Watershed Briefing Paper for the Lower Columbia Basin Watershed

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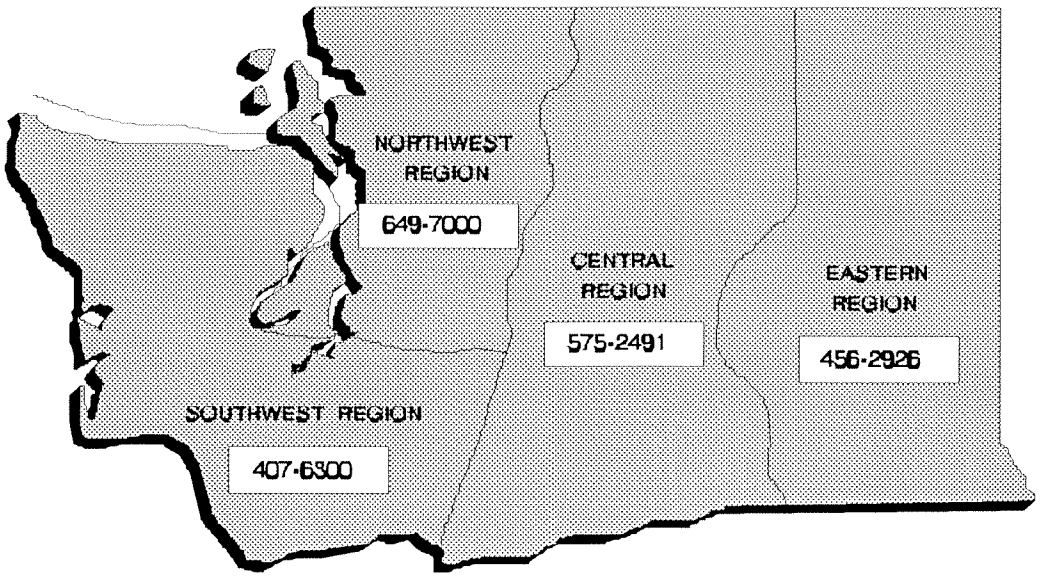

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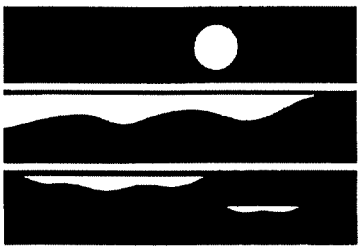

Watershed Briefing Paper for the Lower Columbia Basin Watershed

by
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WRIA 26

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Executive Summary

The results of studies conducted by the Environmental Investigations and Laboratory Services program over the past ten years are reviewed below. In surface waters, fecal coliform bacteria violations in Willapa Bay and its tributaries were repeatedly noted. Temperature, dissolved oxygen, and pH violations were also noted but less frequently. Insufficient data were available to specifically evaluate: the impacts of dairy farms and other nonpoint source pollution, ground water quality, the effects of pesticide application in Willapa Bay, or the effluent quality at many permitted dischargers. Specific recommendations are listed below.

Recommendations

Ambient Monitoring

River and marine water quality monitoring should be coordinated with the ongoing EPA funded study in the Willapa Bay drainage and with the priority projects identified at the scoping meeting.

Invasive aquatic plants have been noted in numerous locations. Identification of unimpacted water bodies would allow us to take a preventive strategy. Extensive survey of water bodies throughout the WQMA is the first step.

Little lake monitoring has been conducted in this portion of the state. Baseline information would be helpful for future reference.

Watershed Assessments

Recommendations of Seyferlich and Joy (1993) should be considered to address fecal coliform contamination in Willapa Bay.

Recommendations of Cusimano (1993) should be considered to address water quality concerns in Longview Ditches.

Recommendations of Joy (1990) should be considered to address water quality impacts from seafood processors.

Further studies of the contributions of dairies and potential effectiveness of Best Management Practices are warranted to address fecal coliform contamination in the WQMA.

Waterbodies listed under Section 303(d) of the federal Clean Water Act should be prioritized for TMDL studies. High priority waterbody segments include: Willapa Bay, Grayland Ditch, Willapa River, Longview Ditches, Coweeman River, Cowlitz River, and Cinnabar Creek.

Several management activities should be considered for possible surrogates for TMDLs to address nonpoint sources, including: watershed analysis, Centennial Clean Water Fund Projects, and Farm Plans (via Conservation Districts).

Toxics Investigations

The issue of Sevin in Willapa Bay should be examined. Information on Sevin (*e.g.* persistence, toxicity, ecological effects) and field data produced during the past decade should be reviewed and, if warranted, an intensive survey conducted to assess the effects of Sevin in Willapa Bay on the biota. Washington State Department of Fish and Wildlife (WDFW), Department of Natural Resources, and possibly the University of Washington should also be consulted on this issue.

Follow-up on aluminum toxicity in Mill and Cameron Creeks. Study should be fine-tuned to address the possibility that aluminum is causing acute toxicity on these creeks. WDFW should be consulted on their level of interest and whether or not other creeks may be affected.

Conduct a screening survey of tributyltin concentrations in the Ilwaco boat basin. This should initially be approached as a small scale survey to determine if TBT is a problem.

Groundwater

On-site septic systems, dairy waste storage lagoons, fish farms, and other agricultural practices warrant an assessment of their probable impacts on ground water quality.

Compliance Monitoring

Class II Inspections are suggested for the following facilities:

Industrial Dischargers

Reynolds Metals-Longview (major), Weyerhaeuser Pulp & Paper -Longview (major), Cytec Industries (minor), Ocean Beauty Seafood (minor), Coast Seafood, South Bend (minor), E. H. Bendiksen Co Inc. (Ocean Park).

Municipal Dischargers

Cowlitz Water Pollution Control STP (major), Long Beach STP (minor), Longview STP (minor), Morton (minor), Raymond STP (minor), Ryderwood STP - Cowlitz County (minor), South Bend STP (minor), Winlock STP (minor), Woodbrook STP - Cowlitz County (minor).

Ambient Monitoring

by
William Ehinger

Rivers and Streams

Monitoring stations were maintained in the Cowlitz drainage and in several rivers draining into Willapa Bay (Table 1) since 1985, and a special study was conducted on the Columbia River in this area. Presently there are two long-term stations in the Willapa basin and one in the Cowlitz. Beginning in fall 1996, two to three additional stations (total) will be sampled on the North River, Willapa River, and Naselle River as part of an EPA funded study of the Willapa Bay estuary. The location of the regional stations should take the current work into account.

Table 1. Ambient monitoring stations, descriptions, and years of record.

Station	Description	Sampled (WY)
24B090	Willapa R. near Willapa	84-92, 95-pres
24B130	Willapa R. at Lebam	84-92
24D090	North R. at Artic	92
24F070	Naselle R. at Naselle	92, 95-pres
26B070	Cowlitz R. at Kelso	84-pres
26B150	Cowlitz R. at Toledo	92
26C070	Coweeman R. at Kelso	84-92
26D070	Toutle R. near Castle	84-92

Willapa Basin

Both stations on the Willapa River, near Willapa and upstream at Lebam, had elevated fecal coliform counts, frequently exceeding 100 colony forming units (cfu)/ 100 mL, for the periods of record. Ammonia concentration frequently exceeded 0.030 mg/L at both stations, although data from the downstream station indicates that this has dropped somewhat. Total phosphorus concentration also appeared to be elevated. Temperature consistently exceeded 20°C at the Willapa station. Nutrient and fecal coliform values in the Naselle River were lower than in the Willapa, although approximately 25% of the fecal coliform observations exceeded 100 cfu/100 mL. Nutrient concentrations and fecal coliform values were even lower in the North River.

Cowlitz River Basin

Two stations were monitored on the Cowlitz River, one long-term station at Kelso and one near Toledo. Total phosphorus, suspended sediment, turbidity, and fecal coliform were all higher at Kelso. Median fecal coliform concentration was approximately 20 cfu/100 mL at Kelso with few observations over 100 cfu/100 mL. Suspended sediment concentration and turbidity were occasionally extremely high in the Cowlitz River at Kelso and in the Toutle River. These have been declining since the early 1980's and are apparently a result of the Mt. St. Helens eruption. Summer temperatures exceeding 20°C are not uncommon on both the Toutle and Coweeman Rivers. Although the median fecal coliform value on the Coweeman River (>30°) was considerably higher than the Toutle (<15°), it was quite variable on both rivers, exceeding 200 cfu/100 mL at times.

Columbia River

No monitoring stations are maintained on this portion of the Columbia River, however two surveys of fecal bacteria were conducted on the Columbia River by the Ambient Monitoring Section through the Lower Columbia River Bi-State Program (Hallock and Ehinger, 1993). Violations of the fecal coliform standard were found as well as violations of the standards for temperature and pH. The fecal coliform values were neither extreme nor widespread.

The US Geological Survey collected data (nutrient, metals, and pesticide/herbicide) from the lower Columbia River and reported it in Fuhrer, *et al.* (1994). In general, concentrations of metals and pesticide/herbicides were low.

Recommendations

Locations for regional monitoring stations will depend upon the prioritization of issues at the November 1996 meetings. The issues involved with the Columbia River extend well beyond the boundaries of the WQMA, and need to be addressed in a more extensive manner.

References

Fuhrer, G.J., D.Q. Tanner, J.L. Morace, S.W. McKenzie, and K.A. Skach. 1994. Water Quality of the Lower Columbia River Basin: Analysis of Current and Historical Water-Quality Data through 1994. U.S. Geological Survey Water-Resources Investigations Report 95-4294.

Hallock, D. and W.J. Ehinger. 1993. Lower Columbia River Bi-State Water Quality Program: Bacteria Study. Wash. Dept. of Ecology. Olympia, WA.

Aquatic Plants

by
Jenifer Parsons

Waterbodies which were surveyed for aquatic plants (Table 2) and those known to have plants listed with the State Noxious Weed Control Board (Table 3) are presented below. All of the listed noxious aquatic weeds, as well as other exotic plants which have the potential to become weedy are established in the lower Columbia River area.

Recommendations

It is important to monitor areas where these plants have not yet become established to catch populations in the early stages of invasion. Lakes and rivers with these plants should be monitored to note any changes in the plant communities over time. Waterbodies that have not been visited should be surveyed in the future.

Table 2. Waterbodies surveyed for aquatic plants.

County	Waterbody Name	WRIA	Date
Cowlitz	Silver Lake	26	9/19/95
Cowlitz	Silver Lake	26	9/7/94
Cowlitz	Solo Slough	25	8/16/95
Cowlitz	Solo Slough	25	7/14/94
Cowlitz	Solo Slough	25	4/13/94
Cowlitz	Willow Grove Slough	25	8/16/95
Cowlitz	Willow Grove Slough	25	7/14/94
Cowlitz	Willow Grove Slough	25	4/13/94
Pacific	Black Lake	24	7/12/94
Pacific	Island Lake	24	7/14/94
Pacific	Loomis Lake	24	7/13/94
Pacific	O'Neil Lake	24	7/12/94
Pacific	Surfside Lake	24	7/13/94
Wahkiakum	Columbia River at Cathlamet	25	8/16/95
Wahkiakum	Puget Island Sloughs	25	5/16/95

Table 3. Waterbodies known to have aquatic weeds (plants listed with the State Noxious Weed Control Board).

Silver Lake, Cowlitz County	had *Egeria densa* and *Myriophyllum spicatum*, now has a population of grass carp.
Solo Slough, Cowlitz County	*Egeria densa, Myriophyllum spicatum, Myriophyllum aquaticum, Cabomba caroliniana*
Willow Grove Slough, Cowlitz County	*Myriophyllum spicatum, Cabomba caroliniana*
Black Lake, Pacific County	*Egeria densa*
Columbia River	*Myriophyllum spicatum* is throughout the Columbia River, at least as far downstream as Cathlamet, *Myriophyllum aquaticum, Cabomba caroliniana,* and *Egeria densa* are also in scattered locations.
Puget Island Sloughs	*Myriophyllum aquaticum, Egeria densa*

note: *Egeria densa* = Brazilian elodea
Myriophyllum spicatum = Eurasian milfoil
Cabomba caroliniana = fanwort
Myriophyllum aquaticum = parrotfeather milfoil

Lakes

by
Kirk Smith

Lake Mayfield was sampled in 1993 as part of the Lake Water Quality Assessment Program. Lakes Loomis and Packwood have not been sampled for some time and information on them should be considered dated at best. Trophic states for the above mentioned lakes and the last year that they were sampled are:

Loomis	Eutrophic (90)
Packwood	Oligotrophic (89)
Mayfield	Oligo-mesotrophic (93)

Additionally, Lake Sacajawea (WRIA 25) and Silver Lake (WRIA 26) have been placed on the 1996 303(d) list for excessive total phosphorus concentrations.

Recommendations

The southwest part of the state has had relatively little lake monitoring. Increased monitoring of this geographic area is recommended in order to increase awareness and to establish baseline information.

Marine Water Monitoring

by
Jan Newton and the Marine Water Monitoring Team

The Marine Water Monitoring (MWM) program of the Ambient Monitoring Section is responsible for monitoring the marine waters of Puget Sound and the estuaries, Grays Harbor and Willapa Bay. The Lower Columbia Basin includes stations from Willapa Bay only. Station location and the data record for all stations sampled by the Marine Water Monitoring Team in Willapa Bay are listed in Table 4. The types of marine water column data available from Ambient's database for both the historical and current stations are listed in Table 5. The data collected from a particular station has not always included all of the parameters in Table 5 for all wateryears. However, temperature, salinity, and Secchi disk depth have always been collected.

Willapa Bay receives marine water from the Pacific Ocean, freshwater from the Willapa, North, Naselle, as well as several other rivers. Depending on the location within the bay and the degree of tidal and wind mixing, the oceanic and fresh waters may be density-stratified or homogenously mixed. Conditions within the bay can vary substantially and rapidly, due to large variations in tidal, wind, and density-driven forces. Because the estuary is relatively shallow, these variations can have significant impact.

Willapa marine waters are rated class A. The Section 303 (d) listing shows excursions for dissolved oxygen, fecal coliform, and pH. Toxic chemical contamination in Willapa is low except for the controversial use of herbicides and pesticides to combat invasive or undesirable species. *Spartina* invasion and the increase in the ghostshrimp population (and the chemical controls now in use for each) are two significant economic/ecological problems in the bay.

The US-EPA has funded a five-year initiative on ecosystem management in Willapa Bay. The case study consists of a coordinated suite of studies on water column processes, benthic-habitat relationships, biological stressors, circulation studies and models, watershed modeling, and development of ecosystem sampling protocols and models. Involved parties include Ecology, EPA-Newport, University of Washington, Oregon State University, and the Willapa Alliance.

Table 4. Marine Waters Monitoring data availability in WRIA #24, Pacific, of Lower Columbia. Station data available for current and historical stations. An "X" denotes monthly data in Ecology's Ambient Monitoring database and in US EPA Storet for the listed wateryear. Some wateryear records are incomplete due to missed surveys or isolated sampling events; sampling during winter months did not commence until WY1989. Station type: "C"=core; "R"=rotating (3 y rotation); blank = historical, not currently sampled.

Station Number	Station Name	Station Type	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Willapa Bay																										
WPA001	Willapa R., Raymond	C	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x
WPA002	Willapa R., South B.		X	X	X		X																			
WPA003	Willapa R., John. Slough	R	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x
WPA004	Toke Point	C	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x
WPA005	Oysterville		X	X	X																					
WPA006	Nahcotta Channel	C																			X	X	X	X	X	x
WPA007	Long Isl., S. Jenson Point	R																			X	X	X	X	X	x
WPA008	Naselle River mouth	R																								x

Table 5. Data parameters available for Marine Waters Monitoring stations. The database field name, US EPA STORET parameter code, units, and parameter name are listed below. Not all parameters are sampled at every station. Typically, parameter values are available at 0.5, 10, and 30 m (exceptions are fecal (0.1 m), pigments (0.5, 10 m), Secchi disk depth, and stations shallower than 30 m).

Dbase Field	P Code	Units	Parameter Name
Physical parameters:			
TEMP	P10	°C	temperature* (also contains stn #, date, time, and depth)
SALIN1	P480	ppt	salinity* (Oct 1986 - present)
SALIN2	P70305	mg/L	salinity (1973 - Sep 1986)
COND	P95	μmhos	specific conductivity
light:			
SECCHI	P78	m	Secchi disk depth
TRANSMIS	P74	%	percent light transmission (via transmissometer)
Chemical parameters:			
OXYGEN	P300	mg/L	dissolved oxygen*
PCTSAT	P301	%	percent oxygen saturation
PH	P400	units	pH*
nutrients :			
NH3_DIS	P608	mg/L	dissolved ammonium-N (Oct 1990 - present)
NH3_N	P610	mg/L	total ammonium-N (1973 - Sep 1990)
NO2_DIS	P613	mg/L	dissolved nitrite-N (Oct 1990 - present)
NO2_N	P615	mg/L	total nitrite-N (1973 - Sep 1990)
NO23_DIS	P631	mg/L	dissolved nitrate + nitrite-N (Oct 1990 - present)
NO2_NO3	P630	mg/L	total nitrate + nitrite-N (1973 - Sep 1990)
NO3_N	P620	mg/L	total nitrate-N (1973 - Sep 1990)
OP_DIS	P671	mg/L	dissolved ortho-P (Oct 1990 - present)
OP_TOT	P70507	mg/L	total ortho-P (1973 - Sep 1990)
TP_P	P665	mg/L	total P (1973 - Sep 1990)
pigments:			
CHL	P32211	μg/L	chlorophyll *a* (extracted fluorescence)
PHEO	P32218	μg/L	phaeopigment " "
Biological parameters:			
FC	P31616	#/100 mL	fecal coliform bacteria (membrane filter method)

NOTES:

*Since Nov 1989, *in situ* CTD sensors have been used to obtain depth, temperature, salinity, light transmission, DO, and pH data. Prior to Nov 1989, these data were obtained using a variety of methods, except for light transmission which was not measured. Information on sensors and methods used is available upon request.

Salinity was measured: via conductance using a CTD from Nov 1989 - present;
via refractometer from 1987 - Oct 1989;
and via titration from 1973 - 1987.

Nutrients were sampled for dissolved rather than total concentrations beginning in Oct 1990. Samples for dissolved nutrient concentrations are filtered through 0.45 μm pore size cellulose filters. As of June 1992, dissolved nitrite-N has been determined in three urban embayments only (Bellingham Bay, Budd Inlet, Commencement Bay).

Fecal Coliform Bacteria

Fecal contamination in Willapa Bay appears to be improving. Because salinities are frequently quite fresh at the surface of the MWM stations, the higher criteria of 200 org./100 mL is used and thus no excursions are seen in the MWM data. Counts at stations WPA001 and WPA003 have been 120 org./100 mL or less over the last 10 years.

The Department of Health's upgrade of most of the "restricted" areas near Bay Center to "conditionally approved" was based on their water quality surveys. However areas near the mouth of the Palix and Niawiakum Rivers still have high levels and are "prohibited". The "prohibited" area near the mouth of the Willapa River is due to proximity of WWTP outfalls.

Dissolved Oxygen

Although the DO standard for class A waters is set at 6.0 mg/L (WAC, 1992), there is no known harm to marine organisms from DO concentrations below 6.0 but above 5.0 mg/L. Excursions below the class A standard are observed at WPA001, but none have been below 5.0 mg/L. While this probably does not pose a threat to marine life, the area should continue to be monitored to observe any change in this sensitive area. Also, information on the sensitivity of local fish (e.g., Chinook and Steelhead) to DO concentrations between 5 and 6 mg/L should be assessed.

pH

There were two excursions recorded at WPA001, one in 1987 and 1991. In 1987, the pH was acidic, with values as low as 5.4 and depression of pH observed at the other down-estuary Willapa stations, WPA003 and WPA004. Salinities during this event ranged 22-30 ppt which would have substantial buffering ability, thus indicating the event was anthropogenic. The 1991 excursion was basic but quite high (8.7).

Harmful Phytoplankton

The occurrence of harmful or toxic phytoplankton in these waters is not well-documented, though outbreaks have occurred. To some extent, the lack of data indicates a lack of outbreaks, but it also indicates a lack of monitoring. Because of the large shellfish industry in the bay, there would be serious implications if blooms developed.

Toxics

We know of no data regarding chemical contaminants in the water column. Agricultural and industrial practices may contribute these compounds, but we have not monitored for toxics in the marine waters. New technology (semi-permeable membrane devices) and/or mussel cages with tissue analysis would yield this information readily.

Recommendations

Because of the relative lack of observed water quality issues, the relative non-severity of the observed exceedances, and the extent of the current study on the bay, the marine waters of the bay are not given high priority for additional investigation. Many of the problems facing Willapa are ecological in nature (e.g., *Spartina* invasion). The large focus being given to Willapa Bay by the EPA Ecosystem Management program should provide information on how watershed land-use and other activities are affecting the ecology of the Bay. An exception would be monitoring for toxics in the marine waters of Willapa Bay since this area has not been investigated.

Continued monitoring of the Willapa MWM stations is highly recommended; however the marine waters do not currently show poor water quality. Water quality in all of the freshwater inputs to Willapa is not as well known. Monitoring of freshwater stations in the Willapa, Naselle, Bear, Palix, and North Rivers is highly recommended as well as some of the smaller streams that may have significant yields (amount per area) despite lower flows. Because the watershed land-use includes significant agricultural and clear cutting activities, these sources should be carefully monitored for trends in nutrient, sediment, and toxic loadings.

References

Janzen, C.D., 1992. Marine Water Column Ambient Monitoring Plan. Washington State Department of Ecology, Publication #92-23, Olympia, WA.

Newton, J.A. 1995. Marine Water Column Ambient Monitoring Wateryear 1995 Long-term Monitoring Implementation Plan. Washington State Department of Ecology, Publication #95-324, Olympia, WA.

Newton, J.A., in press. Observations of El Nino weather conditions reflected in the temperatures and salinities of monitoring stations in Puget Sound. *In* Puget Sound Research '95 Proceedings, Puget Sound Water Quality Authority, Olympia, WA.

OWEA (The Orcas Watershed Education Alliance), 1995. Eastsound Village Watershed Project: Quarterly Report, February 1995. Eastsound, WA.

Watershed Assessments 1985-96

by
Greg Pelletier

The Watershed Assessments Section (WAS) has conducted four studies over the past ten years that contain information on waterbodies in the Lower Columbia WQMA. These include the following:

- an evaluation of fecal coliform contamination in Willapa Bay
- an examination of water quality problems in Longview Ditches
- a statewide examination of water quality problems associated with dairies
- a study of water quality impacts from seafood processors.

Previous Studies by WAS

Willapa Bay Fecal Coliform

Seyferlich and Joy (1993) examined fecal coliform contamination of Willapa Bay. Portions of Willapa Bay and the Willapa River were identified as "water quality limited" due to bacterial pollution from human and animal sources. Fecal coliform sources threaten or impair shellfish harvest areas of Willapa Bay, which produces over 50% of Washington's shellfish. Domestic water use and recreational uses are also threatened by bacterial contamination. The report, which was partially funded by a USEPA Near Coastal Waters Grant, evaluated current bacterial problems, and explored management options for effective control of bacterial loading to achieve compliance with water quality standards and protect beneficial uses.

Most of the bacterial problems in the watershed appear to be generated by nonpoint sources (on-site septic systems, combined sewer overflows, and livestock manure). Some corrections of the major sources have occurred, but problems in other areas have led to shellfish harvesting restrictions. Controlling bacterial contamination in the watershed is a priority among local, state, and federal agencies and organizations. The report recommended that these groups come together and form a cooperative and coordinated control effort. Either a total maximum daily load or local initiative organizational structure could work. The report also recommended several control strategy elements.

Longview Ditches

Cusimano (1993) examined water quality problems in Longview Ditches. Surveys were conducted on September 14 and November 16, 1992, to assess the water quality of a portion of the Longview Ditches. Overall, the ditches' aesthetic values were found to be impaired by materials which offend the senses.

The water in the ditches was found to violate water quality standards for fecal coliform, dissolved oxygen, and turbidity throughout the study area. Levels of iron, total suspended solids (TSS), and *Escherichia coli* (E. coli) were also high. In addition, metals such as copper, lead, mercury, zinc, and possibly cadmium exceeded water quality criteria, at least at one sampling station. These findings, which are consistent with historical water quality assessments, support reducing or eliminating point and nonpoint pollutants which contribute to the degraded water quality conditions in the ditches.

Water Quality Impacts from Dairies

Erickson (1995) prepared a literature review of surface water quality studies related to dairy waste practices. The literature review encompassed the entire state, and included information on the following waterbodies in the Lower Columbia WQMA: Willapa Bay, North River, Cedar River, Grayland Ditch, Pioneer Creek, Tuttle Creek, Willapa River, Stringer Creek, Naselle River, Alder Creek, Nemah River, Palix River, and Skamokawa Creek.

The review examined 48 documents statewide, and summarized each document's conclusions regarding water quality degradation or beneficial use impairment due to dairy waste. The most common water quality impacts were higher fecal coliform levels and lower dissolved oxygen levels. The most common beneficial use impairment was fish habitat degradation. The study areas corresponding to each document are shown on maps together with dairy locations. The areas where dairies were most directly related to water quality did not include waterbodies in the Lower Columbia WQMA. Areas lacking sufficient information included the Cowlitz River.

Water Quality Impacts from Seafood Processing

Joy (1990) studied water quality impacts of four seafood processing plants in southwest Washington (Jessie's Ilwaco Fish Company and Chinook Fish Packing on Baker Bay, which is a part of the Columbia River estuary; Willapa Seafoods at Bay Center in Willapa Bay; and East Point Seafoods at South Bend in the Willapa River).

Adverse impacts on poorly flushed receiving water areas were suspected, but could not be established by the study. Several recommendations for improvement of permit data collection and records-keeping were made.

Other Waterbodies

A total of 33 waterbody segments are listed under Section 303(d) of the federal Clean Water Act (Table 6). Temperature and fecal coliform are the most frequently listed parameters, followed by pH, dissolved oxygen, and total phosphorus. Lead and turbidity were each listed in one segment. Eight of the waterbody segments on the 303(d) list are listed for more than one water quality parameter (Table 6).

The previous studies by WAS only address fecal coliform in Willapa Bay and various water quality parameters in Longview Ditches. No studies were found for other waterbody segments on the 303(d) list.

Conclusions and Recommendations

Willapa Bay Fecal Coliform

The USEPA has funded a major 5-year initiative on ecosystem management in Willapa Bay (refer to the chapter on EILS Ambient Monitoring Section studies for a description). Ecology should continue to be involved to ensure that products of these studies are useful to address control of fecal coliform and other parameters that are not meeting water quality standards.

Seyferlich and Joy (1993) made several specific recommendations for control of fecal coliform in Willapa Bay. Progress on many of the following recommendations may not have proceeded substantially (Joy, 1996) and should be examined.

- Local, state, and federal interests should agree on a lead agency and an overall framework and goals for a control strategy. A formal re-evaluation cycle should be scheduled.

- Education and outreach should be an important part of a control strategy.

- A long-term monitoring plan for water quality should be established to provide data for trend analysis, and a way to evaluate overall effectiveness of the control strategy.

- Data for land use changes and shellfish growing area activities should be documented and tracked. GIS coverages by Willapa Alliance and other agencies or groups should be made available.

Table 6. Summary of Section 303(d) list for the Lower Columbia WQMA (bold type shows waterbodies listed for more than one water quality parameter.)

Waterbody Segment Number	Waterbody Name	Temp-erature	Fecal Coliform	pH	Dissolved Oxygen	Total P	Lead	Turbidity	Total Number of Parameters Listed
WA-24-0020	**Willapa Bay**		**X**	**X**					**2**
WA-24-1010	North River		X						1
WA-24-1011	Smith Creek	X							1
WA-24-1020	Cedar River		X						1
WA-24-1030	**Grayland Ditch**		**X**		**X**				**2**
WA-24-1050	Pioneer Creek	X							1
WA-24-1080	Tuttle Creek			X					1
WA-24-2020	**Willapa River**	**X**	**X**	**X**	**X**				**4**
WA-24-2030	**Willapa River**	**X**	**X**						**2**
WA-24-2037	Forks Creek	X							1
WA-24-3010	Naselle River	X							1
WA-24-3020	Naselle River	X							1
WA-25-1015	Grays River, W.F.	X							1
WA-25-3010	Elochoman River	X							1
WA-25-3300	Abernathy Creek	X							1
WA-25-3500	Germany Creek	X							1
WA-25-5010	**Longview Ditches**		**X**		**X**		**X**	**X**	**4**
WA-25-9010	Lake Sacajawea					X			1
WA-26-1020	**Coweeman River**	**X**	**X**	**X**	**X**				**4**
WA-26-1023	Goble Creek	X							1
WA-26-1025	Mulholland Creek	X							1
WA-26-1026	Baird Creek	X							1
WA-26-1030	Coweeman River	X							1
WA-26-1040	**Cowlitz River**	**X**	**X**	**X**					**3**
WA-26-1050	Toutle River		X						1
WA-26-1087	Herrington Creek	X							1
WA-26-1096	**Cinnabar Creek**	**X**		**X**	**X**				**3**
WA-26-1110	Cispus River	X							1
WA-26-1115	Cispus River, N.F.	X							1
WA-26-1118	Cispus River	X							1
WA-26-1119	East Canyon Creek	X							1
WA-26-1122	Silver Creek	X							1
WA-26-9110	Silver Lake					X			1
Total Number of Waterbodies Listed:		24	10	6	5	2	1	1	

- Intensive monitoring studies could assist in a range of control strategy activities. The following studies were suggested:

  ◊ monitor bacteria in growing areas during the October-December harvest season.
  ◊ investigate bacteria loading response to rainfall for all rivers.
  ◊ investigate bacteria impacts from diked grazing land.
  ◊ define fecal coliform fate and transport in the watersheds and estuary.
  ◊ identify fecal coliform sources in the upper Willapa River.
  ◊ re-evaluate bayshore and river sources of fecal coliform compared with the 1980 sanitary survey.
  ◊ clarify the overall impact of seasonal seafood processing on shellfish resource areas.
  ◊ conduct post-action evaluation of bacteria impacts from Bay Center on-site system upgrades and the Hewitt Addition sewer line installation.
  ◊ complete farm inventories along the entire bayshore and near-bay river reaches.
  ◊ investigate bacteria impacts from spring harbor seal pupping areas, elk herd wallows in near tidal meadows, and migratory bird populations.

Longview Ditches

Cusimano (1993) made the following recommendations:

- Source identification/control efforts or related follow-up studies in the Longview Ditches should focus on the priority contaminants (toxic metals and organics).

- Any further chemical analyses on the ditch sediments should take into account the significant interferences encountered in Cusimano's 1993 study and only be undertaken after consultation with the laboratories doing the analyses.

Water Quality Impacts from Dairies

Except for information compiled by Seyferlich and Joy (1993) for the Willapa Bay watershed, very little information on water quality impacts of dairies was found for the WQMA during the statewide literature search by Erickson (1995.) The statewide literature search found clear evidence of a relationship between dairies and elevated fecal coliform levels in surface waters. Considering that elevated fecal coliform levels are widespread in the WQMA (Table 6), further studies of the contributions of dairies and potential effectiveness of Best Management Practices are warranted. The Cowlitz River was noted by Erickson as an area with insufficient information.

Water Quality Impacts from Seafood Processing

Joy (1990) made the following conclusions and recommendations:

- Discharge monitoring reports for seafood processors were generally inadequate. Accurate data on daily water consumption and production need to be consistently reported to evaluate NPDES permit compliance. Water use for product lines should be metered independently of other water use needs at the plant (*e.g.* lavatories, ice-making, deck/loading area washdown, and water service to boats).

- Weekly, semi-monthly, or monthly monitoring of effluent pH, TSS, and oil and grease should be required. Monitoring of effluent BOD_5 should be required for discharges to poorly flushed waterbodies. Weekly sampling should be required during the primary processing season(s) when 30 consecutive days of processing are expected to occur. Flow-proportioned composite sampling would be best, but four or more grab samples taken at equal intervals over an 8-10 hour production day may be adequate. At least two fecal coliform, and oil and grease grabs should be taken while product effluent is discharged, and one taken during washdown.

- Seafood processing effluents containing far greater concentrations of total P, BOD_5, and TSS than municipal effluent.

- Washdown water is very different from processing effluent and should be considered separately in monitoring schedules, and should not be over-represented.

- The source of elevated fecal coliform in some seafood processing plants should be investigated. Periodic monitoring of fecal coliform at all plants should be required as a preventative measure.

- Effluent from the Chinook Packing plant was suspected of impairing water quality in the boat basin during late summer. Annual maintenance dredging of the boat basin and entrance channel may be mitigating impairment.

- Re-design and replacement of the combined outfall for Jessie's and the Ilwaco Wastewater Treatment Plant should be considered.

- Receiving water monitoring should be performed over an entire tidal cycle as part of the discharge permit application and renewal process. Flushing efficiencies and effluent dispersion during critical periods should be calculated.

Other Waterbodies

No detailed studies by WAS were found for most of the waterbodies that are on the Section 303(d) list, however the following recommendations are made:

- Prioritize problems in these waterbodies, and work cooperatively with other agencies to determine how best to address these problems. Conduct TMDL studies and develop management plans as appropriate.

- The 303(d) list may be useful for prioritizing problem areas. Eight of the waterbody segments on the 303(d) list are listed for more than one water quality parameter (Table 6). These segments (Willapa Bay, Grayland Ditch, Willapa River, Longview Ditches, Coweeman River, Cowlitz River, and Cinnabar Creek) may be among the highest priorities for future TMDL projects.

TMDLs to Control Nonpoint Sources

Most of the identified water quality problems on the 303(d) list for the WQMA have been attributed to nonpoint sources. Excessive temperature and fecal coliform appears to be the most widespread water quality problem in the WQMA. Dissolved oxygen, pH, and total phosphorus are also of concern in several waterbodies.

Several management activities are available to address nonpoint source problems in the WQMA and may be used as the functional equivalent of TMDLs.

- ***Watershed Analysis:*** Watershed Analysis is a process developed by Timber, Fish, and Wildlife (TFW) cooperators to address the cumulative effects of forest practices on fish, water, and capital improvements. Waterbody segments that are listed under 303(d) and are identified as impaired by silviculture should be considered candidates for Watershed Analysis.

- ***Centennial Clean Water Funded Projects:*** Ecology provides grants from the Centennial fund to local governments and state agencies to complete a wide variety of water pollution control projects. In evaluating whether a proposed project receives funding in the WQMA, highest priority should be given to projects that will improve or protect a waterbody on the Section 303(d) list. Funded projects should also be required to meet the major requirements for TMDL approval, including problem formulation, TMDL calculations and supporting studies, control actions and implementation schedules, public participation, and follow-up monitoring. All of the listed waterbody segments in the WQMA should be considered candidates for surrogate TMDLs conducted by Centennial Clean Water funded projects.

- ***Farm Plans:*** The state's local conservation districts work with individual farmers to develop water quality management (farm) plans. Development of these plans may be voluntary, required under the statewide NPDES Dairy Waste General Discharge Permit, or initiated by an agricultural water quality complaint to Ecology. These plans may be included as part of a basin-wide TMDL. A single farm plan or set of plans could also contain all of the components of a complete TMDL if farm management is the primary cause of water quality problems.

References

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Seyferlich, H. and J. Joy, 1993. Willapa Bay Watershed Bacterial Evaluation and Preliminary Control Strategy. Ecology Report, Publication No. 93-64, 96 pp.+ appendices. Environmental Investigations and Laboratory Services Program. Washington State Department of Ecology. Olympia, WA.

Toxics Investigations

by
Dave Serdar

This section addresses issues related to toxic contaminants in waters of the Lower Columbia River Water Quality Management Area (LCWQMA). Reports on the LCWQMA prepared by EILS staff during the past ten years were summarized. Recommendations for future work follow the summaries.

Report Summaries

Johnson, A. and D. Davis, 1996. Washington State Pesticide Monitoring Program - Pesticides and PCBs in Marine Mussels, 1995. Pub. No. 96-301, Washington State Department of Ecology, Olympia, WA.

Marine mussels (*Mytilus trossulus*, formerly *M. edulis*) from the Columbia River near Ilwaco were analyzed for 43 bioaccumulative pesticides and PCBs as part of the Washington State Pesticide Monitoring Program (WSPMP). Mussels from five Puget Sound sites were also analyzed. Nine pesticides plus PCB-1254 (tentatively identified) were detected in the Ilwaco mussels. Concentrations for all but PCB were below criteria to protect human health or fish-eating wildlife. Although PCB was found at a low concentration (6 ug/Kg), it exceeds the EPA human health criterion of 1.4 ug/Kg and the authors therefore recommended including the lower Columbia River on the 303(d) list for PCBs.

Cubbage, J., 1989. Survey of Pesticides in Sediments in the Vicinity of Shoalwater Bay Tribal Lands. Washington State Department of Ecology, Olympia, WA.

During 1989, Ecology analyzed sediments and shellfish (Japanese littleneck clams, Tapes japonica) in and around the Shoalwater Indian Reservation for chlorinated pesticides, organophosphorous pesticides, and PCBs. The survey was done as a follow-up to a 1978-79 USGS survey which found pesticides in water and sediment from streams draining into northern Willapa Bay tidelands. The USGS found DDT at levels which exceeded water quality criteria. No pesticides were detected in samples from the Ecology study.

Davis, D., 1993. Washington State Pesticide Monitoring Program - Reconnaissance Sampling of Surface Waters (1992). Washington State Department of Ecology, Olympia, WA.

This report describes results of first year sampling for the WSPMP. Sites sampled include Tuttle Creek, tributary to the North river in southern Grays Harbor County. It was selected for this program because of its location in a watershed which is sprayed with forest chemicals. None of the 162 pesticides or breakdown products analyzed were detected in Tuttle Creek.

Johnson, A., 1987. Review of Data on Sevin. Memorandum to Jon Neel and Gary Bailey, Washington State Department of Ecology, Olympia, WA.

This report reviews information on the potential impact of Sevin (carbaryl) use in Willapa Bay and Grays Harbor to control burrowing shrimp. The review addresses a variety of questions including those concerning the persistence of carbaryl and its breakdown product, 1-naphthol, in water and sediments, toxicity to marine organisms, effects on abundance and diversity of infauna and epifauna, and the overall ecological consequences of carbaryl's use. The author concludes that there are insufficient data to answer most of these issues for Willapa Bay and Grays Harbor.

The author recommends that data be collected to answer the following high-priority questions: How long do carbaryl and 1-naphthol persist in sediments and at what concentrations are they toxic to marine organisms? What are the effects on the abundance and diversity of infauna? What mortality is experienced by fish and Dungeness crab, and how does this affect the fishery of the latter? What are the potential ecological impacts of Sevin application?

Hunter, M. and A. Johnson, 1996. Aluminum Toxicity Assessment of Mill Creek and Cameron Creek, Wahkiakum and Clark Counties. Washington State Department of Fish and Wildlife memorandum to Brian Cowan, WDFW.

This survey summarizes aluminum sampling conducted on several creeks tributary to the Columbia River in eastern Wahkiakum and western Cowlitz Counties. The sampling was done at the request of WDFW because of the puzzling absence of fish in Mill and Cameron Creeks. Aluminum toxicity was suspected as one possibility because the soils in this area are naturally rich in aluminum and have little capacity to buffer against changes in pH.

Survey results showed that dissolved aluminum concentrations in the water column of upper Mill Creek (41 ug/L) combined with low pH (6.4) has the potential to result in aluminum toxicity (aluminum toxicity increases as pH falls).

Aluminum levels in Cameron Creek could also be toxic, but concentrations weren't as high and pH wasn't as low as Mill Creek.

The authors recommended additional sampling for aluminum in Mill and Cameron Creeks. They also recommended conducting standardized bioassessment in Cameron Creek to determine if the lack of aquatic life is a permanent condition. If so, then a more careful study of toxic agents should be done.

Serdar, D., A. Johnson, and S. Magoon, 1991. Polychlorinated Dioxins and -Furans in Columbia River Sportfish - Chief Joseph Dam to McNary Dam. Pub. No. 91-49, Washington State Department of Ecology, Olympia, WA.

This report focuses on dioxin and furan residues in fish from the middle-to-upper Columbia River. Fall chinook (*Oncorhynchus tshawytscha*) taken in the Columbia mouth commercial fishery were also analyzed to provide background data. Dioxin (2,3,7,8-TCDD) was not detected in the five composite samples analyzed. Furan (2,3,7,8-TCDF) was found in all samples at levels in the range of 0.1 - 0.4 pg/g, lower than other Columbia River fish and similar to concentrations found in rainbow trout (*O. mykiss*) and mountain whitefish (*Prosopium williamsoni*) from another background waterbody, Wenatchee Lake.

Johnson, A. and D. Serdar, 1996. Chemical Analysis of Sediments Adjacent to the Canby Road Tire Fire. Ecology memorandum to Thom Hooper, WDFW.

This report summarizes the chemical analysis of sediments collected downgradient of burning tire chips which had been used as road fill. The fire was located on a bank above Baker Bay on the Columbia River near Ilwaco. Oils produced by the fire had oozed toward the mudflats on Baker Bay but had apparently been contained within booms before reaching the mudflats. Phenols, PAHs, substituted benzenes, naphthalenes, benzothiazoles, and nitriles were present at potentially toxic concentrations within the inner boom but were absent or at low concentrations in the outer booms and sediments in a channel draining the boomed area. WDFW investigators at the site observed some fish mortality in mudflat channels, but they have not released a report of their findings.

Cusimano, B., A. Johnson, and D. Davis, 1993. Longview Drainage System: Water Quality Assessment (Part 1) and Chemical Screening of Sediment Samples (Part 2). Washington State Department of Ecology, Olympia, WA.

The Longview ditch system receives stormwater from Kelso, Longview, and the surrounding area in addition to several industrial discharges. The ditches empty or are pumped to the Coweeman, Cowlitz, or Columbia Rivers or the Coal Creek Slough. Results of the water quality assessment showed violations for a number

of water quality standards including copper, lead, zinc, mercury, and possibly cadmium. In sediments, contaminants identified as a primary concern included oil & grease, total petroleum hydrocarbons (TPH), PAHs, iron, cyanide, lead, chromium, and cadmium. When sediment and water column results are considered together, the following toxic contaminants are a water quality concern in the Longview ditch system: PAHs, iron, cyanide, lead, chromium, cadmium, mercury, copper, and zinc.

Johnson, A. and B. Hopkins, 1991. Metal and Fecal Coliform Concentrations in the Lower Columbia River. Memorandum to Steve Saunders, Washington State Department of Ecology, Olympia, WA.

Water from the Columbia River at Bradwood was analyzed for copper, lead, zinc, mercury, and cadmium as well as fecal coliform bacteria. The survey was conducted because historic USGS data indicated that metals in the lower river exceeded acute or chronic criteria for the protection of aquatic life. The Ecology investigators, however, found levels of these metals to be low and not a threat to aquatic life. They concluded that the USGS data for metals are suspect due to quality assurance shortcomings or because of sample contamination by the USGS depth integrating samplers, which has been documented in the published literature.

Johnson, A. and D. Norton, 1988. Screening Survey for Chemical Contaminants and Toxicity in Sediments at Five Lower Columbia River Ports, September 22-24, 1987. Washington State Department of Ecology, Olympia, WA.

Columbia River ports examined for this survey included Kalama, Longview, and Ilwaco. PAHs were the major concern among the contaminants analyzed. PAH concentrations were elevated in sediments below Reynolds Aluminum in Longview (950 mg PAH/Kg organic carbon). Contaminants at all other sites were found at relatively low concentrations or were undetectable. Bioassays performed on two species did not show any significant mortality.

The authors recommended further sampling in the vicinity of the Reynolds site to determine the extent of PAH contamination. They also debate the significance of slightly elevated metals (copper, mercury, and zinc) in Ilwaco sediments since these are common boatyard/marina contaminants. The investigators did not analyze sediments for organotins although inorganic tin was found at the highest concentration in Ilwaco sediment. Organotins, especially tributyltin (TBT), have been found at toxic levels in several Puget Sound marinas due to TBT's previous widespread use as an antifoulant.

Recommendations

Review of existing data suggest that pesticides used on terrestrial crops are not a major problem in the LCWQMA (reports 1-3). The one exception is pesticides in cranberry bog drainages.

An intensive survey of pesticides in cranberry bog drainage is currently underway in the Grayland area, including the Pacific County Drainage Ditch No. 1. which flows into the northern Willapa Bay tideflats. Water samples are collected weekly for pesticide analysis except during periods of heavy pesticide application, at which time samples are collected daily. Laboratory bioassays, *in situ* bioassays, and pesticide residue analysis of fish and shellfish tissues have also been included as a component of this study.

The study was sparked by 1994 and 1995 data from WSPMP monitoring on a ditch draining Grayland cranberry bogs but emptying into Grays harbor rather than Willapa Bay. Azinphos-methyl, carbofuran, chloropyriphos, and diazinon were found at levels which exceeded aquatic life criteria and were among the highest in waters statewide. DDT was also detected in samples from 1994 and 1995.

The impact of Sevin in Willapa Bay (report 4) remains unknown. The report on Sevin suggests that it has the potential to cause serious deleterious impacts to crustaceans and other organisms in Willapa Bay. The impact on the bay's ecology and surrounding areas (e.g., Willapa Bay NWR and Leadbetter State Park) is also unknown. We know of no follow-up studies on this issue. At the time of the report (1987) oyster growers in Willapa Bay and Grays Harbor had requested a doubling of the area to be treated annually, to 800 acres, and were granted permission to treat 400 acres in Willapa Bay. Unpublished information suggests that since the areas of application rotate on an average of 3-7 years, a larger area of the bay is being affected. However, it is unknown what acreage is currently being treated.

The Canby Road tire fire and the possible aluminum toxicity in Mill and Cameron Creeks both have the potential to impact local fisheries (reports 5 & 7).

Reports on the Lower Columbia River indicate that there is little problem with toxic contamination. Some exceptions include unanswered questions about PAHs in sediments in the vicinity of Reynolds Longview and tributyltins in the Ilwaco boat basin (report 10). The Longview Ditches have significant PAH, cyanide, iron, lead, chromium, cadmium, mercury, copper and zinc contamination but it has been well characterized and does not appear to cause significant contamination of the Columbia River (reports 8 & 9).

Based on this information, it is recommended that future study in the LCWQMA be given the following priority:

1. The impact of Sevin in Willapa Bay should be examined. At the very least, information on Sevin (*e.g.*, persistence, toxicity) and field data produced during the past decade should be reviewed and an intensive study conducted, if warranted, to assess the impact of this pesticide on benthic and other organisms. WDFW, Department of Natural Resources, and possibly University of Washington should also be consulted on this issue.

2. Follow-up on aluminum toxicity in Mill and Cameron Creeks should occur. The study should be fine-tuned to address the possibility that aluminum is causing acute toxicity on these creeks. WDFW should be consulted on their level of interest and whether or not other creeks may be affected.

3. Conduct a screening survey of tributyltin concentrations in the Ilwaco boat basin. This should initially be approached as a small scale survey to examine the possibility that TBT is a problem.

Ground Water

by
Pam Marti

EILS Studies

Only one ground water study has been conducted by EILS in the Lower Columbia Watershed in the past ten years. A study of the Long Beach Peninsula ground water was conducted in 1987-1988 (Carey and Yake, 1990). Due to the geologic nature of the Long Beach Peninsula (highly drained, sandy soils and a shallow water table), ground water is highly vulnerable to contamination. Data obtained during this study indicate that ground water quality has been adversely affected by human activities. Moderately elevated concentrations of chloride and nitrate were detected during the study. Potential sources include seawater intrusion or sea spray (chloride) and effluent from septic tank systems (chloride and nitrate). Additional potential sources of nitrate include lawn, garden and crop (specifically cranberry) fertilization. The degree of the degradation overall was considered moderate.

Other Studies

The USGS conducted a ground water quality study of the Long Beach Peninsula in 1992 (Thomas, 1995). Recent and projected population growth on the peninsula has created concerns about the quantity and quality of the ground water resources. These concerns centered on declining ground water levels from increased pumpage, and ground water contamination from seawater intrusion, pesticides or fertilizers from cranberry growing areas, and septic-system effluent.

The water quality of the shallow ground water was found to be generally good. No appreciable amount of seawater has intruded into the sand aquifer. A heavy average annual precipitation and small ground water withdrawal combine to maintain a thick freshwater lens of ground water that prevents seawater intrusion throughout the year. Agricultural activities do not appear to have appreciably affected the quality of the shallow ground water. The concentration of nitrate in ground water was not significantly higher near cranberry growing areas. Selected pesticides were also sampled for and none found above the analytical detection limit. Septic systems probably caused an increase in the concentrations of nitrate in shallow ground water in areas of higher population density. Concentrations of nitrate were significantly related to population density. However, the concentrations were not generally high.

Possible Ground Water Issues

Following is a list of potential ground water issues. Since EILS has not conducted any specific studies in this watershed related to these topics, each is discussed in general terms.

On-Site Septic Systems

Failing residential on-site septic tank/drainfield systems have been identified as a key ground water issue for this watershed, specifically in the area of the Long Beach Peninsula and Skamokawa Creek. Skamokawa Creek is the water source for many residents of the area and has a high fecal coliform bacteria count. Failing septic systems is suspected to be the source of the fecal coliform. Failing septic systems can also be the source of nitrate, chloride, phosphorus, ammonia, and dissolved organic carbon.

Dairy Waste Storage Lagoons and Land Application of Dairy Wastewater

Dairy lagoons and land application of dairy wastewater in regions of shallow ground water can impact ground water quality. Erickson (1994) evaluated the effects of leakage from four dairy lagoons around the state. In general, leakage from the lagoons did impact ground water quality. Concentrations of the following parameters increased downgradient of the lagoons: chloride, total dissolved solids, total organic carbon, chemical oxygen demand, total phosphorus, ammonia-N, nitrite+nitrate-N, and total and fecal coliform bacteria. Contaminant concentrations often exceeded drinking water standards and ground water quality standards.

Fish Farming

Fish farming is an expanding enterprise in Washington State. Effluent from hatcheries may deliver nutrients, solids, and potential toxicants to the receiving environment (Kendra, 1989). A study conducted by Erickson (1990) in Lewis County showed discharge from a salmon farm had affected local ground water quality. Parameters that showed elevated concentrations in ground water were total phosphorus, total organic carbon, ammonia, iron (total recoverable), and total coliform bacteria. Comparisons with water quality results from 1986 showed that ground water quality had deteriorated.

Agricultural Practices

Water-quality problems that may be caused by agricultural practices include elevated nutrient concentrations (*i.e.*, nitrate), and the presence of pesticides. EILS is currently conducting a surface water study in Grays Harbor and Pacific Counties to quantify the nature and extent of contamination from cranberry bog runoff.

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Thomas, B.E., 1995. Ground-Water Flow and Water Quality in the Sand Aquifer of Long_Beach Peninsula, Washington. U.S. Geological Survey Water-Resource Report 95-4026.

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Compliance Investigations

by
Guy Hoyle-Dodson

EILS Data and Reports

In the Lower Columbia WQMA there are currently 52 dischargers that have permits under the National Pollution Discharge Elimination System (NPDES) and 13 dischargers that are permitted under the State Waste Discharge Permit Program (WAC 173-216). These include:

NPDES Major Permits - 4 Industrial, 1 Municipal
NPDES Minor Permit - 25 Industrial, 23 Municipal
State Discharge to Publicly Owned Treatment Works (POTW) - 8 Industrial
State Discharge to Ground Permits - 4 Industrial, 1 Municipal

The following notes EILS enhanced or limited Class II Inspections at four industrial facilities and one municipal facility that have occurred over the last ten years. All other facilities noted in this briefing have either not been inspected by EILS or were inspected more than ten years ago. Data from studies more than ten years old are considered unrepresentative of current treatment facility effluent characteristics and these studies are not referenced. It should be noted that data from Class II Inspections more than five years old may also not be representative of current facility effluent.

Industrial

- ***February 1990, Reynolds Metal Company:*** An enhanced Class II Inspection was conducted at the primary aluminum smelter in Longview. Samples were collected from the five permitted discharges. Receiving water sediments near the principal discharge to the Columbia River and centrifuge samples of the discharge were also collected.

- ***April 16-18, 1990, Weyerhaeuser, Longview Pulp and Paper Mill:*** Ecology conducted an enhanced Class II Inspection of the paper mill process wastewater treatment system. Sediments were collected from the outfall area on April 10, 1990.

- ***May 7-9 and May 15, 1990, Longview Fibre Company Pulp and Paper Mill:*** Ecology conducted an enhanced Class II Inspection of the process wastewater and sanitary sewage treatment systems.

- ***November 1993, Longview Fibre Company Pulp and Paper Mill:*** A second Class II Inspection was conducted of the facilities wastewater treatment systems.

- ***September (dry weather) and December (wet weather) 1992, Port of Willapa Harbor Pretreatment Facility (PTF):*** An enhanced Class II Inspection of Raymond (Raymond) Wastewater Treatment Plant (WTP) included an inspection of the PFT, which is a significant contributor to the WTP.

Municipal

- September (dry weather) and December (wet weather)1992, Raymond (Raymond) Wastewater Treatment Plant (WTP): Class II Inspections were conducted at the city of Raymond domestic Wastewater Treatment Plant (WWTP).

Summary of Issues

1. Major dischargers who have not received an enhanced Class II Inspection during the last five years include:

Facility Name	Type	City	County	Permit	Expired Date	Permit Status	Last EILS Class II	Last Known Regional Inspection With Sampling
Cowlitz Water Pollution Cntrl (STP)	Municipal	Longview	Cowlitz	WA0037788A	09/30/1996	Active	1978	
Reynolds Metals-Longview	Industrial	Longview	Cowlitz	WA0000086A	10/15/1995	Extend	1990	1994
Weyerhaeuser-Longview	Industrial	Longview	Cowlitz	WA0000124A	05/10/1996	Extend	1990	1990

2. Minor industrial dischargers who have not received an enhanced Class II Inspection during the last five years include:

Facility Name	City	County	Permit	Expire Date	Permit Status	Last EILS Class II	Last Known Regional Inspection With Sampling
Bay Center Fish Co	Bay Center	Pacific	WA0039667A	12/17/1990	Cancel		
Coast Oyster Co (Hatchery)	South Bend	Pacific	WA0037249A	12/12/1983	Cancel	1975	
Coast Seafood (South Bend)	South Bend	Pacific	WA0002186B	05/28/1998	Active		
Cowlitz County Hall Of Justice	Kelso	Cowlitz	WA0039861A	10/02/1991	Extended		
Cowlitz Falls Dam	Randle	Lewis	WA0040207A	04/06/1995	Active		
Cowlitz Stud Co (Randle)	Randle	Lewis	WA0036846A	07/16/1980	Cancel	1974	
Cytec Industries	Longview	Cowlitz	WA0039012C	07/28/2001	Active		1994
E H Bendiksen Co Inc	Nahcotta	Pacific	WA0001899B	01/27/1998	Active		
East Point Seafood (S Bend)	South Bend	Pacific	WA0001104A	03/18/1996	Active	1976	
Harbor Bell Inc	Bay Center	Pacific	WA0001988A	02/21/1995	Extended	1971	1993
Houghton International	Longview	Cowlitz	WA0038814B	07/13/2001	Active		
International Paper Co	Longview	Cowlitz	WA0038725A	05/31/1981	Cancel		
Jessie's Ilwaco Fish Co Inc	Ilwaco	Pacific	WA0000361C	07/28/2001	Active		
Mayfield Dam	Salkum	Lewis	WA0038881A	09/29/1981	Expired		
Mossyrock Dam	Mossyrock	Lewis	WA0038890A	09/29/1981	Expired		
Nelson Crab Inc	Tokeland	Pacific	WA0002291B	02/23/1995	Expired		
Nisbet Oyster Company	South Bend	Pacific	WA0040363A	07/26/1995	Expired		
Ocean Beauty Seafood(Chinook)	Chinook	Pacific	WA0000159A	05/20/1996	Active		
Packwood Lumber Co	Packwood	Lewis	WA0039900A	08/26/1991	Expired		1994
Protan Laboratories	Raymond	Pacific	WA0039896A	03/14/1991	Cancel		
Tubafor Mill Inc	Morton	Lewis	WA0039705A	08/26/1991	Cancel		
Weyco Rearing Pond	Skamokawa	Wahkiakum	WA0039292A	02/06/1984	Cancel		
Weyerhaeuser Co Raymond (Saw)#2	Raymond	Pacific	WA0039161A	05/18/1986	Expired	1978	
Weyerhaeuser Co Raymond (Truck)#1	Raymond	Pacific	WA0039250A	08/16/1983	Expired		
Wiegardt Brothers Inc	Nahcotta	Pacific	WA0038806B	06/03/1998	Active		

3. Minor municipal dischargers who have not received an enhanced Class II Inspection during the last five years include:

Facility Name	City	County	Permit	Expire Date	Permit Status	Last EILS Class II	Last Known Regional Inspection With Sampling
Castle Rock (STP)	Castle Rock	Cowlitz	WA0022683A	10/13/1985	Extended		
Cathlamet (STP)	Cathlamet	Wahkiakum	WA0022667A	01/28/1985	Extended		
Cathlamet (WTP)	Cathlamet	Wahkiakum	WA0038954A	04/17/1983	Extended		
Fort Columbia State Park (STP)	Chinook	Pacific	WA0038709A	06/30/1987	Extended		
Ilwaco (STP)	Ilwaco	Pacific	WA0023159A	08/21/1992	Extended	1974	
Ilwaco (WTP)	Ilwaco	Pacific	WA0037613A	02/23/1981	Extended		
Long Beach (STP)	Long Beach	Pacific	WA0022489A	10/29/1991	Extended	1973	1991
Longview (STP)	Longview	Cowlitz	WA0037311A	09/17/1991	Extended	1979	1991
Longview (WTP)	Longview	Cowlitz	WA0036862A	02/23/1981	Extended		
Morton (STP)	Morton	Lewis	WA0022659B	06/17/2001	Active	1973	
Mossyrock (STP)	Mossyrock	Lewis	WA0021024A	09/25/1986	Extended	1975	
Naselle Youth Camp (Dshs) STP	Naselle	Pacific	WA0023728A	01/05/1986	Extended	1975	
Raymond (WTP)	Raymond	Pacific	WA0036897A	07/11/1985	Extended		
Ryderwood STP (Cowlitz County)	Kelso	Cowlitz	WA0038695A	08/15/1982	Extended	1977	
South Bend (STP)	South Bend	Pacific	WA0037591A	09/25/1991	Extended	1979	
South Bend (WTP)	South Bend	Pacific	WA0038946A	04/17/1983	Extended		
Stella (STP)	Stella	Cowlitz	WA0039152A	10/15/1982	Extended		
Toledo (STP)	Toledo	Lewis	WA0036986A	02/17/1992	Extended	1974	
Toutle STP (Cowlitz County)	Toutle	Cowlitz	WA0037770A	01/28/1985	Active		
Vader (STP)	Vader	Lewis	WA0021083A	10/13/1985	Extended	1976	
Willapa Valley Water Dist WTP	Raymond	Pacific	WA0037532A	05/29/1985	Extended		
Winlock (STP)	Winlock	Lewis	WA0021199A	10/21/1985	Extended	1976	
Woodbrook STP (Cowlitz County)	Kelso	Cowlitz	WA0023795A	03/28/1984	Extended	1977	

4. State to ground and state to PTOW dischargers who have not received an enhanced Class II Inspection during the last five years include:

Facility Name	Type	Size	City	County	Permit	Expire Date	Last EILS Enhanced Class II	Last Regional Inspection With Sampling
Cavenham Forest Industry	Industrial	State To Ground	Cathlamet	Wahkiakum	ST0005096A	11/16/1983		
Cowlitz County Landfill	Industrial	State To Potw	Longview	Cowlitz	ST0006074A	06/30/1998		
Morton Forest Products	Industrial	State To Ground	Morton	Lewis	WA0036927B	07/27/2001		
Mt Adams Veneer Plant	Industrial	State To Ground	Randle	Lewis	ST0005090A	06/08/1983		
Mt Solo Landfill	Industrial	State To POTW	Longview	Cowlitz	ST0006087A	04/28/1995		1995
Pacific Hardwoods	Industrial	State To POTW	South Bend	Pacific	ST0006153A	07/27/2001		
Port Of Longview	Industrial	State To POTW	Longview	Cowlitz	ST0006081B	07/14/2001		
Rainbow Valley Landfill	Industrial	State To POTW	Raymond	Pacific	ST0006049A	07/28/2000		
Shakertown Corp	Industrial	State To Ground	Winlock	Lewis	ST0003888B	07/28/2001	1974	
Surfside Inn Condo #1	Municipal		Ocean Park	Pacific	ST0005081A	09/26/1983		
Solvay Interox	Industrial	State To POTW	Longview	Cowlitz	ST0006070A	05/05/1994		
Specialty Minerals-Longview	Industrial	State To POTW	Longview	Cowlitz	ST0006068B	02/17/1999		1995

5. Several receiving water bodies have known impairments of designated uses. Causes include elevated ammonia, pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), nutrients, priority pollutant (PP) organic toxicants, pesticides, metals, temperature, and fecal coliform. Facilities which are located on impaired receiving waters (303d list) and their tributaries, which are limited in their permit by one or more of the preceding parameters, and whose discharge characteristics may impact the receiving water include:

   A. Major Industrial Dischargers:

   Columbia River, WA-CR-1010:

Cowlitz Water Pollution Ctrl (STP)	(Temp, pH, DO)
Longview Fibre Pulp & Paper Co.-	(Temp, PP organics, pH, DO);
Reynolds Metals -	(Temp, pH, DO);
Weyerhaeuser Pulp & Paper Co.-	(Temp, PP organics, pH, DO)

   B. Minor Industrial Dischargers:

   Columbia River, WA-CR-1010:

Cytec Industries -	(Temp, pH, PP organics, PP metals);
Houghton International -	(Temp, pH);
Jessie's Ilwaco Fish Co. -	(Temp, pH, DO);
Ocean Beauty Seafood -	(Temp, pH, DO,);

   Cowlitz River, WA-26-1040

Cowlitz County Hall Of Justice -	(Temp, pH)
Cowlitz Falls Dam -	(Temp, pH)
Mossyrock Dam -	(Temp, pH)
Packwood Lumber Co -	(Temp, pH)

   Willapa Bay, WA-24-0020

Nelson Crab Inc.	(?)
Nisbet Oyster Company	(?)
Coast Seafood, South Bend -	(pH, fecal)
Wiegardt Brothers Inc.	(?)

   Willapa River, WA-24-2030

E.H. Bendiksen Co Inc (Ocean Park) -	(Temp, Fecal)
East Point Seafood (South Bend) -	(Temp)
Protan Laboratories	(?)
Weyerhaeuser Co (Saw)#2 -	(Temp)
Weyerhaeuser Co (Truck)#1 -	(Temp)

C. Minor Municipals:

Columbia River, WA-CR-1010:

Cathlamet (STP) -	(Temp, pH, DO);
Fort Columbia State Park (STP) -	(Temp, pH, DO)
Ilwaco (STP) -	(Temp, pH, DO)
Longview (STP) -	(Temp, pH, DO)
Stella (STP) -	(Temp, pH, DO)

Cowlitz River, WA-26-1040

Castle Rock (STP) -	(Temp, pH, fecal)
Longview (WTP) -	(Temp, pH)
Woodbrook STP (Cowlitz County) -	(Temp, pH, fecal)

Naselle River, WA-24-3010

Naselle Youth Camp (DSHS) STP -	(Temp)

Toutle River, WA-26-1050

Toutle STP (Cowlitz County) -	(Fecal)

Willapa River, WA-24-2030

Raymond (STP) -	(Temp, Fecal)
Raymond (WTP) -	(Temp)
South Bend (STP) -	(Temp, Fecal)
South Bend (WTP) -	(Temp)
Willapa Valley Water Dist WTP -	(Temp)

6. Past inspections point to problems that warrant further investigation. These include the following:

A. Reynolds Metal Company: Some toxicity was observed in 002A effluent using Daphnia magna, fathead minnow, and Microtox7 bioassays.

B. Weyerhaeuser, Longview Pulp and Paper Mill: Hexavalent chromium was found in the effluent at levels exceeding acute and chronic Water Quality Criteria. A low NOEC for the survival and reproduction chronic bioassay was reported for Daphnia magna.

C. Longview Fibre Pulp & Paper Company: During the 1990 inspection a high fecal coliform count was detected in the mill process effluent stream. The fecal coliform concentration in the sanitary plant effluent was marginally higher than the monthly average limit, but lower than the daily maximum. A daily discharge

of dioxin (2,3,7,8-TCDD) measured in the combined bleach plant effluent (CBPE) was noted. Zinc and copper exceeded the freshwater acute and chronic criteria in one outfall effluent.

During the 1993 inspection, effluent priority pollutant concentrations for mercury, copper, and lead were at or near the chronic State Water Quality Criteria. Bioassays (fathead minnow and rainbow trout) documented limited toxicity. The concentration of (2,3,7,8-TCDD) measured in the combined bleach plant effluent (CBPE) was less than the detection limit. Two grab samples from the process water effluent showed fecal coliform concentrations of 11,00 and 24,000 (#/100 mL). During the 1990 inspection, fecal coliform concentrations in sanitary wastewater effluent were within the permit limit.

D. Port of Willapa Harbor Pretreatment Facility (PTF): effluent BOD5 (360 mg/L) was higher than the permitted daily average of 300 mg/L during the dry weather inspection. TSS was over five times the permitted daily average. Nitrification was not taking place and effluent ammonia concentrations were high. During the wet weather inspection, PTF discharge flow was 23% above the permitted daily average. The 24-hour composite BOD5 was three times the permitted daily average of 300 mg/L. Oil and grease concentrations were more than ten times the design limits but within permit effluent limits. Chromium was found in the PTF sludge at a high concentration (4480 mg/Kg-dw).

E. Raymond (Raymond) Wastewater Treatment Plant (WTP): The WTP effective removal of organics during the wet weather inspection was less than the 85% removal is required by permit. The wet weather effluent BOD5 concentration exceeded the permitted weekly average of 45 mg/L. The effluent BOD5 load was approximately double the 270 lbs/day permitted weekly average. Nitrification did not take place during the wet weather inspection. Chromium was found in high concentrations in the WTP influent and was presumably deposited in plant sludge.

Needs and Recommendations

Lack of data for a particular facility highly recommends that it should be investigated. Some results from previous Class II Inspections indicate a need for follow-up or further study. Priorities have been determined from the number and severity of factors noted in the issues section - i.e. last inspection, activity, expiration date, population served (municipals > 1000), discharge parameters, receiving water status, etc. Class II Inspections are suggested for the following facilities:

High Priority

Industrial Dischargers:
Reynolds Metals-Longview (major), Weyerhaeuser Pulp & Paper -Longview (major), Cytec Industries (minor), Ocean Beauty Seafood (minor), Coast Seafood, South Bend (minor), E. H. Bendiksen Co Inc. (Ocean Park).

Municipal Dischargers:
Cowlitz Water Pollution Control STP (major), Long Beach STP (minor), Longview STP (minor), Morton (minor), Raymond STP (minor), Ryderwood STP - Cowlitz County (minor), South Bend STP (minor), Winlock STP (minor), Woodbrook STP - Cowlitz County (minor).