314 CLEAN LAKES GRANT PROJECT
QUARTERLY PROGRESS REPORT NO.8
TO OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

PROJECT: Phase I Feasibility Study - Smith and Bybee Lakes Sediment Assessment

EPA GRANT NO. CL-000863-01-2

PROJECT AND BUDGET PERIOD: May 1, 1994 - December 31, 1995

REPORT NO. #8, FY95 Third Quarter, April - June, 1995

REPORT DATE: June 30,1995

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FUNDING:
TOTAL BUDGET.....$ 40,740
TOTAL 314 GRANT AWARD.....$ 25,000
TOTAL 314 EXPENDITURE TO DATE.....Estimated $ 15,000

QUARTERLY STATUS OF PLANNED OUTPUTS/MILESTONES

Numerical Modeling

With the synoptic sediment survey and paleolimnogical investigation of Smith and Bybee Lakes completed, uncommitted funds remaining from the Clean Lakes grant were directed toward additional hydrologic and water quality modeling. The objective of this modeling effort is to simulate the hydrodynamics of and water quality impacts on the lakes upon removal of the existing water control structure separating the Columbia Slough, via North Slough, with Bybee and Smith Lakes. Oregon Department of Environmental Quality (DEQ) granted permission to add this modeling effort to the scope of work.

A numerical model of Smith and Bybee Lakes was used with a existing model of the lower Columbia Slough to evaluate the impacts of opening the lakes to the Columbia Slough via the North Slough. The hydrodynamic conditions were first simulated, since this is necessary for evaluating the

impact of exercising this management option on the lakes water quality. Potential sources of contaminants to the lakes under this management option are (1) the Willamette River, (2) combined sewer overflows (CSOs) in the Columbia Slough, and (3) St. Johns Landfill leachate. Simulations use a conservative tracer to model transport from each source and evaluate the dilution in Smith and Bybee Lakes. Transport of a conservative tracer from each source is simulated under seasonal low-water and high-water conditions of the Willamette and Columbia Rivers.

Preliminary conclusions from the modeling study include:

(1) During low-water conditions, Smith Lakes does not respond as readily to tidal fluctuations as Bybee Lake. Tidal amplitude in Smith Lake was reduced to approximately one foot and water level phase up to 0.2 days compared to Bybee Lake water level fluctuation. During high-water conditions, Smith and Bybee Lakes respond similarly to water level variation in the Willamette River;

(2) With North Slough open to the lakes, dissolved oxygen problems that exist under current conditions in North Slough will not occur. The model shows reduced dissolved oxygen concentrations in the lakes during low-water conditions, most likely a result of (a) the assumed model value of sediment oxygen demand for the lakes, (b) the impacts of landfill leachate with high BOD, and/or (c) sedimentation of algae and subsequent decay in the lakes;

(3) CSOs in the summer and winter will cause water quality violations in Smith and Bybee Lakes until they are removed from the Lower Columbia Slough, as scheduled within 5 years; and,

(4) Landfill leachate reaching the surface waters of the North Slough will be diluted of the order of 1000 times in Smith and Bybee Lakes.

Analysis and reporting of this modeling effort are expected to be completed in September, 1995.

Management Decisions

The Smith and Bybee Lakes Technical Advisory Committee (TAC) met twice during the quarter to review recently completed studies on the lakes area and make water management strategy recommendations. The TAC is composed of representatives from federal, state, and local government resource agencies, consultants, and researchers who have been involved with reviewing management

decisions for Smith and Bybee Lakes for the last five years. With the completion of lake ecosystem studies, the committee was asked develop recommendations for a water management strategy for the lakes area that will enhance and protect the natural resources of the area, to the best extent possible, in a manner that is faithful to former natural conditions.

The committee recommended a water control strategy that mimics the local Columbia River water surface level patterns, both seasonally and tidally. The strategy should include:

1) replace the existing water control structure with one that will allow both unobstructed flow in and out of the lakes and permit retention of water in the lakes from minimum to maximum water surface elevations feasible (i.e. approximately 2 to 12 ft. MSL elevations);
2) develop a water source and distribution system to augment flow into the lakes from an outside source to mimic river water levels, control avian botulism, and other management needs;
3) remove the barge currently obstructed flow in the North Slough and replace the habitat values lost with its removal; and,
4) develop a water management plan that includes monitoring and assessment to ensure that management goals are being met.

The objective and strategy was developed by the committee in conformance with *the Natural Resources Management Plan for Smith and Bybee Lakes.* The TAC recommendations will be forwarded to the Smith and Bybee Lakes Management Committee and the Metro Council for consideration for formal adoption.

ADDITIONAL INFORMATION

A screening-level risk assessment (SLRA) and hazard ranking for the Smith and Bybee Lakes Management Area was concluded during the quarter. The SLRA used most of the same methodologies as the larger one conducted concurrently throughout the Columbia Slough system. The study was designed to identify areas of most concern and those receptors (people, aquatic life, wildlife) at the greatest potential risk within the area using worst-case exposure assumptions.

Human Health Risk

Based on interpretation of sediment and fish tissue sampling results, the overall potential risk to human health, aquatic life, and wildlife in the lakes area were generally low relative to the remainder of the Columbia Slough. Non-cancer risks were estimated to be negligible from the consumption of fish caught from the lakes, and were estimated to be low for fish caught and consumed from the Slough. Potential cancer risks from the ingestion of fish were estimated to range from the reference level of $1x10^{-6}$ up to a risk level of $4x10^{-4}$ for fish fillets, and from $7x10^{-6}$ up to a risk level of $8x10^{-4}$ for whole fish (see table below). Generally, the consumption of whole body fish presented higher cancer risks because internal organs and fatty tissues are included and these are known to concentrate chemicals to higher levels than just muscle fillet. The chemicals of most concern are PCBs in the lakes and PCBs and arsenic in the slough.

Summary of human health total cancer risks for the ingestion of fish fillets and whole fish.

	Carp		Bass		Other[1]	
	Fillet	Whole Body	Fillet	Whole Body	Fillet	Whole Body
Smith & Bybee Lakes	7.5×10^{-6}	8.2×10^{-4}	1.3×10^{-6}	7.2×10^{-6}	1.4×10^{-6}	1.0×10^{-5}
North Slough	3.0×10^{-5}	6.2×10^{-4}	N/AP	N/AP	4.0×10^{-4}	6.2×10^{-4}
Lower Slough						
River miles 0-3	6.5×10^{-5}	6.6×10^{-5}	N/AP	N/AP	2.5×10^{-6}	8.8×10^{-5}
River miles 3-6	7.9×10^{-5}	1.9×10^{-4}	N/AP	N/AP	1.2×10^{-5}	1.5×10^{-4}

[1] Other for lakes are Centrarchids excluding bass; other for North Slough are all Centrarchids.

The human health risk based on fish consumption are considered very conservative, given the assumptions (see table). Data from a recently-conducted fish consumption survey of the slough indicate that most fish caught are released, very few people actually consuming the fish caught. There are no data indicating whether the few who may consume fish are eating fillet or whole body, nor what percentage consume carp. These health risks must be viewed in context of the risks associated with consuming fish from surrounding waters, including the Columbia Slough and Willamette and Columbia Rivers.

Assumptions used for estimating human exposure.

Parameter	Value	Units	Reference
Child sediment ingestion rate	200	mg/day	Best Professional Judgement
Adult sediment ingestion rate	100	mg/day	Best Professional Judgement
Sediment deposition rate to skin	1	mg/cm^2	U.S. EPA 1991c
Child skin surface area exposed to sediments[a]	2,466	cm^2	U.S. EPA 1989b
Adult skin surface area exposed to sediments[b]	3,100	cm^2	U.S. EPA 1992a
Child skin surface area exposed to surface water	7,280[c]/2,466[e]	cm^2	U.S. EPA 1992a
Adult skin surface area exposed to surface water	23,000[d]/5,170[f]	cm^2	U.S. EPA 1992a
Child exposure frequency to sediments and surface water while swimming[g]	14	days/year	Best Professional Judgement
Adult exposure frequency to sediments and surface water while swimming[g]	14	days/year	Best Professional Judgement
Incidental ingestion rate of surface water while swimming for children and adults	50	mL/hour	U.S. EPA 1989a
Child exposure time while swimming	2.6	hr/day	U.S. EPA 1988b
Adult exposure time while swimming	2.6	hr/day	U.S. EPA 1988b
Child ingestion rate of fish[h]	54	g/day	Best Professional Judgement
Adult ingestion rate of fish	250	g/day	Best Professional Judgement
Child exposure frequency for ingestion of fish	104	day/year	Best Professional Judgement
Adult exposure frequency for ingestion of fish	104	day/year	Best Professional Judgement
Child ingestion rate of crayfish[h]	4.3	g/day	Best Professional Judgement
Adult ingestion rate of crayfish	20	g/day	Best Professional Judgement
Child exposure frequency for ingestion of crayfish	12	day/year	Best Professional Judgement
Adult exposure frequency for ingestion of crayfish	12	day/year	Best Professional Judgement
Child exposure duration	6	yr	U.S. EPA 1991c
Adult exposure duration	24	yr	U.S. EPA 1991c
Child body weight	15	kg	U.S. EPA 1991c
Adult body weight	70	kg	U.S. EPA 1991c
Averaging time for noncarcinogens	30	yr	U.S. EPA 1991c
Averaging time for carcinogens	75	yr	U.S. EPA 1991c

[a] Average area of hands, feet, one-half of arms, and one-half of legs of 0-6 year old.
[b] Average area of hands, forearms and feet of adult male.
[c] Average total body surface area of 3-6 year old male for swimming exposures.
[d] Upper estimate of average total body area of adult male for swimming exposures.
[e] Average area of hands, feet, one-half of arms, and one-half of legs of 0-6 year old for wading exposures.
[f] Average area of hands, forearms, lower legs, and feet of adult male for wading exposures.
[g] Equal to swimming once per week for 14 weeks (3½ months).
[h] Calculated as the product of the adult ingestion rate of fish (250 g/day) or crayfish (20 g/day) and the ratio of child to adult body weights (15 kg / 70 kg).

Aquatic Life Risks

Potentially significant risks to benthic organisms were predicted, based on estimated sediment interstitial water concentrations, at many sediment sampling locations. These risks were primarily associated with exposures to sediment metals, including lead, chromium, and cobalt. The calculated interstitial water concentrations and predicted risks to benthic organisms are uncertain since the sediment/water partition coefficients are from literature and are not site-specific.

Wildlife Risks

The wildlife risk assessment is intended to be conservative, designed to identify chemicals presenting the greatest potential risk to wildlife, while eliminating from further evaluation those that pose negligible risk. River otter and Great Blue Heron were chosen as representative mammal and bird species that have potential for exposure from contaminants that may be in the sediment, water column, and food web associated with the aquatic environment. The calculated potential risks to both otters and heron were chiefly associated with fish and sediment ingestion pathways for metals (lead, chromium) and with fish ingestion for Aroclor 1260. DDE and selenium were also associated with the risks from fish and sediment ingestion predicted for herons.

Interpretation of the data for absolute risk is highly uncertain. It is likely that the conservative assumptions used to calculate the expected environmental concentrations, the expected environmental dose, and the toxicity values resulted in risk estimates that substantially overestimate true wildlife risks from sediment, surface water, and tissue chemicals. Because it is likely that true risks were overestimated, the wildlife screening-level risk assessment results are probably best used for relative risk comparison between different locations within the sampling area, rather than as an accurate determination of risks.

IMPROVEMENTS/ACTIONS NEEDED

Using guidance provided by the Smith and Bybee Lakes Technical Advisory Committee and integrating information from recently-completed lake studies, a water management strategy will be developed. The objective of the strategy is to maximize wildlife habitat diversity within the Smith and Bybee Lakes Natural Area in a cost-effective manner. This strategy should include retaining ability to

maintain inundation of the lakes basin for extended periods. This strategy will be included the diagnostic/feasibility report to be submitted to DEQ and EPA in late fall, 1995.