Water Uses and Needs in the Mid-Coast

(Note: This section is a summary from Step 3 of the planning process. For citations, please refer to the actual technical reports produced from 2019 to 2021 (Appendix B. All data and information provided in this section originate from the Oregon Water Resources Department Water Use Summary report from 2021 reports unless another source is specified).

During Step 3 of the planning process, three working groups learned about current and future water needs and challenges of three categories of water users and uses: instream/ecological water needs, municipal and special district water providers, and self-supplied water users (self-supplied rural residents, agricultural producers, and industries). Agency partners provided presentations, technical memos, and other information to inform the Step 3 proceedings. This section of the document summarizes the information assembled to support Step 3. All materials developed in support of Step 3 including the Water Use Summary (OWRD 2021) and Water Right Summary (OWRD 2021) can be accessed in an online folder.[16]

Water Law and Water Rights

Under Oregon law, all water belongs to the public. With some exceptions, cities, irrigators, businesses, and other water users must obtain a permit or license from the Water Resources Department to use water from any source — whether it is underground, or from lakes or streams. Generally speaking, landowners with water flowing past, through, or under their property do not automatically have the right to use that water without authorization from the Department.

Oregon's water laws are based on the doctrine of prior appropriation — the first person to obtain a water right on a stream is the last to be shut off in times of low streamflows. In water-short times, junior users in a basin may be "regulated off" by the State to maintain flows for more senior users. Many Mid-Coast rivers and streams have "instream" water rights held by State agencies for fish and wildlife habitat, recreation, navigation, or other uses. Those rights have an effective priority date like any other water right. Generally, Oregon law does not provide a preference for one kind of use over another. If there is a conflict between users, the date of priority determines who may use the available water.

You can find more information on Oregon's water laws and water rights in a primer[17] developed and maintained by the Oregon Water Resources Department.

[16] https://drive.google.com/file/d/1Aj_CzVxgvsCNJWsWgO0ED9iXM6PSGPxi/view?usp=sharing

[17] https://www.oregon.gov/owrd/WRDPublications1/aquabook.pdf

Overview of Instream Water Uses, Needs, and Challenges

Instream water — water left in rivers and in the ground — provides immense value to the Mid-Coast region by supporting natural watershed processes, water quality, habitat needs of fish and wildlife, recreational opportunities, navigation, and aquaculture opportunities (e.g., oyster farms and fish hatcheries). Instream water also provides cultural, spiritual, and aesthetic values. Instream water is vital to maintaining healthy commercial, recreational, and tribal fisheries, which are socially, culturally, and economically important to the region. For example, instream resources are of express cultural significance to the Confederated Tribes of the Siletz Indians. Public surveys conducted by Oregon's Kitchen Table also identified that residents and visitors place a high value on water needed to support Mid-Coast ecosystems.

The Partnership prioritizes the sustainability of healthy ecosystems that support the economic, social, and cultural values of the Mid-Coast region. Supporting healthy freshwater and nearshore ecosystems provides benefits beyond those important to fish and wildlife. Therefore, an integrated approach to managing water resources must consider the flows necessary to maintain all these benefits, and consider impaired flows, reduced water quality, and diminished fish and wildlife as potential warning signs of impacts to public benefits.

Ecological Values and Instream Water Rights

Instream flows are critical for maintaining many ecological functions and supporting aquatic species. Aquatic species evolved in response to the variability, both seasonal and inter-annual (across years) in stream systems and rely on the full range of flows represented by a natural hydrograph to meet their needs. "Streamflow quantity and timing are critical components of water supply, water quality and the ecological integrity of river systems. Indeed, streamflow, which is strongly correlated with many critical physiochemical characteristics of rivers, such as water temperature, channel geomorphology, and habitat diversity, can be considered a 'master variable' that limits the distribution and abundance of riverine species and regulates the ecological integrity of flowing water systems" (Poff et al., 1997). For example, NOAA-NMFS's 2016 Final ESA Recovery Plan for Oregon Coast Coho identified reduced streamflows as one of many interrelated factors affecting the health and viability of Oregon Coast Coho, which will likely be exacerbated by climate change. Reduced streamflows also result in increased water temperature, which is a significant limiting factor for fish and wildlife. According to the Recovery Plan, "in freshwater habitats, lower summer flows, higher summer stream temperatures, and increased winter floods, would affect Coho salmon by reducing available summer rearing habitat, increasing potential scour and egg loss in spawning habitat, increasing thermal stress, and increasing predation risk (NMFS, 2016, 3-32)."

Under Oregon water law, rivers, streams, and springs do not automatically have a legal right to their own water. Instream water rights may be established to protect instream values and are

subject to the system of prior appropriation. Allocations for instream water cannot take away or impair any legally established water right having an earlier priority date. This means that, like all water rights, they are subject to curtailment to meet senior out-of-stream water rights.

When water is not legally protected instream in important reaches and flow targets are not established using ecologically based methods, there are many possible consequences to streams, including:

- Water may be allocated to out-of-stream uses, leaving limited water instream during times of water shortage.
- Flow targets established by instream water rights inadequately capture the full range of flows needed to protect current instream ecosystems, especially for flows during winter months.
- Without ecologically based flow targets, it is difficult for collaborative efforts to act in the interest of the stream.

In Oregon, three agencies (the Oregon Department of Fish and Wildlife, Department of Environmental Quality, and Oregon Parks and Recreation Department) are legally allowed to apply for instream water rights that are then held by the Oregon Water Resources Department in trust to support public uses such as recreation, pollution abatement, navigation, and maintenance and enhancement of fish and wildlife and their habitats. Furthermore, individuals or organizations may lease water from water rights holders for instream public beneficial uses. Those leases are generally considered additive to existing instream water rights.

Facts about ISWRs in the Planning Area:

- There are 133 instream water rights covering 11% of river miles, or about 450 of 4,070 total river miles.
- There are 3,620 river miles without instream water rights, which includes most-of the ocean tributaries.
- Fifty-one streams have existing instream water rights.
- The instream water rights have priority dates in 1966, 1974, 1976, 1983, 1991, 1992, and 2018.
- The amount of water specified in instream water rights varies by month and by reach.
- Many of the earlier instream water rights were minimum perennial streamflows that were converted to instream rights by the Oregon Water Resources Department.
- All of the other instream water rights were filed by the Department of Fish and Wildlife to support fish and wildlife and their habitats.
- No instream rights have been filed to support pollution abatement, recreation, or navigation.

The Partnership recognizes that current instream water rights neither fully represent nor protect ecological values or other instream values, and there is a need to develop a more

comprehensive understanding and approach to protecting and restoring these values, especially in light of climate change impacts. Understanding instream needs for the full range of flows needed to support multiple instream needs and values is a significant data gap that should be prioritized to aid in future planning and project prioritization. Cooperative voluntary actions, such as instream leases and instream flow transfers, are rarely utilized in the Mid-Coast and may present an opportunity for future streamflow restoration and protection activities. You can explore the instream water rights by sub-area in the Mid-Coast StoryMap (under "Is There Enough Water For All?").

Current and Future Instream Water Needs for Fish and Wildlife

All aquatic species have water needs related to the timing, amount, and quality of water that provide habitat and support different life stages. Late summer is a time when flows are critical to the survival of many plants, animals, and fish species and it is also the time when precipitation is lowest and competition for human uses is highest. Winter is a time when seasonally elevated flows contribute to ecologically important habitat maintenance and formation (e.g., pool development, gravel recruitment, etc).

There is relatively little information available on instream needs or demands, though like other demands, there is a range of ways of describing instream needs. Oftentimes, instream water rights are used as a proxy for instream needs even though they are based on older studies and likely do not fully account for new data or the full range of ecological flows. Other approaches to describing instream needs assume that the natural flow regime of the system, essentially the streamflow present before water was diverted, is most protective of the stream ecosystem. From that lens, a description of natural streamflow and the timing and location of critical biological and ecological functions is important for understanding instream needs.

The full range of natural flows of rivers has been altered over time through diversions for out-of-stream uses, groundwater pumping, infrastructure (e.g., dams, road crossings, etc), land development (e.g., channelization, removal of wetlands and riparian vegetation, disconnecting rivers from historic floodplains, etc.) and various management practices. Water diverted from streams for municipal, agricultural, industrial, and domestic uses reduces the water available instream for fish and wildlife and other instream values. This is most evident in areas with significant out-of-stream water use relative to natural streamflows. According to the 2001 Mid-Coast Watersheds Council Sixth Field Watershed Assessment (Garono and Brophy, 2001, 14), "stream flow restoration is a high priority for 6th field watersheds in the Schooner/Drift Creek sub basin, and in the lower Yachats basin."

In the Siletz River watershed, there are multiple out-of-basin diversions that divert water from the Siletz River to other basins. It is an increasingly common summer occurrence for Siletz River flows to dip below the instream water right allotment, triggering curtailment of junior users. Some of the largest water users, including the City of Newport, City of Toledo, and Georgia

Pacific have rights that are senior to the instream water right, which may limit the effectiveness of the instream water right to support instream uses.

In the Step 3 discussions, the Partnership requested assistance from ODFW in performing a preliminary analysis of instream needs (see the Water Use Summary (OWRD 2021) in Appendix B for more information). The analysis included a summary of existing instream water rights in the Mid-Coast Planning Area, along with a draft analysis of how often existing instream water rights are likely to be met. The analysis revealed that the majority of the ISWRs are on mainstem channels in rivers (third, fourth, and fifth order streams). ISWRs on the mainstem channels provide some level of de facto protection to the upstream tributaries that provide water to the mainstem, but they do not quantify or protect the habitat needs in those particular tributaries nor do they prevent water from being removed in those areas in excess of those habitat needs. Most of the streams in the study area are first order streams – these are the headwater streams in a stream network. First and second order streams may be critical areas for rearing and or spawning for fish species, and may also be critical habitat when temperatures in lower, mainstem channels (third, fourth, and fifth order) are too high.

For the few ISWRs that had an associated gage, draft analysis revealed that these ISWRs are more often met in the late fall, winter, and spring (November through May) than in the summer (June through August) or fall (September and October). Gage locations where instream water rights were met most infrequently were Five Rivers near Fisher (discontinued gage), the North Fork Alsea River at Alsea (discontinued gage), the Yaquina River near Chitwood, and the Siletz River at Siletz. Unfortunately, this analysis was limited due to the fact that many of the instream water rights lack an established stream gage to track flows over time. It is important to note that, in some instances, the instream water right or flow target may actually exceed the natural flow in a reach or a basin.

To understand how extensive the existing ISWRs are at covering fish spawning, rearing, and migration habitat, ODFW performed a preliminary analysis of the overlap between target species' habitat locations and existing instream water rights. Using the known habitat distributions for spring and fall Chinook, Coho, and summer and winter Steelhead, ODFW identified the overlap between instream water right reaches (miles) and species habitat (miles) for each stream size type (i.e., stream order) within the study area. Overall, more than 50 percent of identified Chinook, Coho, and Steelhead spawning, rearing, and migration habitat analyzed is covered by ISWRs.

Unfortunately, additional data is needed for a more complete understanding of instream needs. Using instream water rights as a proxy for instream need has limitations because they do not necessarily represent the actual water needed by aquatic species, or the full range of ecological flows, and do not necessarily consider the important relationship between flows and water temperatures needed to sustain healthy fisheries. Assessing instream needs based on ISWRs

alone underestimates current instream needs, and projected instream water needs were not assessed for this report.

The Partnership recognizes that, while instream water rights help protect and maintain natural flows for public beneficial uses, that climate variability and the exercise of existing rights may lead to streamflow patterns unsatisfactory to support some of the most sensitive instream uses and ecosystems. Collaborative, coordinated efforts based on ecological flow targets and out-of-stream needs would best address the complex systems being regulated by instream water rights.

The Partnership recognizes the value of instream flows and is committed to acquiring information to fill data gaps identified in Step 3, including a more comprehensive understanding of ecological water needs and how various practices impact observed flows (see Appendix H for ODFW's letter regarding instream demand). That information can be used to plan, implement, and monitor projects in high-priority areas as advised by ODFW and other agencies. The Partnership is interested in taking an ecosystem-based approach to increasing water supply, meeting the needs of fish and wildlife, and improving water quality for all users.

Critical Issues for Instream Needs

The working group that examined instream and ecological water needs identified the following key issues for strategy development:

- The need to develop a more comprehensive understanding of instream needs that considers the full range of ecological flows, with the intent of establishing more legal protections where needed and developing flow targets to guide restoration efforts;
- The need to protect and enhance riparian vegetation that shades streams and provides other ecological benefits;
- The need to restore and protect beavers and their habitat to support reestablishment of natural processes in watersheds;
- The need to address water quality impairments that negatively impact instream values, with a focus on addressing elevated water temperature and low dissolved oxygen levels associated with low flows and high turbidity associated with high flows;
- The need to promote and encourage management activities on public and private lands that provide multiple ecological benefits;
- The need to prepare for and mitigate the impacts of climate change on streamflows, water temperature, and other ecological functions;
- The need to improve streamflow monitoring efforts to track streamflow conditions and protect instream water rights and instream values.

The working group identified as a priority limiting future out-of-stream allocations on rivers and streams with high ecological values and where out-of-stream uses are significant, partnering

with users to reduce out-of-stream uses and restoring streamflows to protect aquatic species and ecological functions.

Overview Out-of-Stream Water Uses, Needs, and Challenges

Table 3 provides an overview of the out-of-stream water uses in the Mid-Coast planning area.

Table 3. Estimated quantity of use by type of use for Lincoln County based on the 2015 water use estimates produced by the US Geological Survey in gallons per day.

Type of Use	Estimated Amount Diverted (gpd)	Percent of Water Diversions
Self-Supplied Industrial	10,960,000	34%
Self-Supplied Aquaculture	9,390,000	29%
Public Supplied Domestic	6,010,000	19%
Public Supplied Industrial	2,640,000	8%
Self-Supplied Agriculture	2,010,000	6%
Self-Supplied Domestic	790,000	3%
Self-Supplied Golf Courses	200,000	<1%
Self-Supplied Mining	40,000	<1%
Self-Supplied Livestock	40,000	<1%
Total	**31,810,000**	

Self-supplied industrial water use represents 34% of water use in the planning area, which is the largest water use category. The Georgia Pacific pulp mill in Toledo represents the single largest water use in the planning area. During the winter, this water is provided from Olalla Creek and Olalla Reservoir. During the summer months when streamflow in Olalla Creek is low, water for the mill is provided from the Siletz River and Olalla Reservoir. In addition to providing water to the mill, Olalla Reservoir, which is managed and maintained by Georgia Pacific, is an important recreational site in the Mid-Coast. Water diverted from Olalla Creek and the Siletz River are discharged to the Pacific Ocean and are not returned to the system for instream or out-of-stream uses.

Water for hatcheries represents 29% of water use in the planning area, which is the second largest use category. Although hatcheries divert a significant amount of water, this water use is considered to be non-consumptive because diverted water is assumed to be returned to the system without being depleted. The Oregon Department of Fish and Wildlife maintains two hatcheries, one in the Salmon River sub-area and one in the Alsea River sub-area. The Confederated Tribes of the Siletz maintains a hatchery on in the Siletz River sub-area.

Public supplied water represents 27% of water use in the planning area. A total of 19% of the water is used for domestic purposes and 8% is used for industrial purposes. The three largest municipal community water systems are the City of Newport, City of Toledo, and the City of Lincoln City. The City of Newport has the largest public supplied industrial water use, primarily

for fish processing plants. The three largest non-municipal community water systems are Kernville-Gleneden-Lincoln Beach Water District, Seal Rock Water District, and Southwest Lincoln County PUD.

Self-supplied agricultural use represents a relatively small amount of water use in the Mid-Coast region (6%) as well as self-supplied domestic use (3%).

Water use for all water user groups increases during the summer months due to increased industrial production as well as increased demand from tourists and irrigation.

The distribution of water uses varies considerably among sub-areas. You can explore the major water uses in each sub-area in the Mid-Coast Storymap (under "Is There Enough Water for All") or via an interactive online graphic.[18]

Several major water users - Georgia Pacific, City of Newport, City of Toledo, City of Siletz, and Seal Rock Water District - rely on water from the Siletz River during the summer months and most discharge water to the ocean or bays, thus the treated water is not available for other instream and out-of-stream uses downstream of their diversion points. The water rights for each of these users is senior to the instream water right on the Siletz River, though Georgia Pacific agrees to cease pumping when flows reach 75 cfs at the above stream gage and City of Newport managers have tried to strategically utilize reservoir storage to defer withdrawals during expected lowest flows. Seal Rock Water District has developed alternative supplemental summer water sources. Nonetheless, the most senior instream water right on the Siletz River at the gage is 100 cfs and summer flows are increasingly dipping below that level. View this interactive online graphic to see the competing demands on the Siletz River.

Overview of Water Uses, Needs, and Challenges of Community Water Systems

There are seven municipal community water systems serving an estimated 16,188 connections and an estimated residential population of 40,313. There are 22 non-municipal community water systems serving 7,901 connections and an estimated resident population of 17,407.

Governmental organizations, including municipal water systems and public non-municipal water systems, are required to measure and report monthly water use to the Oregon Water Resources Department on an annual basis. The water use reported by these entities is represented in Figures 8 and 9. As shown in these graphics, water use generally increases in the summer months in response to increased industrial activity as well as increased use by residents and visitors. Private or cooperatively owned non-municipal community water systems are not

[18] https://public.flourish.studio/visualisation/5054074/

required to measure and report their water use to the state, therefore their actual water use is not precisely known for purposes of this planning effort.

Municipal and large non-municipal community water systems customarily develop estimates of current water use and projected future demands as a part of their water planning efforts. These estimates may be contained in Water Management Conservation Plans, Water System Master Plans, or other planning documents. Smaller non-municipal water systems (e.g., smaller water districts and water corporations) may not routinely develop and maintain estimates of current water use or future demand projections.

The only water system currently reporting insufficient supply to meet demand is the City of Yachats. As documented in the Oregon Water Resources Department Water Use Summary most other water providers report having sufficient water rights to meet 20-year demands. Some community water systems indicate that demands beyond the 20-year planning

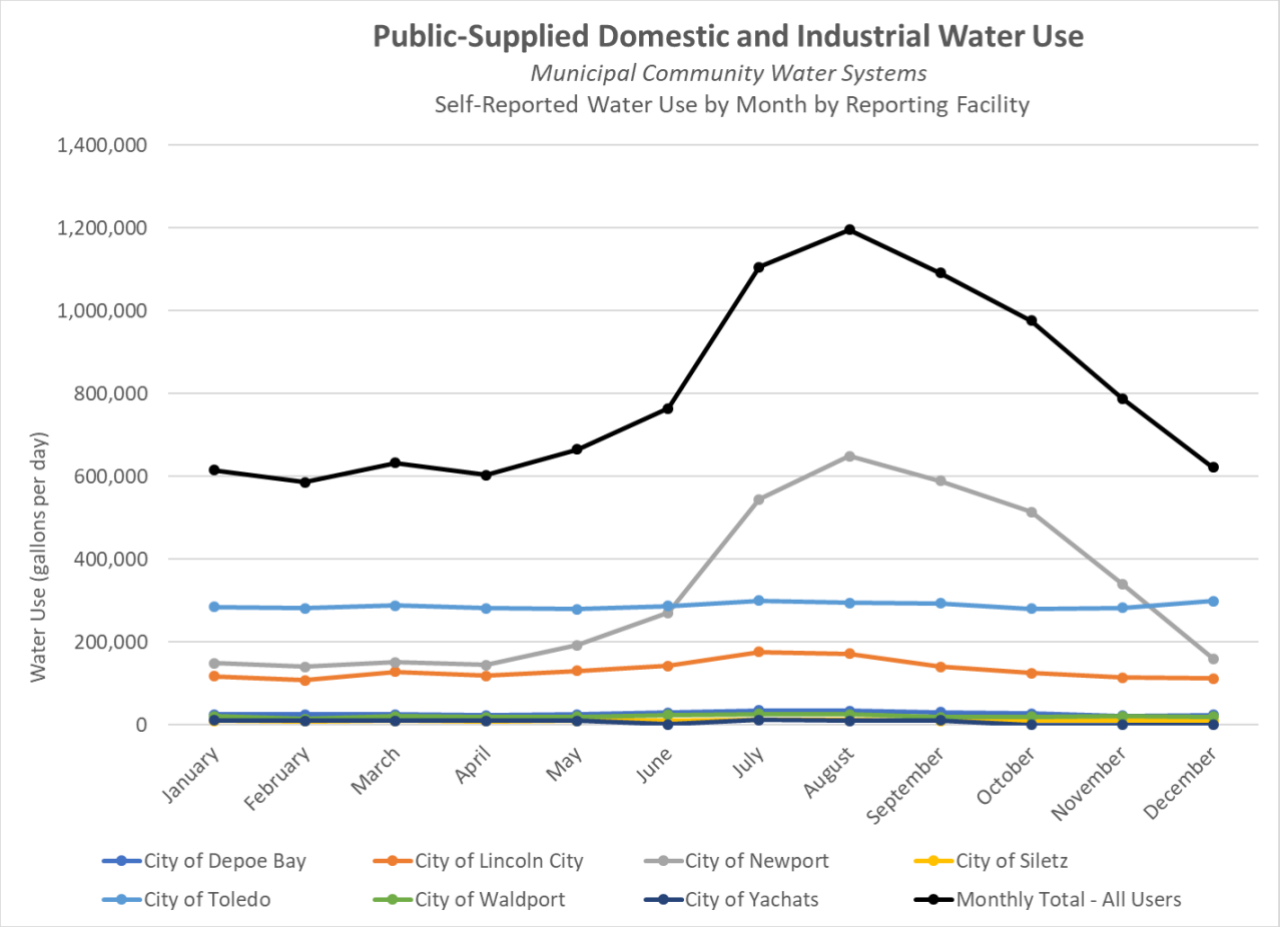

Figure 9. Monthly diverted water used by municipal community water systems in the Mid-Coast.

horizon may not be met with current water rights and there is a need to think about and plan for long-term water supply solutions beyond existing water rights and sources (OWRD, 2021).

The Rocky Creek Regional Water Supply Project planning effort[19] was undertaken in 2002 by the Central Coast Water Council, which was made up of the City of Lincoln City, the City of Newport, the City of Toledo, the City of Waldport, the City of Yachats, Kernville-Gleneden Beach-Lincoln Beach Water District, Southwest Lincoln County Water District, and the City of Siletz. The City of Newport conducted a Study of Newport's Water Supply and the Potential for Future Regionalization of Water Supplies in 1997.[20] The projected demands contained in these reports are not consistent with more recent findings from Water Management Conservation Plans developed by individual entities and may overestimate projected future demands.

There is a need to develop updated defensible projected future demands for community water systems in the region using a consistent, agreed upon methodology. accounting for the future instream needs and the needs of other out-of-stream users. This should be accompanied by an assessment of whether community water systems will likely be able to meet projected demands with current sources, as well as an estimate of potential future deficits with consideration given to instream needs and the needs of other out-of-stream users. The analysis should account for the potential for reductions in water supply resulting from climate change impacts as well as conservation opportunities. Understanding projected future supplies, demands, and deficits will help community water systems determine actions to meet water needs for their individual service areas as well as the region as a whole.

The work group identified a need to develop an updated defensible projected future demand for community water systems in the region, along with an assessment of their ability to meet those demands with current sources and potential future deficits. The analysis should account for the potential for reductions in water supply resulting from climate change impacts and other development. Understanding projected future supplies, demands, and deficits will help community water systems determine actions to meet water needs for their individual service

[19] CH2MHILL. (2002). Rocky Creek Regional Water Supply Project: Preliminary Water Management Plan. Prepared for The Central Coast Water Council. Newport, OR. Accessed at: https://drive.google.com/drive/folders/0BxtG96VYSHkCU0FxV3oxMkFvdUk?resourcekey=0-b4VvXqpn19h-h4vYBXzD0g.

[20] Fuller and Morris. (1997) Long-Range Water Supply: A Study of Newport's Water Supply and the Potential for Future Regionalization of Water Supplies. Prepared for the City of Newport. Newport, OR. Accessed at: https://drive.google.com/drive/folders/0BxtG96VYSHkCU0FxV3oxMkFvdUk?resourcekey=0-b4VvXqpn19h-h4vYBXzD0g

areas as well as the region as a whole. Oregon State University is currently working to develop a model that can be used to forecast future demands under various climate change scenarios.

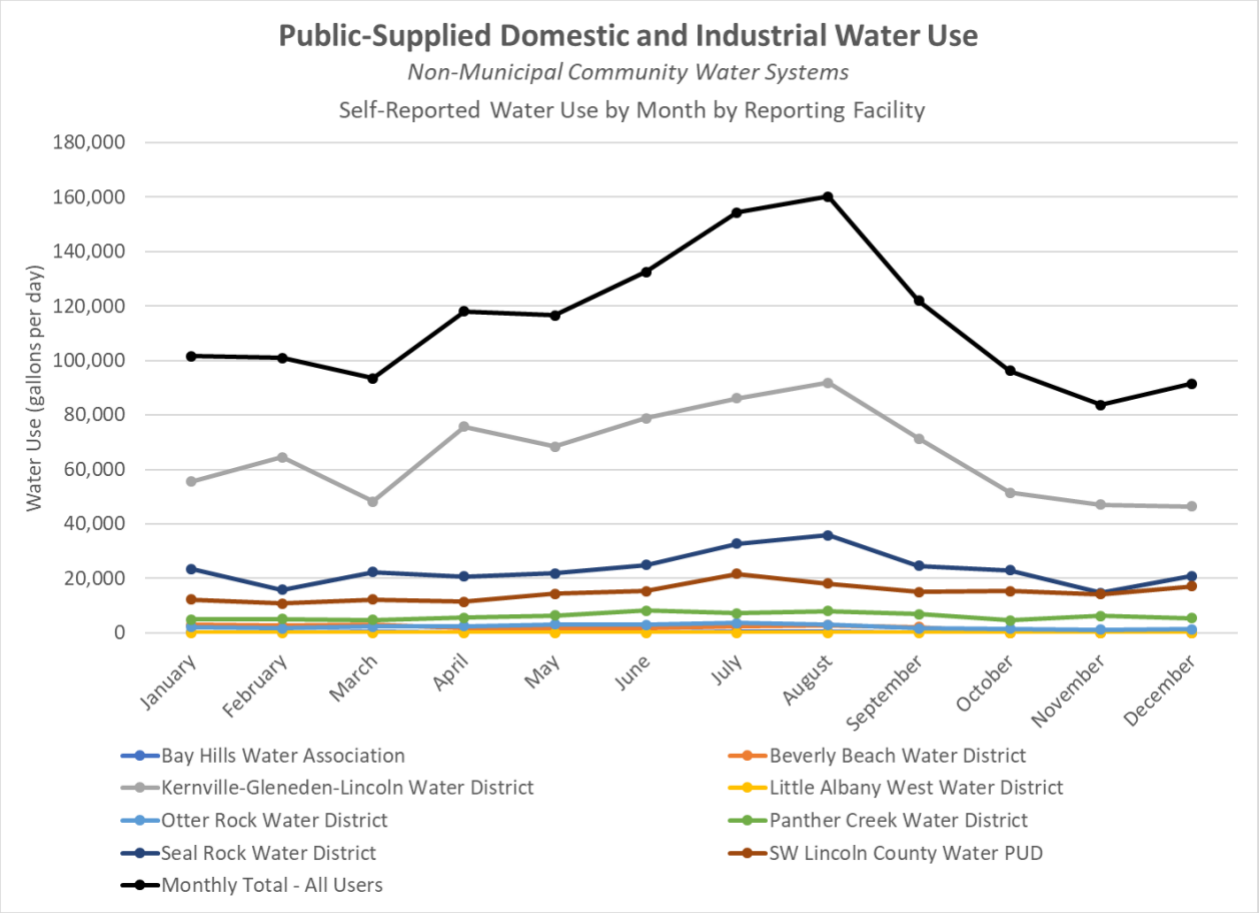

Figure 10. Monthly diverted water used by non-municipal community water systems in the Mid-Coast.

Small community water systems lack the capacity to engage in lengthy planning processes. As a result, the specific needs and challenges of these water users is not sufficiently captured in this plan. Lincoln County did an assessment of the water needs of small community water systems in 1997. It would be beneficial to update this assessment and identify the specific needs of these small, but important water users.

Critical Issues of Community Water Systems (Municipal and Non-Municipal)

The working group that examined the water needs and challenges of municipal and non-municipal community water systems identified the following key issues for strategy development:

- The need for increased access to funding to address current and legacy infrastructure issues and invest in resilient infrastructure that can withstand natural hazards and help communities adapt to climate change impacts;
- The need to coordinate conservation efforts between community water systems;
- The need to develop water supply redundancies and interconnections that would allow communities to access quality water in case of emergencies or shortages;
- The need to sustain efforts that increase coordination and collaboration between community water systems;
- The need to better understand and address the water needs and challenges of small community water systems that were not able to participate in planning;
- The need to address current and potential future water shortages by implementing water conservation measures and exploring future water supply options;
- The need to address water quality limitations posed by low streamflows in the summer and high turbidity in the winter;
- The need to improve coordination on shared water systems like the Siletz River in order to minimize ecological impacts.

Overview of Water Uses, Needs, and Challenges of Self-Supplied Water Uses

Rural Residents

A significant number of people in Lincoln County supply their own water for use in and around their home. It is estimated that 13,075 people, or about 30% of the population in Lincoln County, supply their own water from groundwater, springs, or streams. This is a very important water use for the region, even though the estimated water use is relatively small when compared to other uses.

It is difficult to estimate current water use and future water needs of rural residents. See Table 4 for a breakdown of wells and water rights by sub-area as well as estimated water use. Based on this information, rural domestic water users are distributed throughout Lincoln County. The majority of self-supplied domestic water users are in the Alsea and Yaquina River Basins.

Table 4. Estimated self-supplied rural domestic water users and demand by sub-area.

Sub-Area	Estimated Water Rights	Estimated Wells	Estimated Population Served	Estimated Use (gpd) based on 76-145 per capita per day	Estimated Consumptive Use (gpd)
Salmon River	78	548	1,402	106,552–203,290	21,310–40,658
Siletz Bay – Ocean Tribs	46	511	1,248	94,848–180,960	18,970–36,192
Siletz River	129	532	1,480	112,480–214,600	22,496–42,920
Depoe Bay – Ocean Tribs	55	552	1,360	103,360–197,200	20,672–39,440
Yaquina River	143	1,754	4,249	322,924–616,105	64,585–123,221

Beaver Creek – Ocean Tribs	37	224	585	44,460–84,825	8,892–16,965
Alsea River	178	892	2,397	182,172–347,565	36,434–69,513
Yachats River – Ocean Tribs	37	121	354	26,904–51,330	5,380–10,266
Total	**703**	**5,134**	**13,075**	**993,700–1,895,875**	**198,740–379,175**

Rural residents that supply their own water for domestic use are responsible for ensuring that their own water is safe for drinking. Anecdotal reports from residents and survey results from Oregon's Kitchen Table survey indicate that there is considerable concern about the drinking water quality for those who obtain their domestic water from streams, springs, and wells. There is generally insufficient data to determine the quality of source water for all self-supplied users in the planning area.

Water use of rural residents responsible for supplying their own water was estimated for this report, but is not well known. The current water use and water security of self-supplied rural residents is not well understood and should be further assessed. Anecdotal reports from pump installers, well drillers, the watermaster, and rural residents indicate that late in the dry season, rural residents experience declining water quantity from their springs or wells, especially during drought years. Water providers report increasing demands for bulk water from rural residents, and have begun to track those demands.

As the population in Lincoln County increases, especially from people seeking refuge from hotter climates, there may be increased pressure on water resources in unincorporated areas.

The potential for increased development in unincorporated areas that are not served by community water systems is not well known. Oregon land use laws and economic barriers limit development of agriculture and forest conservation land to other uses. Proactively identifying the potential impact of increased development on localized streams, springs, and groundwater would be beneficial.

Irrigated Agriculture

The 2017 US Department of Agriculture estimates 2,818 actively harvested cropland acres, and 441 irrigated acres. The Oregon Water Resources Department reports that 6,141 acres have irrigation water rights. Estimates of water use for irrigated agriculture vary significantly, and there is not a standardized approach to estimate water use (Table 5).

It is expected that irrigators in the Mid-Coast region have had much of their crop needs met by precipitation. As the dry season extends in length and as temperatures increase, more landowners in the Mid-Coast may rely on irrigation to meet their crop water needs. Farmers who are junior to instream, municipal, or industrial water rights may also have an increasingly difficult

time meeting their water needs. The future needs and vulnerabilities of irrigators are not well understood in this region.

Current irrigation water use is not well understood in the Mid-Coast, and estimates vary greatly. Because of the limited data, it is difficult to know how water use trends are changing over time. Satellite-based monitoring of evapotranspiration using tools such as OpenET may be able to help fill this data gap, though data may be limited due to a limited number of clear, cloudless days on the coast.

Few farmers and irrigated agriculture landowners were directly involved in the planning effort. Effort should be made to better understand how the water needs and practices of farmers are changing over time.

Table 5. Estimated irrigation water users and amount of water use by sub-area.

Sub-Area	Estimated Number of Water Rights (Irrigation/Livestock)	Estimated Irrigated Acres	Estimated Irrigation Diversions[21] (gpd)	Estimated Consumptive Use[22] (gpd)
Salmon River	45 (40/5)	156	348,170 gpd	174,085 gpd
Siletz Bay – Ocean Tribs	23 (18/5)	359	801,683 gpd	400,841 gpd
Siletz River	94 (76/18)	1,187	2,649,659 gpd	1,324,830 gpd
Depoe Bay – Ocean Tribs	11 (11/0)	52	116,057 gpd	58,028 gpd
Yaquina River	87 (77/10)	1,177	2,627,341 gpd	1,313,224 gpd
Beaver Creek – Ocean Tribs	14 (14/0)	82	183,012 gpd	91,953 gpd
Alsea River	176 (159/17)	2,964	6,615,221 gpd	3,307,610 gpd
Yachats River – Ocean Tribs	26 (24/2)	164	366,024 gpd	183,012 gpd
Total	**703**	**6,141**	**13,705,380 gpd**	**6,852,690 gpd**

Industry

There are very few self-supplied industrial water users throughout the planning area and self-supplied industrial water use generally accounts for a small amount of the authorized water use in most of the hydrologic sub-areas. The major exception to this is Georgia Pacific's pulp mill in Toledo, which has the largest authorized withdrawals in the entire planning area (totaling 35 cfs).

The projected future needs or demands of self-supplied industrial users has not been estimated. The largest industrial water users (both self-supplied and public-supplied industrial water use) in

[21] The per acre duty is derived from the OWRD WRIS database that shows the general maximum allowed duty for irrigation water rights is generally 2.5-acre feet per year per acre. Estimated diversions are derived by multiplying acres by a 2.5-acre foot per year per acre duty.

[22] The Oregon Water Resources Department Water Availability Reporting System estimates that 50% of irrigation water use is consumed. The remainder returns to local instream flows.

the planning region represent a significant source of jobs and economic development. Most industrial water use in the region relies on diversions from the Siletz River as well as storage (Olalla Reservoir and Big Creek Reservoirs). Drought conditions in 2015, 2018, and 2021 have likely revealed water insecurities for self-supplied industrial users. A 1997 study of Newport's water supply and the potential for future regionalization of water supplies noted that "Georgia Pacific's water supply is generally adequate to meet the needs of the mill at its present capacity to produce paper. However, to avoid shutting down in past water short years the mill had to practice water conservation measures that are detrimental to equipment and are economically acceptable for short period. A study was made in 1990 to investigate alternatives for increasing their water supply. The study concluded that a 10-foot, 420,000,000-gallon addition to Olalla Dam would be the preferred alternative to expand their supply" (Fuller and Morris, 1997).

Industrial water users did not consistently participate in the planning effort, though others within the group consulted with them through the process and sought to represent their interest. Their specific needs and vulnerabilities are not well known. Effort should be made to better understand their water use, their projected future needs, and vulnerabilities and find ways to engage and support them in efforts to increase their water security and increase efficiency in their operations.

Critical Issues for Self-Supplied Water Users

The working group that examined the water needs and challenges of self-supplied water users identified the following critical issues for strategy development:

- The need to better understand the status of water infrastructure used by self-supplied water users as well as provide resources to upgrade and maintain this infrastructure;
- The need to better understand water quality needs for the various self-supplied uses and ensure safe drinking water for self-supplied rural residents;
- The need to better quantify and track water shortages faced by all self-supplied water users and increase water security;
- The need to connect self-supplied water users with information and resources to increase water conservation and efficiency in and around the home and on the farm;
- The need to assess opportunities for water conservation and efficiency and water security for self-supplied industrial water users.

Water Availability and Future Needs

Patterns of development vary greatly over the planning area, with some areas experiencing high demands on available water resources and some areas experiencing no demands on water resources. These demands generally correspond with land use and management in the area, with water systems that are fully or over-appropriated to out-of-stream uses in and around communities along the US-101 corridor.

Table X provides a high-level overview of the supply and development in each of the eight different sub-areas. Appendix X provides a more detailed summary for each sub-area. Generally speaking, the Water Availability Reporting System maintained by the Oregon Water Resources Department shows that there is limited water available for new out-of-stream appropriations in the summer months. Remaining water availability generally corresponds with the level of existing development of water for out-of-stream uses for community water systems and industry as well as the presence and absence of instream water rights. In sub-areas with instream water rights, water availability is more limited for new out-of-stream appropriations during the summer. In most sub-areas the Water Availability Reporting System shows that there is still water available during the winter for new storage appropriations.

Areas where some water may be available for new out-of-stream appropriations generally encompass ocean tributaries, or streams lower in river drainages. These systems generally have very limited summertime flows and may also be tidally influenced, which could prevent them from being used for most out-of-stream uses. These are also the areas where additional demand is likely to occur given the proximity to US-101 and the desirability of living near the Ocean. Ocean tributaries also generally do not have instream water rights protecting instream values. The ecological value of ocean tributaries should be considered in future allocation decisions.

The status of water allocation can also be viewed in the Mid-Coast Storymap (under "Is There Enough Water For All?").

As conditions become drier and warmer during the late spring, summer, and early fall, water supplies often fall short of aggregate water right allocations. Additional water is generally not available to meet new out-of-stream needs when it is most needed and new uses will need to be met via water rights transfers, water conservation, water reuse, additional storage, or other novel water supply strategies.

Table 6. Water Supply and development by sub-Area.

Sub-Area	Natural flow in September (at 50% exceedance in cubic feet per second)	Estimate of natural flow and percent natural flow consumed by out-of-stream uses in September across all WABs[23] discharging to bays or the ocean	Percent of WABs fully or over-allocated to out-of-stream uses (does not account for instream) / Percent of WABs with <1% allocated	Percent of WABs with instream water rights	Percent of WABs with water available in any months / Percent of WABS with water available in 12 months	Percent of WABs with no water available in any months (at 80% exceedance) / in September	Percent of WABS with storage available (at 50% exceedance)
Salmon River Sub-Area	47.9 cfs	<1 cfs / 2%	0% / 11%	100%	33% / 0%	67% / 100%	100%
Siletz Bay-Ocean Tributaries Sub-Area	57.9 cfs	>32.3 cfs / >55%	22% / 11%	22%	67% / 44%	33% / 56%	78%
Siletz River Sub-Area	159.1 cfs	68 cfs / 43%	0% / 88%	89%	53% / 6%	47% / 94%	100%
Depoe Bay-Ocean Tributaries Sub-Area	32.4 cfs	15.5 cfs / 48%	38% / 23%	0%	92% / 67%	8% / 38%	100%
Yaquina River Sub-Area	41.8 cfs	8.3 cfs / 20%	6% / 33%	89%	50% / 6%	50% / 89%	78%
Beaver Creek – Ocean Tributaries Sub-Area	40.4 cfs	7.1 cfs / 18%	17% / 67%	0%	100% / 83%	0% / 17%	100%
Alsea River Sub-Area	150.1 cfs	8.9 / 6%	0% / 71%	81%	91% / 10%	10% / 81%	100%
Yachats River – Ocean Tributaries Sub-Area	42.2 cfs	12.7 / 30%	8% / 50%	50%	83% / 42%	17% / 58%	100%
	571.8 cfs	153.8 / 27%	10% / 50%	59%	72% / 28%	28% / 69%	95%

[23] WABs are water availability basins determined by the Oregon Water Resources Department for purposes of estimating available supply and demand. There are 111 water availability basins in the Mid-Coast planning area.

The Water Availability Reporting system is based on a period of record from 1958 to 1987.[24] Because three of the most significant drought years occurred in the past decade, the period of record for the Water Availability Reporting System may not accurately represent current streamflow conditions and may overestimate water supply and availability. There is a need to update the period of record to get a better understanding of water use and availability relative to available supply.

Groundwater Use and Development

There are very few permitted water uses that have groundwater as their source. Groundwater is a source of water for Permit-Exempt uses, such as for domestic and livestock uses (ORS 537.545). Local domestic water users, well drillers, and pump installers have all shared anecdotal reports of seasonal water shortages in domestic wells, especially during recent years where much of the west has been experiencing drought. Given the limited storage of the groundwater system, water users on wells may need to consider alternate means of storage or alternate sources of water late in the dry season, especially if dry conditions persist.

Proliferation of permit-exempt wells for future self-supplied domestic uses or other permit-exempt uses will impact streamflows in the long term, but the timing and significance will depend on the local hydrogeology and patterns of development. The current impact of permit-exempt wells on surface water flows has not been assessed and is not known but is expected to be small. Overall consumptive use from rural domestic wells, and household use in general, is very low, as much of the water removed from the aquifer is returned via drain fields. Although permit-exempt uses are very small at a basin scale, there may be important localized impacts from groundwater pumping on streams. The relationship between groundwater and surface water has not been adequately assessed in the Mid-Coast planning area.

[24] For more information on how the Water Availability Reporting System was developed, see: https://www.oregon.gov/owrd/WRDPublications1/DeterminingSurfaceWaterAvailabilityInOregon.pdf.

Climate Vulnerability in the Mid-Coast

The Oregon Climate Change Research Institute (2019) produced a report describing future climate conditions for the Mid-Coast relative to temperature, precipitation, snowpack, floods, droughts, wildfire, sea level, and coastal ocean conditions. Future projected conditions were based on at least 10 global climate models and numerous scenarios of global greenhouse gas emissions, and were made locally relevant by combining the outputs from the global models to historical observations, achieving a resolution of 2.5 miles x 2.5 miles on the landscape. Projections were made for mid-21st century, the 2050s, late 21st century, and the 2080s.

The report authors considered both lower and higher emissions scenarios based on available data and published literature. Lower emissions scenarios represent modest efforts to reduce global greenhouse gas emissions by mid-21st century whereas the higher emissions scenarios represent "business-as-usual" practices, i.e., greenhouse gas emissions continuing to increase through the 21st century (Oregon Climate Change Research Institute 2019).

The Army Corps of Engineers also produced a report on hydro-climatic vulnerability, which confirmed many of the findings from the Oregon Climate Change Research Institute Report (Army Corps of Engineers, 2020).

The following are a few highlights (Figure 10) from that report that describe the likelihood of projected changes in environmental parameters important to the Mid-Coast region.[25]

Climate change will exacerbate challenges that the Mid-Coast region already experiences. As a result of these changes, the Mid-Coast region needs to prepare for the following climate change impacts:

- Decreasing summertime streamflows and increased frequency of drought conditions will impact fish and wildlife, recreational opportunities, and the ability for cities and industry to meet their summertime water needs (which is generally when demand is highest).
- Increasing drinking water insecurity for community water systems and rural residents who draw water from streams, groundwater, and springs, as water supplies decrease with a hotter and longer dry season.
- Increasing stressors on fish and wildlife as they adapt to a changing hydrograph (more water in the winter and less water in the summer), elevated water temperatures and decreasing water quality conditions linked to low streamflows and elevated temperatures.
- Increasing impacts of extreme storms and flooding on community infrastructure.

[25] Note: Not all model runs or scenarios resulted in the projected changes shown in the graphic; there were differences in model outputs for these parameters. However, this graphic illustrates likely Mid-Coast trends.

- Increasing turbidity of drinking water during the winter months due to increased storms and erosion caused by higher precipitation events.
- Increasing potential for wildfire to affect water quality and water infrastructure.
- Increasing reliance on irrigation water to grow crops since crop water needs are less likely to be met by precipitation.

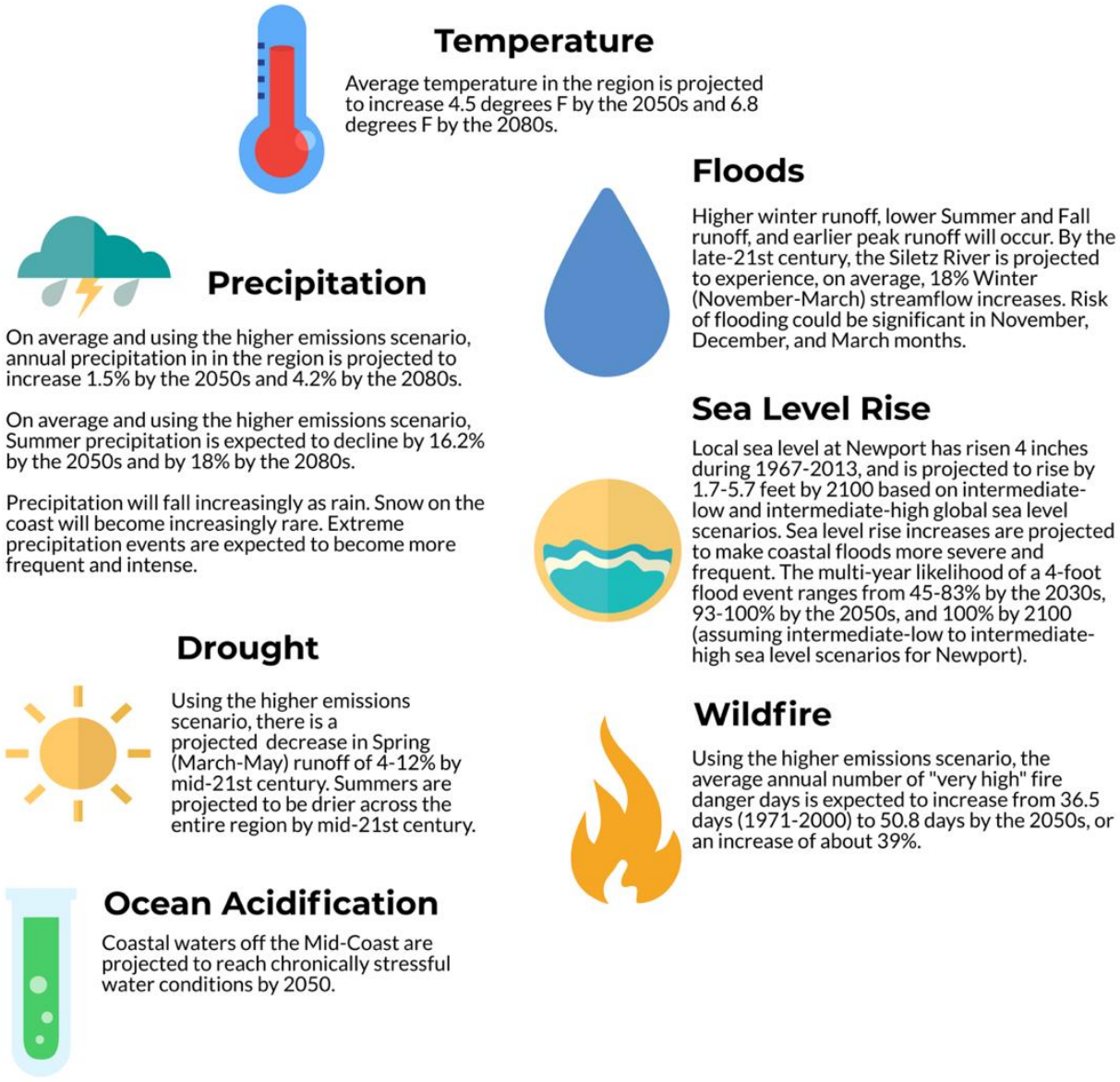

Figure 11. Projected climate change impacts to important parameters in the Mid-Coast region.