



# 5 Natural Resources



## Opportunities, Challenges, and Considerations

Natural resources in Deschutes County are abundant. Wildlife, scenic views of forests and peaks, and open spaces to preserve habitat and native vegetation are among the County's top assets.

Oregon Statewide Planning Goal 5 governs Natural Resources, Scenic and Historic Areas, and Open Spaces. Through this goal, the County maintains inventories and regulatory protections to preserve these many resources. These regulations are created by weighing Economic, Social, Environmental, and Energy (ESEE) consequences associated with protection of a resources.

Topics covered in this chapter include:

- Protected Wildlife Resources
- Open Space and Scenic Views
- Water Resources

### PROTECTED WILDLIFE RESOURCES

Deschutes County has some of the broadest and most robust wildlife protections in the state, covering a variety of species. The County has development protections within and surrounding numerous wildlife habitats. Some of these habitats have mapped geographic boundaries such as Deer Winter Range, Deer Migration Range, Antelope Habitat, Golden Eagle – Sensitive Bird Habitat, and Elk Habitat.

Other species are commonly found in protected riparian areas, such as wetlands and floodplains. Deschutes County contains general habitats for fish, fur-bearing animals, waterfowl, and upland game birds.

A continued challenge to wildlife resources is rural development and impacts on habitat. Mule deer are seeing steady declines, approximately 10% each year per Oregon Department of Fish and Wildlife biologists. These declines in population are due to a variety of factors, including but not limited to loss of habitat, predation, and disease.

### SCENIC VIEWS AND OPEN SPACE

The 2010 Greenprint for Deschutes County listed protection of scenic viewsheds as one of the top five community priorities for conservation in the rural County, and the protection of open space has been one of the key topics of discussion during the most recent update of this Comprehensive Plan. The County has several designated scenic corridors,



including several scenic bikeways, highways, and wild and scenic river sections.

With close to 80% of the County under public ownership, many community members enjoy access to natural resources on public lands. A perennial issue among community members is preserving scenic views and open spaces closer to home on undeveloped private properties.

### WATER RESOURCES

The high desert climate of Central Oregon poses many challenges with water supply and allocation. Water laws are seen as antiquated by many and issues related water levels in private residential wells, irrigation allocation to farmers, and protection of habitat areas for dependent species arise frequently.

A 2021 report by the Oregon Department of Water Resources found that groundwater levels through Deschutes County are declining, by as much as 50 feet of total decline in the central part of the basin. This decline is considered “excessively declined” per state statute and is attributed toward a shift in overall drier conditions since the late 1990s, a warming trend in the basin, and decreased snowpack. Ongoing development and piping of canals (which limits artificial groundwater recharge while conserving canal water) also exacerbate the issue.

Deschutes County has limited jurisdiction of water use, instead playing a coordination role with irrigation districts, water users, and owners of private wells.



## Statewide Planning Goal 5

Oregon land use planning protects wildlife with Statewide Planning Goal 5 and the associated Oregon Administrative Rule (OAR) 660-023. Goal 5 includes a list of resources which each local government must inventory, including wildlife habitat.

The Goal 5 process requires local governments to inventory wildlife habitat and determine which items on the inventory are significant. For sites identified as significant, an Economic, Social, Environmental and Energy (ESEE) analysis is required. The analysis leads to one of three choices: preserve the resource, allow proposed uses that conflict with the resource or strike a balance between the resource and the conflicting uses. A program must be provided to protect the resources as determined by the ESEE analysis.

**Appendix A** of the Comprehensive Plan contains the full ESEE ordinances for the County’s protected Goal 5 resources.

## Context

### Protected Wildlife Resources

Wildlife diversity is a major attraction of Deschutes County. The key to protecting wildlife is protecting the habitats each species needs for food, water, shelter, and reproduction. Also important is retaining or enhancing connectivity between habitats to protect migration routes and avoid isolated populations.

In considering wildlife habitat, counties rely on the expertise of the Oregon Department of Fish and Wildlife (ODFW) and U.S. Fish and Wildlife Service (USFWS). Those agencies provide

information for the required wildlife inventory and recommendations on how to protect wildlife habitat on private lands.

A summary of Deschutes County’s wildlife protection programs follows:

**MULE DEER**

Migration corridors and winter range are essential habitats needed to support mule deer in Deschutes County. The Bend/La Pine migration corridor is approximately 56 miles long and 3 to 4 miles wide and parallels the Deschutes and Little Deschutes Rivers. The corridor is used by deer migrating from summer range in the forest along the east slope of the Cascades to the North Paulina deer winter range. Deschutes County adopted a “Deer Migration Priority Area” based on a 1999 ODFW map submitted to the South County Regional Problem Solving Group. This specific sub-area is precluded from destination resorts.

The ODFW identified the Metolius, Tumalo and North Paulina deer winter ranges during Deschutes County’s initial comprehensive plan creation. The boundaries of these winter ranges are shown on the Big Game Sensitive Area map in the 1978 Comprehensive Plan and have been zoned with the Wildlife Combining Zone since 1979. The winter ranges support a population of approximately 15,000 deer. In 1992, ODFW recommended deer winter range in the northeast corner of the county, in the Smith Rock State Park area, be included in the Deschutes County inventory and protected with the same measures applied to other deer winter range. This area was officially included and mapped on the Wildlife Combining Map when Ordinance 92-040 was adopted by the Board of County Commissioners.

**SENSITIVE BIRDS**

Nest sites for the northern bald eagle, osprey, golden eagle, prairie falcon, great grey owl, greater sage-grouse, and great blue heron rookeries are inventoried by the County. The area required for each nest site varies between species. The minimum area required for protection of nest sites has been

identified by the ODFW in their management guidelines for protecting colony nesting birds, osprey, eagles, and raptor nests.

**ELK**

The Land and Resource Management Plan for the Deschutes National Forest identifies 6 key elk habitat areas in Deschutes County. The ODFW also recognizes these areas as critical elk habitat for calving, winter or summer range. The following areas are mapped on the Big Game Habitat Area map and in the Deschutes National Forest Land and Resource Management Plan:

- Tumalo Mountain
- Kiwa
- Ryan
- Crane Prairie
- Fall River
- Clover Meadow

**ANTELOPE**

The Bend and Ochoco District offices of the ODFW provided maps of the antelope range and winter range. The available information is adequate to indicate that the resource is significant. The antelope habitat is mapped on Deschutes County’s Big Game Habitat-Wildlife Area Combining Zone Map.



## Scenic Views and Open Space

Deschutes County has a rich abundance of open space. Open spaces are generally undeveloped areas that are being maintained for some other purpose, such as farms, parks, forests, or wildlife habitat. Besides the value that stems from the primary use of the land, open spaces provide aesthetically pleasing undeveloped landscapes. Because these areas are undeveloped, they also provide additional benefits such as water recharge, buffers from habitat, and safety zones from natural hazards such as flooding.

Open spaces and scenic views are an important draw for visitors and are often mentioned as important to the area's quality of life. The backdrop of the Cascade Mountains, with its vast forest and sagebrush landscapes and riparian and wetland habitats, all provide an inspirational setting for visitors and residents alike. Statewide Planning Goal 5 recommends, but does not require, creating an inventory and protections for open spaces, scenic views and sites. Oregon Administrative Rule (OAR) 660-023 defines open space designations as parks, forests, wildlife preserves, nature sanctuaries, and golf courses.

Open spaces are protected through an Open Space and Conservation map designation and zoning district. Scenic view protection is implemented through the Landscape Management Combining Zone regulations.

## Water Resources

Deschutes County's Role in Water Management is described below.

### REGULATORY AGENCIES

The primary state regulator of water availability is the Oregon Water Resources Department (OWRD). The Oregon Department of Environmental Quality (DEQ) leads the monitoring and enforcement of water quality standards. The Oregon DEQ is required to comply with the Federal Environmental Protection Agency.

### STATEWIDE PLANNING GOALS

There are two Statewide Planning Goals relating to the protection of water resources. Goal 5 (Natural Resources, Scenic and Historic Areas, and Open Spaces) requires an inventory and protection of the following water resources. In Deschutes County, these inventories have been completed and acknowledged by the Land Conservation and Development Commission (See Appendix A for Goal 5 Inventories). Goal 6 (Air, Land, and Water Resources Quality) requires comprehensive plans to be consistent with state and federal pollution regulations.

The policies in this section relating to water provide the framework for evaluating land use actions and define the responsibility of the County to work in partnership with cities, agencies, non-profits and others to achieve efficient use of water resources and effective management of water quality in the Upper Deschutes Basin.

It is important to underscore that the primary water resource management process occurs outside of the state land use planning system. Oregon land use and water management are not integrated; there are no overarching administrative rules that consider statewide water management in conjunction with land use planning.





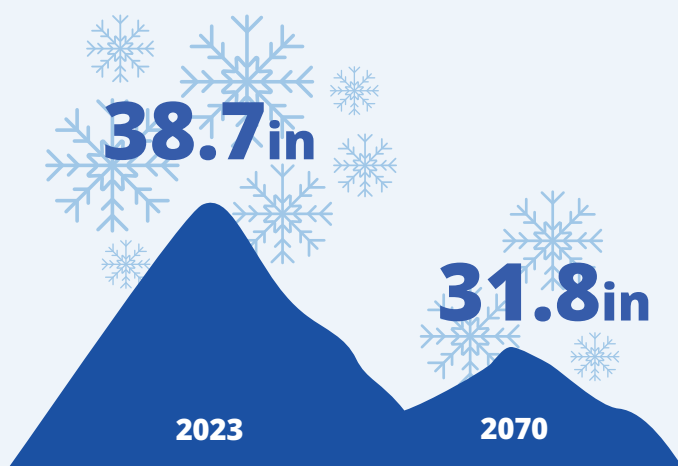
## WATER USE

The Deschutes aquifer has a recharge rate of roughly 3 million acre feet per year. The current water usage comes to roughly 720 thousand acre feet per year. Roughly 40 to 50 thousand acre feet of that water goes toward municipal and non-agricultural use, while the remaining goes toward crop and pasture irrigation. The majority of that municipal water use goes towards outdoor watering (gardens, sports fields, etc.). As an example: the City of Bend uses 5 times as much water in the summer as in the winter.

## SNOWPACK

Although there is expected to be a slight increase in winter precipitation by the middle of the century, snowpack is expected to decline throughout the Cascades. The decline in snowpack (which has already been observed, see figure below)<sup>1</sup> is due largely to increasing temperatures causing some precipitation to fall as rain rather than snow. This has the double effect of decreasing snowfall and melting the previously fallen snow. At the Mt Bachelor Ski Resort, April snowpack is expected to decline between 11% and 18% by the middle of the century and between 18% and 43% by the end of

### Average Snowpack near Mt. Bachelor Base Village on April 1



the century.

<sup>1</sup> Adapted from Mote, P.W., Li, S., Lettenmaier, D.P. et al. Dramatic declines in snowpack in the western US. *npj Clim Atmos Sci* 1, 2 (2018). <https://doi.org/10.1038/s41612-018-0012-1>

## LAVA SPONGE

Deschutes county is fortunate to be underlain on the Western side by relatively young volcanic lava sponge. This sponge is highly porous and is able to absorb large quantities of water during the wet season and gradually release it via abundant springs along the eastern slope. The great advantage this provides is that the resulting summer flows into the Deschutes basin are not as dependent on overground flow of snowmelt, and therefore are expected to maintain a relatively stable water supply even as snowpack decreases into the next century.

## GROUNDWATER

The groundwater aquifer is roughly 1000 feet thick and is replenished yearly by the Cascades' precipitation. Recent years of "exceptional drought" have lowered the aquifer level by roughly 30 feet, resulting in a small percentage of wells running dry, and raising concerns about available groundwater for new developments. Although it is likely that some wells will need to be deepened to cope with increasing temperatures and drought frequency, there is likely to remain ample sustainable groundwater supply.

Because the groundwater in the Deschutes Basin is directly connected to the flow of the Deschutes River, all additional groundwater use must be mitigated by decreased use of groundwater elsewhere through the Oregon Water Resources Department's Deschutes Groundwater Mitigation program. This can include retiring of other water rights, or the release of water into the waterway. A mitigation permit must be obtained before a new groundwater right can be accessed.<sup>2</sup>

Generally, groundwater quality in Deschutes County is generally classified as being 'good,' providing high quality drinking water to most of its residents. However, several productive aquifers lie in shallow alluvial sediments that are vulnerable to contamination from human activities and development.

<sup>2</sup> Information from the Oregon Water Resources Board Mitigation Program.

The Department of Environmental Quality (DEQ) Laboratory and Water Quality Divisions' Groundwater Quality Report for the Deschutes Basin (March 2006) identifies areas of concern for groundwater contamination based on various sources of data and groundwater quality studies. Based on collected data, development patterns and the geology of the underlying aquifer, the report makes recommendations for a couple of areas in the County. The report notes the groundwater aquifer in the Redmond area is vulnerable to contamination from human activities and recommends further study by the DEQ. The La Pine aquifer in the southern portion of the county from the Sunriver area to the Klamath County line between Newberry Caldera and the Cascades is an area of particular concern because of data collected through several studies and the high level of development in the area. The report also identifies underground injection systems that could contaminate the aquifer with pollutants from stormwater drywells or sewage drillholes.

In South Deschutes County, the concern for groundwater quality arises from nitrate contamination associated with on-site wastewater treatment (septic) systems discharging to the shallow unconfined aquifer. The issue is small lots with highly permeable rapidly draining soils and a high groundwater table with relatively cold water temperatures. Combined with the fact that the majority of lots are served by on-site wastewater treatment systems and individual wells, concern arose that nitrates from the septic systems could contaminate local wells and the river system.

Considerable work has gone into studying the groundwater in South County. In 1999 Deschutes County and the Department of Environmental Quality (DEQ) identified the need for a better understanding of the processes that affect the movement and chemistry of nitrogen in the aquifer underlying the La Pine area. In response, the U.S. Geological Service (USGS), in cooperation with Deschutes County and DEQ, began a study to examine the hydrologic and

## Deschutes Basin Hydrogeology

The Deschutes River Basin, from its headwaters to the Columbia River, encompasses 10,400 square miles of the north central part of the State. Nearly 91% of Deschutes County lies within the Deschutes Basin. The upper Deschutes River Basin is characterized by recent volcanic activity and strong and rapid groundwater flows. The geologic conditions lead to a strong connection between surface and ground water (see also Section 3.10).

Groundwater flows eastward from the Cascade Range through permeable volcanic rocks out into the basin and then generally northward. Groundwater recharge comes from precipitation in the Cascade Range, inter-basin flow and leaking irrigation canals. No long-term water-level declines attributable to groundwater pumping were found in the upper Deschutes Basin. Approximately one-half of the ground water flowing from the Cascade Range discharges to spring-fed streams along the margins of the range. The remaining groundwater flows through the subsurface, and eventually discharges to streams near the confluence of the Deschutes, Crooked, and Metolius Rivers.

The large amount of groundwater discharge in the confluence area is primarily caused by geologic factors. The Deschutes River flows north through permeable rock until it hits a region of low-permeable rock near the confluence area. There the permeable rock strata terminates, forcing water to the surface. Virtually all of the regional groundwater in the upper Deschutes Basin discharges to streams south of the area where the Deschutes River enters this low-permeability terrain, at roughly the location of Pelton Dam.

chemical processes that affect the movement and chemical transformation of nitrogen within the aquifer. A primary objective was to provide tools for evaluating the effects of existing and future residential development on water quality and to develop strategies for managing groundwater quality.

Field research from the USGS study shows that in a 250-square-mile study area near La Pine the groundwater underlying the La Pine sub-basin is highly vulnerable and being polluted by continued reliance on traditional onsite systems. Environmental impacts from residential development include higher nitrate concentrations in groundwater that is tapped for domestic water supply and discharges to rivers. Nitrates are regulated by the federal Environmental Protection Agency and DEQ as a human health concern. Vulnerability of the shallow aquifer to contamination led to concern that wastewater from septic systems poses a threat to the primary drinking water supply and local river systems. The Upper Deschutes and Little Deschutes Sub-basins have abundant, natural sources of phosphorus from volcanic soils and rocks so the rivers are naturally nitrogen limited. Nitrogen-limited rivers are sensitive to low concentrations of available nitrogen until some other component becomes limiting, and that may lead to ecological impacts.

In 2008 the County used the research on nitrates to adopt a 'local rule' that required South County residents to convert their septic systems over a period of 14 years to alternative sewage system technology designed to reduce nitrates. New septic systems were also required to use alternative technologies. The County created a process to assist residents in funding the conversions.

Many South County residents expressed concern over the costs involved with converting their septic systems and disputed the science behind the rule. Placed on the ballot by petition, the local rule was rescinded by voters in March 2009.

As of 2010 the DEQ is leading the effort to address nitrates in South County, with the full cooperation of the County. One solution being considered is creating a sewer system or extending Sunriver's to serve some of the nearby areas. Sewer systems are tightly restricted on rural lands by Statewide Planning Goal 11 and OAR 660-11, so the Department of Land Conservation and Development is also involved in these efforts.

### RESERVOIRS

The majority of the irrigation in Deschutes County comes from reservoirs which are mostly spring fed from the Cascades. Reservoirs serve the dual purpose of supplying water for irrigation and ensuring sufficient streamflow in the lower Deschutes River. The water levels in these lakes have been low in recent years due to drought in the region. When water is limited, the supply rate is determined by the age of water rights, with the more senior water permits having priority over the youngest. The Swalley and Central Irrigations are the most senior in the county, while the North Union Irrigation District is the most junior.

### ALGAL BLOOMS

Algal blooms have been a problem for recreational lakes in the cascade mountains in recent years. Since 2007, the Wickiup Reservoir, Crane Prairie Reservoir, and Paulina Lake have experienced algal or bacteria blooms that required a health advisory.<sup>3</sup>

Although not all algal blooms are toxic, they interfere with recreation and aesthetic enjoyment. In general, algal blooms are caused by elevated nutrients, elevated temperature, and still water. Algal blooms in other parts of the state have led to drinking water concerns, but Deschutes County cities are supplied by groundwater and so the risk in algal blooms is mainly to recreation.

<sup>3</sup> <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/RECREATION/HARMFULALGAE/BLOOMS/Pages/archive.aspx>



## Key Community Considerations

Natural resources for recreation, passive enjoyment, habitat protection, and economic production are a fundamental part of life in Deschutes County, and as such were a key part of the community conversation in this Comprehensive Plan update. Highlights of this conversation include:

- Concern about the ability of the County's water supply to accommodate more residents, visitors, and water-intensive jobs in the future
- Interest in a re-evaluation of water rights for urban, agricultural, and "hobby farm" uses.
- A robust discussion around wildlife inventories, habitat conservation, open space regulations, and impacts on private property owners.

The topic of habitat conservation came up frequently, with most respondents saying that further protections are needed. However, there was some push back related to the burden these protections may put on property owners.



## Goals and Policies

### Water Goals and Policies

**Goal 5.1:** Develop regional, comprehensive water management policies that balance the diverse needs of water users and recognize Oregon water law.

**Policy 5.1.1.** Participate in Statewide and regional water planning including, but not limited to:

- a. Work cooperatively with appropriate federal, state, tribal and local agency resource managers, such as The Confederated Tribes of the Warm Springs Reservation of Oregon, the Oregon Water Resources Department (OWRD), and other stakeholders and non-profit water organizations, such as the Deschutes Basin Water Collaborative, the County Soil and Water Conservation District;
- b. Support the development and implementation of Upper Deschutes Basin Study, Habitat Conservation Plan, and Biological Opinion from National Marine Fisheries Service for the middle and lower Deschutes Rivers.

**Policy 5.1.2.** Support grants for water system infrastructure improvements, upgrades, or expansions.

**Policy 5.1.3.** Consider potential impacts on water quality and availability in surrounding areas as part of the siting, planning, and approval processes for Destination Resorts and other large-scale developments.

**Policy 5.1.4.** Develop better understanding of The Confederated Tribes of the Warm Springs Reservation of Oregon's treaty-protected rights to co-manage the water resources of the Deschutes Basin.

**Goal 5.2:** Increase water conservation efforts.

**Policy 5.2.1.** Support efficient water use through targeted conservation, educational and, as needed, regulatory or incentive programs.

- a. Encourage new development incorporates efficient water use practices for all water uses.
- b. Encourage the reuse of grey water for landscaping.
- c. Encourage and educate the community about the relative impacts of thinning or reduction of plant species that adversely impact forest health, water availability, and soil quality.
- d. Encourage and educate the community about on-farm efficiency measures, including upgrades to equipment.
- e. Encourage and educate the community about use of voluntary metering of water use to monitor seasonal impacts on water use.
- f. Provide access to educational materials and tools related to water conservation including publications, information about grant opportunities, and/or partner with organizations on educational events.
- g. Encourage and educate community members on stewardship of wetlands and waterways.
- h. Provide access to educational materials about water-wise gardening and xeriscaping.

**Policy 5.2.2.** Promote coordinated regional water conservation efforts and implementation by regional, tribal, and local organizations and agencies, including increasing public awareness of and implementing water conservation tools, incentives, and best practices.

**Policy 5.2.3.** Support conservation efforts by irrigation districts, property owners and other water users, including programs to provide incentives for water conservation, such as

piping of canals and laterals, water banking, exchanges of water rights, voluntary transfers of in-stream flows, onsite efficiency measures, and other means.

**Goal 5.3:** Maintain and enhance a healthy ecosystem in the Deschutes River Basin.

**Policy 5.3.1.** Notify the Oregon Department of State Lands, The Confederated Tribes of the Warm Springs Reservation of Oregon, and other state and federal agencies as appropriate-of any development applications for land within a wetland identified on the statewide wetland inventory maps.

**Policy 5.3.2.** Work with The Confederated Tribes of Warm Springs Reservation of Oregon and other federal, state, and local agency resource managers to restore, maintain and/or enhance healthy river and riparian ecosystems and wetlands, including the following:

- a. Cooperate to improve surface waters, especially those designated water quality impaired under the federal Clean Water Act;
- b. Support research on methods to restore, maintain and enhance river and riparian ecosystems and wetlands;
- c. Support restoration efforts for river and riparian ecosystems and wetlands;
- d. Inventory and consider protections for cold water springs;
- e. Evaluate waterways in coordination with OPRD for possible designation under the Scenic Waterways program;
- f. In collaboration with appropriate federal, state, tribal and local agency resource managers stakeholders, map channel migration zones and identify effective protections;

- g. Develop comprehensive riparian management or mitigation practices that enhance ecosystems, such as criteria for removal of vegetation that adversely impacts water availability and soil health.

**Policy 5.3.3.** Support studies of the Deschutes River ecosystem and incorporate strategies from current watershed studies that provide new scientific information and indigenous knowledge about the Deschutes River ecosystem.

**Policy 5.3.4.** Support educational efforts and identify areas where the County could provide information on the Deschutes River ecosystem, including rivers, riparian areas, floodplains and wetlands.

- a. Support efforts to educate property owners to understand regulations pertaining to rivers, riparian areas, floodplains and wetlands.

**Goal 5.4:** Maintain and enhance fish and riparian-dependent wildlife habitat.

**Policy 5.4.1.** Coordinate with The Confederated Tribes of Warm Springs Reservation of Oregon and other federal, state, and local agency resource managers and stakeholders to protect and enhance fish and wildlife habitat in river and riparian habitats and wetlands.

**Policy 5.4.2.** Promote healthy fish populations through incentives and education.

**Policy 5.4.3.** Support healthy native salmonid fish populations through coordination with stakeholders, including, but not limited to, The Confederated Tribes of the Warm Springs Reservation of Oregon and other federal, state, and local agency resource managers who provide fish habitat management and restoration.

- a. Review, and apply where appropriate, strategies for protecting fish and fish habitat for native salmonid species.

- b. Promote native salmonid species recovery through voluntary incentives and encouraging appropriate species management and associated habitat conservation and restoration.

**Policy 5.4.4.** Update and implement policies to support federally approved Habitat Conservation Plans for species listed under the Endangered Species Act

- a. Spawning and rearing areas for salmonid species should be considered significant habitat and should be protected in rivers and streams.
- b. Cooperate with covered parties in restoring or enhancing spawning and rearing areas for salmonid species, where feasible.
- c. Support efforts to address riparian restoration associated with streamflow management under approved plans.

**Policy 5.4.5.** Use a combination of incentives and/or regulations to avoid, minimize, and mitigate development impacts on river and riparian ecosystems and wetlands.

**Policy 5.4.6.** Support plans, cooperative agreements, education, water quality monitoring and other tools that protect watersheds, reduce erosion and runoff, enhance riparian vegetation, and protect other natural or engineered water systems/processes that filter and/or clean water and improve and/or preserve water quality.

**Policy 5.4.7.** Coordinate with the Oregon Department of Environmental Quality and other stakeholders on regional water quality maintenance and improvement efforts such as identifying and abating point (single-source) and non-point (unidentified or multiple-source) pollution or developing and implementing Total Maximum Daily Load and Water Quality Management Plans.



**Policy 5.4.8.** Coordinate with The Confederated Tribes of Warm Springs Reservation of Oregon and other federal, state, and local agency resource managers to address water-related public health issues.

- a. Support amendments to State regulations to permit centralized sewer systems in areas with high levels of existing or potential development or identified water quality concerns.
- b. If a public health hazard is declared in rural Deschutes County, expedite actions such as legislative amendments allowing sewers or similar infrastructure.

**Policy 5.4.9.** Continue to evaluate and/or implement regulations, such as a wellhead protection ordinance for public water systems, in accordance with applicable Federal and/or State requirements.

**Policy 5.4.10.** Coordinate and work with the Oregon Department of Agriculture, agricultural uses, and available voluntary programs to support and implement proven new technologies and best practices to maintain and enhance water quality, such as minimizing nitrate contamination, maintaining streamside vegetation, reducing streambank soil erosion and runoff, reducing fish passage barriers, managing return flows, limiting livestock access to riparian areas, and minimizing weeds and bare patches in grazing areas.

**Policy 5.4.11.** Support regulations, education programs, and cleaning procedures at public and private boat landings.

**Goal 5.5:** Coordinate land use and water policies to address management and allocation of water in Deschutes County.

**Policy 5.5.1.** Coordinate with other affected agencies when a land use or development application may impact rivers or riparian ecosystems or wetlands.

**Policy 5.5.2.** Regulate land use patterns and promote best practices to preserve the integrity of the natural hydrologic system, recognize the relationship between ground and surface water, recognize basin-wide impacts, and address water impacts of new land uses and developments, including water-intensive uses.

**Policy 5.5.3.** Support OWRD's efforts to update and modernize Oregon's groundwater allocation rules and policies to protect existing surface water and groundwater users and to maintain sustainable groundwater resources.

**Policy 5.5.4.** Support efforts by the OWRD in collaboration with Central Oregon Cities Organization, The Confederated Tribes of the Warm Springs Reservation of Oregon, and non-governmental organizations to revisit the Deschutes Basin Groundwater Mitigation Program.

**Policy 5.5.5.** Coordinate with the irrigation districts to ensure irrigated land partitions and lot line adjustments are not approved without notice to the affected district.

**Policy 5.5.6.** Utilize Central Oregon Stormwater Manual to apply appropriate stormwater management practices land use decisions.

**Policy 5.5.7.** Allow for development of wastewater facilities and improvements where needed or required to address water quality issues and maintain water quality, consistent with state and local wastewater system requirements.

## Open Space and Scenic Views Goals & Policies

**Goal 5.6:** Coordinate with property owners to protect open spaces, scenic views, and scenic areas and corridors through a combination of incentives and/or educational programs.

**Policy 5.6.1.** Work with stakeholders to create and maintain a system of connected open spaces while balancing private property rights with community benefits.

**Policy 5.6.2.** Work to maintain the visual character and rural appearance of open spaces such as the area along Highway 97 that separates the communities of Bend and Redmond or lands that are visually prominent.

**Policy 5.6.3.** Work to maintain and protect the visual character and rural appearance of visually prominent open spaces within the County, particularly those that are identified in the Goal 5 inventory.

**Policy 5.6.4.** Seek to protect the cultural identity of rural communities, such as the Highway 97 area/corridor between Bend and Redmond, and others.

**Policy 5.6.5.** Protect significant open spaces, scenic views, and scenic sites by encouraging new development to be sensitive to these resources.

**Policy 5.6.6.** Incentivize the placement of structures in a way that is sensitive of view corridors to maintain the visual character of the area.

## Wildlife Goals and Policies

**Goal 5.7:** Maintain and enhance a diversity of wildlife and habitats.

**Policy 5.7.1.** Promote stewardship of wildlife habitats through incentives, public education, and development regulations.

**Policy 5.7.2.** Ensure Goal 5 wildlife inventories and habitat protection programs are up-to-date through public processes, expert sources, and current or recently adopted plans and studies.

**Policy 5.7.3.** Provide incentives for new development to be compatible with and to enhance wildlife habitat.

**Policy 5.7.4.** Require, incentivize, or encourage clustering of development in inventoried wildlife areas to reduce impacts to wildlife populations.

**Policy 5.7.5.** Develop better understanding of The Confederated Tribes of the Warm Springs Reservation of Oregon's treaty-protected rights to co-manage the wildlife resources of the Deschutes Basin.

**Goal 5.8:** Balance protection of wildlife and habitat with the economic and recreational benefits of wildlife and habitat.

**Policy 5.8.1.** Encourage responsible and sustainable wildlife related tourism and recreation.

**Policy 5.8.2.** Coordinate with stakeholders to ensure access to appropriate recreational opportunities within significant wildlife and riparian habitat through public or non-profit ownership.

**Policy 5.8.3.** Coordinate with Confederated Tribes of the Warm Springs Reservation of Oregon and State agencies to develop strategies to support sound wildlife management science and principals for the benefit of the wildlife resource.

**Goal 5.9:** Comply with federal and state regulations related to sensitive, threatened, and endangered species, including the Endangered Species Act, the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and others as applicable.

**Policy 5.9.1.** Coordinate with Federal and State agencies to develop strategies to protect Federal or State Threatened or Endangered Species, or Species of Concern.

**Policy 5.9.2.** Mitigate conflicts between large-scale development and sage grouse habitat.

**Policy 5.9.3.** Consider adopting recommendations from Oregon Department of Fish and Wildlife, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Deschutes River Mitigation and Enhancement Program in dock construction.

## Environmental Quality Goals and Policies

**Goal 5.10:** Maintain and improve upon the quality of air and land in Deschutes County.

**Policy 5.10.1.** Use building techniques, materials, and technologies in existing and future County operations and capital facilities that help maintain and improve environmental quality.

**Policy 5.10.2.** Implement a dark skies educational and or incentive program and periodically update the Dark Skies ordinance to reduce the impacts of light pollution and reduce lighting impacts on adjacent properties.

**Policy 5.10.3.** Coordinate with agency partners to educate residents about controlled burning projects and air quality concerns.

**Policy 5.10.4.** Use public education, education for County departments, and regulations to control noxious weeds and invasive species.

**Goal 5.11:** Promote sustainable building practices that minimize the impacts of development on the natural environment.

**Policy 5.11.1.** Use the County Code and educational materials to promote the use of resource-efficient building and landscaping techniques, materials, and technologies that minimize impacts to environmental quality.

**Policy 5.11.2.** Encourage and support reuse and recycling of consumer goods, green waste, construction waste, hazardous waste, and e-waste through education and enhanced recycling opportunities through the Recycling Program.

**Policy 5.11.3.** Support the process for siting new County solid waste management facilities in rural Deschutes County, consistent with facility needs and County standards for the location and approval of such facilities.

**Policy 5.11.4.** Implement best practices in solid waste management throughout the County.

**Policy 5.11.5.** Develop and implement a Climate Action Plan to address the potential future impacts of climate change on Deschutes County.

**Policy 5.11.6.** Promote and incentivize green infrastructure in new development to improve stormwater management.





**7**

# Natural Hazards



## Opportunities, Challenges, and Considerations

Central Oregon is a dynamic region formed and shaped by the powerful forces of nature. Deschutes County residents and visitors rely on the County and its partners to plan for hazardous events and limit harm to people and property.

Continued rapid population growth, development in wildfire-prone areas, and an increased frequency of natural hazard events make planning for and mitigating risks ever more important. As temperatures rise globally, Central Oregon will face challenges due to drought, wildfire, heat events, and storms. The impacts a major Cascadia Subduction Zone earthquake would have on Deschutes County would be substantial as well.



In order to plan for and address natural hazards, Deschutes County has partnered with local jurisdictions to create its Natural Hazards Mitigation Plan (NHMP). Additional opportunities exist to create greater defensible spaces, encourage fire hardening, utilize grant programs, and pursue education measures to reduce these impacts over time.

According to the NHMP, the hazards with greatest risk in Deschutes County are:

- **Winter Storm.** Destructive storms producing heavy snow, ice and cold temperatures occurred throughout the County's history. Increases in population and tourism make potential impacts to shelter, access to medical services, transportation, utilities, fuel sources, and telecommunication systems more acute. The relative frequency of these events combined with their widespread impacts make winter storms the highest-ranked hazard in the NHMP.

Statewide Planning Goal 7 requires local comprehensive plans to address Oregon’s natural hazards. Protecting people and property from natural hazards requires knowledge, planning, coordination, and education. Good planning does not put buildings or people in harm’s way. Planning, especially for the location of essential services like schools, hospitals, fire and police stations, is done with sensitivity to the potential impact of nearby hazards.

- **Wildfire.** Historically, wildland fires have shaped the forests and wildlands valued by residents and visitors. These landscapes, however, are now significantly altered due to increased rural development and a general lack of large-scale treatments, resulting in overgrown forests with dense fuels that burn more intensely than in the past.
- **Windstorm.** A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Deschutes County, they are especially dangerous in developed areas with significant tree stands and major infrastructure, especially above ground utility lines.
- **Drought.** Periods of drought can have significant impacts on public health, agriculture, and industry. Many counties in eastern Oregon are experiencing more frequent and severe droughts than is historically the norm, and many climate predictions see this trend continuing into the future.
- **Earthquake.** The Pacific Northwest is located at a convergent plate boundary, called the Cascadia Subduction Zone, where the Juan de Fuca and North American tectonic plates meet. This fault line is subject to rare but potentially very large earthquakes. Such

an event would impact Deschutes County communities both directly through damage to infrastructure and property, as well as economically and socially as the broader region recovers from the disaster.

## Context

Informed by an understanding of natural hazards, Deschutes County can reduce the risks to property, environmental quality, and human safety through land use planning and review of specific development proposals. The County’s policies provide the framework for the County’s natural hazards review program. This includes: identification of areas subject to natural hazards, regulations for evaluating land use actions for how they may result in exposure to potential harm from natural hazards, and programmatic elements including partnerships and funding opportunities to support natural hazard risk reduction.

Deschutes County has taken on a number of proactive projects, including:

- 2021 Natural Hazards Mitigation Plan (NHMP)
- 2019 Wildfire Mitigation Advisory Committee
- Project Wildfire, a County-led wildfire education and mitigation program has been in operation since 2012 and has been very successful in changing attitudes towards wildfire and prevention.
- Community Wildfire Protection Plans (CWPP) for many communities, including:
  - » Greater Bend CWPP (2016, expected revision 2021)
  - » Greater La Pine CWPP (2020, expected revision 2025)
  - » Greater Redmond CWPP (2018, expected revision 2023)
  - » Greater Sisters Country CWPP (2019, expected revision 2024)
  - » Sunriver CWPP (2020, expected revision 2025)



- » East and West Deschutes County CWPP (2018, expected revision 2023)
- » Upper Deschutes River Coalition CWPP (2018, expected revision 2023)

In addition, dozens of neighborhoods are pursuing or have received FireWise certification through the National Fire Protection Association. The County also supports the Heart of Oregon and Youth Conservation Corps crews in fuels reduction work and other mitigation efforts, with financial assistance from other entities.

## Wildfire

According to the Natural Hazards Mitigation Plan, wildfire is the second most significant hazard to the county (after winter storms) and was the most discussed natural hazard discussed during outreach events. Throughout the 20<sup>th</sup> century, the years with warm and dry conditions corresponded with larger fires that have burned greater areas. Overall increases in heat will also lengthen growing seasons - building greater fuel loads and decreasing soil and fuel moisture, thereby increasing the likelihood of larger fires. By mid-century, the annual potential for very large fires is projected to increase by at least 350% over the 20<sup>th</sup> century average.<sup>1</sup>



1 Halofsky, J. Peterson, D, Harvey, B. "Changing Wildfire, changing forests: the effects of climate change on fire regimes and vegetation in the Pacific Northwest, USA. Fire Ecology. 2020.

The annual frequency of very high and extreme fire danger days is expected to increase by 10-15 additional days per year by mid-century<sup>4</sup> (up from 36 currently). These trends are due to exacerbated conditions with a combination of high air temperatures and very low fuel moisture, which increases the likelihood of fire starts that can spread. As Deschutes County communities have experienced, increased fire activity - even at quite a distance - will impact air quality, increasing public health risks and impacting aspects of everyday life.

Research indicates that in regions where fire has moved through the landscape with increased severity, regrowth is changing the species composition of the forests, which are likely to be more resilient to future fires.<sup>2</sup> Other compounding factors, like drought and pest outbreaks, will continue to build fuel loads in the forests and change the forest's composition. Post-fire landscapes in Deschutes County will likely see increases in the prevalence of invasive and pioneer tree species, and a reduction in fire-susceptible species such as western hemlock, subalpine fir, and some spruce. Fire resistant species like mature Douglas fir and western larch will have greater survival capacity to fire,<sup>3</sup> but perhaps not to other stressors. Larger fires that occur over shorter intervals will negatively impact seed dispersion capacity, and reduced moisture available in ponderosa forest regions will be vulnerable to reforestation failures, leading to conversion to other ecosystem types. In the mountain forests, the average yearly area burned is expected to nearly double by mid-century, while the area burned in the grass/shrub plateau areas is likely to decrease slightly by mid-century. This is partly due to extended drought decreasing plant growth and therefore available fuel. The risk of unusually severe fires is expected to increase across large swaths of Oregon, including Deschutes County.<sup>4</sup>

2 Sebastian U. Busby, Kevan B. Moffett, Andrés Holz. High severity and short interval wildfires limit forest recovery in the Central Cascade Range. *Ecosphere*, 2020; 11 (9) DOI: 10.1002/ecs2.3247

3 6 Halofsky et al. 2020.

4 Oregon Forest Resources Institute Fact Sheet

**WILDFIRE AND HEAT**

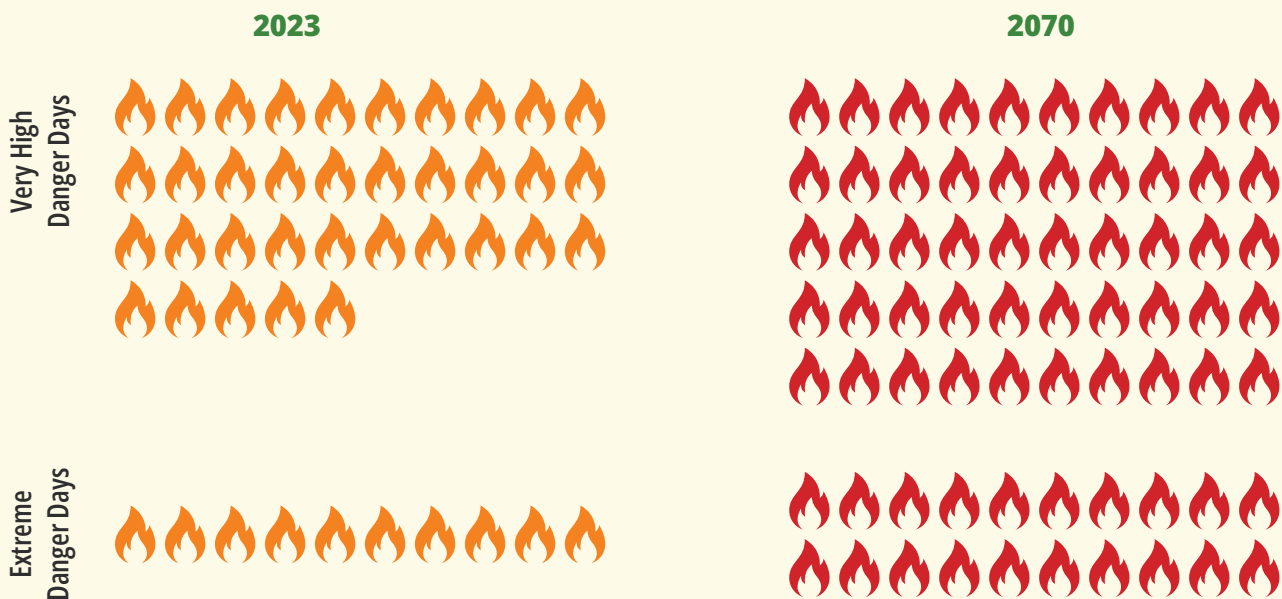
By the middle of this century, increasing temperatures are expected to drive increasing wildfire risk, especially in the Cascades. The yearly percentage of area burned is likely to increase in the mountains and the interval of return (years between fires) is expected to decrease across the county. Both the highest and lowest summer temperatures will increase, leading to more extreme heat days and reducing the historical nighttime cooling effect of the high desert.

Under all change projections, there will be an increase in the number of days with a heat index above both 90° and 100°F by mid-century.<sup>8</sup> By 2100, Deschutes County can expect summer maximum temperatures to be 12°F hotter than current highs. Overall, extreme heat is not considered a human health risk in Deschutes County because of low night temperatures and the low humidity in the region. However, the Redmond airport, which sees the hottest temperatures in the county, will likely start to see occasional temperatures above 105° every few years by mid-century, and at least once a year by 2100. In addition, summer night lows are likely to increase by up to 5° degrees by mid-century, reducing the cooling effect of the high desert climate.

**Vulnerable Populations**

The socio-demographic qualities of the community population such as language, race and ethnicity, age, income, and educational attainment are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. A disproportionate burden is placed upon special needs groups, particularly children, the elderly, the disabled, minorities, and low-income persons. Population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning. For planning purposes, it is essential that Deschutes County and the cities of Bend, La Pine, Redmond, and Sisters consider both immediate and long-term socio-demographic implications of hazard resilience.

**Fire Danger near Mt. Bachelor Village**



## Key Community Considerations

Community conversations related to natural hazards have centered around the following topics:

- **Impacts of Climate Change.** Throughout the community engagement process, community members spoke to the importance of recognizing and addressing the impacts of climate change in Deschutes County and its relationship with natural hazard events.
- **Education and Communication.** Providing information about potential risks to residents and visitors can help the community as a whole be more prepared for natural hazards.
- **Development Code Regulations and Incentives.** Some community members expressed a desire for stricter regulations and additional incentives about “fire-wise” construction and defensible space practices.
- **Limiting Development in hazard-prone areas.** Increased development in remote areas of the County, where life-saving services may be scarce and human impacts may exacerbate risks, was a concern for some.

## Goals and Policies

**Goal 7.1:** Develop policies, partnerships, and programs to increase resilience and response capacity in order to protect people, property, infrastructure, the economy, natural resources, and the environment from natural hazards.

**Policy 7.1.1.** Partner with county, state, and regional partners to regularly update and implement the Deschutes County Natural Hazards Mitigation Plan.

**Policy 7.1.2.** Collaborate with federal, state, and local partners to maintain updated mapping of high wildfire risk areas, floodplains, and other natural hazard areas within the county.

**Policy 7.1.3.** Communicate and cooperate with federal, state, and local entities to clarify responsibilities regarding wildfire mitigation and suppression to improve fire protection services.

**Policy 7.1.4.** Use the development code to provide incentives and regulations to manage development in areas prone to natural hazards.

**Policy 7.1.5.** Work with agency partners to address and respond to increased episodes of poor air quality resulting from wildfires in the region.

**Policy 7.1.6.** Protect wildlife with wildland fire mitigation measures on private lands.

**Policy 7.1.7.** Address wildfire risk, particularly in the wildland urban interface.

**Policy 7.1.8.** Identify all areas not protected by structural fire protection agencies and promote discussions to address fire protection in unprotected lands in the County.

**Policy 7.1.9.** Support forest management practices that reduce wildfire risk.

**Policy 7.1.10.** Support local fire protection districts and departments in providing and improving fire protection services.





**Policy 7.1.11.** Continue to review and revise County Code as needed to:

- a. Ensure that land use activities do not aggravate, accelerate or increase the level of risk from natural hazards.
- b. Require development proposals to include an impact evaluation that reviews the ability of the affected fire agency to maintain an appropriate level of service to existing development and the proposed development.
- c. Minimize erosion from development and ensure disturbed or exposed areas are promptly restored to a stable, natural and/or vegetated condition using natural materials or native plants.
- d. Ensure drainage from development or alterations to historic drainage patterns do not increase erosion on-site or on adjacent properties.
- e. Reduce problems associated with administration of the Floodplain Zone.
- f. Require new subdivisions and destination resorts to achieve FireWise Standards or other currently accepted fire mitigation standards from the beginning of the projects and maintain those standards in perpetuity.

**Goal 7.2:** Ensure the County’s built environment and infrastructure are adequately prepared for natural disasters.

**Policy 7.2.1.** Increase the quality, resiliency, diversity, and redundancy of utility and transportation infrastructure to increase chances of continued service following a natural disaster.

**Policy 7.2.2.** Prohibit the development of new essential public facilities and uses that serve vulnerable populations from being located within areas at high risk of flooding and wildfire, and aim to relocate existing uses in these areas.

**Policy 7.2.3.** Support siting of Central Oregon Ready, Responsive, Resilient (CORE3) regional coordinated emergency services training facility.

**Policy 7.2.4.** Coordinate with emergency service providers when new development is proposed to ensure that response capacity can meet the needs of the new development.

**Policy 7.2.5.** Require new development to follow home hardening, defensible space, and other resilient design strategies in areas prone to wildfires and other natural hazards.

**Policy 7.2.6.** Encourage and incentivize development that exceeds minimum building code standards and promote retrofitting of existing development for better natural disaster resiliency.

**Policy 7.2.7.** Require development to be designed to minimize alteration of the natural landform in areas subject to slope instability, drainage issues or erosion.

**Policy 7.2.8.** Regulate development in designated floodplains identified on the Deschutes County Zoning Map based on Federal Emergency Management Act regulations.

- a. Continue evaluation of participation in and implementation of the Community Rating System as part of the National Flood Insurance Program.
- b. Cooperate with other stakeholders to identify alternatives for acquiring and/or relocating existing structures prone to flooding.
- c. Continue to coordinate with stakeholders and agency staff to correct mapping errors.

**Goal 7.3:** Develop programs that inform the public about the increased risks from natural hazards.

**Policy 7.3.1.** Identify high risk, high need populations and ensure equitable access to emergency preparedness and recovery services.

**Policy 7.3.2.** Increase outreach and education for hazard awareness and natural disaster preparedness, especially for low-income, elderly, non-English speaking, and other vulnerable populations.

**Policy 7.3.3.** Expand partnerships with government agencies, utilities, and other groups that can help Deschutes County residents prepare for natural disasters.

**Policy 7.3.4.** Work with regional partners to establish and maintain adequate support for a Deschutes County Community Emergency Response Team (CERT) to aid in responding to natural hazard events.

**Policy 7.3.5.** Promote and support business resilience planning.

