**Deschutes River, Capitol Lake, and Budd Inlet**
**TMDL Advisory Group Meeting**

Thursday, January 27, 2011 -- 9:00 a.m. to 12:00 p.m.
Tumwater Fire Department, 311 Israel Rd. SW

## Attendees

Black Hills Audubon Society
- Sue Danver

Capitol Lake Improvement Protection Association
- Jack Havens
- Mark Horton
- Bob Wubbena

Deschutes Estuary Restoration Partnership
- Sue Patnude

Ecology, WA State Dept. of
- Shawna Beers, WQ
- Betsy Dickes, WQ
- Chuck Hoffman, WQ
- Mindy Roberts, EAP
- Lydia Wagner, WQ

Environmental Protection Agency
- Dave Ragsdale

General Administration, WA Dept. of
- Nathaniel Jones

LOTT Clean Water Alliance
- Karla Fowler
- Laurie Pierce
- Paula Williamson

Olympia, City of
- Laura Keehan

Olympia, Port of
- Robert Zinkevich

Olympia Yacht Club
- Jim Lengenfelder

Squaxin Island Tribe
- John Konovsky

Thurston County Environmental Health
- Sue Davis

Thurston County Dept. of Water & Waste Management
- Barb Wood

Thurston Public Utilities District
- Chris Stearns

Tumwater, City of
- Dan Smith

WSU Extension Office
- Bob Simmons

## Updates

The meeting began with a slight change in the agenda. The Middle Watershed summary presentation is off the agenda. Lydia will send a written summary to the Advisory Group within the week following this meeting.

**2011 Meetings**: The February 24 meeting is cancelled. We're back on schedule to meet again on March 31. However, the location has changed and we will instead meet at the LOTT Clean Water Alliance facility. Updated meeting information is online at http://www.ecy.wa.gov/programs/wq/tmdl/deschutes/advisorycomm/DeschutesAdvGrp2011MtgDates.pdf.

## Lower Watershed Presentation:

*Mindy Roberts, Ph.D, P.E., Ecology, Environmental Assessment Program*

The following are highlights from her presentation:

There are multiple parameters not meeting water quality standards throughout the lower Deschutes watershed, Capitol Lake, and Budd Inlet. They are fecal coliform bacteria, dissolved oxygen, temperature, fine sediments, and pH. The lower watershed has problems with them all, in varying degrees.

**Fecal Coliform Bacteria:** There are fecal coliform issues throughout the watershed, with more in the urban area tributaries. Slide 5 shows fecal coliform bacteria reduction targets for winter and summer. The draft Technical Report refers to these as the growing (summer) and non-growing (winter) periods. There is an increased stormwater problem during summer months that we need to address. Bacteria is not easy to predict. We have to be tenacious and physically go out to look for it. Indian and Moxlie Creeks have the biggest problem with bacteria.

**Temperature**: The Deschutes River around Henderson Blvd. picks up a lot of groundwater. This results in some cooler water but not enough. The main stem of the Deschutes River and Percival Creek are too hot. We need shade improvements in the Lower Deschutes upstream of Capitol Lake. Maps in Slides 9-10 show recommended amount of improvement needed for the Deschutes River. The bigger dots represent more current shade and the smaller dots represent less shade. Improving shade with riparian vegetation will lower temperature.

Percival Creek and Black Lake Ditch come out of wetlands and a lake. They collect water which cools as it moves downstream. Recommended treatment is riparian restoration to create shade. This area has a narrower stream than the Deschutes River. It gets shade from trees and canyon system. If temperature is improved in the Percival Creek system it will get secondary improvements to dissolved oxygen. Upstream of Percival Creek has stricter water quality standards because it is a core Salmonid habitat.

Based on information from Sue Davis, Thurston County Environmental Health, about 90% of the flow from Black Lake goes down Percival Creek. We do not have enough historical information about Percival Creek to know if the flow levels have decreased over time like the Deschutes River. Beaver activity also influences flow.

*Is the GIS layer for temperature able to focus down to a parcel scale?* Yes.

**Dissolved Oxygen (DO):** Temperature improvements will help DO levels. Improvements to riparian vegetation to increase shade will result in meeting water quality numeric standards near Capitol Lake. The current conditions are in violation of the water quality standards.

**Nutrients:** Slide 15 addresses dissolved inorganic nitrogen (DIN) and organic phosphorus (OP) in the Deschutes River. Most of the nitrogen and phosphorus concentration comes mainly from distributed groundwater inputs. This applies to phosphorus too. There is no single "hotspot" for either. The levels start low and increase as we move downstream.

**Fine Sediments:** These smother Salmonid habitat and are an issue due to the riverine habitat.

Recommendations to improve conditions:

- Maintain healthy riparian vegetation
- Restore missing riparian vegetation
- Control sediment sources when possible
- Enhance channel complexity

**Overall Recommendations for the Lower Watershed:**

- Continue to identify and reduce bacterial pollution
- Restore riparian shade
- Manage sediments
- Control nutrients

**Capitol Lake & Budd Inlet**

Part of what changed in the Olympia area directly affected Budd Inlet. The majority of the peninsula is fill. There is less water coming in and out of the very southern section of Budd Inlet. The water circulation is limited and overall Budd Inlet has less circulation than other Puget Sound inlets. Circulation has an effect on dissolved oxygen. There is strong circulation in spring tides with a transition into fall tides. The overall pattern is critical period result in lowest oxygen levels. Our human contributions may not cause a problem during spring tides because there is more water mixing. There is a lot of tidal flushing near Boston Harbor.

*Does the impact from dredging change the tidal prism?* Dredging only occurs in the shipping areas and not in Budd Inlet. According to Nathaniel Jones, WA State Department of General Administration (GA), dredging was necessary to allow ships access to the brewery.

*How much fill was imported from offsite?*

This question generated discussion by several attendees with differing opinions on the issue. In particular, there was disagreement about the source, quantity, and resulting effects of the fill.

*How much loss of reservoir when the dam was created is in effect today?* Nathaniel Jones, GA, stated the lake basin has lost about 60% of capacity.

The dam releases water at low tide and the gate reacts to different water elevations. It cannot release water at high tide because there is not enough pressure of water buildup from the Deschutes River and Percival Creek. As the water level rises in the lake, there is a pulse outflow from Capitol Lake. The lake outflow travels to the north and moves from West Bay to Priest Point.

**Why reduce nutrients when we care about DO?**

Plants + nutrients + sunshine = more plants. The plants die resulting in organic matter. Bacteria living in the area digest the organic matter and break it down. This reduces the oxygen levels. When you see white caps in Budd Inlet this is a good demonstration that air is mixing with water, which helps increase oxygen levels in Budd Inlet. This is a natural process.

When humans are involved we generate and contribute more waste. For example, we may use fertilizers, containing nitrogen and phosphorus, to grow more plants. More plants = more organic matter which decreases the dissolved oxygen levels. In marine waters nitrogen helps control plant growth. In freshwater phosphorus is more of an issue. The upper end of the Deschutes watershed is nitrogen-limited, affecting plant growth.

Slide 26 shows the annual dissolved inorganic nitrogen (DIN) loads throughout all the Puget Sound waterbodies. The Deschutes River has some of the highest DIN concentrations on an annual basis. Budd Inlet has had problems with oxygen for decades.

Slide 28 is a graph comparing LOTT Clean Water Alliance (LOTT) wastewater treatment plant effluent to all the other Puget Sound plants. As a permit requirement, LOTT modifies their process in the summer months to remove nitrogen. They began the denitrification process to reduce nitrogen loads in 1994.

*Is there a table with data available?* Yes.

Ecology recently released the publication, "South Puget Sound Dissolved Oxygen Study: Interim Nutrient Load Summary". Rivers generally contribute on surface waters and wastewater treatment plants contribute below. The study contains annual and late-summer load estimates for the various wastewater treatment plants and river. It is available online at https://fortress.wa.gov/ecy/publications/SummaryPages/1103001.html.

*How much does waste input to Budd Inlet affect dissolved oxygen?* In the 1990s, LOTT conducted a study to understand Budd Inlet and how the system works. Ecology used the same modeling tool but made minor changes to include Capitol Lake.

*What if the lake is an estuary, would there be an effect on the infrastructure?* The U.S. Geological Study (USGS) completed a project as part of the Deschutes Estuary Feasibility Study evaluating shore erosion and sediment transport if the dam is removed. This study is available online at http://www.ga.wa.gov/capitollake/Reports/03-DeschutesEstuaryFeasibilityStudyFinalReport(June20.pdf.

*If the dam is removed and flow is dependent on natural tides, how would sediment move?* We would see a big pulse of sediment transport in the beginning with lots of erosion.

*What do we predict once things settle down?* Oxygen in West Bay will increase with continuous flow. Increased flow through Capitol Lake would improve oxygen levels. Algae growth would decrease since it needs stagnant water for growth. We would see less water quality violations with the estuary alternative.

**Model Demonstration:** Mindy ran a computer model display showing the current velocities and near-bottom dissolved oxygen levels both with and without the dam in place for the different scenarios outlined in Slide 31. The animation shows the overall circulation patterns in Budd Inlet due to the tides going in and out. The colors indicated how near-bottom dissolved oxygen concentrations changed from north to south in Budd Inlet and over time. While the information behind it is very complicated, the animation conveys an overall sense of what the model is predicting. These predictions are summarized in the other graphics.

The bottom line is that Capitol Lake is not meeting water quality standards. Non-point sources of nutrients are too high.

Slide 34 lists the factors affecting Capitol Lake water quality:

- Low circulation
- Shallow water depths
- Warm temperatures
- High phosphorus from sediments and the watershed
- High macrophyte biomass
- Algae blooms

Slides 37 & 38 compare the model results for the lake or estuary alternative.

The water quality standards are similar for Capitol Lake and Budd Inlet. For Budd Inlet, the dissolved oxygen concentrations cannot fall below a particular concentration that varies by location (the break-line is Priest Point Park) at any time. If natural conditions fall below the numerical value in the water quality standards, humans cannot contribute any sources and result in more than 0.2 mg/L reductions.

Slide 32 addresses lake standards, which do not have a numerical threshold but do have the same change from natural conditions as in the marine standards. Human influences cannot degrade concentrations by more than 0.2 mg/L. There is not a numeric trigger, only a differential trigger of 0.2 mg/L. The model results indicate the central basin is the most affected area of Capitol Lake.

Attendees asked questions regarding the modeling. Here is a summary of the topics.

Issues Ecology staff looked at while developing the model:

- Is the level of chlorophyll correct?
- Are the predictions for nutrients and oxygen levels correct?
- Is the model predicting the correct water levels?
- Is the model accurately simulating seasonal patterns?
- Can we describe what we measured in the field?
- Prepare the model and compare results to actual data.
- Decide on monitoring locations.
- Collect the field data.
- Consider the physics of the water surface, structure of the water column, incoming loads, their source and location, and how the water mixes back and forth.
- The model will develop a simulation over an established time period spanning when the data collection occurred. Model output is compared to the data to see how well the model performed. Then the model provides a look at what happens before, during, and after data collection.
- Staff looked at products from the Deschutes Estuary restoration study.
- Staff looked at U.S. Geological Study (USGS) data to see what was the predicted bathymetry if the dam was removed. No bathymetry changes to West Bay were included in the model.
- Periodically compare the modeling data to actual data.

Other points regarding the model:

- They ran a simulation with Capitol Lake in place.
- They ran a lot of “what if” scenarios regarding lake or no lake.
- They ran the model taking the dam out. The water in West Bay does not stagnate as much when the water is not pulsing in and out of the lake.

- The model indicated improvements in Capitol Lake with fewer improvements to dissolved oxygen in lower Budd Inlet.
- We do not have any existing estuary data to run the model with the estuary alternative.
- We do not run a sediment transport model. This tool does not model inorganic sediments. There is different, yet complimentary, work done by the USGS.
- East Bay: The circulation is very sluggish. This area has ideal algae growing conditions.
- Capitol Lake: The Deschutes River has problems with oxygen but it is not as much of a problem in the lower watershed. Nutrients come in from the Deschutes River. Tumwater Falls aerates the water to increase the dissolved oxygen levels.

In addition to the modeling tools applied to Capitol Lake, General Administration (GA) requested an analysis of what a dredged lake would look like and how changes in the watershed would influence Capitol Lake water quality. The results were presented in a memo to GA and are not part of the draft technical report. Given the size of the watershed, the amount of water and phosphorus from the Deschutes River, and the surface area and volume of Capitol Lake, dredging the lake would not result in observable changes in lake characteristics. Even if all of the phosphorus from the Deschutes River watershed is eliminated, nutrient releases from the sediments will continue to contribute to the eutrophic nature of Capitol Lake.

**Additional questions**:

*Would phosphorous release from sediments in Capitol Lake eventually slow?*

Delayed response, likely over decades, not immediate. Phosphorous release from sediments keeps Capitol Lake a eutrophic lake.

*Were release calculations obtained from measurements of lab samples or how were sediments evaluated?*

Benthic flux chambers. Exchanges of oxygen and nutrients were measured and then the model was used to calculate.

*(Regarding the) Lake as nutrient rich. How does it compare to others in same category?*

The Washington Lakes Program and others conducted assessments in the 1970s-80s. Some resources are available. Less has been done since then. Capitol Lake is unique in that it is at the mouth of a river and it is a shallow lake in an urban area.

*(What are the) Major sources of phosphorous coming to lake?*

Diffused sources all along the Deschutes River. Headwater source. Continuous and kind of everywhere. Mimics nitrogen pattern.

*(Related question) Is it human/non-human?*

This study not done to tease that out. Another study was done that shows natural levels of nitrogen and phosphorus, and levels in the Deschutes are much higher. This argues for a human source for nitrogen and phosphorus.

*If there is instream and riparian restoration than can lower river temperature, can we assume the July/Sept period maybe get down 7-8 degrees? What would that do to dissolved oxygen levels in Budd Inlet?*

> If you allow riparian vegetation to mature, it could improve the temperature of the Deschutes River by 3-5 degrees Celsius, which would have benefit to dissolved oxygen in the Deschutes River itself. Oxygen and temperature going into Capitol Lake does not govern the temperature of the lake. We would see the effect much more in the south basin. The central and middle basins simply would respond to solar radiation. Deschutes River oxygen levels would not affect Budd Inlet dissolved oxygen with the lake in place or even under an estuary. Budd Inlet dissolved oxygen responds to nutrient inputs and circulation.

*This committee's goal/purpose is related to TMDL and pollutant reductions. Are we expected to address the issue of estuary vs. lake? Is it Ecology's expectation we talk about that?*

> Yes, we will talk about this matter. If there is still no decision, the TMDL (water cleanup plan) we submit to EPA will have two options. It will address implementation needed for both scenarios - lake and estuary. If it remains a lake we need to do… If it is an estuary we need to do… Either way, we need to take steps to meet the water quality standards. Part of the plan will directly address load reduction targets for Percival Creek.

If you have additional questions on the lower watershed presentation, send to Lydia Wagner, Lydia.Wagner@ecy.wa.gov and Mindy Roberts, Mindy.Roberts@ecy.wa.gov for follow-up.

*No matter what is done, we recognize and acknowledge we cannot totally meet the water quality standards without additional nutrient reductions. We still need to do what we can to quantify the reductions.*

**Open Comment:** None

**Next meeting**

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| Date: | Thursday, March 31, 2011 |
| Time: | 9:00 a.m. – 12 noon |
| Place: | LOTT Clean Water Alliance, 500 Adams St. NE, Olympia |
| Agenda: | Overview and tour of the Lott Clean Water Alliance organization |