



MEMORANDUM

TO: Deschutes County Board of Commissioners

FROM: Peter Gutowsky, AICP, Director
Todd Cleveland, Onsite Wastewater Manager

DATE: January 31, 2024

SUBJECT: Oregon Department of Environmental Quality / South County Groundwater Protection

On February 7, 2024, the Board of County Commissioners (Board) will receive an update from the Oregon Department of Environmental Quality (DEQ). Shannon Davis, DEQ Deputy Director, provided a letter to the Board in December discussing groundwater pollution concerns from septic systems in the South Deschutes County area (Attachment 1). Conditions documented from past investigations and outlined in a USGS factsheet remain valid. DEQ respectfully recommended a meeting to begin discussing possible solutions.

To assist the conversation, the Community Development Department prepared a list of Deschutes County and DEQ's efforts over the last several decades to protect the groundwater in South County (Attachment 2). The list is not exhaustive.



Oregon

Tina Kotek, Governor

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December 19, 2023

Deschutes County Board of Commissioners
1300 NW Wall Street, Suite 200
Bend, Oregon 97701

RE: Meeting Proposal for County and DEQ staff to discuss future Septic Development and Variances, South Deschutes County

Dear Commissioners:

For many years now the Department of Environmental Quality (DEQ) and Deschutes County have been working to address groundwater pollution concerns from septic systems in the South Deschutes County area. Groundwater in the Sunriver and La Pine area is vulnerable to nitrate contamination from septic systems and private wells are the primary drinking water source for most properties in this area.

The area was platted into many subdivisions back in the late 60's and early 70's before a comprehensive land use planning program was established. DEQ had previously worked with the County, the Department of Land Conservation and Development (DLCD), and the United States Geological Survey (USGS) to investigate groundwater pollution concerns in the South Deschutes County area.

Conditions documented from past investigations and outlined in USGS factsheet (attached) are still valid. Testing and research indicate most of the contamination in this region comes from septic systems. This means nutrients from septic systems are seeping into the area's porous, volcanic soil and the aquifer that is used as a primary drinking water source. Continued unrestricted development in the area will reach a tipping point that may be difficult or impossible to recover from due to groundwater contamination which will then require additional regulation and funding to address.

As outlined in a 2008 letter (attached), DEQ requested that the County, in coordination with DLCD establish areas in South Deschutes County that may be eligible for sewer systems. Eligibility would be based on a determination by DEQ that there was no practical alternative to a sewer system to abate the public health hazard. However, these previous efforts including a county code variance, variance repeal, and Statewide Planning Goal 11 exemption were unsuccessful.

DEQ previously determined that a variety of approaches were likely needed to properly manage wastewater pollutants and nitrate loading, including individual onsite wastewater treatment systems and various types of community sewer systems. In some locations, DEQ believes the use of various types of community sewer systems and/or drinking water systems may be a better long-term solution to human

health impacts, however, drinking water systems may not mitigate the effect on surface water or ecological impacts.

We recommend that County and DEQ staff meet and begin to discuss possible next steps to address the situation. Some items suggested include:

- Discuss current County process and DEQ variance process for approval of individual septic systems. Septic system site evaluation denial is commonly due to the depth to the seasonally high-water table. Oregon regulations require at least 24 inches below the ground surface to the water table, with a minimum 24-inch separation between the water table and the bottom of a septic system's sand filter. Meeting this regulation still doesn't ensure that there aren't impacts to groundwater from the systems.
- Discuss recent DEQ 2023 sampling of private residential wells that still indicate conditions are much the same as they were in the past with nitrate impacts to wells and the Deschutes River.
- Even with a septic design capable of producing high quality effluent, the treatment may not sufficiently minimize or eliminate nutrients and pathogens from the wastewater or future impacts to the aquifer system as outlined by a USGS model.
- Discuss whether a determination of "public health hazard" by DLCD and DEQ may be a precursor to sewer or water service to rural lands via a Goal 11 exemption.
- Convene a meeting with non-government organizations (NGO), non-profits, and 3rd party stakeholders on support of installation and funding of sanitary systems, water systems, Goal 11 exemptions or other alternatives. Does there need to be an informed choice between smart development and human health and ecological water quality impacts in South Deschutes County or can there be a balance?
- Some parcels are not suitable for septic systems. Discuss potential to address or use "red tag" lots using some type of purchase for buffering potential impacts. Explore future DEQ Water Quality Onsite rulemaking that could include additional treatment standards while considering other nitrate loading factor such as regional climate changes and density of developments.
- Discuss suggestions or modification of County rules to meet rule requirements.
- Outline options to manage existing monitoring wells installed during the LaPine Demonstration Project that require maintenance and/or abandonment.
- Discuss whether a determination of "area of concern" by DEQ may be a precursor to a declaration of a Groundwater Management Area (GWMA) by DEQ.

DEQ still believes that conditions in South Deschutes County are a potential public health and ecological impact issue. There may also be rural community impacts, funding and financing issues, environmental justice concerns and climate change implications that should be addressed. As outlined in previous communications, DEQ understands that there will be further aspects of this process that will

require additional work, refinement, clarification and coordination and we stand committed to helping Deschutes County and the citizens in South Deschutes County.

If you have any questions concerning this letter and to begin discussions on a joint meeting, please contact Sean Rochette, DEQ Onsite Manager at (541) 633-2036 or via email at Sean.Rochette@deq.oregon.gov.

Respectfully,



Shannon Davis
DEQ Deputy Director

ecc:

Todd Cleveland, Deschutes County
Peter Gutowsky, Deschutes County Planning Director
Sean Rochette, DEQ – Bend
Greg Svelund, DEQ – Bend
Ann Farris, DEQ – Bend
Jennifer Wigal, DEQ – HQ

Attachment(s):

DEQ January 4, 2008, letter
USGS 2007 factsheet



Oregon

Theodore Kulongoski, Governor

Department of Environmental Quality

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January 4, 2008

Deschutes County Board of Commissioners
1300 NW Wall Street, Suite 200
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RE: Application of Goal 11 to South Deschutes County

Dear Commissioners:

For many years now the Department of Environmental Quality (DEQ), the Department of Land Conservation and Development (DLCDD), the United States Geological Service (USGS) and Deschutes County have been addressing groundwater pollution concerns in the South Deschutes County area. We believe these concerns are first and foremost a public health issue rather than a land use planning issue. The area was platted into many subdivisions back in the late 60's and early 70's before a comprehensive land use planning program was established, which included Statewide Planning Goal 11.

Based on the summary and conclusions of the recently released USGS report 2007-5237 entitled "Evaluation of approaches for managing nitrate loading from on-site wastewater systems near La Pine, Oregon" and along with DLCDD's definition of a "public health hazard,"¹ DEQ requests that Deschutes County, in coordination with DLCDD, establish in South Deschutes County the areas in and around the tax lots delineated on Deschutes County maps titled "Sources of Sewage Contributing to Health Hazard"² dated December 19, 2007, as areas that may be eligible for sewer systems. Eligibility is primarily based on a determination by DEQ that there is no practicable alternative to a sewer system in order to abate the public health hazard.

This request is in accordance with Oregon Administrative Rule (OAR) Chapter 660, Division 11, Section 0060 (Sewer Service to Rural Lands), where a DEQ determination of a Public Health Hazard negates the need for an exception to Goal 11. Under the Goal 11 rules, specifically OAR 660-011-0060 (4) (a) (A), (B), (C), and (D), the DEQ is required to:

- 1. Determine that a public health hazard exists in the area;**
- 2. Determine that the public health hazard is caused by sewage from development that existed in the area on July 28, 1998;**

¹ OAR 660-011-0060(1) (d) defines a "Public health hazard" as a "...condition whereby it is probable that the public is exposed to disease-caused physical suffering or illness due to the presence of inadequately treated sewage;"

² The maps titled "Sources of Sewage Contributing to Health Hazard" dated December 19, 2007, may not include all of the sources of sewage. Therefore, this map as well as other maps referenced in this letter are considered as "work in progress documents" and may need to be modified over time.

3. Describe the physical location of the identified sources of the sewage contributing to the public health hazard; and

DEQ has determined that conditions that exist under items 1 and 2, above, have been satisfied as documented in the USGS report 2007-5237. Deschutes County maps titled "Sources of Sewage Contributing to Health Hazard", which show the physical location of the identified sources of the sewage contributing to the public health hazard satisfies item 3. This information was compiled based on information obtained by the County on the location of dwellings and information from WPCF-Onsite permits issued by DEQ in Deschutes County. Other maps prepared by the County identify sources that existed in the area prior to July 28, 1998.

4. Determine that there is no practicable alternative to a sewer system in order to abate the public health hazard.

To address the effects of nitrogen and other pollutants from onsite wastewater treatment systems on the quality of ground water in the South Deschutes County area, DEQ has determined that a variety of approaches are needed to properly manage wastewater pollutants and nitrate loading, including individual onsite wastewater treatment systems and various types of community sewer systems. In some locations within the area, DEQ believes the use of various types of community sewer systems are a better long term solution. Therefore, within or near the tax lots delineated on Deschutes County maps titled "Sources of Sewage Contributing to Health Hazard" as sources contributing to the public health hazard, DEQ intends to make the determination required under item 4. This will be done on a case-by-case basis when information has been presented to DEQ demonstrating that there is no practicable alternative to a sewer system in order to abate the public health hazard for that specific area, lot, parcel, or group of parcels or lots. The property affected by DEQ's determination will be clearly identified and presented to Deschutes County and DLCD's regional representative in a timely manner. At the time the determination is presented, DEQ would have satisfied all four conditions required by OAR 660-011-0060(4) (a) for the area so identified and our responsibility for providing affected local governments and special districts notification of the determination as required by OAR 660-011-0060(7).

In accordance with OAR 660-011-0060(4) (b), and based on recommendations by DEQ, Deschutes County and other public sanitary sewer authorities are required to:

- 1. Determine the type of sewer system and service to be provided;**
- 2. Determine the boundaries of the sewer system service area, pursuant to OAR 660-011-0060(6);**

DEQ considers items 1 and 2 as primary and necessary in protecting public health in the area and determinations can be made using the Nitrate Loading Management Model (NLMM) developed as a management tool by the USGS. Upon the determination required by DEQ under OAR 660-011-0060(4) (D) that there is no practicable alternative to a sewer system in order to abate the public health hazard, DEQ will provide the county with recommendations as to the type of sewer system to be provided and the boundaries of the sewer system service area. The boundaries



of the sewer system service area delineated by DEQ will include: (1) lots or parcels that contain the identified sources of the sewage contributing to the health hazard for that area; and (2) lots or parcels that are surrounded by or abut the contributing lots or parcels where, due to soils, insufficient lot size, or other conditions, there is a reasonably clear probability that onsite systems installed to serve uses on such lots or parcels will fail and further contribute to the health hazard (OAR 660-011-0060(6)).

3. **Adopt land use regulations that ensure the sewer system is designed and constructed so that its capacity does not exceed the minimum necessary to serve the area within the boundaries;**
4. **Adopt land use regulations to prohibit the sewer system from serving any uses other than those existing or allowed in the identified service area on the date the sewer system is approved;**
5. **Adopt plan and zone amendments to ensure that only rural land uses are allowed on rural lands in the area to be served by the sewer system, consistent with Goal 14 and OAR 660-004-0018, unless a Goal 14 exception has been acknowledged;**
6. **Ensure that land use regulations do not authorize a higher density of residential development than would be authorized without the presence of the sewer system; and**
7. **Determine that the system satisfies ORS 215.296(1) or (2) to protect farm and forest practices, except for systems located in the subsurface of public roads and highways along the public right of way.**

At the time DEQ makes the determination that there is no practicable alternative to a sewer system in order to abate the public health hazard, DEQ will be available to assist and provide recommendations to Deschutes County in satisfying the land use planning requirements specified under items 3 through 7, above. DEQ has already requested that DLCD assist the County in developing the necessary land use provisions to implement these items.

In accordance with OAR 660-011-0060(5), Deschutes County, based on recommendations from DEQ, shall determine the most practicable sewer system to abate the health hazard based on the following:

1. **The system must be sufficient to abate the public health hazard pursuant to DEQ requirements applicable to such systems; and**
2. **New or expanded sewer systems serving only the health hazard area shall be generally preferred over the extension of a sewer system from an urban growth boundary. However, if the health hazard area is within the service area of a sanitary authority or district, the sewer system operated by the authority or district, if available and sufficient, shall be preferred over other sewer system options.**

At the time DEQ makes the determination that there is no practicable alternative to a sewer system in order to abate the public health hazard, DEQ will provide the County with recommendations as to the sufficiency of the sewer system to abate the public health hazard and whether it is more feasible to obtain sewer service from an existing sewer service provider.



With the assistance from DLCD, DEQ also requests that Deschutes County expedite all planning requirements specified above in order to allow, in conjunction with the individual onsite wastewater treatment systems, the use of community sewer systems, extension of existing sewer systems, and use of smaller "cluster systems" within or near the tax lots delineated on Deschutes County maps titled "Sources of Sewage Contributing to Health Hazard", as satisfying OAR 660-011-0060(4) (A), (B) and (C), and within the specific areas as further determined by DEQ as satisfying OAR 660-011-0060(4) (D).

DEQ views the determinations described above and as later defined in more detail, and the County's quick response to that determination, as positive steps towards the protection of groundwater in South Deschutes County. We request an accelerated land use process from the County and DLCD when implementing future determinations for sewer systems.

We understand that there will be further aspects of this process that will require additional work, refinement, clarification and coordination. However, we also believe this is the most efficient way to work through this particular issue under the current land use regulations. We also understand that the determinations made by DEQ that sewer systems are more practicable raises other issues and questions not fully explored. We stand committed to helping Deschutes County, DLCD and the citizens in South Deschutes County sort through those matters.

If you have any questions concerning this designation and request for action, please contact Joni Hammond, DEQ's Interim Deputy Director at (503) 229-5332.

Sincerely,



Dick Pedersen
Interim Director

cc: Joni Hammond, DEQ – Portland
Bob Baggett, DEQ – Bend
Mike Kucinski, DEQ – Roseburg
Richard Whitman, DLCD – Salem
Jon Jinings, DLCD – Bend
Doug White, DLCD – Bend
Darren Nichols – DLCD La Grande
Tom Anderson, Deschutes County Community Development Director
Katherine Morrow, Deschutes County Planning Director



Prepared in cooperation with Deschutes County and the Oregon Department of Environmental Quality

Questions and Answers About the Effects of Septic Systems on Water Quality in the La Pine Area, Oregon

Nitrate levels in the ground-water aquifer underlying the central Oregon city of La Pine and the surrounding area are increasing due to contamination from residential septic systems. This contamination has public health implications because ground water is the sole source of drinking water for area residents. The U.S. Geological Survey, in cooperation with Deschutes County and the Oregon Department of Environmental Quality, studied the movement and chemistry of nitrate in the aquifer and developed computer models that can be used to predict future nitrate levels and to evaluate alternatives for protecting water quality. This fact sheet summarizes the results of that study in the form of questions and answers.

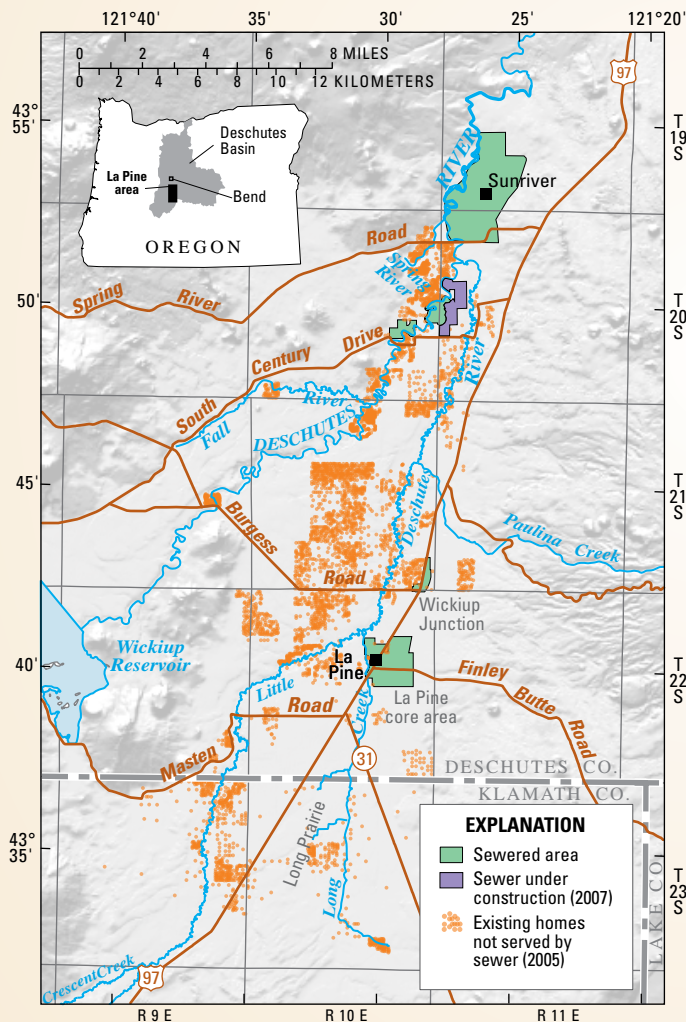


Figure 1. Residential development near La Pine, Oregon, is proceeding at a rapid pace. This map of the area shows the boundary of a USGS study to examine the processes that affect the movement and chemistry of nitrogen in the ground-water system.

The population of rural residential areas near La Pine in southern Deschutes County and northern Klamath County, Oregon, has grown rapidly since the 1960s. Most of these areas lie within a tract adjacent to the Deschutes and Little Deschutes Rivers that extends roughly 25 miles south of Sunriver (fig. 1). Existing and future homes on more than 9,300 residential lots in the area now use or will use individual, on-site septic systems for wastewater disposal and shallow wells for water supply. At least 50 percent of these wells draw ground water from the upper 50 feet of the shallow aquifer that underlies the area (Morgan and others, 2007).

Vulnerability of the shallow aquifer to contamination has led to concern by residents, County planners and resource managers, and State regulators that wastewater from septic systems may pose a threat to the primary drinking water supply if residential development continues at planned densities using conventional septic systems. Another concern is the quality of local streams (Hinkle, Morgan, and others, 2007). The Deschutes and Little Deschutes Rivers, which flow through the developed areas near La Pine, already have excessive algae in some reaches, possibly due to nutrient (nitrogen and phosphorus) contributions from ground water (Anderson, 2000; Jones, 2003).



Septic system being installed near La Pine, Oregon.

Conventional residential septic systems are the principal source of nitrogen to the shallow aquifer in the La Pine area (Century West Engineering, 1982; Oregon Department of Environmental Quality, 1994; Hinkle, Böhlke, and others, 2007), and the nitrate contribution (loading) to the aquifer from these septic systems has increased rapidly as a result of ongoing residential development (fig. 2). Conventional septic systems, including sand filter and pressure distribution systems, are not designed to remove nitrogen from wastewater. Nitrate is a human health concern because it can cause methemoglobinemia (Blue-Baby Syndrome) in infants (<http://www.atsdr.cdc.gov/HEC/CSEM/nitrate/>). The U.S. Environmental Protection Agency has established 10 parts per million (ppm) of nitrogen as the maximum allowable nitrate concentration in drinking water for public water supply systems. Oregon law sets a nitrate concentration of 7 ppm as the level at which regulatory action must be taken to control water-quality degradation.

The city of La Pine was the location of the first concentrated development within the area. The first building permits, recorded in what was then called the core area, date from 1910. In 2006, the core area was incorporated as the City of La Pine. The Oregon Department of Environmental Quality (ODEQ) issued an administrative rule requiring community sewage treatment for the core area after studies in 1979 and 1982 documented nitrate contamination in drinking water wells (Century West Engineering, 1982; Cole, 2006).

Surveys of wells outside of the core area by ODEQ between 1993 and 1995 found unnaturally elevated nitrate concentrations in several of the most densely developed parts of the region

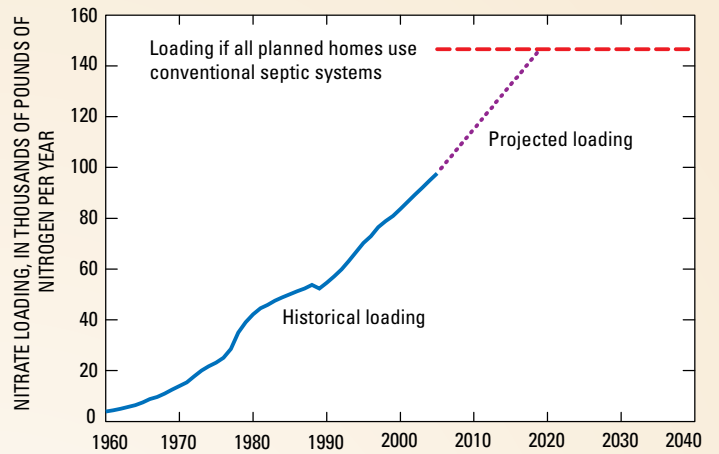


Figure 2. The rapid increase in nitrate loading to the aquifer that supplies drinking water to homes in the La Pine area is due to the rapid pace of residential development.

(R.J. Weick, ODEQ, written commun., 1998; Cole, 2006). The high concentrations were attributed to contamination by effluent from septic systems.

In 1999, Deschutes County and ODEQ 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 order to develop strategies for managing ground-water quality. In response, the USGS, in cooperation with Deschutes County and ODEQ, began a study in 1999 to examine the hydrologic and chemical processes that affect the movement and fate (chemical transformation) of nitrogen within the aquifer (Hinkle, Böhlke, and others, 2007; Morgan and others, 2007). A primary objective was to provide tools for evaluating the effects of existing and future residential development on water quality. The study has provided area residents and local and State agencies the information and tools needed to make informed decisions about the future of development in the La Pine area. Results from the study have been published in several reports (see References Cited). This fact sheet summarizes the results that relate to the effects of septic systems on water quality in the area.



As part of the La Pine area ground-water study, the USGS drilled wells to collect geologic and water-quality data.



Geologists examined drill-core samples to define the geology at different depths.

Is shallow ground water in the vicinity of La Pine vulnerable to contamination from on-site wastewater systems?

Yes, several factors contribute to the vulnerability:

1. The ground-water table is shallow, typically less than 20 feet below land surface and seasonally rising to within 2 feet in low-lying areas (fig. 3).
2. The sandy soils allow rapid infiltration of septic system effluent to the water table.
3. The amount of rain and snowmelt that enters the aquifer is small, which limits dilution of septic system effluent.
4. Most existing drinking-water wells draw water from shallow sand and gravel deposits within 50 feet of land surface. These deposits form the primary aquifer in the area.
5. Fifty-eight percent of lots are less than 1 acre and 82 percent are less than 2 acres, making residential densities relatively high for an area where homes are dependent on individual septic systems and wells.

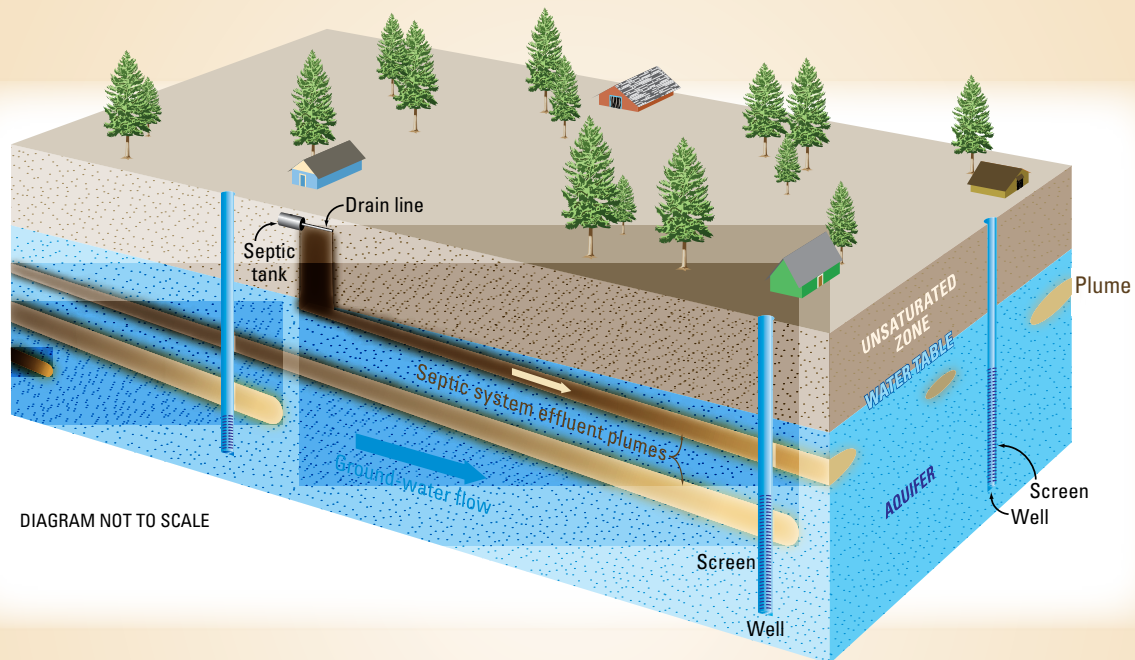


Figure 3. Wastewater from septic systems contains nitrogen in the forms of ammonia and organic nitrogen. As wastewater leaves the septic system drainfield and percolates through the unsaturated zone, these forms of nitrogen are converted to nitrate. When the wastewater reaches the water table it forms plumes of elevated nitrate within the aquifer. The plumes move downward with the ground water and slowly spread. Currently, relatively few wells have water with high nitrate concentrations because these plumes have not had time to reach the depths where most domestic supply wells draw water. As more homes are built, and as plumes move deeper and spread, many more supply wells will be affected.

Why don't more domestic wells in the area have high nitrate levels?

Ground water moves slowly through the shallow aquifer. Because ground water moves slowly, it takes a long time for nitrate to appear in well water.

For example, the severity of nitrate contamination in the La Pine core area did not become evident until 1979, nearly 70 years after development of that area began. Away from the core area, most wells currently provide drinking water that percolated to the water table decades ago, when there were very few homes and septic systems. Nitrate plumes, however, are beginning to affect a significant number of drinking-water wells. Of nearly 200 well samples collected by ODEQ in 2000, over 10 percent had nitrate concentrations above 4 ppm, indicating contamination from septic systems.

Much of the nitrate in the aquifer currently is confined to plumes less than about 30 feet below the water table, so not all supply wells are drawing water from affected areas of the aquifer (fig. 3). As development proceeds and the nitrate plumes expand and move deeper into the aquifer, more wells will be affected. Age dating of ground water in the La Pine area provides additional insight into this process. USGS scientists determined the age of ground water by sampling special monitoring wells and analyzing the water for tracers called chlorofluorocarbons (common refrigerant gases found in the atmosphere). These tracers indicate that nitrate from septic systems is moving downward into deeper parts of the aquifer where more wells will be affected in the future (Hinkle, Böhlke, and others, 2007; Morgan and others, 2007).

Could other sources of nitrate, like agriculture, animals, golf courses, or lawns, cause water-quality problems?

Probably not. Several lines of evidence point to septic systems as the main source of the nitrate (Hinkle, Böhlke, and others, 2007):

1. Agriculture (primarily pasture) represents only about 4 percent of the study area. The four golf courses in the area cover less than 0.4 percent of the study area and are located where they would affect few if any wells. Animal waste contribution is much less than that of humans, and it is deposited on the land surface, where various processes remove nitrogen. Most homes in the area have natural landscaping or small lawn areas; assuming fertilizer is applied at recommended rates, very little nitrogen infiltrates below the root zone and into the ground water.
2. Nitrogen isotope (^{15}N) concentrations can be used to identify the source of nitrate in ground water; nitrogen isotope data for the La Pine area indicate that septic systems are the source of nitrate in the shallow ground water.
3. The occurrence of nitrate in distinct plumes is consistent with localized sources (individual septic systems) and is not consistent with dispersed sources, such as agricultural fields, golf courses, or livestock pasture.
4. Chloride, a wastewater component, is present in the shallow aquifer at higher concentrations than seen outside of the La Pine area or in deep ground water beneath the area. Other sources of chloride, such as agriculture or road salt, are not common in the area. Therefore, the elevated chloride concentrations indicate that the shallow ground water contains a proportion of septic system effluent.



These scientists are measuring the flow of ground water into the Little Deschutes River through the streambed.



The USGS measured water levels in the aquifer under the La Pine area to determine the direction of ground-water flow.

What will happen to water quality if nitrate loading from septic systems continues at projected rates?

Large areas of the shallow aquifer will have nitrate concentrations above 10 ppm, and more nitrate will be carried into streams by ground water.

If residential development proceeds as planned and no efforts are made to reduce the rates of nitrate loading from septic systems, loading is projected to increase 52 percent above 2005 rates (fig. 2). Computer model simulations of this future scenario show that:

1. Peak nitrate concentrations will exceed 10 ppm over large areas of the shallow aquifer (fig. 4). On average, drinking water in those areas will be composed of at least 22 percent septic system effluent.
2. The highest nitrate concentrations will be near the water table, but many wells that draw water from the upper 50 feet of the aquifer will be at risk for nitrate contamination.
3. It will take decades for peak concentrations to occur and decades for concentrations to subside if nitrate loading is reduced.
4. Increasing amounts of nitrate from septic systems will be carried into the Deschutes and Little Deschutes Rivers by ground water.

The computer model integrates the current understanding of nitrogen geochemistry, hydrology, and geology of the aquifer underlying the La Pine area. The model was tested by simulating past ground-water levels, ground-water travel times, ground-water discharge to streams, and ground-water-quality conditions and then comparing the model results with measurements made in the study area. The simulated conditions, including past ground-water nitrate concentrations, matched measured conditions within acceptable limits. These results indicate that the model has sufficient accuracy to be a valid tool for evaluating the potential effects of septic systems on future ground-water quality.

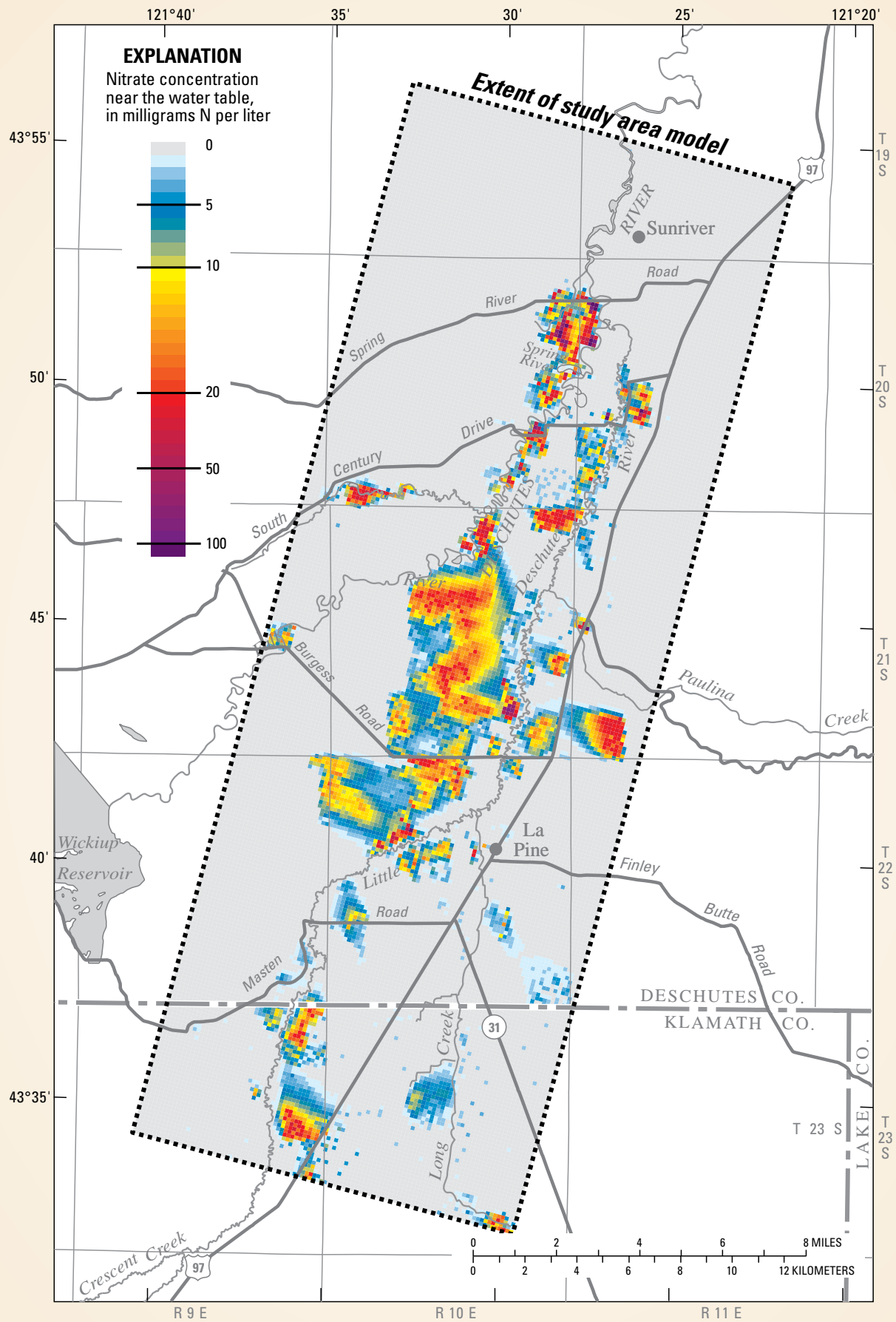


Figure 4. Ground water in much of the shallow aquifer underlying residential areas will exceed State and Federal water-quality standards for nitrate if existing and future homes continue to use conventional septic systems.

How much nitrate can be put into the aquifer while still protecting water quality?

The computer model is a tool that can be used to help answer this question.

The capacity of the aquifer to receive nitrate varies throughout the area and depends on factors related to geology, climate, chemistry, and nearby development. These factors are accounted for by the model, allowing it to compute the maximum sustainable nitrate loading capacity in each of 95 subareas ranging in size from 160 to 640 acres. The maximum sustainable loading capacity also depends on the water-quality protection goals for the aquifer. Model users set the values of water-quality goals, which can be the maximum acceptable nitrate concentration in ground water, the maximum acceptable discharge of nitrate to streams, or both. Goals that are more protective, such as limiting nitrate concentrations in ground water to 7 ppm instead of 10 ppm, reduce the sustainable loading capacity of the aquifer (fig. 5). The model can be used to examine the trade-offs between more stringent water-quality goals and the costs of limiting nitrate loading. Planners and resource managers also can use the model to identify areas where loading from planned or existing development exceeds the sustainable nitrate loading capacity of the aquifer and devise appropriate strategies for reducing loading.

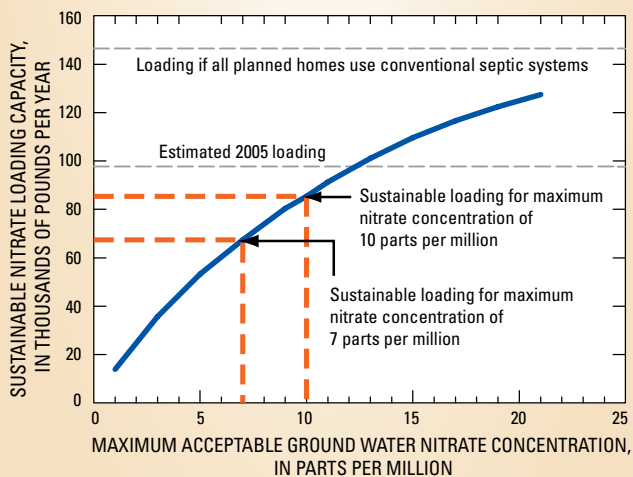


Figure 5. This graph shows the relation between maximum acceptable nitrate concentration in ground water and the sustainable nitrate loading capacity of the aquifer, as determined using the computer model. The graph illustrates that there is a trade-off between the sustainable loading capacity and water quality goals.

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Base Credits for figures 1 and 4.

Base modified from U.S. Geological Survey 1:500,000 state base map, 1982 with digital data from U.S. Bureau of the Census, TIGER/Line (R), 1990 and U.S. Geological Survey Digital Line Graphs published at 1:100,000. Publication projection is Lambert Conformal Conic, Standard parallels 42°20' and 44°40', central meridian -120°30'. Datum is NAD83

John S. Williams, David S. Morgan, and Stephen R. Hinkle
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For more information, contact:

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 (503) 251-3200 <http://or.water.usgs.gov>

South Deschutes County – Groundwater Quality Efforts

Year	Topic	Comments
1960 - 1970	Preplatted Subdivisions	30-square mile area in southern Deschutes County (excluding La Pine Urban Unincorporated Area and Sunriver) was subdivided into over 11,000 lots prior to SB 100 and the establishment of Oregon Statewide Land Use System.
1982	Nitrates Detected in La Pine	Oregon Department of Environmental Quality (DEQ) La Pine Aquifer Study identified high nitrate levels in groundwater underlying the core area of La Pine.
1986	La Pine Core Area	La Pine core area sewered.
1994	Nitrates Detected Outside of La Pine	DEQ identified increasing nitrate levels outside of the La Pine area.
1996	Regional Problem Solving Grant	County received a \$157,250 Regional Problem Solving (RPS) grant from Department of Land Conservation and Development (DLCD) to identify regional problems and evaluate solutions.
1997	Cost / Benefit Analysis for Sewer Feasibility	<i>South County Regional Cost/Benefit Analysis PRS Project Final Report, Sewer Feasibility Study</i> , found creating or expanding sewers in the study area costs between \$19,000 and \$28,000 per household. A 20-year payback at 3% costs between \$1,275 and \$2,880 per household per year. This estimate also assumed that the sewage treatment plant site and related land could be purchased at \$3,000 per acre.
1998	Regional Problem Solving Water Quality Directives	Water Quality Directives resulting from RPS included: <ul style="list-style-type: none"> ▪ Continuing to study nitrates, well head protection, and alternative sewage disposal systems. ▪ Do not build a new sewer system in study area ▪ Reducing residential density to meet the carrying capacity of onsite sewage disposal systems through a market-based Transfer of Development Credit (TDC) Program ▪ Identifying areas where existing community sewer systems can be expanded (La Pine Sewer District). ▪ Supporting Oregon Water Wonderland II efforts to upgrade the existing sewage treatment facilities for that subdivision
1999	National Demonstration Project	DEQ received \$5.5 million grant from U.S. Environmental Protection Agency to study the groundwater, model the aquifer, and field test nitrogen reducing onsite systems not available in Oregon.
1999 - 2004	Groundwater Sampling	DEQ and Deschutes County field sampled groundwater and onsite wastewater treatment system effluent. Results of studies reported at numerous national, regional and state meetings.

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2000	Comprehensive Plan Amendments (RPS)	<p>Deschutes County Comprehensive Plan amended to include certain goals in response to public comments during RPS:</p> <ol style="list-style-type: none"> 1. To preserve water and air quality, reduce wildfire hazards and protect wildlife habitat. 2. To ensure that domestic water derived from groundwater meets safe drinking water standards. 3. To develop an equitable, market-driven system, that reduces the potential development of existing lots in floodplains, wetlands, mule deer migration corridors and areas susceptible to groundwater pollution. 4. To create a new neighborhood, primarily residential in character, between La Pine and Wickiup Junction, that provides services efficiently, sustains economic development and reduces adverse impacts to groundwater quality in South Deschutes County. 5. To explore innovative sewage treatment and disposal methods.
2002	Transferable Development Credits Adopted	TDC Program adopted into County Code.
2003	La Pine National Demonstration Project Findings	Findings of the La Pine National Demonstration Project groundwater investigation and three-dimensional groundwater modeling presented at a public meeting in La Pine.
	Oregon Water Wonderland II Sewer Treatment Facility Upgrade	Board of County Commissioners (Board) approved a Comprehensive Plan Amendment, Zone Change, and exceptions to Goals 4 and 11 for Oregon Water Wonderland II for a 480-acre parcel to establish sewage treatment facilities for that subdivision.
2005	USGS Nitrate Fate and Transport Model Completed	The US Geological Survey (USGS) completed upgrade to a three-dimensional groundwater model and produced a Nitrate Loading Management Model.
	USGS Report	USGS releases a report, <i>Organic Wastewater Compounds, Pharmaceuticals, and Coliphage in Ground Water Receiving Discharge from Onsite Wastewater Treatment Systems near La Pine, Oregon: Occurrence, and Implications for Transport</i> . Organic wastewater compounds, pharmaceuticals, and coliphage (viruses that infect coliform bacteria) in onsite wastewater and in a shallow, unconfined aquifer that serves as the primary source of drinking water for most residents near La Pine was documented.
	TDC Technical Advisory Committee	The County convenes the TDC Technical Advisory Committee to amend the Transferable Development Credit Program to focus resources created by the La Pine Neighborhood Planning Area on solving the groundwater protection problem.
	Pollution Reduction Credits	<p>The TDC Technical Advisory Committee recommends creating a Pollution Reduction Credit program to work in conjunction with a Local Rule to require the use of nitrogen reducing onsite wastewater treatment systems.</p> <p>The Board adopted amendments to the TDC Program to create Pollution Reduction Credits to create financial assistance for homeowners upgrading their existing onsite wastewater treatment systems to better protect groundwater.</p>

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2005	New Alternative Treatment Technologies for Septic Systems	Based on the results of the La Pine National Demonstration Project, DEQ amended state rules to allow alternative treatment technologies in Oregon for onsite septic systems. These systems provide a higher level of treatment for wastewater.
2007	USGS Report	USGS released a report, <i>Evaluation of Approaches for Managing Nitrate Loading from On-Site Wastewater Systems near La Pine, Oregon</i> .
	Draft Local Rule	<p>The Board held three public hearings in La Pine to take testimony on a draft Local Rule that would require that:</p> <ul style="list-style-type: none"> ▪ New development (on bare land) uses the best performing nitrogen reducing systems. If future development installs the best system possible the costs for existing system upgrades are kept as low as possible ▪ All existing systems are upgraded within 10 years of the date the rule is adopted.
	Groundwater Discussions	The Board held a public meeting with the DEQ and DLCD to discuss the groundwater science and modeling and next steps for protecting groundwater in the region.
	USGS Report	USGS releases report, <i>Ground Water Redox Zonation near La Pine, Oregon: Relation to River Position within the Aquifer-Riparian Zone Continuum</i> , acknowledging that the Deschutes and Little Deschutes Rivers, which receive part of their flow from groundwater, are vulnerable to contamination by wastewater from septic systems in southern Deschutes County and northern Klamath County.
2008	DEQ Public Health Hazard Letter	<p>DEQ issued a letter that stated that a public health hazard is being created in the region by continued use of conventional onsite wastewater treatment systems. DEQ stated that potential solutions to this public health hazard may include a variety of approaches ranging from onsite wastewater treatment systems to expanded or new sewer systems through a Goal 11 exception.</p> <p>The Board held a public work session with the DEQ and DLCD to discuss the groundwater science and modeling and next steps for protecting groundwater in the region.</p>
	Financial Advisory Committee	The Board convened a financial advisory committee to provide recommendations for a financial assistance program. This program is intended to help residents of south Deschutes County offset the costs of installing groundwater protection measures.

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2008	Draft Local Rule	<p>The Board held a public hearing in La Pine to take testimony on a revised draft Local Rule that would require that:</p> <ul style="list-style-type: none"> ▪ New residential development (on bare land) uses the best performing nitrogen reducing systems. If future development installs the best system possible the costs for existing system upgrades are kept as low as possible ▪ All existing systems are upgraded within 10-14 years of the date the rule is adopted.
	Ordinance 2008-019 (Advance On-site Treatment Systems for New Residential Development)	<p>The Board adopted Ordinance 2008-019. <u>CDD currently administers OAR 340-071-130(1), Nitrogen-Reducing Systems today by requiring advanced onsite wastewater treatment systems for:</u></p> <ol style="list-style-type: none"> 1. New residential dwellings, 2. Major septic repairs (repairs to drainfields, this does not include tank replacements), and 3. Major residential alterations (changes that would cause increases in flows or proposing to connect to a system that doesn't meet minimum sizing requirements for the use).
	Local Rule Adopted	<p>The Board adopted Ordinance 2008-012 which required:</p> <ul style="list-style-type: none"> ▪ All existing septic systems to be upgraded to an approved nitrate reducing system or other methods to prevent nitrate pollution from conventional septic systems by November 2022. <p>6,500 existing septic units in southern Deschutes County affected by this requirement. Cost estimates for property owners at the time were between \$7,000-\$16,000.</p>
	Nitrate Loading Management Model Adopted	<p>The Board adopted Resolution 2008-021, adopting a Nitrate Loading Management Model to establish performance measures for onsite wastewater treatment systems. The model could be used to identify performance standards for onsite systems that maintain no higher than 7 mg/L nitrate as N average concentrations in the shallow groundwater in accordance with Oregon Administrative Rule 340-040, Groundwater Quality Protection. Minimum and maximum nitrogen regulation requirements and locations for the performance standards were established.</p>

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2008 - 2009	High Groundwater Project	<p>Deschutes received a \$90,000 DLCD Technical Assistance Grant to provide support for a technical committee and community involvement process to address land-use and water quality issues in South Deschutes County. Three months of community conversations identified numerous priorities including:</p> <ul style="list-style-type: none"> ▪ Involving the community in decisions affecting South County ▪ Reducing wildfire hazards ▪ DEQ and sewer districts leading the formation or expansion of sewer systems ▪ Deschutes County leading an effort to construct and pave roads ▪ Additional protection of natural resources <p>However, residents remained deadlocked on development in high groundwater areas.</p>
2009	Local Rule Overturned	Voters overturned Ordinance 2008-019 by voting “No” to Measure 9-70, a special election ballot referendum. “No” carried with 56.99% of the vote.
	DEQ Takes Over Groundwater Protection	Deschutes County, DLCD, members of La Pine community met with DEQ to discuss next steps. The Board requested that DEQ take the lead on groundwater protection, expressing that it has exhausted its efforts to address the issue on a local level. DEQ agreed.
2010 - 2013	DEQ Groundwater Steering Committee	DEQ assembled a steering committee of community members to discuss and make recommendations to improve groundwater protection in South Deschutes and North Klamath counties. They met over 20 times for nearly three years.
2010	Nonconforming Loan Program	Deschutes County entered into a Personal Services Contract with NeighborImpact to administer a nonconforming loan program for septic upgrades in South Deschutes County. The purpose of the contract is to establish a separate lending pool for South Deschutes residents who have been disqualified from the existing loan program due to mortgage delinquency and/or inadequate equity. Deschutes County has funded the loan program (grants, Newberry Neighborhood land sales) with a total contribution of \$240,000. Disbursements in the amount of \$60,000 to NeighborImpact occurred in FY 2011, FY 2012, FY 2014 and FY 2017. <u>The program in partnership with NeighborImpact remains in effect today.</u>
	Sunriver Sewer Feasibility Study	Sunriver LLC completed, <i>South Deschutes County Sewage Collection, Treatment, and Disposal Feasibility Study</i> , supported by DEQ and Deschutes County that examined the cost of extending sewer into rural areas south of Sunriver.

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2010	Rebate Program	The Board adopted Order 2010-006, establishing a nitrogen reducing onsite wastewater treatment rebate program administered by the Community Development Department. The amount of the rebate based on meeting certain conditions is \$3,750. Funds are derived from the sale of County-owned property (Newberry Neighborhood) in the city of La Pine. <u>The rebate program remains in effect today.</u> To date, CDD has issued 149 rebates.
2011	South County Local Wetland Inventory	The Board adopted a South County Local Wetland Inventory. It replaced the National Wetland Inventory for South County and improved the accuracy in the identification of jurisdictional wetland characteristics in the upper Deschutes Basin. Functions that were evaluated included wildlife habitat quality, contribution to fish habitat, water quality improvement, and floodwater retention capability.
2013	DEQ Groundwater Steering Committee Recommendations	<p>DEQ released, <i>South Deschutes/North Klamath Groundwater Protection Report and Recommendations</i>. DEQ steering committee approved a list of recommendations to address groundwater contamination in the area, then having fulfilled its mission, voted to disband. Recommendations included:</p> <ol style="list-style-type: none"> 1. A Goal 11 exception for at-risk areas in South Deschutes and North Klamath counties; 2. DEQ design a testing program to determine whether there is a groundwater contamination problem, and if so, where it might be located; 3. Form a Sanitation Authority to protect the groundwater in the affected area spanning South Deschutes and North Klamath counties; 4. Institute an ordinance that limits the number of livestock per acre to reduce risk to groundwater contamination and provide education to manage livestock; 5. Investigate establishing a permitting/groundwater monitoring program for all golf courses, nurseries and other point sources; 6. Explore an ATT moratorium; 7. Explore disadvantaged community financing solutions; 8. Establish an outreach committee to educate the community; and 9. Explore alternative “green” solutions for disposing human waste.

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2013	Newberry Country Plan / Policies	<p>Board adopted, <i>Newberry Country, A Plan for Southern Deschutes County</i>, into the Comprehensive Plan. Policies include:</p> <ul style="list-style-type: none"> ▪ Consider an ordinance to limit the number of livestock allowed on small acreages in order to limit nitrates from entering the groundwater and protecting public health; ▪ Use all the proceeds derived from the sale of County-owned property in the La Pine Neighborhood Planning Area to protect the groundwater in South Deschutes County, through methods such as funding septic system repairs and upgrades to qualifying low-income homeowners; ▪ Evaluate and revise as needed, the TDC and Pollution Reduction Credit programs; and ▪ Explore opportunities for Goal 11 exceptions and the full range of advance wastewater treatment opportunities.
2014	Livestock and Animal Husbandry	<p>Planning Commission convened a domestic livestock panel comprised of representatives from Deschutes Soil and Water Conservation District, the Oregon Department of Agriculture, Oregon State University (OSU) Extension Services, and the South Deschutes/North Klamath Groundwater Protection Project Steering Committee. The panel and subsequent public comments focused on the importance of best management practices and several educational opportunities that are currently available to rural property owners. Planning Commission recommended that while there is no need for additional land use regulations, there is an extraordinary opportunity to emphasize the value of the information gathered during this process.</p> <p>The Board agreed with the Planning Commission's recommendations regarding rural residential domestic livestock and animal husbandry, directing staff to develop and/or promote:</p> <ul style="list-style-type: none"> ▪ An education and enforcement contacts matrix ▪ Links to web sites of related organizations ▪ An Upper Deschutes Agricultural Water Quality Management Area Plan ▪ A Deschutes County Rural Living Handbook ▪ Deschutes County Code Chapter 13.36, Nuisances and Abatement

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2015 - 2016	Goal 11 Exception	DEQ, DLCD and the Community Development Department initiated a legislative amendment updating the County’s Comprehensive Plan to take an exception to Statewide Planning Goal 11 (Public Facilities and Services) to allow for sewers in unincorporated lands in southern Deschutes County. After numerous public hearings with the Planning Commission and the Board, the Board adopted Ordinance 2016-007 taking an exception to Goal 11.
2016	Goal 11 Exception Remand from LUBA	<p>Central Oregon Landwatch (COLW) appealed Ordinance 2016-007 to the Land Use Board of Appeals (LUBA). COLW argued the Record did not demonstrate there was an imminent and significant threat to public health per OAR 660-011-0060(9). LUBA concurred and remanded the decision back to the County. Notable excerpts of LUBA’s decision included:</p> <ul style="list-style-type: none"> ▪ Deschutes County, DEQ, and DLCD did not demonstrate there is imminent public health hazard that necessitates extending sewers. ▪ It is the scope of the exception (11,000 lots), the area of the exception (180 square miles), and the indefiniteness of the number and location of the lots, if any, that will be connected to the sewer system that makes it improper. ▪ The ordinance impermissibly “established a planning or zoning policy of general applicability” that allows sewer systems in order to facilitate residential development on rural lands in the county. ▪ Deschutes County, DEQ, and DLCD need to explain how sewer service that they describe as “necessary to guard against unacceptable levels of pollution in the area’s groundwater that would expose citizens to health risks” will correct the problem when connection to the sewer system is entirely optional.
2022 - 2024	DEQ Groundwater Monitoring Study	DEQ initiated a groundwater monitoring study for South Deschutes County. Results expected in 2024.

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2023	<p style="text-align: center;">DEQ Future Septic Development and Variance Letter</p>	<p>DEQ provided a letter to the Board recommending the County and DEQ staff meet and begin to discuss possible next steps to address groundwater protection. Items included:</p> <ul style="list-style-type: none"> ▪ DEQ variance process ▪ DEQ 2023 sampling of private wells ▪ Public health hazard and Goal 11 exception ▪ Meetings with non-governmental organizations to support and fund alternatives ▪ High groundwater lots ▪ Rule modifications ▪ Monitoring existing wells ▪ Groundwater Management Area declaration