

Why we need to restrict Phosphorus entering Vancouver Lake

According to this study Biological Assessment of the Plankton in

Vancouver Lake, WA By Stephen Bollens and Gretchen Rollwagen-Bollens of Washington State University Vancouver

"According to Elser's, in order for a Cynobacteria bloom to begin there must first be high nutrient loading to the system. Moreover, according to Elser, if the ratio of nitrogen to phosphorus (N:P) in the nutrient load is low then cyanobacteria will be favored over algae."

To this end phosphorus is critical to initiating and regulating Cynobacteria populations within Vancouver Lake. When Cynobacteria are lacking available Nitrogen they can fix atmospheric nitrogen (in cystic vacuoles that are resistant to feeders) in this way available phosphorus is the limiting nutrient factor. For this reason the limiting of available phosphorus is a part of all lake restoration efforts where the control of Blue Green Alga is critical world wide. This is why in addition to any plan to isolate or eliminate available nutrients in any lake restoration program there is a need to reduce available and new phosphorus contributions entering the lake. This is supported by the best available science and is integral to all Blue Green Algae remedial projects under way world wide.

[CYANONET: a global network for Cyanobacterial bloom and toxin risk.](http://unesdoc.unesco.org/images/0014/001425/142557e.pdf)

<http://unesdoc.unesco.org/images/0014/001425/142557e.pdf> page 127-129

<http://www.ecy.wa.gov/programs/wq/plants/algae/lakes/LakeRestoration.html> -- DOE Alga management.

Dissolved phosphorus can be quite low but with low oxygen conditions which occur in the summer sedimentary phosphorus that is chemically bound becomes free leading to high levels of dissolved phosphorus. The chemical fixing of phosphorus associated with lake sediments will be a major element of any remedial plan. This can be accomplished through the application of iron chloride in example, Vadnais Lake Minnesota.

http://www.cityofvancouver.us/PublicWorks/vancouverlake/Algal_Control_Techniques-VLWP2009Final.pdf

<http://www.ecy.wa.gov/programs/wq/plants/algae/lakes/LakeRestoration.html>

Alum treatment has been used in Green Lake, Seattle. A much smaller lake. From Page 11 of Alternatives for Vancouver Lake Draft Dec of 2010. The application of any phosphorus treatment is expensive and not without negative biological consequences. To prolong the effectiveness of this "Fix" and to minimize the cost and cumulative negative effects associated with repeated applications new sedimentary and dissolved phosphorus entering the lake needs to be minimized. The extent of current phosphorus entering the lake nor the total amount of phosphorus in the lakes sediments has been quantified in any of the studies to date.

<http://www.cityofseattle.net/PARKS/parkspaces/GreenLakePark/GreenLakeAlumStudy.pdf>

<http://www.ecy.wa.gov/programs/wq/plants/algae/lakes/LakeRestoration.html>

All of the water sources that contribute to Vancouver Lake also contribute Phosphorus and each of these sources have unique soils and land use factors that will determine unique sets of best management solutions that will reduce the new phosphorus from entering the lake. The following are apparent of each of the contributing sources:

Burnt Bridge Creek

This area comprises Pleistocene peat soils that when oxidized contain significant amounts of free phosphorus. Storm sewer outfalls, a golf course and a large number of Septic systems working or not working within watershed also contribute phosphorus. A Total Maximum Daily loading plan or a TMDL is being prepared for this watershed but DOE will not take Vancouver Lake needs into consideration. I would ask that we might individually and as agencies urge DOE to include phosphorus restrictions in support of the need to restrict phosphorus in Vancouver Lake. A TMDL is not essential for locale jurisdictions to put in place phosphorus reducing BMPs and programs need for erosion, stormwater, and sewerage to reduce nutrients in surface and ground water.

An Example of a phosphorus TMDL By DOE Would Be the Spokane River:

<http://www.martenlaw.com/newsletter/20091029-phosphorus-maximum-daily-load>

Salmon Creek

At one time this watershed had significant amounts of farming and Dairies. This has been largely displaced by suburban and urban development. A large number of septic tanks are on this watershed and at least 10 neighborhoods with a preponderance of failed septic tanks were identified by the Clark County Health department in the 1996 Salmon Creek Legacy plan. A revised TMDL is underway on this watershed of which phosphorus reduction is not one of the parameters. DOE has been asked to include restrictions on phosphorus in support of restoring Vancouver Lake as part of this TMDL but DOE is not prepared or inclined to do this at this time I ask that we might individually and collectively advocate for a TMDL that includes phosphorus restrictions be carried out on this basin. DOE has completed TMDLs with phosphorus as a parameter elsewhere in Washington State.

Such as Newman lake:

<http://www.ecy.wa.gov/programs/wq/tmdl/NewmanLkTMDLSummary.html>

Such as Sawyer Lake:

<http://www.ecy.wa.gov/programs/wq/tmdl/LkSawyerTMDL.html>

Felida Slope

Multiple small vernal and year round streams and stormwater outfalls drain this area. Some of the most concentrated Fecal Coliform counts during the 1980 lake cleanup were from this watershed. Many failed and working Septic systems are found here. Impacts

under storm events due to volume and velocity is attested to the deltas of sediment that have been deposited by these outfalls in Vancouver Lake. Many Septic tanks are located on this watershed and minimal summer flows in these creek/outfalls have high Fecal Coliform levels.

Vancouver Lake Flushing Channel

The flushing has been blocked in the open position and operated passively to detriment of water quality and fishery needs. The flushing channel needs to be managed actively only allowing Columbia River water into the lake when Columbia River water is beneficial to water quality and fisheries. The flushing channel gates should also be screened so that juvenile fish do not enter this area till such time as we improve water quality and habitat levels within the lake. In the words of a now retired local director of the Vancouver Washington State Department of Fish and Wildlife "This is a fish killing machine."

Watershed planning TMDLs

DOE officials have said to do a proper TMDL on Vancouver Lake would take more resources than all that being committed to TMDLs state wide. They urge us to go forward without a Lake TMDL and to implement phosphorus limiting BMPs in the contributing watersheds.

The few successful lake restoration projects that have been conducted in the Northwest have included strong commitments within the contributing watersheds to Best Management Practices that reduce nutrients. Without such commitments our community can not reasonably seek financial support from regional, State or Federal funding sources for planning or implementation of any planed lake restoration.

Part II Best management practices

Bioretention ponds constructed to EPA standards remove 65 to 87 % of phosphorus from stormwater. These values are reduced to a top value of 50% in Vol V chapter 3-3 Phosphorus reduction menu of the Stormwater Manual for western Washington.
<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>
<http://www.epa.gov/owm/mtb/biortn.pdf>

Alum injection to Stormwater outfalls can tie-up available dissolved and some sedimentary phosphorus. This is not without both long term Financial and ecological/biological costs. This can also be an interim strategy till BMPs reduce phosphorus loading .
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=80>

DOE has more about this in:

<http://www.ecy.wa.gov/programs/wq/plants/algae/lakes/LakeRestoration.html>

Septic system management and conversion, Preventing Septic System Failure. Many failed systems are located within the watersheds contributing phosphorus to Vancouver Lake Some of the successful strategies for both maintenance and conversion are referred to in this EPA Document:

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=25>

Olympia Washington program: http://olympiawa.gov/city-utilities/wastewater/~/_media/Files/PublicWorks/Water-Resources/OSS_ConversionFAQs_UpdatedJAN2010wlinks.ashx

Bioretention (Rain Gardens) when correctly constructed and maintained remove from 65 to 87% of phosphorus. EPA. DOE limits the use of Rain garden application with regard to soils and 1/4 mile proximity to critical waterways or its tributaries/wetlands. <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=72>

Agricultural BMPs This is a index of both structural and non structural BMPs to reduce the off site runoff of this valued Plant nutrient. USDA and NIFA, These include buffers, retention ponds, and critical timing strategies that retain nutrients for optimimel plant use which result in increased production. <http://ohioline.osu.edu/aex-fact/0464.html>

Nutrient BMPs in Western Manuel

In Vol V Chapter 3-3 of the Stormwater Management Manual for Western Washington a list of primary and secondary BMPs are listed in a phosphorus treatment menu. The Primary, secondary designations have to do with the need for treatment trains to achieve nutrient reduction goals. This needs to be read with subsequent corrections By DOE and can be found at: <http://www.ecy.wa.gov/programs/wq/stormwater/manual.html> These include:

- Infiltration preceded by phosphorus Treatment

If the soils do not meet the soil suitability criteria **and** the infiltration site is within ¼ mile of a phosphorus-sensitive receiving water, or a tributary to that water, treatment must be provided by one of the other treatment facility options listed below.

- Large Sand Filter – See Chapter 8
- Amended Sand Filter – See Chapter 12

Note: Processed steel fiber and crushed calcitic limestone are the only sand filter amendments for which Ecology has data that documents increased dissolved metals removal. Though Ecology is interested in obtaining additional data on the effectiveness of these amendments, local governments may exercise their judgment on the extent to which to allow their use.

- Large Wetpond – See Chapter 10
- Media Filter targeted for phosphorus removal – See Chapter 12

Note: The use of a Stormfilter™ with iron-infused media is approved for use in limited circumstances, provided a monitoring program consistent with the TAPE protocols (Ch. 12) is implemented.

- Two-Facility Treatment Trains – See Table 3.1

Table 3.1 – Treatment Trains for Phosphorus Removal

First Basic Treatment Facility Second Treatment Facility
Biofiltration Swale Basic Sand Filter or Sand Filter Vault
Filter Strip Linear Sand Filter (no presettling needed)
Linear Sand Filter Filter Strip
Basic Wetpond Basic Sand Filter or Sand Filter Vault
Wetvault Basic Sand Filter or Sand Filter Vault
Stormwater Treatment Wetland Basic Sand Filter or Sand Filter Vault
Basic Combined Detention and Wetpool Basic Sand Filter or Sand Filter Vault

Phosphorus in detergent

Phosphorus in detergents is and has been a problem for Washington State and its waters. Laundry detergent containing phosphorus has been banned since 1994. Major manufacturers in the United States made the switch in laundry soaps to help keep waters clean. The same is true for automatic dishwasher soaps as of July 1, 2010, when Washington retailers may only sell low- and no-phosphate automatic dishwasher detergents for residential use. The new law also goes into effect in [16 states](#) on that date. <http://www.ecy.wa.gov/programs/wq/nonpoint/phosphorus/PhosphorusBan.html>

Recommendations

- 1. Continue to develop a viable Scientifically based lake restoration plan developing as part of that plan lake nutrient sediment loads, the best methods of reducing available phosphorus and present levels of watershed nutrient loading to the lake.**
- 2. The Technical Advisory group, the City of Vancouver and Clark County to look at the Western Stormwater manual phosphorus reducing BMPs and other sources and make recommendations with regard to the best BMPs for this area that will reduce phosphorus from entering Vancouver lake from its watersheds.**
- 3. The Technical Advisory group and the Port of Vancouver with DOE, Washington Fish and Wildlife and the Army Corps of Engineers work out a plan that favors the operation of the Flushing channel for both Lake water quality and fisheries.**
- 4. For the Vancouver Lake Partnership to listen to and modify and as necessary vote on each of these initiatives and to then move these issues forward into the greater community in advocacy toward restoring Vancouver Lake.**