

Greenfleet's 100th Expedition Report

On June 21, 2012 we completed our 100th expedition and our two year agreement with Base Camps of America to perform indicator monitoring and research on the dissolved oxygen (DO) problem in Quilcene and Dabob bays. Although our monitoring techniques have changed somewhat over the past two years, we have consistently used YSI probes to measure DO at depths to 300 feet on an average of once a week. In addition to dissolved oxygen, we have measured salinity, temperature, nitrate levels, and Secchi depth (an indication of the amount of algae and zooplankton in the water). These 5 measurements have given us a good idea of DO content at various water depths. All of our measurements are published on this website.

During the past two years, our monitoring at 55 stations in Quilcene Bay, Dabob Bay, and Hood Canal has given us some readings that have caused both surprise and concern. Keeping in mind that optimal readings would probably be between 90% and 100% DO (a saturation measurement comparable to approximately 9 to 10 mg/l) at the surface, getting a high reading of 151%, as we did during Expedition #100, was an eyebrow raiser. (See Exp. #100 data.) But coupled with a Secchi depth of only 16 feet, it became clear that the algae in both bays were active and prospering—creating an overabundance of microorganisms. As expected under these conditions, the nitrates were being aggressively consumed between the surface and 50 feet. But the high DO readings we got throughout the entire 2012 spring may not be a good sign for what will happen during the next decade. Letting the current status ride will not be in our or the fishes' favor.

As some of you might know, fish may be stressed at supersaturation DO levels (over 100%) or at DO levels below 50%. Because Dabob and Quilcene bays mix differently than Southern Hood Canal, we are not yet in danger of getting serious fish kills. Still, because we are too often in or close to the hypoxic range (below 30%) that causes severe stress to bottom fish, the danger is nearby. Should industries and citizens continue to pour nutrients into the bays, the conditions for any still-surviving bottom or forage fish is bound to get worse. As to the causes of the abnormally high readings so far this year, I have three candidates for excessive algal nutrients entering Dabob and Quilcene bays:

- through groundwater from failing or overburdened septics and from deciduous trees (primarily alders within a few miles of river mouths)



We use a YSI DO probe to check the dissolved oxygen in our 2 bays and Northern Hood Canal.



This photo shows a GPS shot of our stations in both bays and the upper portion of Northern Hood Canal. Most of our expeditions during the first two years were in Quilcene and Dabob bays but we made numerous visits to Bangor (in the center of the photo) to check on the contagion effect.



Averages for month sorted by highest percent DO saturation

REPORT #4 Month Averages 100% DO and greater in Quilcene and Dabob bays

Prepared by Greenfleet Monitoring Expeditions

(greenfleetme.org)

This report shows the monthly averages of our DO probe readings for expeditions 1 through 100 ending June 20, 2012 and sorted by highest dissolved oxygen readings. Notice that it shows months and depths where the DO average was greater than 100% (supersaturation). Supersaturation indicates that our bays have too much algae -- which produces dissolved oxygen. An overabundance of algae is a result of too much nutrients (mostly nitrogen) entering the two bays primarily by failing septics or oyster seed facilities.

More details at our Learning Center on algae and how supersaturation could give our bays the low dissolved oxygen problem now plaguing Southern Hood Canal.

| Area | Depth | Month | Year | mg/l Ave | % Ave | Fish Stress Range | Optimal Range | Number of Readings | AT SPECIFIC DEPTH | | |
|----------------------|-------|-------|------|----------|------------|-------------------|---------------|--------------------|----------------------|---------------------|-----------------------|
| | | | | | | | | | Month Lowest Reading | Fish Stress Reading | Month Highest Reading |
| Point Whitney | 10 | 5 | 2012 | 13.0 | 144 = HIGH | | 91 - 100 | 96 | 121 = SERIOUS | 156 = SEVERE | |
| Point Whitney | 20 | 7 | 2010 | 12.5 | 140 = HIGH | | 91 - 100 | 4 | 136 = HIGH | 142 = HIGH | |
| Dabob Bay North | 20 | 6 | 2012 | 12.5 | 137 = HIGH | | 91 - 100 | 3 | 126 = SERIOUS | 152 = SEVERE | |
| Dabob Estuary | 10 | 8 | 2011 | 11.5 | 137 = HIGH | | 91 - 100 | 16 | 125 = SERIOUS | 147 = HIGH | |
| Quilcene Bay Estuary | 20 | 7 | 2010 | 11.8 | 136 = HIGH | | 91 - 100 | 24 | 125 = SERIOUS | 142 = HIGH | |
| Dabob Estuary | 20 | 6 | 2011 | 12.3 | 135 = HIGH | | 91 - 100 | 16 | 130 = HIGH | 140 = HIGH | |
| Quilcene Bay Estuary | 10 | 7 | 2010 | 10.0 | 135 = HIGH | | 91 - 100 | 39 | 118 = LOW | 149 = HIGH | |
| Dabob Estuary | 20 | 8 | 2010 | 11.8 | 135 = HIGH | | 91 - 100 | 10 | 129 = SERIOUS | 141 = HIGH | |
| Point Whitney | 20 | 6 | 2011 | 12.0 | 132 = HIGH | | 91 - 100 | 8 | 127 = SERIOUS | 136 = HIGH | |
| Quilcene Bay Estuary | 10 | 5 | 2012 | 12.5 | 132 = HIGH | | 91 - 100 | 82 | 102 = SLIGHT | 156 = SEVERE | |
| Dabob Bay North | 20 | 6 | 2011 | 11.7 | 131 = HIGH | | 91 - 100 | 4 | 122 = SERIOUS | 138 = HIGH | |
| Point Whitney | 20 | 7 | 2011 | 11.5 | 131 = HIGH | | 91 - 100 | 5 | 130 = HIGH | 131 = HIGH | |
| Dabob Estuary | 10 | 8 | 2010 | 10.7 | 131 = HIGH | | 91 - 100 | 10 | 117 = LOW | 142 = HIGH | |

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This is an image of one of our reports that you'll find online at greenfleetme.org. It is difficult to read here but online it will be clear that our highest DO reading was 156% saturation—which is "severe" in our fish stress range. Notice that it was May of 2012 and with a total of 406 readings at all depths and 96 at 10', it was a busy month. The average for May was 144%—an ominous sign for Quilcene and Dabob bays!

- from industrial waste (mostly nutrients and algal waste) at aquaculture facilities (Coast Seafoods and Penn Cove Shellfish in Quilcene Bay / Taylor Shellfish and Troutlodge in Dabob Bay)
- a contagion effect from Southern Hood Canal or by seawater flowing through the Salish Sea from the Pacific Ocean

With the understanding that high dissolved oxygen counts near the surface will eventually lead to low oxygen at the bottom, we should realize that we must find the source of algal nutrients if we want to keep Dabob and Quilcene bays from becoming like lower Hood Canal. In those waters, bottom and forage fish are either nonexistent or under frequent stress. (The effects on salmon are largely unknown.)

Indicator monitoring is not meant to be the end of our studies into the DO status of our bays. To the contrary, it is but a beginning. A more comprehensive "protocol monitoring" is needed if we are to get some solid answers. This step in the monitoring process will include extensive chlorophyll monitoring using probes plus laboratory analysis to get an accurate algae count. It would also include nitrate measurements from the bottom to the surface and pathogen analysis in order to determine the quantity and quality of nutrients coming from septic. Of course, DO readings and related parameters will be a constant during the second step.

However, the second step is much more expensive than the indicator-monitoring step. Although not beyond Greenfleet's capabilities, it is beyond our current budget. The second step will require \$100,000 annual funding for a minimum of two years. With the current attitude of "project funding" trumping monitoring funding with major funding agencies, we may have to live with indicator monitoring until attitudes change.

The struggle to save Dabob and Quilcene bays must go on. Just because the Hood Canal Coordinating Council (HCCC) and Puget Sound Partnership have not recognized the DO problem in our bays as an impending catastrophe when they consider the problems of Puget Sound and Southern Hood Canal, doesn't mean we give up. We'll do our indicator monitoring on a shoestring and try to give you the best picture available of the way things are. Together, let's try to get our fish back.

Stay Tuned!

JD Gallant
Program Director – Greenfleet Monitoring Expeditions



This recent housing development on Quilcene Bay may or may not have an adequate septic system so as not to allow nutrients and pathogens to get into the groundwater and run into the bay. However, we know from research that a substantial number of homes on or close to the shoreline are either failing or overburdened. Although Jefferson County is working to find the violators, there is currently little progress. Only by checking for fecal coliform can we determine how much failing septic systems are contributing to the nutrient problem in Quilcene Bay.



Industrial waste from the Coast Oyster plant is obvious to anyone leaving or entering Herb Beck Marina by boat. Although we don't know what exactly is coming out of the many pipes that create 3 streams running into Quilcene Bay, our chemical analysis shows that there are substantial nitrates in the water. Accurate and complete analysis would require extensive testing for other nutrients, algae, pathogens, and industrial chemicals.

Please be sure to look at our Observations through photos at www.greenfleetme.org/observations.htm