Climate change?
  - Additional irrigation?
- Precipitation is not decreasing



Improve Water Quality & Quantity



Improve Water Quality & Quantity

- Juniper will consume up to 75,000 gallons of water per year per acre
- Decrease in outflow likely related to juniper invasion
- PREP creates a market for juniper biomass!

- $280{,}000\frac{acreft}{year} - 195{,}000\frac{acreft}{year} = 85{,}000\frac{acreft}{year}$
- $\frac{85{,}000\ acreft}{year} * 325{,}851\frac{gallons}{acreft} = 27{,}697{,}335{,}000\frac{gallons}{year}$
- $\frac{27{,}697{,}335{,}000\frac{gallons}{year}}{75{,}000\frac{gallons}{acre}} = 370{,}000\ acres\ of\ Juniper\ increase$

An acre inch of water is the equivalent of 27,154 gallons of water. Acre Ft of water is 325,000 gallons

Assumptions:

Dr. Lee Eddleman, retired OSU juniper researcher statement: 9 -13 large trees (greater than 12" dbh) can use all the water delivered in a 13" precip zone. That's 353,002 gallons per acre.

Juniper tree interception alone accounts for an equal percent loss per percent of crown cover (what precipitation the tree canopy captures and holds until it evaporates back into the atmosphere without touching the soil surface). Therefore a 20 percent canopy cover of juniper per acre results in a direct loss of 20 percent of the annual precipitation. So in a 13" precip zone, canopy loss alone is 2.6 inches of annual precipitation. That's 70,600 gallons per acre.

Large juniper tree (>12" dbh) water use can be as high as 26 gallons per day if the soil moisture is available. Let's assume this water use model per tree for the year (my model):

26 gallons/day for 120 days = 3120 gallons
15 gallons/day for 100 days = 1500 gallons
5 gallons/day for 50 days = 250 gallons
0 gallons/day for 95 days = 0 gallons
total gallons = 4960 gallons per tree per year

Average tree density per acre = 13
Water consumption = 13 x 4960 = 64,480 gallons per year (doesn't include tree canopy interception and evaporation).

from 1936 to 1999, Juniper acres in Crook County alone increased by 627,000 acres.
600,000 ac. x 80,000 gallon/acre (water consumption and interception) = 48,000,000,000 gallons per year

48,000,000,000 = 147,692 ac ft of water annually.

Since 1936, juniper acreage increase

County	Acres increased since 1936	Annual water equivalent
Crook County	627,000	145,000 ac ft
Deschutes County	28,000	6,500 ac ft
Jefferson County	441,000	102,000 ac ft
Wheeler County	459,000	106,000 ac ft
Grant County	796,000	184,000 ac ft
Lake County	625,000	144,000 ac ft

Klamath County 172,000 40,000 ac ft

Here is the table those calculations come from so just removing what is above still leaves lots of acres of juniper:

Estimated Juniper Acres by County

County		Total Acres		1936[a]		1999		Percent Increase
Crook		1,964		509		1,136		223
Deschutes		1,932		329		357		108
Jefferson		1,140		63		504		800
Klamath		3,804		106		278		262
Lake		5,207		222		847		381
Harney		6,486		189		1,212		641
Wheeler		1,097		50		509		1010
Grant		2,898		41		837		2041
Baker		1,964		20		418		2090

[a] Estimates of juniper based on 1936 vegetation map from Oregon Department of Forestry
Source: The Western Juniper Resource of Eastern Oregon, PNW-RB249, 2005

1 cfs = 2 ac ft of storage

For the Crooked River,
145,000 ac ft / 2 = 72,500 cfs
72,500 cfs/365 days = 198 cfs/day year-round, a little more than twice the flow agreed to in the HCP for the Crooked River every day of the year. ☺

And these water calculations for the basin would be even higher if we accounted for our over dense national forest of pine and fir.

Tim Deboodt
Natural Resources Policy Coordinator, Crook County
498 SE Lynn Blvd.
Prineville, OR 97754
(541)903-5903
tim.deboodt@co.crook.or.us

The reason that works for me is:

70 percent of our annual precipitation occurs from Oct 1 - April 30 (non growing season so you can't argue plant water use except for Juniper which is evergreen and can transpire water 12 months of the year)

70% of 12 inch precip is 8.5 inches

Soil water holding capacity (saturation) is 1"/ft of soil (less in pumice soils)

2 ft of soil depth is 2" of water holding capacity what happens to the other 6 inches of water (per acre)?

The majority goes to either ground water recharge or surface water run-off (a little goes to soil surface evaporation).
6"/ac multiplied by just the juniper acres gained since the early 1930's is a hell of a lot of water. If you go to the increase since the 1880's when expansion started, even more.

Tim Deboodt
Natural Resources Policy Coordinator, Crook County
498 SE Lynn Blvd.
Prineville, OR 97754
(541)903-5903
tim.deboodt@co.crook.or.us

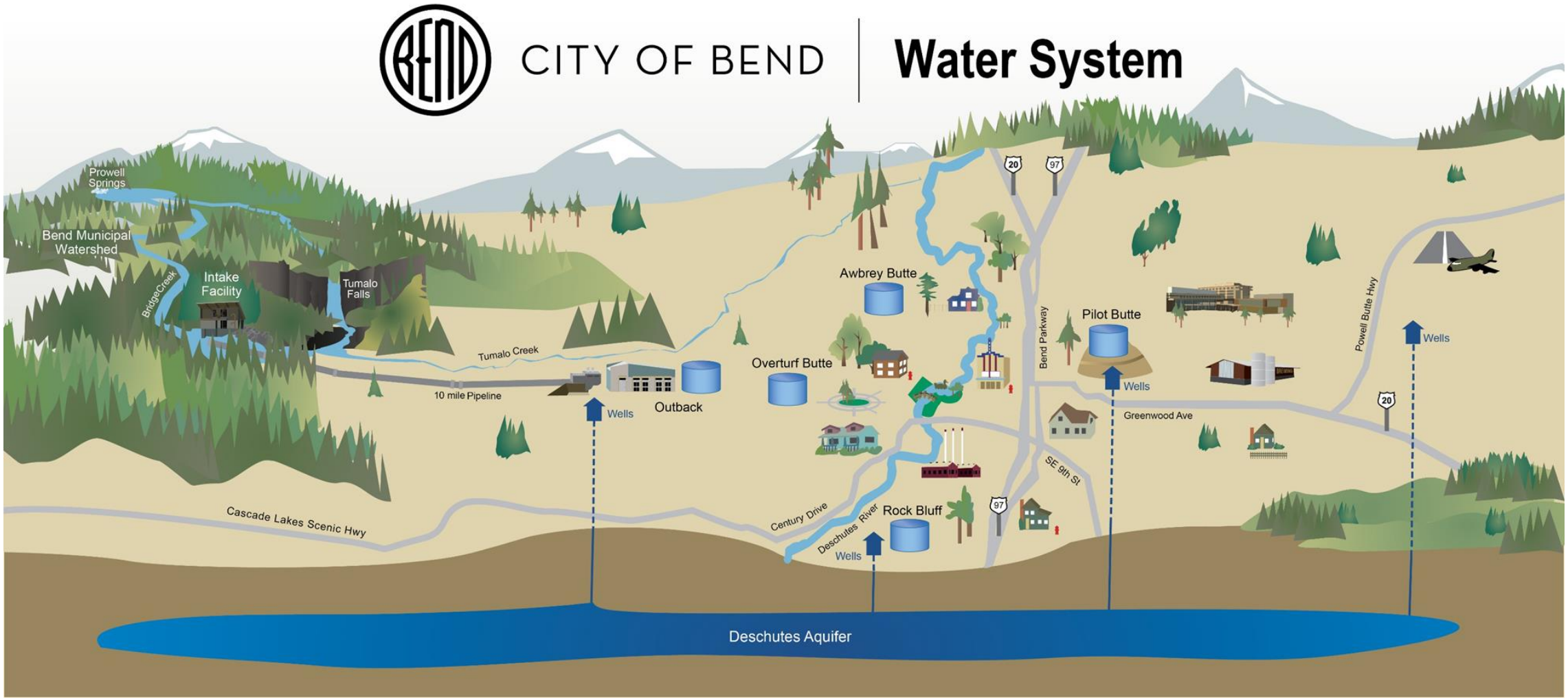
CITY OF BEND WATER SYSTEM OVERVIEW

Mike Buettner
Utility Director
mbuettner@bendoregon.gov

Looking ahead:

1. Brief introduction
2. Water system overview
3. How Bend uses water
4. Conservation in Bend
5. Future issues & projections

WATER SYSTEM OVERVIEW

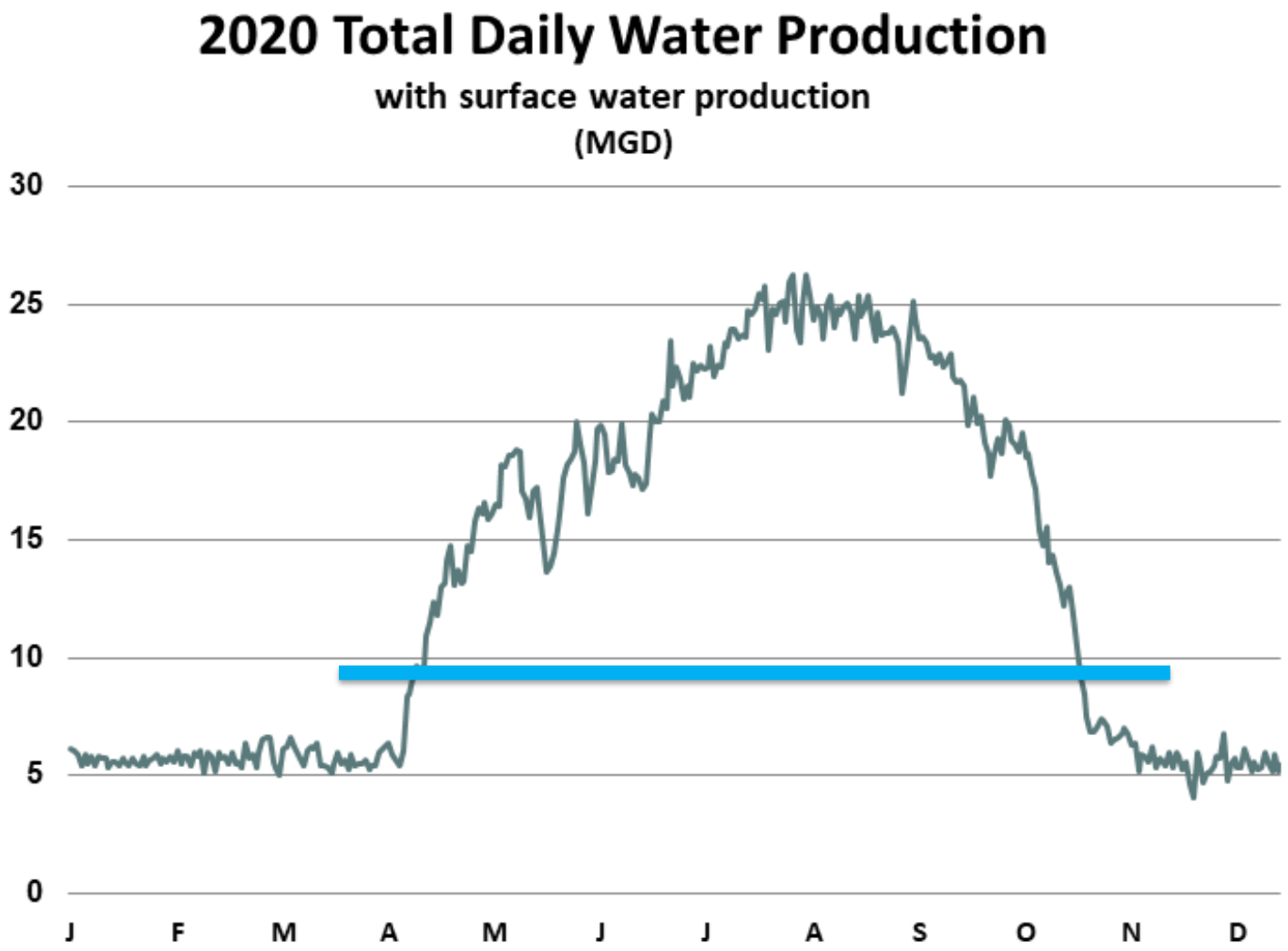


HOW BEND USES WATER

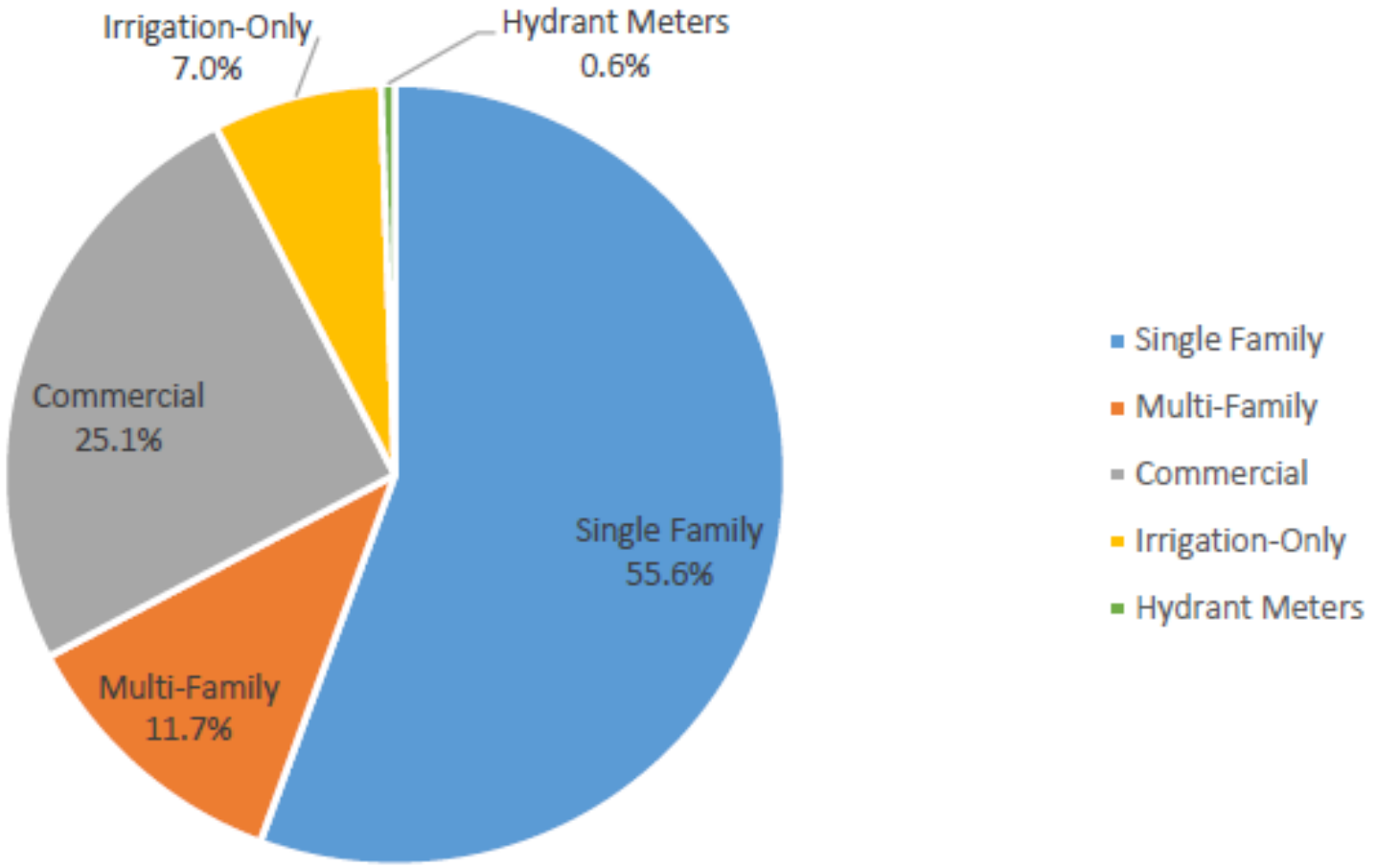
SURFACE WATER – 65%

GROUNDWATER – 35%

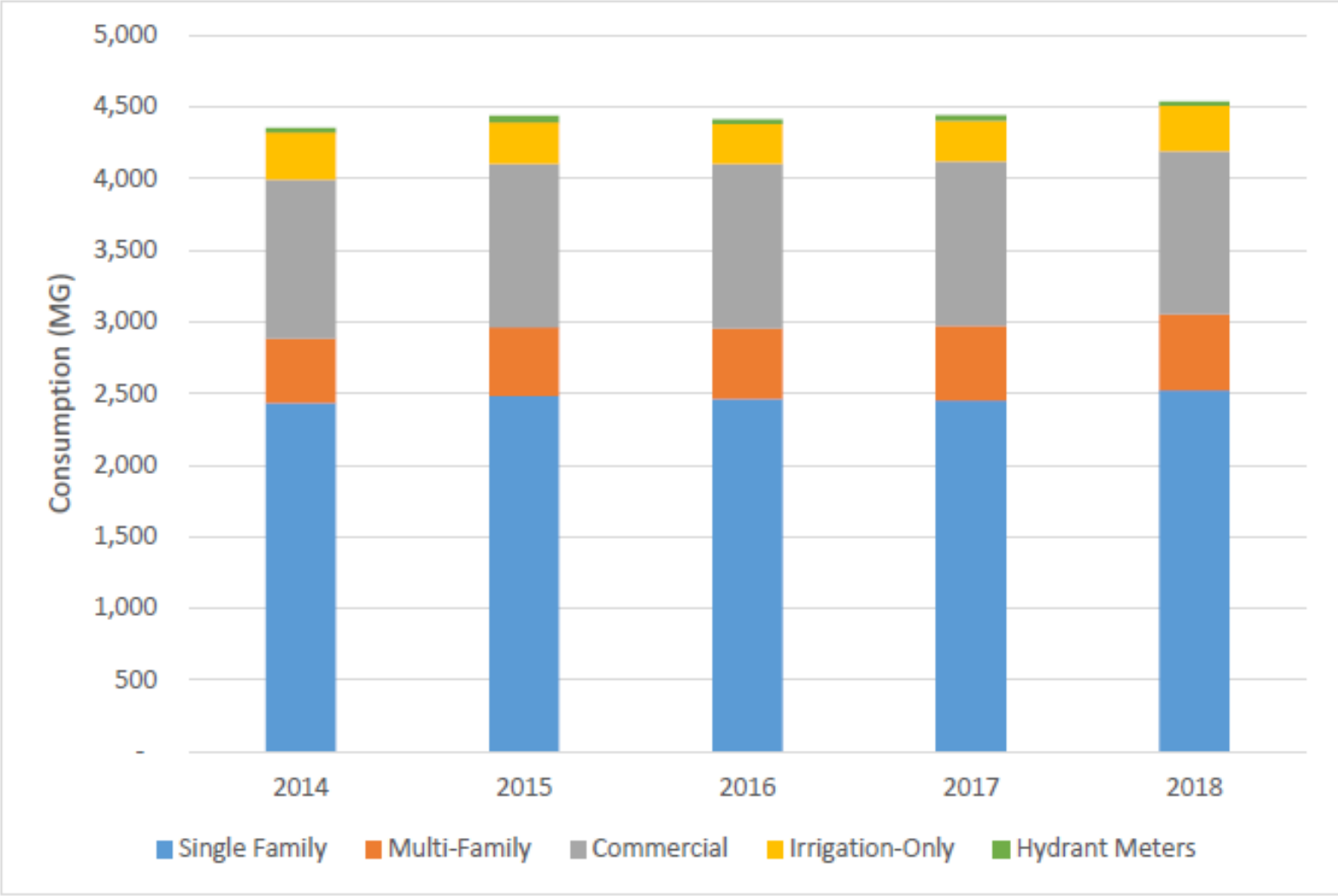
HOW BEND USES WATER



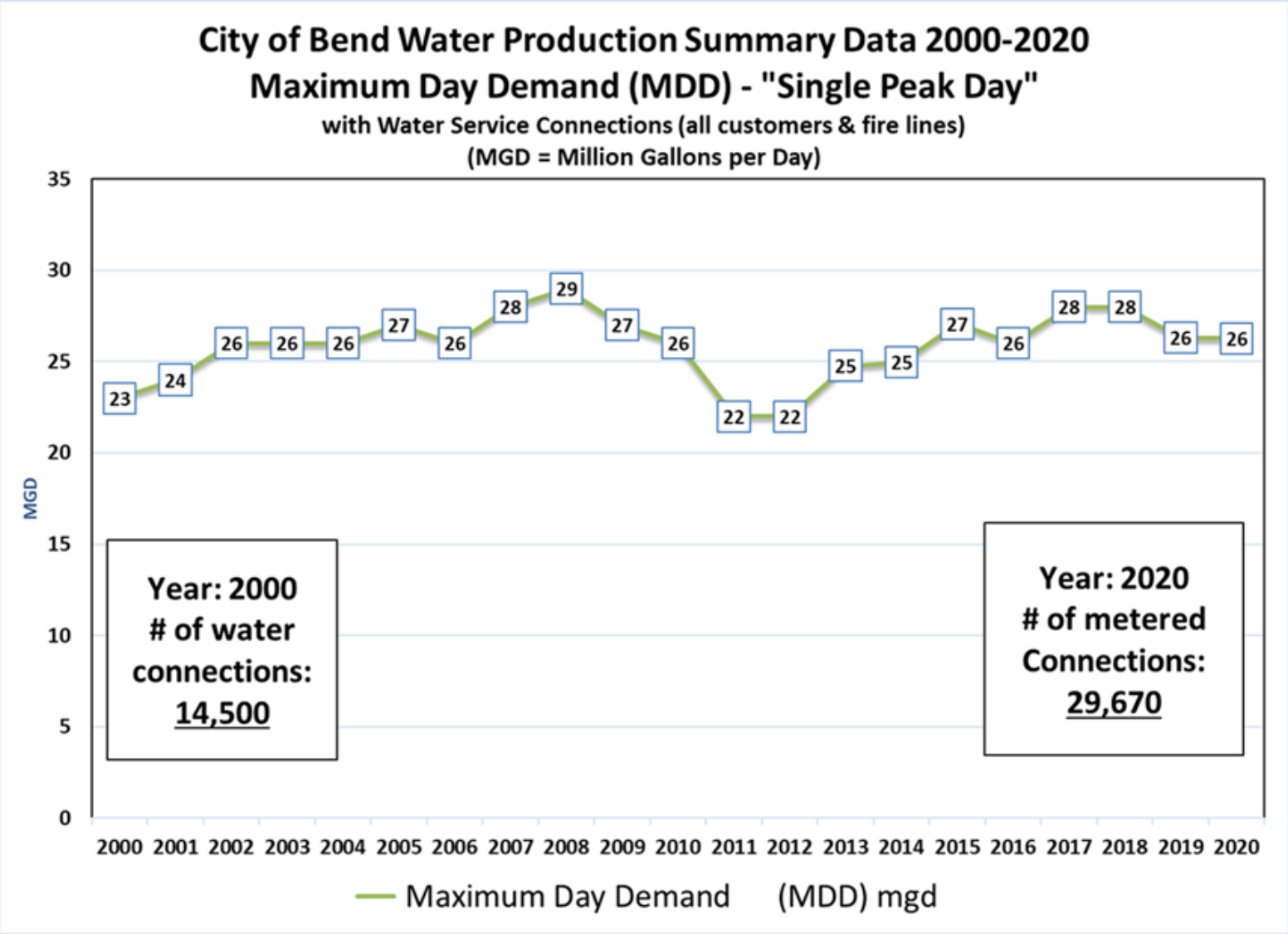
HOW BEND USES WATER



HOW BEND USES WATER



HOW BEND USES WATER



WATER CONSERVATION IN BEND

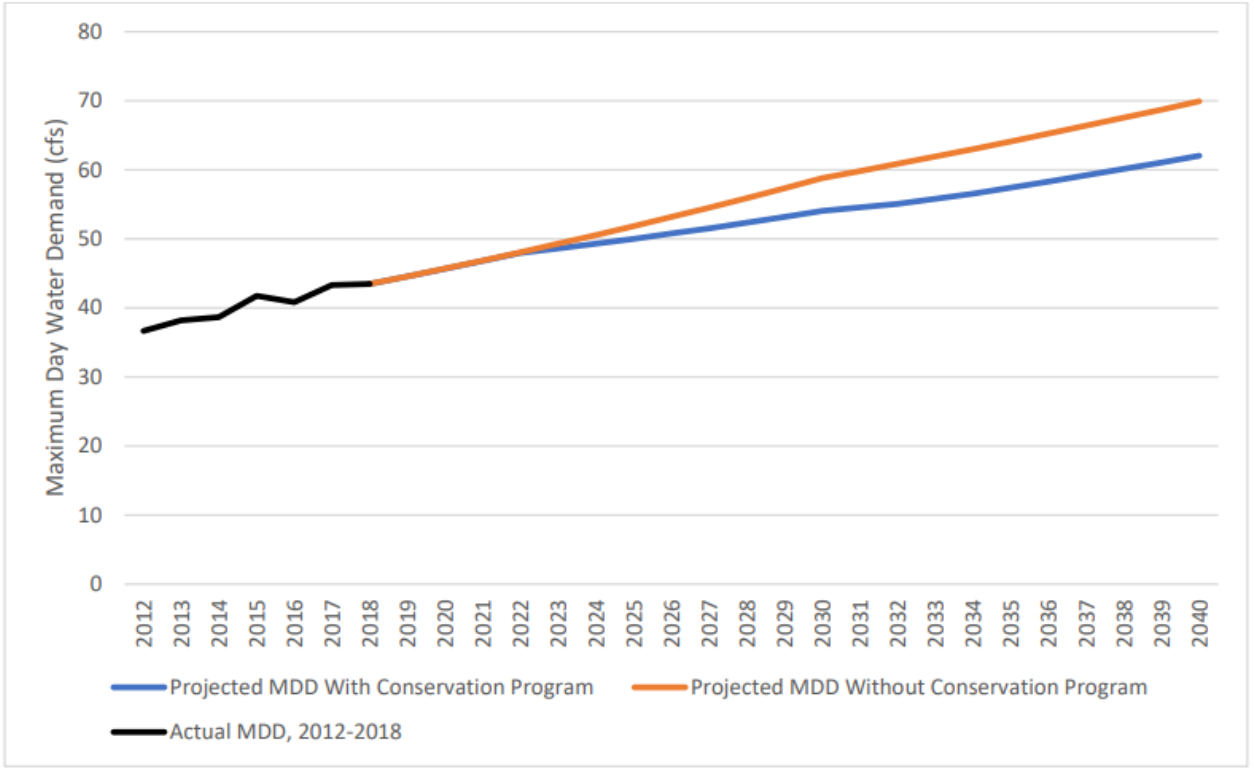
High Desert Water Reality

- Outlined in Water Management & Conservation Plan
- Integrated approach to conservation
- Awarded “Best Conservation Program”
- NEW conservation measures in 2022

www.bendoregon.gov/water

Investing in Water Conservation Over 20 Years:

Exhibit 5-5. Actual MDD, 2012-2018, and Projected MDD With and Without Implementation of Conservation Program, 2018-2040



Future Issues:

1. Continued drought
2. Regulatory certainty

Projections:

1. Greater water conservation ethic
2. Flexible water banking programs
3. More focus on transparency & equity
4. State leadership on 100 Year Vision

Questions?

Mike Buettner
Utility Director
mbuettner@bendoregon.gov

Exhibit 2 2. City of Bend Water Service Area