

Oregon's Nutrient Management Program

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1. Introduction

In March 2011, the U.S. Environmental Protection Agency published a memo describing seven steps that states should take to address excess nutrients that cause reduced oxygen levels (eutrophication) in fresh, estuarine, and coastal waters; impairment of drinking water sources; and hazardous algal blooms. The memo outlined seven steps that states should take to address excess nutrients:

1. Prioritize watersheds on a statewide basis for nitrogen and phosphorus loading reductions.
2. Set watershed load reduction goals based upon best available information.
3. Ensure effectiveness of point source permits in targeted/priority sub-watersheds.
4. Develop watershed-scale plans that target the most effective practices for nutrient reductions in agricultural areas.
5. Identify how the state will use state, county and local government tools to assure nitrogen and phosphorus reductions for stormwater and septic systems.
6. Develop accountability and verification measures.
7. Conduct annual reporting of implementation activities and biannual reporting of load reductions and environmental impacts associated with each management activity in targeted watersheds.
8. Develop a work plan and schedule for numeric criteria development.

This document describes Oregon's Nutrient Management Program, organized by the steps EPA outlined in its memo. In general, the report describes the state of the program as it exists today, as well as describing emerging issues. However, as priorities develop and change, or as resources are available to address certain nutrient management challenges, Oregon Department of Environmental Quality may modify the program accordingly.

Nutrient-related water quality issues in Oregon generally occur in slower-moving valley bottom streams and lakes. Nutrient inputs into Oregon waters do not contribute to large-scale impairments, such as those in the Gulf of Mexico or Chesapeake Bay. Evidence indicates that nutrients from the Columbia River are not a causal factor for periodic anoxia (total oxygen depletion) in the Pacific Ocean off the coast of Oregon that's been reported since 2002. Evidence indicates that periodic nutrient-rich upwelling from deep ocean waters is generally responsible for anoxia¹.

While there are no widespread nutrient concerns in the state, excess nutrient loads contribute to localized water quality issues in certain streams, lakes and estuaries. DEQ's overarching objective is to address nutrient inputs where they are contributing to water quality impairments for nuisance algal blooms, dissolved oxygen, chlorophyll and pH. At the same time, Oregon is committed to finding cost-effective ways to prevent nutrient inputs on a statewide level, such as phosphate detergent bans and limits to direct discharges to lakes.

Overall, DEQ has developed nutrient load reduction goals for at least 16 waterbodies (with at least two more in development) through development of total maximum daily loads. Moreover, DEQ has developed nitrogen and phosphorus permit effluent limits for dischargers to these waterbodies for at least 37 end-of-pipe or point pollution sources. In addition, DEQ developed water quality improvement plans for these waterbodies that describe how TMDL pollution reduction goals will be met.

¹ Chan, F., J. A. Barth, J. Lubchenco, A. Kirincich, H. Weeks, W. T. Peterson, and B. A. Menger. "Emergence of Anoxia in the California Current Large Marine Ecosystem." *Science* 319 (2008): 920. Web.

Oregon also addresses nutrients through statewide legislation and programs, such as laws that ban the use of phosphorus in laundry and dishwasher detergents, as well as DEQ's groundwater protection area program, its municipal stormwater permits and Onsite Protection Program.

In agricultural areas, the Oregon Department of Agriculture addresses excessive nutrient runoff through implementation of its 38 Agricultural Water Quality Management Area Plans and Rules (associated regulations). Numerous financial incentives are available to encourage agricultural landowners to reduce nutrient runoff, including programs through the state Soil and Water Conservation Districts, Oregon Watershed Enhancement Board, DEQ's Section 319 nonpoint grants, and federal grant programs. The Oregon Department of Forestry also addresses nutrients in its fertilizer application management program.

The presence of hazardous algal blooms, primarily in lakes and reservoirs, is an emerging issue at least partially related to excess nutrients in Oregon.² DEQ identified 32 lakes and reservoirs as impaired due to algal blooms in its 2010 Integrated Report. As DEQ develops total maximum daily loads and other strategies to address these hazardous algal blooms, the agency will analyze the extent to which nutrients are a causal factor.

² Oregon Department of Environmental Quality. 2011. *Oregon DEQ Harmful Algal Bloom (HAB) Strategy*, by Andy Schaedel, Portland, OR.

2. Prioritizing watersheds for nutrient management

One of DEQ's primary tools for managing nutrients is to establish Total Maximum Daily Loads (TMDLs) for waters identified in DEQ's 303(d) water quality assessment as not meeting one or more of the following water quality standards:

- Chlorophyll a (OAR 340-041-0019)
- Dissolved oxygen (OAR 340-041-0016)
- pH (OAR 340-041-0021)
- Deleterious algal growth (OAR 340-041-007(10))
- Biocriteria (OAR 340-041-007(340-041-0011))
- Phosphorus in the Yamhill River Basin (OAR 340-041-0344(5)(a))
- Phosphorus in Clear Lake and Collard Lake (OAR 340-041-0225)

Through the TMDL, DEQ identifies the causes of the water quality impairment. If nutrient loading is a contributing factor, the sources of nutrients are identified and a pollution-reduction plan is developed. Nitrogen and phosphorus targets and load and waste load allocations are established and assigned to the contributing sources in order to reduce the pollutant load.

For the first three standards on this list, DEQ employs numeric criteria to determine if state standards are met.³ For the narrative deleterious algal bloom standard, DEQ has relied on health advisories for blue-green algae issued by the Oregon Health Authority, as one method to identify concerns and 32 water bodies were added to DEQ's 2010 303(d) list. DEQ also has relied on expert reports from the Center for Lakes and Reservoirs and Portland State University as a basis for impaired listings under the narrative deleterious algal bloom standard.

DEQ has prioritized development of TMDLs for nutrients, as well as for other parameters. Key drivers of priorities include:

- Best professional judgment regarding pollutants posing the greatest threat to beneficial uses in each watershed
- Responses to litigation
- Commitments made to EPA Region 10 in DEQ's annual performance partnership agreement funding discussions
- Priorities identified in integrated reports on water quality
- Upcoming National Pollutant Discharge Elimination System permit renewals

While using this process is not an ideal way of determining priorities, DEQ expects that the need to prioritize TMDL development will continue due to resource limitations. In the past 10 years, much emphasis has been placed on developing TMDLs for Oregon waters that do not meet DEQ's temperature criteria. While these TMDLs do not specifically address nutrient pollution, management activities designed to address temperature impairments, such as riparian restoration, also should also result in reductions of nutrient loads.

³ For additional details about Oregon's methodology for listing, visit the Assessment Report Methodology document at <http://www.deq.state.or.us/wq/assessment/docs/2010AssessmentMethodology.pdf>.

At some point, as resources allow, DEQ may develop additional methods to interpret and apply the state's narrative deleterious algal bloom criteria. The Hazardous Algal Bloom Strategy that DEQ developed in 2011 will guide future work in this area.

1. Watershed Approach

The Watershed Approach to improve the state's water quality provides DEQ with a good tool to help identify where nutrients may lead to water quality impairments. For example, in its North Coast Basin water quality status and action plans, DEQ identified a need to determine if nutrients were resulting in algal blooms in two lakes in that region. The plan also identified Tillamook Bay as an area where additional information was needed to examine dissolved oxygen issues. DEQ may use information from the water quality status and action plans in its 303(d) water quality assessments as well as prioritizing local actions.

2. HAB Surveillance

DEQ has begun addressing hazardous algal blooms in its listing and TMDL priorities. DEQ identifies a waterbody (usually a lake or reservoir) as impaired if the Oregon Health Authority publishes a health advisory due to HABs. OHA hazardous algal bloom listings are based on one or more of the following criteria:

- visible scum with supporting photographs and analysis
- cell counts of all toxigenic species exceeding 100,000 cells/mL
- cell counts of *Microcystis* or *Planktothris* greater than 40,000 cells/ML
- toxin testing above guideline values

In its 2010 integrated report, DEQ listed 28 lakes as impaired due to OHA-published HABS listings, in addition to four listings based on reports from the Oregon Department of Agriculture and the U.S. Forest Service. In addition, several other lakes in Oregon have been listed in previous reports for HABS based on reports by the Center for Lakes and Reservoirs at Portland State University.

3. Watershed load reduction goals based on best available information

1. Identification of load reduction goals through TMDL development

DEQ utilizes its TMDL process to set instream targets and load reduction goals. Nutrient reduction goals are primarily set to ensure that waterbodies meet water quality standards for dissolved oxygen, chlorophyll *a*, pH, and nuisance algal growth. For any TMDL addressing one or more of these parameters in a given waterbody, DEQ examines nutrient data and data for other parameters, such as temperature, light, carbonaceous and nitrogen biological oxygen demand, ammonia, and sediment oxygen demand. Depending on the amount and type of data available, DEQ may use different methods to determine which parameters result in the water quality impairment. In some cases, simple correlation or multiple regression analysis may be used. In other cases, more sophisticated computer models have been utilized. If nutrients cause or contribute to the impairment, DEQ proceeds to develop load and wasteload allocations for the nutrient(s).

To date, DEQ has found that excess nutrients are causing or contributing to impairments for at least 16 streams, lakes, and estuaries (Table 1). Of these 16 waters, 14 are listed as impaired for pH, 12 for dissolved oxygen, four for chlorophyll *a*, and one each for nuisance algae, aquatic weeds and algae, and phosphorus⁴ (some are listed for multiple parameters). There are many Oregon waters that are listed as impaired for these pollutants and for which TMDLs are under development or will be developed; in these cases, nutrients will be considered in the same manner as described here.

TMDLs include allocating loads to sectors or designated management agencies and WQMPs that include control measures designed to meet the waste load allocations and load allocations in the TMDL, including a categorization of sources and a description of the control measures proposed for each source category; timelines for implementing control measures including schedules revising permits, achieving appropriate incremental and measurable water quality targets, and completion of other measurable milestones; explanation of how implementing the control measures will result in attainment of water quality standards or represent control to the maximum extent practicable; identification of sector-specific or source-specific implementation plans at the time the TMDL is issued.

⁴ The South Umpqua River was listed as impaired for phosphorus in 1998, based on samples exceeding phosphorus criteria of 0.1 mg/L; it is not clear when that criterion was established. In 2010, DEQ delisted the site, as a TMDL was approved by EPA. The TMDL addresses numerous impairments for dissolved oxygen, chlorophyll *a*, and algae, as well as the phosphorus impairment.

Table 1. Nutrient load reduction targets in Oregon waterbodies.

Waterbody (TMDL date)	Limitation	Cause	Pollutant	Nutrient Instream Target
Garrison Lake (1988)	pH, Chl _a	phytoplankton	TP	576 lbs / year
Tualatin (1988, 1994; revised 2001)	pH and DO	phytoplankton	NH ₃ , TP, BOD, settleable solids	TP: 40 to 110 µg/L
Bear Creek (1992; revised 2007)	pH and DO	periphyton	TP and BOD	TP: 100 µgP/L
Yamhill (1992)	pH and DO	phytoplankton	NH ₃ , TP, DO, BOD, TSS	TP: 50 ó 70 µgP/L
Coast Fork Willamette (1996)	pH and DO	periphyton	DOP,	DOP: 11 µgP/L
Grande Ronde, Catherine Creek (2000)	pH and DO	periphyton	DOP, DIN	DOP: 7 µgP/L DIN: 20 µgN/L
Upper Klamath Lake (2002)	pH	phytoplankton	TP	~110 ug/l annual lake mean TP; ~30 ug/l spring (March ó May) lake mean TP; ~66 ug/l annual mean TP from all inflows;
Snake River (2004)	Nuisance algae, DO	periphyton	TP	TP: 70 µgP/L
Zollner Creek (2006 ó part of Willamette River TMDL)	Nitrate	Nitrate	NO ₃	TN: ~22 kg/day*flow
South Umpqua River (2007)	DO, pH, Chl _a , phosphorus	periphyton	TP and DOP	DOP: 8 µgP/L* TP: 14 µgP/L
Cow Creek (2007)	pH and DO	periphyton	TP and DOP	DOP: 10 µg/L* TP: 20 µg/L
Jackson Creek (2007)	pH	periphyton	DOP and DIN	DOP: 35 µg/L* DIN: 45 µg/L
Steamboat Ck (2007)	pH and DO	periphyton	DOP and DIN	DOP: 21 µg/L* DIN: 30 µg/L
Calapooia Ck (2007)	pH and DO	periphyton	Phosphorus and organic solids	TP: 20 µg/L*
Tenmile Lake (2007)	Aquatic weeds and algae	phytoplankton	Sediment Load with a TP target	0.07 tones/ha/yr with a 50% reduction within 25 years; TP target of 7.1 µg/L
Malheur River (2010)	To meet Snake River TMDL		TP	TP: 70 µgP/L
Draft Klamath River	DO, pH, Chl _a , ammonia toxicity	phytoplankton, periphyton, BOD	TP, TN, 5-day BOD	TP: 27 µg/L * (1) TN: 520 µg/L * (1) BOD: 1.7 mg/L (2)
Draft Lost River	DO, Chl _a , pH, ammonia tox.	macrophytes, BOD	CBOD, DIN	Not reported

2. Analysis of causal factors for HABS.

As they've become an emerging issue in Oregon, DEQ has begun to place special emphasis on the causal factors of HABS. In 2011, DEQ developed a HAB strategy with many recommendations on steps needed to address HAB proliferation.⁵ TMDL development for many HABS-impaired lakes and reservoirs likely won't happen for several years. However, DEQ is interested in determining what causal factors (nutrients, light, BOD, or other ecological stressors) result in HABS proliferation. DEQ received contractor support from EPA for a pilot project to identify models that could be used for determining the causal factors for HABS. As additional resources permit, DEQ could pursue this effort or other needs that will assist in addressing HABS proliferation.

⁵ Oregon Department of Environmental Quality. 2011. *Oregon DEQ Harmful Algal Bloom (HAB) Strategy*, by Andy Schaedel, Portland, OR.

4. Point source permits in targeted/priority sub-watersheds

DEQ has a number of mechanisms in place to ensure that point source discharges of nutrients do not cause or contribute to water quality impairments for DO, pH, chlorophyll *a*, or nuisance algae. The primary mechanism is developing water quality based effluent limits designed to meet the wasteload allocations identified in TMDLs. In addition, the State of Oregon passed legislation in the 1970s banning discharges to lakes with limited exceptions. More recently, DEQ has begun to implement a nutrient trading regime within the Tualatin River watershed to meet phosphorus targets where phosphorus has contributed to pH and DO impairments, while ensuring that such targets are met in an economically efficient manner.

1. Water Quality Based Effluent Limits (WQBELs)

If nutrients are found contribute to a waterbody impairment, DEQ develops a wasteload allocation that would lead to the waters meeting water quality standards. The targets are generally calculated models.⁶ DEQ generally uses QUAL2Kw (in conjunction with Heat Source) for smaller streams and CE-QUAL-W2 for larger streams; DEQ also uses spreadsheet-based models in some cases.

Once a target has been developed, DEQ may use models or simple calculations to determine WLAs to reduce nutrients in the point source. In developing WLAs, DEQ may establish them for facilities that discharge directly to the reach that is impaired, or may establish WLAs for facilities that discharge upstream of the impaired water and which contribute pollutants which result in the impairment. DEQ may allow higher loads during higher flow periods and/or higher loads and concentrations during cool weather months when algal growth is temperature limited.

To date, DEQ has developed nutrient WLAs and effluent limits for at least 37 individual NPDES permittees throughout the state including 27 wastewater treatment plants, six industrial facilities, a hatchery, an irrigation district, a landfill, and a school (Table 1)⁷. These wasteload allocations have been incorporated as water quality-based effluent limits (WQBELs) in permits for these facilities.

As part of TMDL development, DEQ analyzes the extent to which point sources covered under general NPDES permits contribute to nutrient loads. For example, in the Tualatin TMDL, DEQ identified 59 total sources that must meet narrative effluent limits (i.e., best management practices) designed to meet in-stream phosphorus targets. In the draft Lost River TMDL, DEQ looked at data from 19 general NPDES sources and determined they don't significantly contribute to nutrient loads.

2. Nutrient limits and monitoring in general NPDES permits

A few general NPDES permits have specific prohibitions for nutrients or require monitoring:

- The 300-J permit for fish hatcheries requires quarterly effluent and effluent discharge cleaning monitoring for total phosphorus and ammonia-nitrogen. In addition, the permit prohibits disposal

⁶ Earlier TMDLs do not indicate the method by which nutrient targets were established.

⁷ DEQ anticipates developing nutrient WLAs for 3 point sources (Powers, Myrtle Beach, and Coquille) discharging to the Coquille River and South Fork Coquille River in a few months.

of untreated waste, dead fish, fish eggs, or processing waste in a manner that prevents such materials from entering waters of the state.

- The 1700-A washwater permit requires that all chemicals, soaps, or detergents used be phosphate-free.

3. Prohibition of discharges to lakes

In Oregon, no point source discharge of wastes to lakes or reservoirs is allowed. A Statewide Narrative Criteria (OAR 340-041-0007 (4)) states: "No discharges of wastes to lakes or reservoirs may be allowed except as provided in section OAR 340-041-0004(9)."⁸

This rule has been of great benefit for preventing point source discharge of nutrients directly to these water and should be continued. The benefits of diverting wastewater, including secondary treated domestic wastewater and dairy wastewater, have been well documented in studies of numerous lakes. There still may some potential concerns where a discharge may have existed prior to this rule (estimated as 1976) or where the discharge is upstream of a reservoir or a river system that acts like a reservoir (e.g. the lower Tualatin River) would not be addressed by this rule. These situations can be addressed through TMDLs where alternatives can be explored for determining what is best for the system (e.g. whether it is better to have no discharge to the system, require a high level of treatment such as required in the Tualatin TMDL or other alternative). For example, in the Garrison Lake, to relocate its discharge from a tributary that entered Garrison Lake. The discharge was moved outside of the Garrison Lake watershed.

4. Limits to phosphates in dishwasher and laundry detergents

In 1992, the Oregon legislature passed a law limiting the amount of phosphate in laundry detergents to 0.5%. In 2009, the legislature passed similar legislation limiting phosphate in dishwasher detergent to 0.5%. DEQ does not have quantitative information regarding the extent to which these requirements resulted in decreased loading; however, they likely have decreased loads from wastewater discharges substantially, especially in urban areas.

⁸ The rule describes is part of Oregon's antidegradation policy, which allows discharges if standards are not violated, the benefits of lowered water quality outweigh the environmental costs of reduced water quality, no beneficial uses will be impaired, and the receiving water isn't classified as being water quality limited.

Table 2. Sources for which DEQ has developed Permit Limits or WLAs.

TMDL	Permit Holder	Wasteload Allocation
Garrison Creek	Port Orford STP	0 lbs. TP/year
Tualatin	Forest Grove, Hillsboro, and Rock Creek STPs	Combined 66.1 lbs TP/day (proposed)
	Durham STP	0.11 mg TP/l monthly median 0.26 mg TP/l daily max
Bear Creek	Ashland STP	2 lbs TP/day
Yamhill	Carlton, Lafayette, McMinnville, Yamhill STPs	70 ug/l
Coast Fork Willamette	Cottage Grove STP	60 ug/l DOP
Upper Grand Ronde (Catherine Creek)	La Grande, Union STPs	No discharge
Upper Klamath Lake	Chiloquin STP	0.3 metric tons TP/year
	Crooked Creek Hatchery	1.3 metric tons TP/year
Snake River	Nyssa STP	2.2 kg TP /day
	Amalgamated Sugar	50 kg TP /day
	Heinz Frozen Foods	83 kg TP /day
	Ontario STP	0 kg TP /day
South Umpqua River	Sutherlin STP	0 lbs TP/day
	Oakland STP	0 lbs TP/day
	Glendale STP	2.8 lbs TP/day
	Riddle STP	1.1 lbs TP/day
	Tiller Ranger Station	.046 lbs TP/day
	Canyonville STP	1.2 lbs TP/day
	Myrtle Creek STP	1.8 lbs TP/day
	Winston Green STP	1.9 lbs TP/day
	Roseburg Landfill	0.1 lbs TP/day
	Roseburg Urban Sanitation Authority STP	3.4 lbs TP/day
Columbia Slough	Lucky Farm (fmly. Oregon Fresh Farms) (food packaging)	No measurable increase in total phosphorus levels (varies based on flow).
Klamath River (Draft)	Klamath Falls STP	9.6 lbs TP/day; 618 lbs TN/day
	South Suburban STP	6.0 lbs TP/day; 390 lbs TN/day
	Columbia Forest Products	2.1 lbs TP/day; 10 lbs TN/day
	Collins Forest Products	3.5 lbs TP/day; 21 lbs TN/day
Lost River (Draft)	Henley School	0
	Klamath Irrigation District	0 (not expected to contribute)
Umatilla River	Shearer Foods (Snack Alliance)	Groundwater nitrate-N not to exceed 10.0 mg/L.

5. Nutrient reduction programs in agricultural and forestry areas

Load allocations (LA) for nitrogen and/or phosphorus have been developed in seventeen watersheds, the basins of which cover a substantial portion of the state (Table 1). In agricultural areas, the Oregon Department of Agriculture (ODA) is the primary designated management agency (DMA) in charge of implementing and monitoring load allocations for surface waters and Groundwater Management Area (GWMA) action plans through its Agricultural Water Quality Management Area Plans and Rules (associated regulations).

ODA also oversees the Confined Animal Feeding Operation (CAFO) program, which it jointly develops with DEQ. ODA issues and enforces CAFO permits in Oregon. These permits include requirements for collecting, storing and using or disposing of animal waste and for managing the application of animal waste on the land so that excess loads will not runoff into surface waters or leach into groundwater.

Many of the on-the-ground activities on agricultural lands are funded and overseen by Oregon's Soil and Water Conservation Districts (SWCDs). Other funding and technical assistance mechanisms include the Oregon Watershed Enhancement Board (OWEB) grants, DEQ's Section 319 Grants, and assistance provided by the U.S. Department of Agriculture Farm Service Agency and Natural Resource Conservation Service.

The Oregon Department of Forestry oversees fertilizer application in the state's forests under the Forest Practices Act.

In addition to the water quality management plans, DEQ's basin assessments, as described in Section 1 of this document, also provide a good opportunity for the agency to target needed actions for nutrient reductions in agricultural areas. Many of these can then be incorporated into priorities for on-the-ground activities.

1. Agricultural Water Quality Management Area Plans and Rules

The Agricultural Water Quality Management Act (ORS 568.900 to 568.933) authorizes the Oregon Department of Agriculture (ODA) to develop Agricultural Water Quality Management Area Plans (area plans) throughout the state. The statute also authorizes the development of Agricultural Water Quality Management Area Rules (area rules). ORS 561.191 says that ODA shall develop and implement any program or rules that directly regulate farming practices to protect water quality. ODA develops area plans and regulations for 38 regions covering all of Oregon. ODA develops the plans and regulations with a local advisory committee (LAC) in each water quality management area. Area plans and regulations are required to be reviewed and updated every two years.

Agricultural water quality management area plans and regulations must be sufficient to prevent and control water pollution and meet water quality standards and TMDL LAs. If DEQ determines that the plan and rules are not adequate to implement the LA, DEQ provides ODA with comments on what would be sufficient to meet TMDL load allocations. If a resolution cannot be achieved, DEQ can request the Environmental Quality Commission to petition ODA for a review of part or all of water quality management area plan and regulations implementing the TMDL. (OAR 340-042-0080)

Some area plans and regulation address nitrogen and phosphorus directly. For example, the Middle Deschutes and Upper Grand Ronde Agricultural Water Quality Rules specifically note that:

“Upon rule adoption, nutrient application rates and timing must not exceed specific crop requirements. Crop nutrients will be based on recommendations from the best available data applicable to a specific site.” (OAR 603-095-0440 and OAR 603-095-1640)

Many water quality management area regulations have requirements for streamside vegetation to prevent inputs of sediment, nutrients, and heat into the stream. A few others have nutrient application and management requirements. These rules have a range of specificity from relatively vague to specific.

LACs prepare progress reports every two years that discuss area plans and regulations, activities of each soil and water conservation district, and priorities for water quality. Some progress reports specifically discuss nutrient management activities. For example, the Middle Deschutes Area Progress Report details a study being conducted there to determine the source of high levels of nitrates in the groundwater there.

2. Soil and Water Conservation Districts

Oregon’s SWCDs help landowners complete a variety of projects to protect and improve water quality. Oregon began providing funding to the SWCDs in 1997. According to ODA, during the 2009-2011 biennium, the SWCD accomplished the following activities that will assist in reducing nutrient loads:

Streamside Restoration Projects

- 750 acres of riparian restoration
- 295,000 feet of fencing
- 140 livestock water facilities

Nutrient and manure management

- 2,200 acres of nutrient management
- 13 comprehensive nutrient management plans
- 25 manure storage and composting facilities

Erosion control and soil quality

- 11,291 acres of no-till and other conservation cropping strategies
- 192,270 feet of erosion control terraces
- 152 sediment control basins

Range and pasture management

- 13,200 acres of weed and juniper control treatments
- 50 livestock water facilities (in addition to those reported above in “Streamside Restoration Projects.”)

Irrigation efficiency

- 27 irrigation system upgrades
- 4,600 acres of efficient irrigation water management
- 52 pipeline projects

3. Natural Resource Conservation Service Programs

DEQ and ODA work with the NRCS to evaluate projects that receive federal assistance through the Environmental Quality Incentives Partnership (EQIP) and Conservation Stewardship Program (CSP), among other programs. Several current projects are geared towards reducing nutrients (Table 3).

Table 3. NRCS Nutrient-Reduction Projects

Location	Waterbody	Project
Clatsop County	Youngs River/Youngs Bay	Increase riparian buffer areas and improve pasture production
Polk County	Wellhead Protection	Assist landowners to better manage irrigation water, make better choices in the selection and use of nutrients and pesticides and help buffer ground water resources.
Lane County	North Fork Siuslaw River	Improved land management on private nonindustrial forest land
Linn County		1. Have all CAFOs obtain a Comprehensive Nutrient Management Plan (CNMP) by 2016. 2. Enhance water quality through increased conservation practices by CAFOs.
Coos, Curry Counties	Coquille, Sixes, and Coos subbasins	Assist producers within ½ mile of 303(d) listed segments in reducing point and non-point source pollution of excessive nutrients, organics, and sediment to adjacent streams and waterways.
Jackson County	Little Butte Creek	Conversion to sprinkler systems whose application rates do not exceed the soils infiltration rates, and the implementation of proper irrigation water management.
Gilliam, Grant, Morrow Counties	John Day and Umatilla Basins	Provide an opportunity for all identified AFO/CAFO permit holders to successfully apply for and develop a Comprehensive Nutrient Management Plan, CNMP.

4. Confined Animal Feeding Operations (CAFOs)

ODA oversees management of Oregon CAFOs to prevent discharges from such operations that contribute loads of nutrients and other pollutants, leading to water quality standard exceedances. The State's CAFO regulations are generally more stringent than federal requirements and apply to a broader range of facilities.

CAFOs are required to obtain coverage under a general NPDES permit developed jointly by ODA and DEQ. The general NPDES permit prohibits CAFOs from discharging manure, litter, or process waste water to surface waters, except under certain conditions, provided they do not contribute to water quality standard violations. Waste control facilities must be designed, constructed, operated, and maintained to contain all process-generated wastewaters plus the runoff and direct precipitation from a 25-year, 24-hour rainfall event. Newly constructed large concentrated AFOs that house swine, poultry, or veal, on the other hand, are prohibited from discharging any manure, litter, or process waste to waters of the State, including stormwater runoff.

The permit requires that any land application of manure, litter, or process waste water to lands be done at agronomic rates in accordance with an ODA-approved animal waste management plan (AWMP). Other nutrient-related provisions include:

- prohibition of any confined animal contact with State waters;
- requirements for waste storage facilities;
- prevention of system overloading (i.e., not increasing the number of animals without sufficient utilization and storage capacity);
- handling of animal mortalities;
- setback requirements for manure, litter and process wastewater land applications; and
- waste transfer requirements

The AWMPs must contain a number of different elements describing how waste will be managed. Large concentrated animal feeding operations are required to analyze their manure, litter, and process waste water, as well as soil from land application areas for nitrogen and phosphorus annually. Smaller operations are required to test soil from land application areas at least once every five years. The permit also requires a number of reporting and recordkeeping requirements, including the number of pounds of nitrogen and phosphorus applied annually. Surface and groundwater monitoring is not required unless an operation discharges to waters twice in a 24-month period. In such cases, ODA may require monitoring for bacteria, total suspended solids, total Kjeldahl nitrogen, biochemical oxygen demand, and other nutrient indicators.

5. ODA Fertilizer Program

The ODA Fertilizer Program inspects and registers fertilizer, agricultural mineral, lime, and agricultural amendment products distributed in or into Oregon. All nutrients claimed or advertised must be guaranteed on product labels that must be applied to each package. ODA reviews the product labels to ensure they are compliant before a product is registered.

ODA also provides fertilizer research grants to address the interaction of fertilizers, agricultural amendments, or agricultural minerals with ground or surface water. The grant program is funding two projects in GWMA. The first project was conducted in the Lower Umatilla Basin GWMA and examined DEQ's well monitoring network and made recommendations for assessing groundwater quality and nutrient migration. The second project, in the South Willamette Valley GWMA, is reviewing how improved fertilizer practices is affecting nitrate levels in groundwater.

6. Section 319 Grants

DEQ administers the EPA-funded Section 319 grant program that provides money to organizations to address non-point sources of pollutants. The 319 program priorities in each DEQ region and often targets nutrient reductions in areas with TMDLs. Nutrient-related grants for 2012 are presented in Table 3.

Table 4. Nutrient reduction projects using 2012 Section 319 grant funding

Watershed	Project	Funding
Owyhee	Filter Strip Water Quality Improvement	\$25,300
Owyhee	Owyhee River Improvement Project	\$38,000
South Willamette Valley Groundwater Management Area	Partners and Stakeholders Action Project	\$43,471

Mid-Coast	Mid-Coast BMP Implementation Project	\$45,420
Bear Creek	Bear Creek Clean Water Project Marketing Campaign	\$18,900
Butte Creek	Little Butte Creek Water Quality ó Frey Phase	\$20,000
Curry Creek	Nitrogen sources in a tidally-restricted estuary	\$13,419
Garrison Lake	Septic revitalization project	\$7,186
S. Fork Coquille River	Action Plan	\$14,850

7. Fertilizer management in forestlands

Oregon rules (OAR 629-620-0400(6)) place the following restrictions on forestry fertilizer applications near waters of the state:

- No direct application of fertilizers within 100 feet of Type D (domestic use) streams and the domestic use portions of Type F streams.
- No direct application within the aquatic areas of other Type F (fish use) streams or to large and medium Type N (no domestic use; no fish use) streams.
- No direct application within any portion of significant wetlands (all estuaries, all bogs, all important springs in eastern Oregon; and all other wetlands larger than eight acres).
- No direct application within the aquatic areas (zone below the average high water level) of large lakes.
- No direct application within the aquatic areas of lakes with fish use.
- No direct application to other areas of standing open water larger than one-quarter acre at the time of the application.

“No direct application” means no application at the standard rate to the restricted areas listed above. In practice, the goal is to have no application at all in the restricted areas, but there may be limited, inadvertent, incidental incursions into the restricted areas with no violation of the rule cited above.

6. Assuring nutrient reductions for stormwater and septic systems

1. Incorporation of nutrient-management strategies into municipal stormwater (MS4) permits.

DEQ manages stormwater runoff through its Municipal Separate Storm Sewer System (MS4) permits. DEQ includes a number of conditions in Phase I permits (systems serving over 100,000 people) to proactively prevent nutrients and other pollutants from entering Oregon's waters. Many of these conditions are more stringent than in other areas of the country.

Current Phase I MS4 permits require municipalities to incorporate a number of nutrient-specific requirements into their stormwater programs. In particular, the Clackamas County Group Phase I permit, which covers a number of entities that discharge into waters covered by the Tualatin River Nutrient TMDL, includes requirements geared toward nutrient reductions. One such requirement is that entities covered under the Phase I incorporate Low Impact Development and Green Infrastructure elements into their post-construction ordinances, design standards, and design manuals, as well as in their education and outreach programs. The Clackamas County Group Phase I MS4 permit also requires the permittees to develop post-construction and runoff control programs that create or replace impervious surfaces. These programs must meet specific conditions including the following:

- The programs must incorporate practices that target natural surface or predevelopment hydrologic functions as much as practical.
- The programs must reduce site specific post-development runoff volume, duration and rates to the MS4.
- The programs must prioritize and include implementation of Low-Impact Development (LID), Green Infrastructure (GI), or the equivalent.
- The programs must be designed to capture and treat 80% of the annual average runoff volume.

The Clackamas County Group permit also requires co-permittees that discharge to a water with a nutrient-related TMDL to conduct a number of measures to monitor the extent to which their activities are meeting WLAs for nutrients and other TMDL parameters.⁹ In the case the permittees are not meeting WLAs, permittees are required to identify additional or improved BMPs that will meet the allocations. Other nutrient-related permit conditions that DEQ includes in Phase I MS4 permits include requirements to do the following:

- Implement erosion control and sediment prevention measures for construction site runoff.
- Revise ordinance, code or development standards that inhibit minimization of impervious surfaces and reduce stormwater runoff.
- Identify minimum performance standards that must be achieved by the permittees (e.g., a 65% reduction in phosphorus from new development.)

⁹ Monitoring frequency and locations vary by co-permittee. For example, the City of Gladstone is required to monitor one site for nutrients during at least three storm events per year, whereas the City of Lake Oswego is required to monitor seven sites during twelve events per year.

- Conduct public education on the proper use and disposal of fertilizers, as well as implement management programs to control and minimize fertilizers use and application.
- Identify at least one stormwater quality improvement project to address TMDL pollutant parameters.
- Conduct in-stream monitoring of nutrients.
- Permittees are required to develop a stormwater quality retrofit strategy for developed areas that are impacting water quality, but which are underserved or lacking stormwater quality controls.
- If there are pollutants on the 303(d) list, the permittees must evaluate whether the BMPs in their existing Plan are effective in reducing the 303(d) pollutants.

All Phase II MS4 permits, covering systems serving fewer than 100,000 people, are undergoing renewal. DEQ is currently examining to what extent requirements in Phase I permits shall be incorporated into Phase II permits including nutrient management requirements.

In addition to the permits, DEQ has placed a priority on funding stormwater-related projects to reduce nutrients in its 2013 Section 319 Grant Program. In particular, DEQ's Eastern Region has targeted projects, such as local planning, stakeholder and homeowner education and information program development, feasibility studies and similar efforts. DEQ also has prioritized stormwater projects for non-Phase II communities in the Rogue River Basin, demonstration of BMPs, such as low impact development, in the Willamette Basin, and projects in the Siletz Basin to address nutrients and other pollutants in drinking water source areas.

2. Nutrient management strategies in industrial stormwater permits

DEQ's industrial 1200-Z industrial stormwater permit includes nutrient benchmarks for certain sectors. Companies in several sectors are required to meet a benchmark of 0.68 mg/L Nitrate plus Nitrite Nitrogen; companies producing agricultural chemicals also are required to meet a phosphorus benchmark of 2.0 mg/L. If facilities exceed these benchmarks in stormwater discharge, they are required to incorporate additional best management practices to control nutrients.

The 1200-C and 1200-CN permit for construction activities includes a number of erosion prevention and source control BMPs that apply to construction sites that will disturb one or more acres. These procedures must be documented in an erosion and sediment control plan (ESCP) that must be submitted to DEQ or its agent.

3. Tualatin River Basin Phosphorus Removal Efficiency Requirements

DEQ's standards for the Tualatin River Basin require minimum phosphorus removal efficiency for stormwater facilities in new developments (OAR 340-041-0345). The required phosphorus removal efficiency is based on the following equation: $R_p = 100 - 24.5/R_v$, where R_v is the runoff coefficient for the site, which is based on an equation that accounts for the portions of the site that are: 1) paved streets that discharge to storm sewers or ditches; 2) paved streets that discharge to swales; 3) building roof that discharges to storm sewers; 4) area that is grass, trees, and marsh areas; and 5) area for which runoff is collected and not discharged to surface waters.

4. Onsite Treatment (Septic System) Program

DEQ's Onsite Treatment Program regulates the siting, design, installation and ongoing operation and maintenance of septic systems. These systems may introduce nutrients into Oregon waters if not properly sited, maintained or operated. DEQ directly manages the onsite septic system program in 12 counties, while the other 24 counties are managed under contract with DEQ. DEQ and the contract counties are responsible for ensuring that septic tank pumpers have the necessary equipment to safely pump, transport and dispose of septage. In addition, DEQ certifies installers and maintenance providers, licenses installers

and pumps, and approves products such as septic tanks, alternative treatment technologies and alternative drainfield products.

Under the Onsite Program, DEQ provides technical assistance and guidance to contract county agents, manufacturers, pumps, septic system operators and installers. In addition, DEQ performs enforcement activities to ensure that septic systems are operating in accordance with the Onsite Treatment Regulations.¹⁰

Recently, DEQ's Onsite Treatment Program worked on an EPA-funded demonstration project in La Pine, Oregon to address nitrate contamination from onsite sewage treatment system discharge to groundwater. The primary objective of the La Pine Demonstration Project was to identify ways to protect the La Pine sub-basin's water quality, including the primary source of drinking water, while allowing planned development to occur through a holistic approach using new pollution reducing onsite wastewater treatment systems. The Project included the following tasks:

- Installation of new and retrofitting existing systems with 200 or more innovative onsite systems by a grant and/or low-interest loan program.
- Establishment of a regional monitoring well network of up to 130 wells.
- Development of an onsite system maintenance structure.
- Development of a funding program to assist in low-interest loans for onsite system repair and/or replacement using the appropriate technology.
- Collection and analysis of field data on new and retrofitted onsite systems and from the groundwater monitoring network. This work directly supports the innovative system field test program and the 3-D modeling work.
- Laboratory analytical testing of onsite system effluent and groundwater samples. This data is used to evaluate the innovative treatment systems and to develop the 3-D model scenarios.
- Development of three-dimensional groundwater flow and nitrate fate and transport models, lot size optimization modeling for nitrate loading reduction, and identify areas and/or neighborhoods of concern for development of a comprehensive groundwater protection strategy.

5. Coastal Zone Onsite Pollution Control Program

In July 2013, DEQ submitted to EPA and the National Oceanic and Atmospheric Administration (NOAA) a memo documenting measures that it would take to meet mandates of the Coastal Zone Act Reauthorization Amendments (CZARA). Among those commitments was a measure addressing onsite disposal systems management. DEQ updated the submittal in March 2014. Specifically, the July submittal discusses a voluntary approach for time-of-property-transfer septic system inspections and a regulatory approach under the TMDL program. In the 2014 submittal, DEQ incorporated additional information regarding methods for tracking and evaluating the voluntary program and committing to use back-up enforcement authority in case tracking shows that the voluntary approach falls short of its objectives.

The "voluntary approach" to time-of-transfer-inspections includes requirements of an Oregon law requiring the following documentation on a Seller's Disclosure Statement regarding OSDS conditions:

- A. Is the property connected to a public or community sewage system?
- B. Are there any new public or community sewage systems proposed for the property?
- C. Is the property connected to an on-site septic system?
 - When was the system installed?

¹⁰ OAR 340-071-0100 to 340-071-0650

- Was the system installed by permit?
 - Has the system been repaired or altered?
 - Has the condition of the system been evaluated and a report issued?
 - Has the septic system ever been pumped?
 - Does the system have a pump?
 - Does the system have a treatment unit such as a sand filter or an aerobic unit?
 - Is a service contract for routine maintenance required for the system
 - Are all components of the system located on the property?
- D. Are there any sewage system problems or needed repairs?
- E. Does your sewage system require on-site pumping to another level?

DEQ also is working with the Oregon Association of Realtors on a number of actions:

- A. Promote and increase education and awareness on the importance of onsite septic system inspections during property transfer and proper use and regular maintenance of onsite systems.
- B. Recommend amendments to the Law and Rule Required Course that would define a time-of-transfer evaluation. The course is updated every other year and real estate agents are required to take this course.
- C. Develop a continuing education program for Realtors regarding onsite system inspections and other information about septic system usage and maintenance.
- D. Amend the Buyer and Seller Advisories to include recommendations for having septic systems inspected at time of property transfer.
- E. Develop a new home buyer packet that will include information on septic system usage and maintenance.
- F. Work with the Oregon Bankers Association to determine lender requirements for providing loans for property served by septic systems.

DEQ committed in its 2013 memo to assign load allocations to failing OSDSs if they are a cause of any impairment listings. If this is the case, entities having authority over onsite systems will be required to meet TMDL and Water Quality Management Plan responsibilities. In 2007, for example, the Tenmile Lakes TMDL assigned a load allocation to OSDSs for total phosphorus and includes management measures in the Water Quality Management Plan.

In the March 2014 submittal to NOAA and EPA, DEQ noted that it has provided OSDS classes to 37% of Oregon's 30 Realtor Associations and had plans to do so to an additional 20% in 2014.

The March 2014 memo also noted the mechanisms that DEQ would utilize for tracking OSDS time of transfer inspections. The first mechanism is facilitated through annual inspection reports that approved inspectors must submit as part of the Oregon Septic Smart program. Such reports will help to guide outreach and enforcement efforts at the county level. The second mechanism uses a reporting process through Oregon Septic Smart in which home buyers fill out an on-line survey and answer questions about whether or not an OSDS inspection was included as part of the home buying process. Survey participants are identified using county assessors' records and contacted through mail. Results from these two tracking mechanisms will be compared in order to identify inconsistencies between data sets and to identify focus areas for outreach and evaluation.

The goal for 2014 is to achieve inspections for 60% of residential property transfers involving an OSDS in coastal counties and 80% by 2020. In addition, to help prioritize DEQ's outreach and evaluation efforts, DEQ is developing a GIS tool that can be used to proactively identify coastal areas that have a high risk for OSDS repairs and failure. A similar approach has already successfully been used in one Oregon county to provide focused outreach and resources for OSDS repair and replacement. The target

for the current project is to have a pilot area within a coastal county mapped and analyzed by September 2014. This model can then be used to identify high risk areas within all coastal counties. These data will also aid in the interpretation of inspection reports submitted through the Oregon Septic Smart program.

If the voluntary time of transfer program does not meet stated objectives, DEQ committed to proposing rules requiring time of transfer inspection for adoption by the Environmental Quality Commission.

6. Voluntary municipal programs

In researching for this strategy, DEQ noted that a few communities have programs or ordinances in place geared at reducing nutrient loads for stormwater. The City of Lake Oswego introduced a program to make a 0-phosphorus brand of lawn fertilizer available and encourage homeowners to use it in order to address eutrophication in Lake Oswego. The Dunes, Oregon also has a city ordinance restricting the use of phosphorus containing fertilizers.

7. Accountability and verification measures

The 2011 EPA memo identified three activities needed to develop accountability and verification of nutrient reductions:

- A. Identify where and how each of the tools identified in sections 3, 4 and 5 of this document will be used within targeted/priority sub-watersheds to assure nutrient reductions will occur.
- B. Verify that load reduction practices are in place.
- C. Assess and demonstrate progress in implementing and maintaining management activities and achieving load reductions goals. Establish a baseline of existing N & P loads and current Best Management Practices (BMP) implementation in each targeted/priority sub-watershed, conduct ongoing sampling and analysis to provide regular seasonal measurements of N & P loads leaving the watershed, and provide a description and confirmation of the degree of additional BMP implementation and maintenance activities.

In general, DEQ uses traditional mechanisms (discharge monitoring reports; inspections) to ensure the effectiveness of point source loads of nutrients in areas where they are resulting in impairments and for sources that are required to monitor for one or more nutrient-related parameters. In addition, inspections by DEQ and its Agents ensure that BMP implementation is in place for point sources, stormwater, and septic systems. ODA ensures that BMP implementation is consistent with Area Plans and Rules and CAFO permitting in agricultural lands.

DEQ has established a baseline of existing N & P concentrations or loads as part of TMDL development and as part of data collection efforts in groundwater management areas (GWMAs). There has not been any statewide or basin-wide effort to establish an overall baseline of BMP implementation or compliance with Agricultural Plans and Rules and there are no plans to do so in the short term.¹¹ However, DEQ regularly collects total phosphorus and total nitrogen samples from streams throughout the state as part of its ambient monitoring program, which may be useful for a future analysis of BMP effectiveness if it becomes a priority for the state.

DEQ and its partners have analyzed nutrient loads leaving some priority watersheds. For example, Clean Water Services, which manages wastewater treatment in the Tualatin River, analyzed trends in phosphorus and other pollutants. Data from their analysis show that some segments listed as impaired now meet TMDL targets for total phosphorus.¹² In Bear Creek, implementation of wasteload allocations at municipal wastewater treatment plants and BMP implementation has improved phosphorus levels to almost meeting TMDL targets.¹³ However, such tracking is not done in all priority watersheds. DEQ is aware that there is a critical need for more complete effectiveness monitoring to track progress toward TMDL LAs.

For nutrient-related nonpoint projects that DEQ funds through Section 319 grants, DEQ has estimated load reductions. For the three 2012 projects for which nutrient load reductions were calculated, total load

¹¹ Oregon Department of Agriculture, 2012. Oregon Agricultural Water Quality Report. Salem, OR.

¹² http://water.epa.gov/polwaste/nps/success319/or_tualatin.cfm. Accessed October 3, 2013.

¹³ http://water.epa.gov/polwaste/nps/success319/or_bear.cfm. Accessed October 3, 2013.

reductions were 6,095 pounds of nitrogen per year and 2,136 pounds of phosphorus per year.¹⁴ This information is available in EPA's Grants Tracking and Reporting System.¹⁵

The Oregon Legislature provided permanent funding to the Oregon Department of Agriculture to conduct ambient water quality monitoring at 19 sites with high agricultural usage. These sites are in addition to 42 sites that DEQ already monitors as part of its ambient monitoring program. Such monitoring could provide trend at the specific location, but is not suited for evaluating the results of TMDL implementation.

¹⁴ ODEQ, 2013. Oregon Nonpoint Source Pollution Program 2012 Annual Report

¹⁵ <http://iaspub.epa.gov/apex/grts/f?p=110:199:0::NO::>

8. Reporting of nutrient management activities and load reductions.

In Groundwater Management Areas (GWMA), DEQ reports every four years to determine the extent to which the area has met goals and objectives toward meeting nitrate levels. The reports examine both nitrate level trends and the extent to which implementation methods have been met in the GWMA, as well as provide recommendations and goals for the next four-year period. For example, the report for the Lower Umatilla Basin GWMA identified that goals regarding CAFO BMP implementation, permit requirements at food processor waste plans, and treatment system operation at the Umatilla Chemical depot had been met and that goals for septic system management and local government requirements had been partially met. However, goals regarding resident awareness, non-CAFO BMP implementation, and overall ground water nitrate levels had not been met.

Other than in GWMA, DEQ does not currently conduct regular reporting of implementation activities (and associated environmental impacts) related to reduction of nutrients, nor load reductions. DEQ current efforts to develop its watershed approach may fit well into conducting regular reporting for implementation activities to reduce nutrients and other pollutants and document trends in nutrient loading in targeted watersheds. DEQ does not currently have the resources to commit to conducting such reporting annually or biannually; the planned cycle calls for basin assessments to be conducted on 5-year rotating cycles, with DEQ conducting assessments for three of its fifteen basins each year. The basin assessment examines all pollution sources in the interconnected water system and proposes solutions to reduce pollution from each source. These assessments provide an opportunity for DEQ to report in a general manner on nutrient trends and current nutrient management activities and programmatic needs in targeted watersheds and identify areas where anthropogenic nutrient inputs may be resulting in water quality impairments. For example, the North Coast Basin Assessment noted that there were declining water quality trends for phosphorus at one out of ten sites that were assessed (Nehalem River) and nitrogen for one site (Kilchis River).

9. Numeric criteria development

Oregon does not currently have a work plan and schedule for numeric criteria development. In general, other areas, such as temperature, toxics, and sediment, are currently higher priorities. Oregon considers that its current approach, in which nutrient management is prioritized based on impairments to current water quality standards, such as DO, pH, chlorophyll *a*, or HABS, is sufficient to prioritize watersheds for nutrient management through TMDL development. As evidenced by the great range of nutrient targets that DEQ has developed to meet DO and pH criteria and chlorophyll *a* action levels, there is an indirect relationship between nutrients and beneficial use impact; DEQ's approach is to manage the pollutant or parameter that more directly impacts the designated use. In some cases, that requires nutrient target development; in other cases, another parameter is the limiting pollutant.

Moreover, the variability of nutrient concentrations that result in impacts to designated uses can vary greatly by waterbody type and characteristics; thus, even eco-region specific criteria may not address impairments. Moreover, Oregon does not have a large coastal water impairment, such as exists in the Gulf of Mexico, for which a statewide reduction target is needed. DEQ's approach instead is to combine existing nutrient prevention programs (e.g., ban on lake discharges; phosphate detergent bans, CAFO permitting) with developing site-specific programs or targets where nutrients are a concern.

In addition, DEQ also may develop specific programs to address emerging concerns, such as HABS, as funding allows. And finally, if biological monitoring indicates poor or fair biological health and nutrients or the related parameters are determined to be stressors, this could also trigger follow up work, such as a nutrient reduction targets or load allocations.