4. Planning Step 4: Develop Integrated Solutions for Meeting Long-Term Water Needs

In this Planning Step, the DBWC lists and describes potential strategies and corresponding sets of tools offered by individual DBWC workgroup members for generating shareable water, improving supply reliability, restoring flows and habitat for fish and wildlife, and improving water quality. The strategies and tools listed in this Planning Step were suggested by individual stakeholders and represent a menu of possible approaches that may be available to help meet water demands in the Basin. As such, ***no consensus was sought on inclusion of potential strategies and tools presented in Planning Step 4***. Similarly, any considerations for the strategies and tools described below were raised by individual stakeholders and do not represent consensus among the entire DBWC.

Only the strategies/tools on this list that are endorsed by the entire DBWC will be pursued under the Plan; these consensus strategies and tools for implementation will be presented in Planning Step 5. The list of ideas presented in Planning Step 4 are organized by one of four primary categories: 1) Irrigation, 2) Municipal/Quasi-Municipal, 3) Environmental, and 4) Domestic Water Supply and Land Use.

4.1 Irrigation

Agricultural Water Conservation, ***Market-Based Approaches***, ***Enhanced Storage, Irrigation Policy,*** and ***Education and Outreach*** are the five strategies by which water supply could be generated from irrigation.

4.1.1 Agricultural Water Conservation

Agricultural water conservation involves irrigation system modernization to promote efficient water use and voluntarily make water supply available to other users and uses. Potential tools include:

- District Canal and Lateral Piping
- Private Lateral Piping
- On-Farm Irrigation Efficiency Projects
- Monitoring, Measurement, and Reporting

4.1.1.1 District Canal and Lateral Piping

Opportunity

- Piping district conveyance infrastructure conserves water that seeps into the underlying aquifer through open canals composed of porous volcanic basalt (up to 50% conveyance loss). This saved water can be used to meet other demands.
- The Upper Deschutes River Basin Study Working Group (BSWG) estimated in 2019 that additional piping would result in approximately 120,000 AF of water savings at total cost of $720M, or an estimated average cost of $6,000 per AF.
- In the Deschutes Basin, irrigation districts have generally committed to putting 100% of saved water permanently instream via federal and state grants (i.e., PL 566 and SB 839).

Potential Beneficiaries

- Improved district water supply reliability.

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- North Unit Irrigation District/Upper Deschutes winter flows and associated riparian and wetland habitat restoration.
- Middle Deschutes summer flows and associated water quality benefits.

Considerations

- Canal piping that goes through the Conserved Water Act provides a tool to protect water instream. Piping projects that don't restore conserved water instream increase consumptive use and reduce recharge to the Lower Deschutes.
- Growing project costs and non-federal match challenges.
- Resistance to canal piping from some residents and interest groups (e.g., Save Our Canals, etc.).
- The Allocation of Conserved Water statute currently does not support moving conserved water between districts in exchange for winter flow restoration from reservoir storage (relevant only for the NUID/Upper Deschutes winter flow beneficiary of piping projects).
- Lack of consensus among stakeholders regarding the retirement or transfer of conveyance (or carry) water allocated to the Upper Deschutes irrigation districts under the 1934 Duffy Decree as it becomes available in the future once all canals and laterals have been piped.
- Audits of conserved water projects needed at a district/project scale.

4.1.1.2 Private Lateral Piping

Opportunity

- Private laterals convey water from district-owned or -operated canals and laterals to patron-owned properties.
- Piping private laterals conserves water that seeps into the underlying aquifer through open ditches composed of porous volcanic basalt (up to 50% conveyance loss). This saved water could be used to meet other demands.
- The BSWG estimated in 2019 that approximately 35,000 AF/year could be saved through piping of COID's private laterals at an average cost of $1,000 per AF (with other districts expected to have similar costs).
- Private lateral piping also eliminates operational spills, creates opportunities to meter and measure water deliveries at each patron's property, and opens up opportunities for increasing flexibility of water management.

Potential Beneficiaries

- Improved district water supply reliability.
- North Unit Irrigation District/Upper Deschutes winter flows and associated riparian and wetland habitat restoration.
- Middle Deschutes summer flows and associated water quality benefits.

Considerations

- Growing project costs and match challenges.
- Clarity needed on whether districts have the legal authority to require or implement upgrades to private systems.
- Patron willingness to participate in private lateral piping projects.

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- High transaction costs associated with coordinating multiple landowners on shared laterals.
- District support for using water savings associated with patron duties to meet basin needs.
- District willingness to reduce deliveries based on reduced needs in private systems.
- Putting these projects through the Conserved Water Act offers an opportunity to protect water instream. Piping projects that do not restore water instream increase consumptive use and reduce recharge to the Lower Deschutes.

4.1.1.3 On-Farm Irrigation Efficiency Projects

Opportunity

- On-farm water application system upgrades include activities such as converting from flood irrigation to sprinklers and improving efficiencies through other technology.
- The BSWG estimated in 2019 that approximately 65,000 AF could be saved annually through on-farm infrastructure improvements at an average cost of $9,700/AF.
    - It was also estimated that about half this amount of water, 30,000 AF/year, could be saved from the most cost-effective on-farm projects at an average cost of $4,000 per AF.

Potential Beneficiaries

- Improved district and patron water supply reliability.
- North Unit Irrigation District/Upper Deschutes winter flows and associated riparian and wetland habitat restoration.
- Middle Deschutes summer flows and associated water quality benefits.

Considerations

- Landowners may be primarily interested in increasing their own water supply reliability.
- Unclear path to mobilize on-farm water savings for other needs.
- District willingness to reduce deliveries based on reduced needs in private systems.
- Most districts have conserved water policies that only allow for district-owned conserved water projects (barrier if using Allocation of Conserved Water Statute).
- Many funding sources require public benefit (i.e., water protected instream).
- Clarity needed on whether districts have the legal authority to require or implement upgrades to private systems.
- The full benefit from water generated from on-farm efficiency improvements cannot be achieved until district main canals are fully piped.

4.1.1.4 Monitoring, Measurement, and Reporting

Opportunity

- Increased district monitoring, measurement, and reporting of water use beyond initial points of diversion creates the opportunity for water conservation in the following ways:
    - The installation of SCADA (supervisory control and data acquisition) and telemetry enables districts and OWRD to better monitor and control the amount of water entering points throughout delivery systems, resulting in improved management and potential water savings.

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    - The installation of on-farm meters enables the collection of information about on-farm water use and provides opportunities for incentivized water sharing through potential water marketing mechanisms.
    - Additionally, the combination of on-farm irrigation efficiency projects and on-farm metering better enables projects to utilize the ACW program to restore streamflows.
- Consumptive use monitoring through tools such as Open ET provides opportunities to limit water delivery to the amount of water being beneficially used by crops, generating water savings that could be used to meet other needs in the basin.

Considerations

- Districts are only required to report annually.
- No statutory requirement for real-time measurement and reporting (statutory change required).

4.1.2 Market-Based Approaches

Market-based tools involve the use of incentives to promote efficient water use and voluntarily make water supply available to other users and uses. The BSWG estimated in 2019 that market-based tools provided an opportunity to permanently save up to 160,000 AF of consumptively used water at a total cost of $65M, or an estimated average cost of $400 per AF. (The unit cost of this estimated amount of "economically available" water was based in part on a discount rate being applied to temporary costs to generate a permanent value of leased water). Tools include:

- Instream Leasing and Temporary Transfers
- Duty Reductions
- Permanent Water Rights Transfers
- Informal Water Bank Agreements

4.1.2.1 Instream Leasing and Temporary Transfers

Opportunity

- Instream leasing compensates a water right holder to fallow acres for 1-5 years or for part of an irrigation season (split-season lease). The lease is administered through the Oregon Water Resources Department and the leased water is protected instream. The water rights holder retains the water right and receives a year of beneficial use based on the instream use of the water.
- Time-limited instream transfers also allow temporarily transferring a water right instream for periods in excess of 5 years.
- Temporary transfers involve the leasing of a water right to another water user for a period and require specification of which acres the water is being leased from and which acres the water is being used on. Temporary transfers are administered through the Oregon Water Resources Department; the water rights holder retains the water right and receives a year of beneficial use through the transfer.
- An expedited process could be utilized in or triggered by a Drought Declaration.
- If combined with permanent contractual agreements, instream leases and time-limited instream transfers could provide a reliable supply of mitigation credits for water suppliers.

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Potential Beneficiaries

- Instream leases result in instream flows in irrigation season (largely Middle Deschutes and Tumalo Creek).
- Temporary transfers can move water rights within or between districts (contingent on district approvals).
- Instream leases are a tool to reset the forfeiture clock for water users approaching the 5-year-period of non-use.
- Transfers from existing water right holders to municipalities can help meet projected water demands.
- Temporary instream transfers and leases can generate temporary groundwater mitigation credits for cities.
- Streamflow restoration actions can also improve water quality (i.e., temperature, dissolved oxygen).

Considerations

- Operational challenges for districts conveying (or pushing) water down the system and managing water delivery at the lateral level if one or more parcels is dry.
- Administrative burden of managing district water rights certificate(s) as water is moved temporarily to other uses.
- Weed management resources for fallow land.

4.1.2.2 Duty Reductions

Opportunity

- Reduction in the total volume of water used on-farm through increased efficiency, improved water management, or crop choice.
- This tool could be utilized voluntarily or triggered by a Drought Declaration.

Potential Beneficiaries

- Reduced water demand may benefit junior users (districts) next in line.

Considerations

- OWRD does not currently authorize "partial duty" leases or transfers (unless resulting from an ACW project) so water savings would stay within the system.
- Potential operational challenges for districts conveying (or pushing) water through the system if cumulative reductions in demand exceed thresholds; opportunities should increase with increased piping; problem areas could be identified/piped in the interim.
- Opposition by some conservation groups.

4.1.2.3 Permanent Water Rights Transfers

Opportunity

- The permanent transfer of water from a district's point of diversion to a dedicated instream water right or from one place of use to another. Administered through the Oregon Water Resources Department and results in a permanent change to the water right.

Potential Beneficiaries

- Transfers can benefit patrons on specific acres within a district.
- Transfers can occur between existing water right holders on specified acres.
- Water can be transferred permanently instream in the irrigation season.
- Permanent instream transfers can generate groundwater mitigation credits for cities.
- Transfers from existing water right holders to municipalities can help meet projected water demands.
- Streamflow restoration actions can also improve water quality (i.e., temperature, dissolved oxygen).

Considerations

- Operational challenges for district conveying (or pushing) water down the system and managing water delivery at the lateral level if one or more parcels is dry.
- Financial implications for district of patrons permanently exiting and no longer paying annual assessments.
- Broader district concerns about letting water permanently leave district boundaries to meet other basin needs, particularly during water-short years.
- Equity concerns regarding how acquired water is provided to individual patrons and at what cost.
- Cost increase of OWRD application fees.

4.1.2.4 Informal Water Bank Agreements

Opportunity

- Informal agreements (i.e., outside of a formal water bank) to incentive water users to conserve water and move savings to other users or to instream flows.
- For example: COID landowners voluntarily fallow their lands and allow that water to pass through to NUID via forbearance agreements with other districts, in exchange for releases of stored water from Wickiup Reservoir in the winter.

Potential Beneficiaries

- To date, informal water bank agreements have benefited junior district supply reliability and instream flows in the Upper Deschutes River in the winter.
- Depending on the exact mechanism, informal water bank agreements may also have the potential to benefit instream flows in the Middle Deschutes during irrigation season, which may generate mitigation credits for cities.

Considerations

- Operational challenges for districts conveying (or pushing) water down the system and managing water delivery at the lateral level if one or more parcels is dry.
- Not allowed by some districts if patrons are on an existing rotation.

4.1.3 Enhanced Storage

Enhanced/New Storage Infrastructure involves creating or relocating agricultural water storage to promote efficient water use and improve streamflows. Potential tools include:

- Optimization of Existing Storage

- Relocated Storage
- Bulge Storage Ponds
- Lake Billy Chinook Pumping Station
- Cloud Seeding

4.1.3.1 Optimization of Existing Storage

Opportunity

- Implement optimized or adaptive operations of existing storage reservoirs, particularly NUID's Haystack Reservoir.
- There may be some benefit to keeping some storage available in the spring shoulder season to recapture some of the early-season conservation water, and/or be able to help mitigate spring runoff issues that occasionally occur when the Little Deschutes is experiencing high flows prior to irrigation season, which cannot yet be diverted at Bend.

Potential Beneficiaries

- Improve operational flexibility for districts' irrigation water delivery, particularly for NUID.

Considerations

- Maximizing storage may have impacts on streamflow.
- There is an ODFW-managed fishery and recreational site that may be interested in establishing some sort of minimum pool that may be impacted by maximized storage.

4.1.3.2 Relocated Storage

Opportunity

- Relocate a portion of the existing storage in Wickiup Reservoir downstream to potential off-channel storage sites closer to NUID agricultural lands (e.g., Expanded Haystack Reservoir; Monner Reservoir proposed site, etc.).

Potential Beneficiaries

- NUID patrons.
- Upper Deschutes instream flow in winter through downstream delivery to new storage.
- Middle Deschutes instream flow through reduced diversions at North Canal Dam in Bend.

Considerations

- Cost ($30M to $300M in construction).
- Land acquisition, mitigation, and infrastructure.

4.1.3.3 Bulge Storage Ponds

Opportunity

- Construct "bulge in the system" temporary storage facilities (bulge ponds) that allow districts to manage and deliver their legally diverted water right during the irrigation season for irrigation use.

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Potential Beneficiaries

- Improve operational flexibility for districts' irrigation water delivery.

Considerations

- If a bulge in the system impounds more than 9.2 AF and has a dam in excess of 10 feet in height, the water user will need to submit dam plans and specifications and have them approved.
- To be considered "temporary", the period of time between agricultural applications of stored water must not exceed 10 days, and the pond must be drained to a minimum level or emptied at the end of the legal season of use.
- Misuse of this tool (e.g., water ski ponds).
- There are technical questions regarding implementation of OWRD's statutory authority that need further exploration for this tool to be implemented.

4.1.3.4 Lake Billy Chinook Pumping Station

Opportunity

- Permanently relocate existing NUID pumps on the Crooked River to a pumping station on the Lake Billy Chinook reservoir pool.
- Could include transfer of Wickiup storage to Lake Billy Chinook.

Potential Beneficiaries

- NUID patrons with more reliable water supply.
- Potential for Crooked River flow during irrigation season.
- Upper Deschutes instream flow in winter through downstream delivery to new storage.
- Middle Deschutes instream flow in irrigation season from previous POD at Bend to the new downstream POD

Considerations

- Cost (up to $350-400M in construction and $5-10M or more/year for pumping and operations).
- Extensive feasibility and analysis are still needed on costs and benefits specific to evolving project details.
- Enlargement issues (e.g., cannot pull more water from Lake Billy Chinook than NUID could pull from the Crooked River, which in the summer months is essentially zero for live flow).

4.1.3.5 Cloud Seeding

Opportunity

- Cloud seeding is a weather modification technique that introduces silver iodide into existing clouds to aid in the formation of ice crystals. It could potentially increase precipitation in Central Oregon.

Considerations

- Effectiveness is uncertain.

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- Environmental effects are uncertain.

4.1.4 Irrigation Policy

Irrigation policy involves promoting efficient water use through legislation or regulation. This strategy and the corresponding tools could be utilized through district or state policy and/or triggered by a Drought Declaration. Potential tools include:

- Regulating for "Beneficial Use" and to Avoid "Waste"
- Deschutes Water Bank
- Split Rate/Split Duty
- Irrigation Efficiency Standards
- Incentive Pricing for Irrigation Water

4.1.4.1 Regulating for "Beneficial Use" and to Avoid "Waste"

Opportunity

- Define waste to provide practical and measurable guardrails that can be enforced.
- Better enforcement by OWRD of beneficial use without waste provision of Oregon water law.

Potential Beneficiaries

- Users with less reliable water rights and instream flows during irrigation season.

Considerations

- Would require state leadership.
- Statutory definition of waste requires state legislation, though the definition could be refined by rule without legislation.

4.1.4.2 Deschutes Water Bank (mechanism for current and potential market-based tools)

Opportunity

- The water bank could be the umbrella under which existing and future market-based transactions (including the tools described in Section 4.1.2) are administered and implemented.
- Opportunities include moving water freed up through market-based incentives from senior districts to junior districts in exchange for winter flows in the Upper Deschutes.
- Water bank charter can be set up to require that transactions have net instream flow benefits protected either during irrigation season through an instream lease or during the winter through an instream lease or flow augmentation right.
- Moving water to instream use may enable the water bank to create mitigation credits.
- Additional flexibility could be enabled by a Drought Declaration.

Potential Beneficiaries

- Depending on the exact mechanism, the bank has the potential to benefit all three legs of the stool.

Considerations

- May require state legislation.

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- Potential to disincentivize instream leasing.
- May commodify water.
- Potential to lock in outdated rates/duties of senior districts.
- May perpetuate longstanding inequities in the basin.
- Might not lead to permanent solutions.
- Might not provide certainty for instream restoration.

4.1.4.3 Split Rate/Split Duty

Opportunity

- Voluntary reduction in on-farm duty through increased efficiency, improved water management, or less water intensive crop choice.
- Split rate/split duty moves water savings by reducing both the instantaneous rate of delivery and overall volume of water used on-farm to directly meet the needs of junior users or instream flow needs (instead of the next in line by priority).
- Duty reduction could be utilized voluntarily or triggered by a Drought Declaration.

Potential Beneficiaries

- Reduced demand may benefit junior users (districts) other than just those that are next in line by priority.
- Reduced demand may benefit instream flows in the Middle Deschutes during the irrigation season.
- Saved water could be used to improve summer instream flows or NUID reliability in exchange for Upper Deschutes winter flows if managed through a water bank or through other agreements. A water bank may also offer a pathway forward to create mitigation credits.

Considerations

- OWRD does not currently authorize "partial duty" leases or transfers (unless resulting from an ACW project) so a legislative change would be required to move water savings instream.
- Split rate/split duty does not reduce duty, it spreads it to additional lands, which could ultimately increase consumptive use in the basin.
- Split rate/split duty without an instream component solidifies long standing inequities in the basin and locks in outdated rates/duties of the most senior water rights.
- Potential operational challenges for districts conveying (or pushing) water through the system if cumulative reductions in demand exceed thresholds; opportunities should increase with increased piping; problem areas could be identified/piped in the interim.
- Opposition by some conservation groups.

4.1.4.4 Irrigation Efficiency Standards

Opportunity

- Set the rate and duty associated with water rights to be consistent with the best available technology (conveyance and on-farm systems), and/or other factors including evapotranspiration rates of crop types, soil, and climate of irrigation districts.
- Assist in providing a better, more enforceable definition of water waste.

- Efficiency standards could potentially be set based on an economic threshold for a parcel of land tied to a water right in addition to the other factors described above.
- This tool could be utilized through state directive, district policy and/or be triggered by a Drought Declaration.

Potential Beneficiaries

- Water users with less reliable water rights, as well as instream flows on the Middle Deschutes during the irrigation season or the Upper Deschutes during the winter.

Considerations

- Would require state leadership.
- Cost impacts for water rights holders to upgrade systems, if needed.

4.1.4.5 Incentive Pricing for Irrigation Water

Opportunity

- Incentive water pricing can create a direct relationship between the amount of water an irrigator uses and their assessment costs by rewarding efficient use of water, and/or penalizing inefficient use through higher costs.
- Potential rate structures include but are not limited to:
    - 100% volume-based fee
    - Mixed structure; for example, 10-30% fixed (account fees) and 70-90% volume-based fee
    - Tiered; for example, 10% fixed and 90% volume-based, where prices increase for each incremental acre-foot applied per acre.
    - Economic rate structures where costs per unit of water scale depending on the economic activity of the land parcel attached to the water right (could be applied to all rate structures described above).

Potential Beneficiaries

- Water generated from incentivized conservation could benefit patrons with less reliable water rights.
- Water generated from incentivized conservation could benefit instream flows during irrigation season.

Considerations

- Would require state leadership/regulation to promote the use of incentive pricing.
- Or it would require irrigation districts to enact such pricing policies (some tiered pricing is already set or driven by Reclamation contracts, e.g., NUID).

4.1.5 Education and Outreach

Efficient water use can be promoted through education and outreach. This strategy and the corresponding tools could be ramped up following a Drought Declaration and/or district curtailment. Potential tools include:

- Patron Education and Outreach

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- District Board Education
- District-Wide Education and Outreach

4.1.5.1 Patron Education and Outreach

Opportunity

- Educating new property owners, through programs like those offered by the Soil and Water Conservation Districts, provides an opportunity to instill responsible water management practices.
- Educating specific landowners who are using water wastefully, identified through ditch rider observation or neighbor-driven complaints, could reduce water use in the district.

Considerations

- Staff capacity.

4.1.5.2 District Board Education

Opportunity

- Exchanging information and ideas with new and existing district board members on potential opportunities for implementing water conservation and marketing strategies.

Considerations

- Staff capacity.

4.1.5.3 District-Wide Education and Outreach

Opportunity

- On-going outreach and social-marketing campaigns, which include the use of the district website, social media, text messaging, snail mail, and open houses and events, can help educate patrons about ongoing conservation efforts and opportunities.

Considerations

- Staff capacity.

4.2 Municipal/Quasi-Municipal

Municipal Water Conservation, Municipal Water Supply, Municipal Policies, ***Municipal Infrastructure,*** *and* ***Education and Outreach*** are the four strategies by which water supply could be generated from municipal water use.

4.2.1 Municipal Water Conservation

Cities and quasi-municipal water suppliers (e.g., Avion, Roats) could extend existing supplies by continuing, expanding existing, and deploying additional new conservation tools that reduce per capita water demand. Any conservation measures, including those that are required by OWRD and those that are voluntarily implemented by water suppliers, are described in municipal Water Management and Conservation Plans (WMCPs). This section focuses on opportunities to expand existing water conservation programs that go above and beyond WMCP requirements, or to develop new conservation programs. Potential tools include:

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- Waterwise Landscaping
- Rebates and Incentives for Efficiency Plumbing and Irrigation Systems
- Codes and Standards Requiring Water-Efficient Landscapes
- Incentive Pricing for Municipal Water
- Landscape and Outdoor Water Restrictions

4.2.1.1 Waterwise Landscaping

Opportunity

- Increase funding for rebate programs like the City of Bend's turf removal initiative.
- Convert city green spaces to desert landscaping where suitable. Increased funding may also expedite these conversions.
- Retrofit public spaces with xeriscaping and efficient irrigation systems. Increased funding may also expedite these conversions.

Potential Beneficiaries

- Demand reduction for water suppliers.

Considerations

- Securing funding may be difficult, especially with competing priorities.
- City green spaces may not be managed by the city itself (Bend Parks and Recreation Department is a separate entity from the City of Bend) and many parks are not supplied by city water.
- Community resistance to landscape changes may limit adoption.
- Ongoing education and maintenance efforts are essential for success.

4.2.1.2 Rebates and Incentives for Efficient Plumbing and Irrigation Systems

Opportunity

- Municipalities can establish and expand programs to offer incentives and rebates for the installation of water-efficient appliances and sprinklers.

Potential Beneficiaries

- Demand reduction for water suppliers.
- Reduced water costs for municipal water customers after efficiency upgrades have been made.

Considerations

- Initial upgrade costs may deter participation and are particularly burdensome for lower-income customers.
- Raising awareness of water-efficient technologies can be resource-intensive.
- Technical assistance to customers/property owners is typically required to ensure proper systems, installation, and operation, which is time-consuming and requires staff and funding resources.
- Expensive – water suppliers must have a funding source and/or rate increases to pay for rebates, education, enforcement activities, and the loss of revenue.
- Potential cost implications for water patrons.

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4.2.1.3 Codes and Standards Requiring Water-Efficient Landscapes

Opportunity

- Development codes adopted by cities can restrict the amount of irrigated lawn on new development lots or prohibit inefficient irrigation systems and turf in right-of-way planter strips.
- Some municipalities are currently implementing such development codes; similar codes could be adopted by other municipalities as well.
- This could also be a directive received from the state or federal government.

Potential Beneficiaries

- Demand reduction for water suppliers.

Considerations

- Development codes cannot be retroactively applied to existing development or planned development with already approved plans/permits.
- Resistance can be expected from some property owners and Homeowner Associations who prefer greener, higher water use landscaping.
- Resistance may come from the development community, businesses, and residents who view new regulations and burdensome and who may appeal new development code to the state Land Use Board of Appeals.
- Ensuring compliance with and raising awareness of water-efficient technologies is resource intensive.

4.2.1.4 Incentive Pricing for Municipal Water

Opportunity

- Similar to irrigation water pricing (Section 4.1.4.3), municipal water can be priced to incentivize conservation by rewarding efficient use and/or penalizing inefficient use through higher costs.

Potential Beneficiaries

- Demand reduction for water suppliers.

Considerations

- Tiered pricing may disproportionately affect low-income households and/or land uses such as school properties where the cost to retrofit landscapes is cost-prohibitive and where lawn areas are needed and used.
- Managing tiered pricing systems requires administrative resources.
- Reduced water use could lead to revenue shortfalls for municipalities.

4.2.1.5 Landscape and Outdoor Watering Restrictions

Opportunity

- One of the largest uses of municipal water is for watering residential lawns or city parks and open spaces. Municipalities can set restrictions to limit or prevent this type of outdoor water use, including limiting watering to alternating days and time of day, and in

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some cases also include codes disallowing water waste such as water overspray onto paved surfaces.
- Municipalities typically already implement irrigation season restrictions on outdoor water use, though some water suppliers could update their codes to expand restrictions or penalties and/or apply more rigorous code compliance efforts.

Potential Beneficiaries
- Demand reduction for water suppliers.

Considerations
- Enforcement is resource intensive and requires implementing a legal code compliance procedure including civil penalties that can require use of the courts.
- Many water waste cases occur at night or otherwise may be hard to capture/enforce.
- To achieve the best long-term compliance, this is best coupled with technical assistance and incentives to encourage changes to behaviors and irrigation systems. This is expensive and resource intensive.
- Potential cost implications for water patrons.

4.2.2 Municipal Water Supply

In addition to ongoing actions to reduce municipal demand through conservation, municipalities may also need to increase their existing supply of municipal groundwater in order to meet future projected demands (see Sections 3.3.3 and 3.3.4). As mentioned in Section 2.2.3, through the Deschutes Groundwater Mitigation Program, any new uses of groundwater must be offset to mitigate their impact on connected surface water flows. Potential tools to improve long-term municipal water supplies include:
- Access to Groundwater Rights
- Access to Mitigation Credits

4.2.2.1 Access to Groundwater Rights

Opportunity
- Municipalities may need to acquire new groundwater rights in order to meet future projected demands.
- Municipalities can acquire existing groundwater rights from other water right holders to meet future projected demand (see Section 4.1.2.3).

Potential Beneficiaries
- Municipal water suppliers.

Considerations
- The Groundwater Mitigation Program has a cap of 200 cfs on the cumulative total for final orders on approved groundwater permit applications. Modifying the cap requires a rule change by the Oregon Water Resources Commission. The cap has not been reached.
- Significant groundwater declines in some areas may prevent the issuance of new groundwater rights.

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4.2.2.2 Access to Mitigation Credits

Opportunity

- Under the Deschutes Basin Groundwater Mitigation Program, cities must offset any impacts by new appropriations of groundwater by securing groundwater mitigation credits that protect State Scenic Waterway flows.
- Water suppliers can also provide mitigation "incrementally" by providing mitigation credits over time as demand grows.
- To date, the primary mechanism by which permanent and temporary mitigation credits have been created is through the temporary instream lease or permanent instream transfer of the consumptive use portion of existing irrigation water rights.
- There is also a desire by municipalities to expand the types of tools that can generate mitigation credits if they meet the parameters of reducing consumptive use and protecting water instream.

Potential Beneficiaries

- Municipal water suppliers.
- By design, the Groundwater Mitigation Program also protects state scenic waterways flows.

Considerations

- The Groundwater Mitigation Program has a sunset date of January 2, 2029, and a cap of 200 cfs on the cumulative total for final orders on approved groundwater permit applications.
- Extending the program beyond 2029 will require legislative change at the state level.
- Raising the cap requires a rule change by the Oregon Water Resources Commission.
- Credit supply is significantly lower than projected demand (551 credits vs a projected need of 16,000 mitigation credits over the next 50 years, see Section 3.3.3).

4.2.3 Municipal Policies

In addition to the voluntary measures the cities have been and can continue to implement and/or expand (described above), the state can also encourage or require conservation by enacting policies that reduce per capita water demand. Unlike the voluntary tools above, the tools in this section would require legislative or policy changes from the state. Potential tools include:

- Municipal Efficiency Standards
- Enhanced Water Conservation Policy Support

4.2.3.1 Municipal Efficiency Standards

Opportunity

- There are already statewide efficiency standards mandated under the plumbing code that apply to installation of new fixtures like faucets, showerheads, and toilets.
- However, the state could institute updated plumbing code standards that would increase efficiency.

Potential Beneficiaries

- Demand reduction for municipal water suppliers.

Considerations

- Would require state legislation.
- Cost implications for water customers and/or suppliers for appliance upgrades.

4.2.3.2 Enhanced Water Conservation Policy Support

Opportunity

- With targeted state-funded initiatives and strategic partnerships, municipalities can significantly broaden their conservation efforts. State support offers the essential research, training, and financial resources needed to advance water-saving technologies and practices, enabling cities to not only sustain but also elevate their conservation programs.
- Opportunities for state support of water conservation include:
    - Expanding state support for education and certifications in advanced water management (e.g., AWWA Water Use Efficiency Practitioner or M36 Water Audit training and certifications).
    - Leveraging OSU Extension to assist with research and development of integrated waterwise-firewise practices crucial for developing sustainable and resilient landscapes.
    - Establishing state-funded initiatives to develop and transfer water-saving technologies to accelerate the adoption of innovative solutions across communities.
    - Fostering statewide collaboration for sharing best practices and resources.

Potential Beneficiaries

- Municipal water suppliers.

Considerations

- Expanding, enhancing, and implementing new municipal water conservation programs depends heavily on robust support and collaboration with state agencies and institutions.

4.2.4 Municipal Infrastructure

Cities and water suppliers could extend existing supplies through the creation of infrastructure that stores, recycles, reclaims, or reuses municipal water. Potential tools include:

- Construction of Treated Water Storage Reservoirs
- Recycled or Reclaimed Water Projects
- Greywater and Stormwater

4.2.4.1 Construction of Treated Water Storage Reservoirs

Opportunity

- Construction of additional storage reservoirs (typically tanks) could provide for storing treated water during off-peak use times to be used during peak demand times.

Potential Beneficiaries

- Supply reliability during peak demands for water suppliers.

Considerations

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- Design and construction of reservoirs, including piping, valves, land acquisitions, etc., is extremely expensive.
- The amount of storage needed to provide for peak demands likely requires multiple new reservoirs per jurisdiction.
- Operational and water quality issues can result from having excess storage in the water system, requiring additional infrastructure and operational costs that can include extra chlorination, monitoring, or valves/piping.
- Does not control or reduce demands, only shifts around their timing.

4.2.4.2 Recycled or Reclaimed Water Projects

Opportunity

- Many cities are already implementing and operating recycled or reclaimed water projects through combinations of treated effluent infiltration ponds, infiltration wetlands, and effluent irrigation of agricultural lands or golf courses.
- Cities could explore additional opportunities to recycle or reclaim/reuse treated effluent to boost supply or provide water to other needs. Opportunities may include:
    - Diversion of treated effluent into irrigation district canals during irrigation season.
    - Additional construction of purple pipe reuse water systems and treated effluent reuse on additional landscapes or agricultural lands.

Potential Beneficiaries

- Treated wastewater effluent that meets DEQ water quality standards can be reused for some irrigation or commercial and residential landscape applications.

Considerations

- Most treated effluent is currently infiltrated into the aquifer through effluent infiltration ponds and wetlands, so any effort to reuse this water for other purposes will result in a similar reduction in artificial recharge. In a system like the Upper Deschutes Basin with uniquely porous hydrogeology, the net impact on the water budget is similar to simply expanding groundwater pumping.
- A decrease in return flow (surface or groundwater) could have negative impacts on streamflows and/or recharge.
- DEQ NPDES and Water Pollution Control Facility (WPCF) Permitting.
- High cost of constructing and operating infrastructure (e.g., treatment systems to provide quality effluent, separate pipes, pump stations, etc.) to treat and deliver effluent to receiving sites.
- Negative public perceptions about the safety of treated wastewater.
- If the underlying groundwater permit has a mitigation obligation, the permits require updating the mitigation obligations if consumptive use changes (which would increase with recycled/reclaimed water, meaning more mitigation would be required).
- Must go through the state's recycled water statutes, which require a determination that the project will not harm fish.

4.2.4.3 Greywater and Stormwater

Opportunity

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- Greywater ("used" water from sources such as sinks or washing machines) can, in certain circumstances when allowed by state plumbing code, be filtered and used for non-potable uses such as yard watering or, with proper permitting, be used for limited indoor use for toilet flushing.
- Stormwater could be directed from impervious areas such as rooftops onto landscaped areas to contribute a limited supplement to plant water needs.

Potential Beneficiaries

- Some demand reduction benefits for water suppliers.

Considerations

- There is a limited quantity of greywater, and its use would be limited to individual buildings.
- These buildings would require additional, separate plumbing systems entirely for greywater capture and reuse. Local development code and building code changes would be necessary to require this for development and would add cost to housing and other buildings.
- Stormwater capture and reuse is most feasible in areas with considerably more precipitation than Central Oregon.
- Most stormwater in Central Oregon already discharges to underground injection facilities such as drywells, already providing some level of groundwater recharge.

4.2.5 Education and Outreach

Efficient water use can be promoted through education and outreach. This strategy and the corresponding tools could be ramped up following a Drought Declaration. Potential tools include:

- Customer Education and Outreach

4.2.5.1 Customer Education and Outreach

Opportunity

- Expand on existing educational programs offered by municipalities to educate municipal water customers on water conservation.
- Conduct outreach to customers to increase enrollment in rebate/incentive programs for improving municipal water use efficiency.

4.3 Environmental

Instream Flow Protection and Restoration, Habitat and Watershed Restoration, Water Quality Protection and Restoration, Environmental Policies, Additional Analyses and Monitoring, and ***Education and Outreach*** are the five strategies by which water supply and/or water quality improvements could be facilitated.

4.3.1 Instream Flow Protection and Restoration

Many of the tools described in this Chapter that generate water from conservation projects have the potential to improve instream flows (through the use of the Conserved Water Act). Market-based tools, like instream transfers and leases (Sections 4.1.2.1 and 4.1.2.3), also benefit streamflows. However, beyond instream transfers and leases and use of the Conserved Water

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Act, there are additional tools by which instream flows could be restored or protected through other pathways. Potential tools include:

- New Instream Water Rights
- Resolving Protested Instream Water Right
- Set Instream Flow Targets Beyond Existing Instream Rights and Scenic Waterway Flows
- Instream Transfers and Leases
- Use of Conserved Water Act

4.3.1.1 New Instream Water Rights

Opportunity

- State agencies can apply for new instream water rights on stream reaches in the Upper Deschutes Basin.
- Additional instream water rights could protect peak/ecological flows, new instream demands (e.g., frog needs) and/or fill gaps (1990's instream rights were not issued in the amounts ODFW applied for).
- Instream water rights could also protect water quality (with DEQ as the applicant).
- Instream water rights could also protect scenic waterway flows (with Parks as applicant).

Potential Beneficiaries

- Instream flow protection (fish and wildlife, water quality, scenic/recreation).

Considerations

- Instream water right would have a junior priority date and would not guarantee flow protection.

4.3.1.2 Resolving Protested Instream Water Right

Opportunity

- Resolving protested ODFW instream water right in the Middle Deschutes would increase assurances for instream needs in this reach into the future, especially with regards to transfers

Potential Beneficiaries

- Instream flow protection.

Considerations

- OWRD backlog on water rights protests.
- Instream water right would have a junior priority date and would not guarantee flow protection.

4.3.1.3 Set Target Flows

Opportunity

- Work as a collaborative to set target flows beyond existing instream water rights, scenic waterway flows and HCP requirements to ensure instream needs are met.

Potential Beneficiaries

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- Instream values including but not limited to fish and wildlife, recreation, water quality, scenic values.

Considerations

- [Other stakeholders to add]

4.3.1.4 Instream Leases and Transfers – see Sections 4.1.2.1 and 4.1.2.3 above

4.3.1.5 Allocation of Conserved Water – the pathway used for conservation tools in Section 4.1.1

4.3.2 Habitat and Watershed Restoration

Involves projects aimed at restoring habitat to improve hydrologic function and instream flows. Potential tools include:

- Natural Storage (i.e., channel, floodplain, riparian, wetland, upland restoration)
- Channel, Riparian, and Wetland Restoration
- Fish Passage Barriers/Screening

4.3.2.1 Natural Storage (i.e., channel, floodplain, riparian, wetland, upland restoration)

Opportunity

- Increasing the natural storage capability (the sponge) in riparian, wetland, and upland areas can attenuate available precipitation and increase late summer streamflow, boosting water reliability for streams and irrigation water users.

Potential Beneficiaries

- Improve water reliability for streams and irrigation water users.
- Restore working landscapes and fish and wildlife habitats.
- Increased filtration through the landscape to improve water quality.

4.3.2.2 Channel, Riparian, and Wetland Restoration

Opportunity

- The Upper Deschutes River channel has been highly altered due to flow alterations, has increased about 20% in width, and much of the channel is disconnected from its floodplain.
- Restoring physical habitat and reconnecting wetlands is critical to complement planned flow restoration activities to restore river function and habitat for Oregon spotted frog, redband trout, and other native species.

Potential Beneficiaries

- Restored or enhanced fish and wildlife habitat, particularly for Oregon spotted frog (when paired with flow restoration).

Considerations

- Funding.

4.3.2.3 Fish Passage Barriers/Screening

Opportunity

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- Address any remaining fish passage barriers (e.g., Mirror Pond Dam).
- Update existing fish screens as needed (e.g., NUID diversion at North Canal Dam).

Potential Beneficiaries
- Fish migration.

4.3.3 Water Quality Protection and Restoration
Streamflow is a major driver for water quality issues in the Upper Deschutes Mainstem. Water management strategies identified throughout this Plan, such as restoring instream flows in the summer, improve water quality (temperature, dissolved oxygen, pH). The Upper Deschutes and Little Deschutes subbasins are on ODEQ's medium priority list for TMDL development and are estimated to be submitted for EPA approval in April of 2030. Potential tools for addressing water quality protection and restoration include:
- Nonpoint Source Pollution Reduction
- Point Source/Permitted Input Management
- Source Water Protection
- Water Temperature Reduction

4.3.3.1 Nonpoint Source Pollution Reduction
Opportunity
- The Deschutes Basin Water Quality Status and Action Plan identifies the tools being implemented to address nonpoint source pollution from agricultural, forest, urban, and recreational land uses (Oregon Department of Environmental Quality 2011).
    - Agricultural lands: improve grazing, cropping, and water management practices.
    - Forest lands: reduce the impact of logging, roads and other use practices in riparian corridors and similarly sensitive areas.
    - Urban lands: stormwater management plans are in place in all cities in the basin.
    - Recreational lands: upgrade facilities (i.e., restrooms and dumping facilities).
- Additional tools for reducing nonpoint source pollution into waterways of the Upper Deschutes Basin may be identified as part of the forthcoming TMDL development process.

Potential Beneficiaries
- Improved surface water quality.

Considerations
- TMDL development process is not scheduled to take place until 2030.

4.3.3.2 Point Source/Permitted Discharge Management
Opportunity
- As of December 2023, 58% of the NPDES permits in Oregon have not been renewed on time; Oregon DEQ is committed to improving the NPDES individual permit backlog through continuous improvement.
    - Deschutes Basin has two NPDES individual permits for point sources: City of Bend's Municipal Stormwater Area and Gilchrist Forest Products (see Section 2.2.7).

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- The forthcoming TMDL documents will describe the sources of pollutants that cause water quality impairments and will identify potential solutions for reducing pollutant loading into waterways from point and nonpoint sources.

Potential Beneficiaries
- Improved surface water quality.

Considerations
- TMDL development process is not scheduled to take place until 2030.
- There are only two point source permits in the Deschutes Basin.

4.3.3.3 Source Water Protection
Opportunity
- Source water protection is accomplished by effective state public health programs, environmental protection, land use policies, proactive land stewardship, and by implementation of local drinking water protection efforts by communities and public water suppliers.
- Local jurisdictions have DEQ WPCF permits for stormwater discharge to groundwater, through which the cities implement best management practices to prevent groundwater pollution.
- A 2023 bill provides funding for land acquisition to protect source water.

Potential Beneficiaries
- Drinking water quality.

4.3.3.4 Water Temperature Reduction
Opportunity
- The health and survival of fish species is hindered when stream temperatures increase, which is more likely to occur when stream flows and inputs from spring discharge have declined.
- Monitoring both stream temperatures and how groundwater declines have and will continue to impact cold-water spring discharges (further discussed in the monitoring sections of this plan) will provide information about how additional tools, such as flow augmentation, riparian improvement, and groundwater protection, can be utilized to protect springs and reduce stream temperatures.

Potential Beneficiaries
- Improve water quality and habitat health for aquatic species.

4.3.4 Environmental Policies
Environmental policies involve enacting legislation that would improve streamflows. Potential tools include:
- Establishing Minimum Flows
- Required Survival Flows for Fish and Wildlife
- Public Interest/Environmental Review on Transfers

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4.3.4.1 Establish Minimum Flows

Opportunity

- Set and enforce minimum streamflows needed to support fish and wildlife.

Potential Beneficiaries

- Instream flow protection benefits aquatic species and habitats.

Considerations

- Impacts to other water users in an over-appropriated system.

4.3.4.2 Required Survival Flows for Fish and Wildlife

Opportunity

- Establish minimum flows to prevent impacts on fish and wildlife during low-water years.
- This tool could be utilized or triggered by a Drought Declaration.

Potential Beneficiaries

- Instream flow protection to benefit aquatic species and habitats.

Considerations

- Impacts to other water users in an over-appropriated system.

4.3.4.3 Public Interest/Environmental Review on Transfers

Opportunity

- Establish a standard of review for transfers that would ensure no harm to aquatic fish and wildlife (e.g., flow, water quality, etc.).
- Protect streamflows not protected by instream water rights from further harm by consumptive use transfers (e.g., Middle Deschutes).

Considerations

- District opposition to this tool.

4.3.5 Additional Analyses and Monitoring

Additional analyses could provide additional information to assist in making water management decisions. Potential tools include:

- Spring and Groundwater-Dependent Ecosystems Analyses
- Groundwater Monitoring

4.3.5.1 Updated Groundwater Analyses

Opportunity

- Surface water and groundwater are interconnected in the Deschutes Basin.
- Need for an updated study on the status of groundwater levels and the relative impact of various driving factors on the regional aquifer.
- All water management strategies and scenarios should be assessed for potential impacts to springs and groundwater-dependent ecosystems so tradeoff analyses can take place.

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Considerations

- More work is needed on specifics.
- Previous groundwater studies did not investigate the potential contribution of land fallowing or switching from flood to drip irrigation on groundwater levels.

4.3.5.2 Groundwater Monitoring

Opportunity

- Increased and improved groundwater monitoring could provide valuable data to assist in decision-making and project prioritization.

4.3.6 Education and Outreach

Efficient water use can be promoted through education and outreach. Potential tools include:

- Coordinated Basin-wide Education Program

4.3.6.1 Coordinated Basin-wide Education Program

Opportunity

- Education and outreach campaigns - such as the DRC's Raise the Deschutes Campaign and others organized by the Upper Deschutes Watershed Council, Deschutes Land Trust, and others - provide opportunities to inform and engage the public and water users.
- Opportunity for stakeholders to collaborate on a coordinated, targeted, basin-wide education program approach.

4.4 Domestic Water Supply and Land Use

Other consumptive uses of water in the basin fall outside the boundaries of municipal water suppliers or irrigation districts. ***Exempt Wells***, ***Land Use Planning and Development***, and ***Recreation/Tourism*** are the strategies that can address these types of water and land uses.

4.4.1 Exempt Wells

Domestic water users located outside of municipal water supplier service areas use exempt groundwater wells to meet their water needs. As discussed in Section 3.4.1, these wells are exempt from the requirements of obtaining a water right or metering. Potential tools for managing exempt wells to avoid cumulative impacts on the regional aquifer and prevent wells from going dry include:

- Measurement, Reporting, and Regulation
- Aquifer Recharge

4.4.1.1 Measurement, Reporting, and Regulation

Opportunity

- Requiring measurement and reporting on exempt wells can reduce demand on the aquifer from domestic water uses.
- Exempt wells that are injuring other water rights can be regulated (allowed by statute).
- As an alternative to regulation, mitigation can be required to offset use from exempt wells.

Potential Beneficiaries

- Other groundwater users (domestic or agricultural).

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- Spring discharge/instream flow.

Considerations

- Some components would require state legislation.
- State political will/capacity to regulate exempt wells.
- Well owners may resist new requirements, viewing them as intrusive.
- Accurate reporting and compliance can be costly and difficult to manage.

4.4.1.2 Aquifer Recharge

Opportunity

- Utilizing underground storage in the basin's regional aquifer as a strategy for addressing groundwater levels to potentially mitigate the impacts of climate change and reductions in artificial recharge from canal piping and irrigation modernization.
- Recharging aquifers for spring health and other ecological values.

Potential Beneficiaries

- Improves groundwater levels to increase supply reliability for exempt well users.
- Increases discharge from springs/seeps supporting streamflow and regulating stream temperature in the lower portion of the Planning Area.

Considerations

- Requires a limited license to divert surface water (as the source of recharged water) from an already over-appropriated system.
- The interconnected nature of the regional aquifer makes it difficult to track the movement of recharged water and thus protect it from future extraction elsewhere in the basin.
- The upper basin is over appropriated 12 months of the year.
- Any potential water for recharge would be diverted from instream flows.
- Peak and ecological flows have not been set or protected for the upper Deschutes Basin.

4.4.2 Land Use

Land use planning and development policies enacted at the state or local level could incorporate considerations for water use and water quality for areas and users that fall outside the boundaries of municipal water suppliers or irrigation districts. Potential tools include:

- Land Use Planning and Development
- Southern Deschutes County Wastewater Management

4.4.2.1 Land Use Planning and Development

Opportunity

- Align our state water and land use policies to ensure sufficient water for the land uses that our state policies prioritize.

Considerations

- More work is needed on specifics.
- Much of the land in our senior irrigation districts is zoned for rural residential use or is inside an Urban Growth Boundary.

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- Non-farm uses of EFU-zoned lands.
- Rural residential users may switch to exempt wells to meet their water needs if they

4.4.2.2 Southern Deschutes County Wastewater Management

Opportunity

- Addressing nitrate contamination issues in groundwater caused by septic tanks used by communities in southern Deschutes County (see Section 2.3.6).
- Getting an exception to state land use planning system to put in centralized wastewater management systems in high population density areas of homes on septic.
- Transferring development rights for buildable vacant lots within the Urban Growth Boundary of La Pine to direct them into La Pine's sewer system rather than be put on septic.
- Continuing to upgrade existing septic systems.

Potential Beneficiaries

- Protect water quality of groundwater used as primary drinking supply in southern Deschutes County communities.
- Protect water quality of groundwater discharged into the Upper Deschutes River and Little Deschutes River.

Considerations

- Exception to state land use planning system required to get sewer systems put in place in these areas.

4.4.3 Recreation/Tourism

Bend Parks and Recreation Department is a separate entity from the City of Bend and holds water rights that it uses to irrigate public parks and green spaces. One potential tool is:

- Bend Parks and Recreation Water Conservation

4.4.3.1 Bend Parks and Recreation Water Conservation

Opportunity

- Reducing consumptive use of water for irrigation of city parks and irrigation.

Potential Beneficiaries

- Reduced demand on surface and groundwater.

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