Fall 2003 proposal

Achieving Multiple Objectives with Hydrologic Management of a Tidal Floodplain Wetland

(Smith and Bybee Lakes Wildlife Area, Portland, Oregon)

Summary of Project:

The 800-ha Smith-Bybee wetland system historically functioned as a seasonal marsh in the Columbia River floodplain near the mouth of the Willamette River. A new water control structure recently implemented at Smith-Bybee will allow the capture and retention of winter floodwaters through the spring growing season. Although water control structures are becoming widely used in wetland management, there is no information on the use of water control structures to simultaneously support wetland ecosystem processes and ESA-listed salmonids that use these wetlands. The three principal objectives in managing the Smith-Bybee structure are to control reed canarygrass (RCG), support native plant communities and provide habitat for juvenile salmonids. The goal of this project is to evaluate the implementation success of these management objectives.

I. Project Background

Over recent decades, the Smith-Bybee wetland system has been profoundly altered and degraded by the construction of local and regional dams and dikes, deposition of dredge spoils and the introduction of exotic plants and animals. A new water control structure, completed in December 2003, enables water level management to restore functions and values to this wetland complex.

Water control structures are increasingly common tools for wetland restoration. They are used in our region to flood and control invasive species, encourage the growth of native emergent and bottomland hardwood plant communities and provide wetland habitat for a variety of fish and wildlife. The Columbia and Willamette rivers' hydrographs have been radically altered with the installation of dams to generate hydropower and to provide water for irrigation and control flood events. One of the biggest changes has been the loss of the spring freshet, which occurred in most years when melting snowpack combined with spring rains to produce a significant flood event, typically in late May or early June. Broad expanses of floodplain wetlands were flooded annually by the freshet.

The native plants in these floodplain ecosystems are adapted to life with a spring freshet. Most are cool-season plants that do not emerge or break bud until June or July, when floodwaters would have receded. The loss of the spring freshet resulted in earlier drying of wetlands, often very early in the spring. The current hydrologic regime favors the non-native and invasive reed canarygrass (RCG), a cool-season plant that begins growing as early as February. RCG becomes well-established before native plants begin growing, and thus out-competes them to produce vast monotypic stands in wetland systems such as Smith-Bybee.

The preferred method for restoring wetland systems in the lower Columbia River is to restore the historic hydrologic regime; however, this is not feasible. Water control structures are an alternative approach for wetland managers to mimic historic flooding patterns to the extent possible. The new structure at Smith-Bybee will allow the capture and retention of winter floodwaters through the spring growing season to control RCG growth. Because storm events and water releases from upstream reservoirs are unpredictable, and large releases in late spring

are uncertain, management at Smith-Bybee is focused on capturing water from all events through winter and spring and holding as much water as possible until late May or early June.

The conceptual plan for water level management at Smith-Bybee is:

- Capture and retain water during winter and through spring to provide high water during the spring freshet time of late May and early June.
- Draw down water in the wetlands from late spring through summer, finishing in August.
- Leave the structure open to tidal flow from late summer through fall.
- In late fall (typically November), close the structure to capitalize on high-water events and begin the cycle again.

This management regime is designed to provide many benefits in addition to RCG control. One key benefit is the provision of off-channel rearing habitat and refugia for downstream migrating juvenile salmonids. Several ESA-listed stocks of salmon inhabit the lower Willamette River, yet this stretch of the river has lost nearly all its floodplain wetlands and many small streams that provided habitat for juvenile salmonids. These fish need habitat that is protected from high flows to survive flood events and to thrive. A fishway in the Smith-Bybee structure provides access to nearly 650 ha of wetlands for use by salmonids during winter and spring.

The goal of this project is to evaluate the implementation success regarding the three principal objectives in managing the Smith-Bybee structure: to control reed canarygrass, to support native plant communities and to provide habitat for juvenile salmonids. We will accomplish this goal via a three-way partnership of Metro, Portland State University (PSU) and Ducks Unlimited (DU).

Proposed Budget for Four Year Project Period

Total project cost:	$212,816
Federal funds:	$144,094
Non-federal match:	$ 68,722

II. Key Project Objectives:

1. Determine the effects of the change in water regime on the distribution of reed canarygrass.
2. Determine the use of the wetlands by juvenile salmonids and confirm bi-directional passage capability of juvenile salmonids through the fish ladder.
3. Determine the response of native plant communities to the change in water regime.
4. Evaluate whether tradeoffs exist in optimizing water level management for support of salmonids, control of reed canarygrass and support of native plant communities.
5. Educate visitors to the wildlife area about wetland restoration and related issues.

III. Work Plan Components:

Work Plan Component #1: Monitor the effects of the new water regime on reed canarygrass and native plant communities.

Estimated Work Years: 0.45 FTE/year (graduate student) plus 0.1 FTE/year (project manager and partners)
Timeline: 8/1/03 – 6/30/07
Amount: $146,558 total ($98,328 EPA and $48,231 match)

Deliverables: M.S. theses from two graduate students at Portland State University; also an expectation of at least 2 papers published in peer-reviewed journals as a result of this work.

Task A. Establish transects for vegetation sampling.

Due: Much of this task has been completed and provides part of our match for this grant. Remaining tasks to be completed September 30, 2004.
Description: Ten transects were established in 1992 in a variety of plant communities to characterize the vegetation at Smith-Bybee. Seven of these transects were re-located and re-sampled in 2001. An additional 30 transects were located randomly within the range of elevations where it should be possible to manage vegetation with water level manipulation. The latter 30 transects are perpendicular to the "shore" and follow an elevation gradient from the late-fall water level to the anticipated maximum water elevation. The transects range in length from 20 to 280 m, depending on local gradient. Vegetation was sampled using a line intercept approach, at 0.1 m sampling intervals.

Remaining work: determine the topography of each transect in 1-m increments using survey level, survey rod and meter tape.

Task B. Sample vegetation along transects to determine distribution and extent of RCG, other exotics, and native plants.

Due: December 1 each year for three years; final sampling completed in 2006.
Description: Measure vegetation along each transect using the line intercept method. Plant composition will be determined at 0.1 m intervals for all heights, capturing all vertical layers. Portland State University already completed one full round of sampling of the 30 new transects in fall 2003 to establish baseline conditions; it was found that RCG accounted for 49% of total plant cover. Prior transects and the 30 transects will be measured at least twice annually. Additional sampling may occur seasonally within one or more years to determine RCG growth rates and height change during the growing season, as well as other phenological and community composition questions that may arise. Water level loggers installed as part of the fish monitoring work will allow us to correlate flooding regime changes with plant community structure and composition changes. Successful water level management should reduce the total cover of RCG by half and replace the RCG with native plants.

Task C. Report findings.

Due: June 30, 2005 and 2007.
Description: Two graduate students at Portland State University will use aspects of this project for their theses. One student completed the baseline survey in fall 2003 and will compare those results with the 2004 vegetation survey. One year of data following the installation of the water control structure will provide an initial response of the plant species composition and in particular RCG to inundation. Additionally, measurements of RCG height during the season along the transects will provide information of initial structural responses of this invasive species. A second M.S. student will continue the work in 2005 and 2006 to develop a longterm understanding of RCG and overall plant community response to seasonal flooding, and will account for interannual variability in climate and Columbia river water management. We anticipate new questions with the initial results from the first thesis effort and plan to incorporate those questions within the second thesis effort during the following two years of sampling.

Work Plan Component #2: Monitor the use of Smith-Bybee by juvenile salmonids.

Estimated Work Years: 0.4 FTE/year
Timeline: 12/1/03 – 4/30/07
Amount: $40,350 ($34,739 EPA and $5,611 match)

Deliverables: Project partners with Ducks Unlimited prepare annual monitoring reports, and these will be provided to EPA as they are completed.

Task A. Monitor juvenile salmonid use of the wetlands.

Due: 12/30/05 and 4/30/07 (report completion dates)
Description: Passive trap nets will be used to capture fishes in the North Slough and the Smith-Bybee wetlands every five to six weeks during winter and spring (November to June). In addition, a two-way trap within the fishway will be fished continuously during the same sampling season. Fish will be identified to species and fork length and wet weight (salmonids only) measurements will be recorded, along with trap type and direction (for two-way trap captures). Water level loggers will provide continuous data on water elevations within the wetlands and in the adjacent slough.

Task B. Document juvenile salmonids' residence time and growth rates.

Due: 12/30/05 and 4/30/07 (report completion dates)
Description: Salmon captured inbound to Smith-Bybee wetlands in the two-way fish trap will be uniquely identified with Passive Integrated Transponder (PIT) tags inserted into their body cavities. This will allow individual growth rates and residence times to be tracked when recaptured within the wetland with trap nets and in the outbound portion of the two-way trap. Growth rates are expected to be higher for salmonids that spend more time in the wetlands. We will also document whether salmonids move out of the wetlands successfully prior to drawdown.

Work Plan Component #3: Evaluate the effectiveness of the water level management approach in simultaneously achieving the three objectives.

Estimated Work Years: 0.2 FTE per year (project manager and partners)
Timeline: 5/1/04 – 6/30/07
Amount: $18,232 ($4,027 EPA and $14,204 match)

Deliverables: Final grant report to EPA.

Task A. Interim data review and adaptive management.

Due: 8/31/05 and 8/31/06
Description: Project partners will meet as a group quarterly, and informal meetings and communication will occur more often. Data entry and analysis will occur immediately following each field season per timelines provided in the previous work plan components. Knowledge gained during the initial years of operation and monitoring will support adaptive management. This will be an iterative process. For example, initial results of vegetation monitoring may

suggest a change in flooding duration for better RCG control or release of native plants. Subsequent fish monitoring may suggest another adjustment to improve fish passage. This adaptive management will continue throughout the life of the project.

Task B. Final report integrating results of vegetation and fish studies.

Due: June 30, 2007.
Description: Metro and project partners will integrate the findings of the first three work plan components. The knowledge gained in this project will be shared with EPA in a final project report. Project results will be transferable to other restored wetlands in this ecoregion. Data will be provided to EPA for STORET.

Workplan Component #4: Interpretive panels for visitors to the wildlife area.

Estimated Work Years: 0.1 FTE
Timeline: 5/1/2004 – 6/30/07
Amount: $7,676 ($7,000 EPA and $676 match)
Deliverables: Installed panels located at the Smith-Bybee visitor facilities.

Task A. Interpretive panel development and production.

Due: June 30, 2007.
Description: Metro will translate education themes and wetland restoration concepts into interpretive panels for display at the Smith-Bybee visitor facilities. Subjects may include: wetland concepts including water management and restoration; a description of the water control structure, its purpose and operation; wetland plants and plant communities; and wildlife and their wetland connections. Funds in Year 2 will provide a permanent interpretive panel introducing visitors to Smith-Bybee and providing key concepts about the site including wetland concepts. During Years 3 and 4, additional panels will be developed that can be placed a case for rotating displays. These latter panels will convey other concepts listed above as well as the results of this study.

IV. Joint Evaluation of Performance:

The grantee welcomes feedback from EPA on all reports submitted as part of the work plan components. If the EPA has any concerns regarding progress on this project, then grantee will work with EPA to achieve a resolution.

V. Quality Assurance:

Quality assurance will be provided in several ways. Academic oversight of the vegetation monitoring will ensure a well-designed and well-supervised work plan component. Theses and published papers resulting from this work will undergo rigorous review. NOAA Fisheries will routinely review fish monitoring work and reports as part of the permitting process. EPA will have the opportunity to review and comment on the final project report.

VI. Roles and Responsibilities of EPA in Carrying Out Project Components:

Work plan commitments are the responsibility of the grantee and project partners. EPA will monitor progress as needed to ensure project completion.

	Year 1 8/03 - 6/04		Year 2 7/04 - 6/05		Year 3 7/05 - 6/06		Year 4 7/06 - 6/07		Total	
	EPA	Match	EPA	Match	EPA	Match	EPA	Match	EPA	Match
Metro project manager		513		2,000		2,080		2,163	0	6,756
PSU senior manager	0	3,028	0	3,119	0	3,212	0	3,309	0	12,667
PSU grad student	2,792	5,584	11,167	0	11,614	0	12,078	0	37,651	5,584
PSU undergraduate intern	0	4,160	0	4,285	0	4,413	0	4,546	0	17,404
DU fish biologist			2,260		2,350		2,444		7,055	0
DU technician		840	9,240		9,610				18,850	840
DU crew leader		1,020	3,570		3,713				7,283	1,020
Total salaries	2,792	15,144	26,237	9,403	27,287	9,706	14,523	10,017	70,839	44,271
Computer			2,000						2,000	0
Veg. sampling supplies		500	1,000	500	1,000	500	1,000	500	3,000	2,000
Two-way fish trap			2,500						2,500	0
PIT tags			400		400				800	0
Pressure transducers				2,400					0	2,400
Travel			2,833		2,946		2,000		7,779	0
Interpretive panels			4,000		1,500		1,500		7,000	0
Publication costs					500		500		1,000	0
Total materials and supplies	0	500	12,733	2,900	6,346	500	5,000	500	24,079	4,400
PSU tuition remission	2,538	5,076	7,919		8,235		8,565		27,257	5,076
PSU indirect costs	2,239	5,364	6,790	3,109	6,348	3,203	6,543	3,299	21,920	14,975
Total other costs	4,777	10,440	14,709	3,109	14,583	3,203	15,108	3,299	49,176	20,051
Project total	$7,568	$26,084	$53,679	$15,413	$48,216	$13,408	$34,631	$13,816	$144,094	$68,722

Project Total
212,816