

**14 Lakes Riparian Habitat Enhancement
Project Plan and As-Built Report
Original Plan 2005
Updated 2012**



Report prepared by Heidy Barnett, Sally Nickelson, and David Chapin
Watershed Services Division
Seattle Public Utilities

1.0 Project and Site Description

The 14 Lakes wetland complex in the Cedar River Municipal Watershed (CRMW) includes five ponds that differ in size, water depth, slope, and vegetative character. These depressional wetlands lack inlets or outlets, so their hydrology is primarily influenced by precipitation and groundwater fluctuations. The ponds are located less than one mile east of the large Rock Creek wetland complex and less than one mile north of the Cedar River (Figure 1). The ponds do not support any fish species and consistently support the heaviest density of amphibian breeding in the lower CRMW.

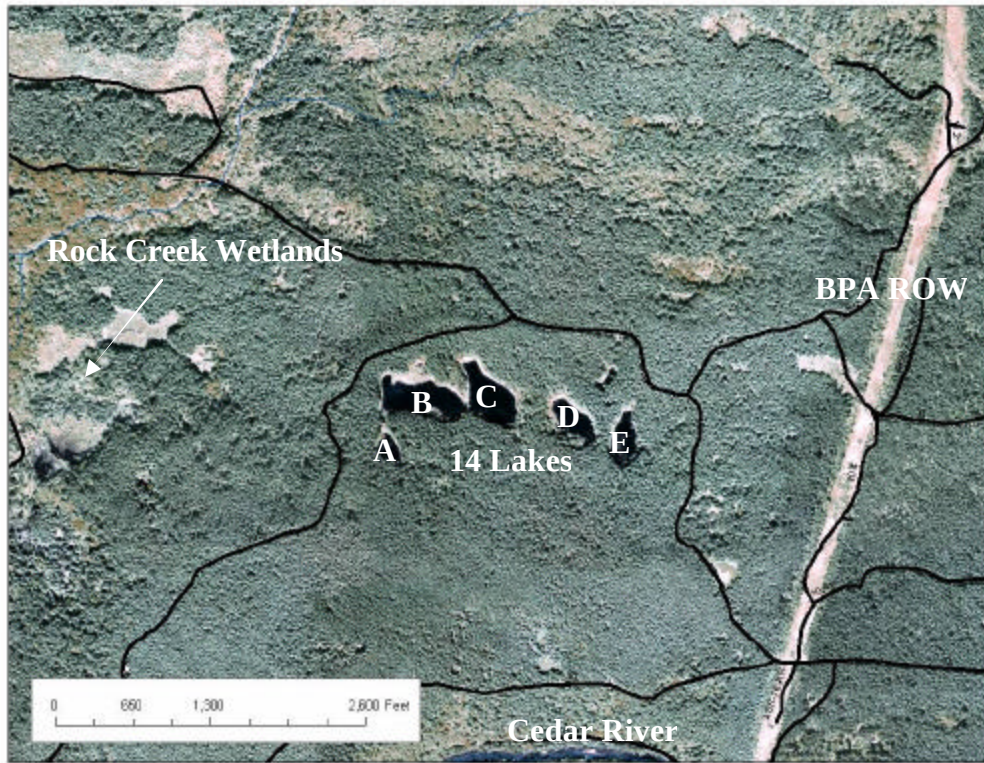


Figure 1. Location of 14 Lakes wetland complex (T22N, R7E, Sec.14).

The forest surrounding the ponds was harvested in the early 1900's and subsequently burned, as shown in 1912 archival photos. A Douglas-fir (*Pseudotsuga menziesii*) dominated forest surrounds the ponds, with a well-defined forest edge. Pond water level varies annually within, as well as between, ponds. Historical water levels remained higher through the year, and the ponds rarely dried (D. Paige, SPU, pers. comm.). Current lower water levels mean that breeding amphibians, as well as newly metamorphosed individuals, must move across dry grassland before reaching the forest edge. This zone lacks large wood on the ground at most pond sites and contains little shade or protection from predators for the amphibians. Trees felled towards the pond edge would create a migration corridor for amphibians during the breeding season and for newly metamorphosed individuals leaving the ponds. This project for Ponds B (subsequently named Big Lake), C (Deep Lake) and D (Blackberry Lake) provides an opportunity to link enhancement/restoration efforts between upland, riparian, and wetland habitat in a biologically diverse portion of the municipal watershed.

1.1 Individual Pond Characteristics

All ponds in the 14 Lakes wetland complex have unique habitat features. Pond A (0.8 acres) and Pond E (1.9 acres) already contain numerous pieces of wood connecting the pond to the upland forest and are not recommended for habitat enhancement in this project. Pond B (4.3 acres) has the largest water surface area of all the ponds, and also shows the largest water fluctuations between years. Very little wood is present surrounding the pond. Vegetation consists primarily of grass species with a few forbs and the northern edge of the pond slopes gradually up to the forest edge. The distance between the forest edge and the pond varies between 15 to 30 meters, depending on water level. In some years, Pond B completely dries and the water temperature in the late summer has been measured as high as 23°C.

The water depth in Pond C (3.5 acres) is greater than the other ponds, with the water level remaining relatively consistent throughout the year, generally dropping only a few feet between March and September. The forest edge is generally 15 to 20 meters from the pond. Riparian vegetation consists primarily of grass species with a few young alder, and the slope of the pond is much steeper than any other pond.

Pond D (2.1 acres) is much smaller than Pond B, but also contains a more gradual slope from the pond to the forest edge and is shallow. A mud substrate persists in the bottom of this lake, likely because the pond infrequently dries out. The distance to the forest edge at Pond D varies between 15 to 30 meters.

1.2 Past Work on Amphibians at 14 Lakes

In 2002, the area was surveyed to document amphibian species present. Red-legged frogs (*Rana aurora*), Pacific treefrogs (*Pseudacris regilla*), roughskin newts (*Taricha granulosa*), northwestern salamanders (*Ambystoma gracile*), and long-toed salamanders (*Ambystoma macrodactylum*) were present and breeding at 14 Lakes. Egg mass surveys began in 2003 and continued in 2004 and 2005 (Table 1). The number and location of all egg masses and amphibians encountered were recorded (except for Pacific treefrog egg masses, which were too numerous). The pond edge was also surveyed by turning movable pieces of wood and rocks to search for animals. Key findings include:

- Adult salamanders and frogs were found under pieces of wood during spring egg mass surveys (Photo 1).
- There is a lack of vegetation structure and branches for egg mass attachment in Ponds B, C, and D. Salamander and frog eggs are typically located in large aggregations on the few pieces of vegetation present in the ponds.
- Newly metamorphosed frogs and salamanders were documented under rocks and wood during late summer and early fall (Photo 2). All amphibians at 14 Lakes appear to metamorphose in one year and then move to the upland forest to overwinter.
- Distance between cover items and the edge of water was substantial in some areas.
- Temperatures in Pond B reached over 23°C during the late summer of 2004. During this visit, highly stressed frogs were observed, likely due to lack of cover and shade between the pond and the upland forest.

Table 1. Results of Amphibian Egg Mass Surveys at 14 Lakes. (First number is northwestern salamander / second number is red-legged frog).

	2003	2004	2005
Pond A (Big Lake)	12 / 0	0 / 0	106 / 45
Pond B (Deep Lake)	54 / 72	2 / 262	1 / 67
Pond C (Blackberry Lake)	0 / 292	33 / 283	82 / 628
Total of all Ponds	66 / 364	35 / 545	189 / 740



Photo 1. Example of the importance of wood and other cover objects to pond-breeding amphibians migrating to 14 Lakes to breed (March 2003). One northwestern salamander, two long-toed salamanders and two treefrogs were found under one small piece of wood.



Photo 2. Newly metamorphosed northwestern salamanders under a rock (these areas retain moisture through hot days). Additional logs would provide more cover options, while also providing a migration route to the forest.

2.0 Project Goals and Objectives

The objectives at Ponds B, C, and D in the 14 Lakes wetland complex are:

- Improve connectivity between the ponds and the adjacent upland forest by creating corridors for wildlife, including amphibians and small mammals.
- Provide additional habitat diversity within the ponds by adding treetops to serve as cover for aquatic organisms and egg mass attachment substrate for breeding amphibians.

3.0 Project Justification

The ponds at 14 Lakes provide some of the most important habitat for pond breeding amphibians in the lower CRMW. An apparent change from the historical hydrology of these wetlands has created lower water levels in the ponds during summer months. The forest edge is a substantial distance from the pond edge in some locations, especially at low water levels, and little to no shade or cover exists around the pond edge. Metamorphosing amphibians must move through the area between the ponds and the forest as they migrate to upland habitat to overwinter. The lack of trees or other cover objects in this zone creates hot dry conditions for juvenile frogs and salamanders to move through on their migration to upland forest habitat. Providing log corridors that retain moisture, and provide shade and cover from predators, will enhance the habitat for amphibians.

4.0 Coordination with Other Projects

This project will coordinate with an upland forest habitat restoration project planned through the Bonneville Power Administration (BPA) mitigation program. This project includes the forest surrounding 14 Lakes and stretches east across the BPA right-of-way (800 acres). The goals of the upland forest habitat project are to diversify the forest by adding small gaps in the forest canopy, planting tree species not currently present in the forest, creating snags, and falling some trees on the forest floor to provide downed wood habitat.

5.0 Evaluation of Potential Effects

We do not anticipate any negative effects from this small-scale habitat enhancement project. The forest at the edge of the 14 Lakes ponds is approximately 85 years old and comprised mainly of Douglas-fir. The project calls for cutting a minimal number of trees (20-40) and all parts of the tree will be left at the site to provide habitat for wildlife species.

6.0 Cost versus Benefits

It is expected to take two chainsaw operators and one Ecosystems staff member approximately four hours to implement the project (Table 2). The expected benefit of this project is improved habitat for amphibians within the 14 Lakes wetland complex. The benefit of this project will continue for many years, as amphibians often use the same migration routes back to a pond as they took leaving a pond.

Table 2. Estimated project costs for implementing the 14 Lakes habitat enhancement project.

Project Element	Cost per Unit	Cost
Two chainsaw operators	4 hours @ \$70/hour	\$560
Ecosystems staff members – project planning	20 hours @ \$70/hour	\$1,400
Ecosystems staff member- project implementation	4 hours @ \$70/hour	\$280
Total		\$2,240

7.0 Project Design, Prescriptions, and Mitigation

The project team visited all ponds in the 14 Lakes wetland complex in July, 2005, and documented conditions at each pond. Tree height measurements were taken at Ponds B, C, and D to ensure that treetops would reach the ponds. It was determined that the selection of trees to fall would be done by the chainsaw operator working with an Ecosystems staff member in the field. By waiting to select specific trees, we hope to minimize damage to surrounding trees while still picking those trees that maximized benefit to habitat at each pond. Due to the small number of trees identified for falling at each pond, we do not anticipate significant delays in the project by waiting until a chainsaw operator is in the field.

The project team estimated that by cutting 10-15 trees around Pond B, corridors to the upland forest would be present around the entire pond. Some of these trees will be clumped to effectively create a wider corridor away from the pond, others will be placed next to logs already present at Pond B, and some logs will be placed in areas where no cover currently exists. Cutting will be planned to result in the trees lying flush with the ground, to provide better travel corridors for amphibians. Project plans call for cutting 6-10 trees around Pond C and 3-5 trees around Pond D. The cutting procedure will be similar to that described for Pond B.

8.0 Outside Review, Permitting, and Approvals

This project does not require permits from county, state, or federal agencies (e.g. FPA, HPA, Shorelines). Because all ponds proposed for habitat enhancement in the 14 Lakes complex are less than 20 acres in size, a Shorelines exemption will not be needed. The project will not involve the sale of any trees.

9.0 Implementation Plan

At the time of project implementation (October, 2005), the project team and chainsaw operators will work together to determine specific trees to fall. The project team will mark specific trees prior to the implementation date and then talk with the chainsaw operators to ensure these trees can be placed where desired. Changes will be made in the field to accommodate tree placement

goals if necessary. All safety guidelines as outlined by SPU safety protocol will be followed during project implementation.

10.0 As-Built Results

Marking Trees

- Watershed Services Ecosystems staff marked 27 trees around the three different ponds (11 at Pond B, 12 at Pond C, and 4 at Pond D).
- The diameter at breast height (dbh) of trees varied from 15 to 29.2 inches, with a mean of 22 inches (Table 3).
- A proposed bearing was noted for each tree to help fallers understand where the tree should be placed.
- Each tree was flagged and an ID number and bearing was noted on the flagging.
- Marking of trees took two people approximately five hours, including travel time.

Table 3. Individual tree data for all trees dropped towards the ponds.

Pond	Species	DBH (in)	Height (ft)	Length of top in water (ft)
B	DF	22	126	66
	DF	17.5	112	43
	DF	18.2	127	40
	DF	19.8	102	40
	DF	23.8	153	70
	DF	24.5	138	55
	DF	24.1	158	30
	DF	22.4	140	10
	DF	29.2	153	?
	DF	20.3	145	?
	DF	26.1	152	?
C	DF	25.2	149	50
	DF	23.1	149	50
	DF	17.2	122	0
	DF	18.8	130	0
	DF	23.8	130	?
	DF	25	140	30
	DF	27.6	150	60
	DF	20.7	140	45
	DF	24.2	140	60
	RA	11.5	30	10
	DF	22.3	140	30
	DF	20.3	130	30
D	DF	28.5	138	25
	DF	21.8	124	25
	DF	21.1	125	25
	DF	15	95	20

Falling Trees

- Watershed Services Operations staff felled all the marked trees.
- Twenty-four of the trees were felled on October 27th, and the remaining three trees were cut on October 28th.
- One red alder (Pond C) and 26 Douglas-fir were dropped towards the ponds.
- Tree fallers felt that their skill improved as the project progressed.
- Most trees fell in the desired location and the tops will reach the pond edge at high water levels.
- Most trees were felled so that they were flush to the ground, but a few on steeper slopes required bucking.

Final Cost of Implementation

Implementation cost was only about \$700 more than predicted (Table 3). The Watershed Services Operations Section used this project as an opportunity to train additional staff in directional felling of trees. Consequently, the chainsaw operators required more labor hours to complete the task than originally estimated. It took less time for Ecosystems staff to plan the project than anticipated, but more hours to implement.

Table 3. Final project costs to implement the 14 Lakes riparian habitat enhancement project

Project Element	Cost per Unit	Cost
Two Chainsaw operators	11 hours x 2 @ \$70/hour	\$1,540
Two Ecosystems staff members – project planning, fieldwork	5 hours x 2 @ \$70/hour	\$700
Ecosystems staff member- project implementation	Total of 10.5 hours @ \$70/hour	\$735
Total		\$2,975

Lessons Learned

The project went very smoothly, with good cooperation between the Ecosystems and Operations staff. Planning, review, and implementation were quick and efficient, primarily because it was a simple, low-cost project that addressed a single need rather than trying to tackle all the potential restoration needs at 14 Lakes at one time. Results from subsequent years of monitoring egg mass placement (see following section) showed that it was also successful in achieving its objective of providing egg mass attachment sites.

11.0 Monitoring 2006-2010

Annual amphibian egg mass counts were conducted in late March or early April each year from 2006 through 2010. Data were separated into those egg masses associated with trees dropped during this project and those attached to other materials. Very few egg masses were associated with the dropped wood in 2006, and in 2007 water levels were too high to conduct a survey. However, in 2008, 2009, and 2010, large numbers of egg masses were attached to the tree tops. For example, red-legged frog egg masses associated with dropped trees in Pond B varied from 27 to 44 percent, and in Pond D from 29 to 84 percent (Table 4).

Table 4. Percent of red-legged frog egg masses associated with wood dropped into three ponds at 14 Lakes, Cedar River Municipal Watershed.

Pond	Year	Total egg masses	% associated with dropped trees
B	2006	252	0%
	2007	n/a	n/a
	2008	344	28%
	2009	143	27%
	2010	496	44%
C	2006	515	3%
	2007	n/a	n/a
	2008	351	0%
	2009	493	21%
	2010	123	72%
D	2006	127	0%
	2007	n/a	n/a
	2008	430	84%
	2009	209	29%
	2010	129	56%

Photo points were established at each pond and pictures taken from each photo point during or shortly after the egg mass survey each year. One photo point each was established at Small, Wood, and Blackberry Lakes, two at Deep Lake, and four at Big Lake. A numbered metal tag was fastened to a large tree facing the pond. Each year the biologist stands with their back at the tag, facing the same direction to take the picture. They carry a photo from the previous year and attempt as best they can to duplicate the area in the picture. Location of all felled trees and the photo points were entered into GIS (Figure 2). These photo points are proving invaluable in documenting the large variation in water levels in early spring.

For complete results of the amphibian egg mass surveys and photo points, see Amphibian Egg Mass Surveys, 14 Lakes Wetland Complex 2006-2012, found on the City of Seattle Habitat Conservation plan website:

http://www.seattle.gov/util/EnvironmentConservation/OurWatersheds/Habitat_Conservation_Plan/Species/Amphibians/Pond-Breeding/StatusintheCedar/index.htm

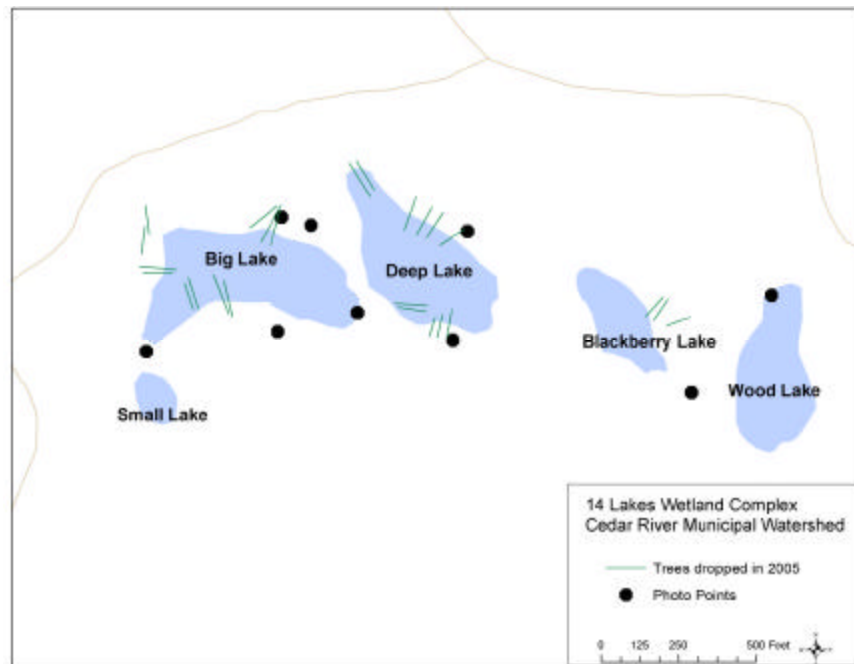


Figure 2. Location of trees dropped and photo points at 14 Lakes, Cedar River Municipal Watershed.