Sandy River Delta Habitat Restoration

Annual Report

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ABSTRACT

During the period 2008-2009, there were 2 contracts with BPA. One (#38539) was dealing with the restoration work for 2007 and the other (#26198) was an extension on the 2006 contract including the NEPA for Dam removal on the old channel of the Sandy River.

For contract #38539, the Sandy River Delta Habitat Restoration project continued its focus on riparian hardwood reforestation with less emphasis on wetlands restoration. Emphasis was placed on Sundial Island again due to the potential removal of the dike and the loss of access in the near future. AshCreek Forest Management was able to leverage additional funding from grants to help finance the restoration effort; this required a mid year revision of work funded by BPA. The revised work not only continued the maintenance of restored hardwood forests, but was aimed to commence the restoration of the Columbia River Banks, an area all along the Columbia River. This would be the final restoration for Sundial Island. The grant funding would help achieve this. Thus by 2011, all major work will have been completed on Sundial Island and the need for access with vehicles would no longer be required.

The restored forests continued to show excellent growth and development towards true riparian gallery forests. Final inter-planting was commenced, and will continue through 2010 before the area is considered fully restored.

No new wetland work was completed. The wetlands were filled by pumping in early summer to augment the water levels but due to better rainfall, no new fuel was required to augment existing.

Monitoring results continued to show very good growth of the trees and the restoration at large was performing beyond expectations. Weed problems continue to be the most difficult issue.

The \$100,000 from BPA planned for forest restoration in 2008, was augmented by \$25,000 from USFS, \$120,000 from OR150 grant, \$18,000 from LCREP, and the COE continued to add \$250,000 for their portion. Summary of the use of these funds are displayed in Table 1 (page 5).

Work on the restoration of the original Sandy River channel (dam removal, contract #26198) continued slowly. The draft EA was completed and sent out for review. The COE has decided to finish the NEPA with the intent to complete the project.

Sandy River Delta Habitat Restoration

The 2001 annual report summarized the work from 1997 through 2001 in detail illustrating how the Forest Service, working with its partners, was using adaptive management to accomplish this restoration project. Subsequent Annual Reports built upon the 2001 report; only briefly summarizing past accomplishments but detailing the more recent work. This work was funded by the Bonneville Power Administration (BPA), the USDA Forest Service (FS), Ducks Unlimited (DU), COE (Army Corps of Engineers), AshCreek Forest Management, Foundations, non-profit organizations, and many hours of volunteers.

Statement of Work

The purpose and need of this work is to satisfy a portion of the mitigation requirements of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, as amended. This act requires that BPA fund, where appropriate, fish and wildlife actions recommended by the Northwest Power Planning Council, that mitigate for the effects to fish and wildlife resources associated with the construction and operation of the Federal Columbia River Power System. The project would meet RPA 152, RPA 155 and RPA 157. The yearly project prioritization process will determine subsequent inclusion of habitat rehabilitation actions at Sandy River Delta.

Overview: Project Description, Goal, Objectives, Tasks, and Deliverables

The goal of this project is the restoration of historic landscape components within the 1500 acre delta of the Sandy River. Sandy River Delta (SRD) was historically a wooded, riparian wetland with components of ponds, sloughs, bottomland woodland, oak woodland, prairie, and low and high elevation floodplain.

Figure 1. Aerial photo of SRD taken in 1935. Note the forested condition of Sundial Island and the Sandy flowing in its original channel.

Figure 2. Aerial photo of SRD taken in 1994. This is the condition of the Delta at the time of Forest Service acquisition. Note how little forest remains and how much of the area has been cleared.

Figure 2. Sandy River Delta 1994 –Condition at Forest Service acquisition

The Sandy River Delta has been greatly altered by past agricultural practices and the Columbia River hydropower system. Before this work began the SRD was heavily infested with reed canary grass, blackberries and thistles; some portions had drainage ditches installed and the area had been planted to pasture grasses. The original channel of the Sandy River was blocked in the 1930's, and diverted into the "Little Sandy River". The original Sandy River channel has subsequently filled in and largely become a slough. The initial focus of this restoration project has been on restoration of riparian forest and wetlands. As this work progresses, the Forest Service proposes to remove the 1930's

dam across the Sandy River to restore the hydrologic pattern and improve estuary habitat for anadromous fish. Restoration of open upland areas (meadow/prairie) would follow substantial completion of the riparian and wetland restoration.

The FS acquired the Sandy River Delta (SRD) in 1991 from Reynolds Aluminum (via the Trust for Public Lands). The Delta had been grazed for many years but shortly after FS acquisition grazing was terminated while a master plan and Environmental Impact Statement (EIS) were developed for the site. During the following three years, the vegetation changed dramatically as a result of cessation of grazing. The dramatic changes included the explosive increases of reed canary grass monocultures in wet areas and the expansion of Himalayan blackberries throughout the site.

The completed comprehensive management plan (*Sandy River Delta Plan and EIS*, 1996) identified a landscape restoration plan, recreation facilities (trails and parking area), I-84 transportation improvements, and a 'gateway' to the Columbia River Gorge National Scenic Area (CRGNSA). The master plan envisions wetland, riparian forest, shrub-scrub, upland forest, and upland meadow restoration. Riparian forest and wetland restoration were identified as first priorities which this BPA funded project is accomplishing.

The long-term objectives, tasks, and deliverables are summarized below:

Wetlands Restoration: Restore 200 acres of wetland and associated upland habitat, and monitor and evaluate restoration success. Convert vegetation on 200 acres from invasive species (reed canary grass) to a more native plant community. Convert 10 existing acres of seasonal open water to 25 acres of seasonal open water; convert 55 acres of upland meadow to palustrine emergent wetlands; improve vegetative condition on remaining 120 acres palustrine emergent wetlands. Document the contribution of restored wetlands to biodiversity.

Riparian Forest Restoration: Restore a 600 acre block of "gallery" Columbia River bottomland riparian forest (dense, unbroken stands of black cottonwood, willow, and ash). Riparian reforestation will improve habitat for neo-tropical migrants (some of which are extirpated in Oregon), herptiles (including the sensitive red-legged frog and potentially for Western pond turtles), the great blue heron, raptors (including bald eagles) and a community of native plants and animals. In the long term, site reforestation will benefit adjacent waterways, and provide shade along anadromous rivers (Sandy and Columbia Rivers).

Original Sandy River Channel Restoration: Remove a 1930's dam across the Sandy River to restore the hydrologic pattern and improve estuary habitat for anadromous fish. Removing the dam will reclaim about a mile of the original Sandy River channel, in the very lowest reach before the river enters the Columbia River.

Partnerships: Partnerships and volunteers are strongly sought to build local community ownership for Sandy River Delta, and to build advocacy and support for ecological restoration, public lands and natural resources.

Figure 3. Sandy River Delta Plan – 1996.

Table 1. 2008 BPA Cost Summary for Work Completed by Forest Service

Objective Work Element	Progress	BPA Planned Cost	BPA Funds Spent -FS	BPA Funds Spent -DU	BPA Net Funds 3/31/2007
Objective 1: Dam Removal/ Breaching (#26918)					
Work Element 174: Produce Plan					
▪ Work on NEPA	Continues	\$52,845	\$6,446	0	\$46,399
Total		\$52,845	\$6,446	\$00	\$46,399
Objective 2: Wetland Restoration (#38539)					
Work Element 22: wetland restoration					
Objective 3: Riparian Forest Restoration					
Work Element 47: planting 34,000 trees and shrubs; 70 ac Col. River Banks (CRB)	Completed	\$23,100	0	\$23,100	0
Labor for planting 34,000 tree/shrubs at CRB	Completed	\$18,700	0	\$18,700	0
Native trees/shrubs	Completed	\$4,400	0	\$4,400	0
Work Element #53. Remove Vegetation on 70 ac CRB (Col. River Banks)		\$40,958.82	0	\$40,958.82	\$0
Initial site prep and spray	Completed	\$28,000	0	\$28,000	0
Site prep cutting trails	Completed	\$12,958.82	0	\$12,958.82	0
Work Element 22: Maintain Vegetation 70 ac.		\$24,500	0	\$24,500	0
▪ Maintain spot spray	Completed	\$10,500	0	\$10,500	0
▪ Maintenance mowing	Completed	\$14,000	\$0	\$14,000	0
Subtotal		\$90,958.82	\$0	\$90,958.82	\$
Objective 4: Project Administration and Reporting					
Work Element 119: Manage and Administer Projects	Completed	\$7,069.33	\$3,549.33	\$3,520	\$0
Work Element 132: Produce Annual Reports	Completed	\$1,047.	\$747	0	\$300
Work Element 185: Produce Status Reports	Completed	\$788.74	\$558.52	\$00	\$230.22
FS Burden		\$635.18	\$635.18	\$00	\$0
Subtotal Restoration		\$9,041.18	\$4,990.96	\$3,520	\$530.22
TOTAL COSTS		\$100,000	\$4,990.96	\$94,478.8	\$530.22

Riparian Forest Restoration (Sundial Island)

The north island (Sundial Island) was envisioned to become re-forested to the maximum extent possible. Clearly, it would not be possible to reforest under the transmission lines so this area was designated to be planted with shrubs. The old sloughs through the north island would be left intact as future flood channels. The species used for reforestation would those found in native gallery hardwood riparian forests: black cottonwood and Oregon ash with a diversity of other small trees and shrubs, such as willow spp., dogwood, ninebark, Indian plum, etc.

The Forest Service outlined the initial reforestation in a flexible five-year plan, which is illustrated in Figure 4 below.

Figure 4. Sandy River Delta Riparian Reforestation Units set up with BPA funding.

The reforestation area was divided into blocks indicating when the areas were to be planted and when the associated activities were anticipated to occur. This type of out-year planning had to be very flexible to accommodate yearly changes, a result of adaptive management.

Summarized below is a brief chronology of the work accomplished prior to 2004 (for more details, please reference appropriate Annual Reports).

- 1997: - Seven acres were planted by volunteers in unit A1. High density at 900 trees/ac.
- 1998: - Severe deer browsing, vole girdling and weed competition occurred.
- Seven more acres (A2) were planted at high density using weed mats.
 - Weeding the plantings was becoming prohibitively costly.
 - Site prep work cleared 30 ac of blackberries.
- 1999: - Planted 22 ac. (A3 and A4) at same density.
- Used vexar tubes to help control deer predation. Trees above tubes continued to get severe browsing. Trees were not growing at expected rate.
 - Voles were living under weed mats and continued to girdle trees.
- 2000: - A new approach had to be developed to over come the problems.
- For existing plantings, decided to fence individual trees to preclude browsing.
 - In new plantings experimented with 6 ft tall trees to overcome deer problem.
 - Decided to purchase tractor to facilitate vegetation control; this would result in row plantings at 20 foot rows.
 - Site prep work cleared and sprayed an additional 60 ac of blackberries.
 - A 200 ac fire occurred in planting area and presented opportunity to jump start a 15 ac trial (B2) of 20 ft row planting in the fall using tall planting stocks with no mats but did place tin foil to prevent girdling.
- 2001: - More cages were placed over the existing high-density plantings (A1-3) with dramatic results; some trees were showing 3 ft growth.
- Mowed vegetation between rows (B2) with tractor but there is still much concern with vegetation competition within row and around plants.
 - New row plantings showing no browsing and good establishment. Planted an additional 10 ac. (B3)
 - Exploring new approach of site prep by eliminating all vegetation, disking, and planting with trees in 12 ft rows.
- 2002: - All planted areas were maintained as required.
- Monitoring data was collected showing good survival of plants in the mowed-tractor rows and in caged trees.
 - Additional 10 acres planted by volunteers through SOLVE
 - Trial pilot study area of 50 acres (B4) was selected to try a new approach to re-forestation. This approach essentially eliminated all vegetation through herbicides and cultivation to create a clean planting bed for the trees and native grasses. This approach is not as light-handed on the land but the anticipated increase in tree growth should be significantly greater and time to achieve desired outcome greatly reduced. Control of voles, deer, and vegetation will be far more effective.
 - The pilot area, and an additional 72 ac. (all inclusive in B4), were disked several times, sprayed with glyphosate and garlon twice, and the trees were mechanically planted in late December.
- 2003: - The trees protected by wire cages showed increase growth while many of the unprotected trees continued to show mortality.

- The trees in the mowed rows (B2-3) with existing vegetation likewise continued to show better survival than the original planting, but growth was still very poor and mortality due to girdling, deer rubbing and drought continued to diminish overall survival. Maintenance of this area continued to demand a lot of effort.
 - The new pilot planting, B4, (using herbicides, tractors, and other machines for site prep), established in 2002, was showing very promising growth and survival. Weeds in the bare soil between and within the rows were a major concern and required most of the maintenance effort.
 - About 60 ac (B5) to the west of the pilot was site prepped (mowed, disced, sprayed, contoured, etc.).
 - In response to the weed problem in the bare soil, the newly prepped 60 acres to the west of the pilot area were planted with native grasses in late Fall to see how this would help with maintenance cost and weed control. A few of the rows in the pilot area were planted with native grasses.
 - Planted shrubs under the power lines in the pilot area (B4).
 - Volunteers continued to play an important role, although more intensive planting efforts had to rely on machine and crews.
- 2004:
- All planted areas were maintained as required.
 - Monitoring data was collected showing good survival of plants in the mowed-tractor rows and in caged trees.
 - It was now very clear that planting trees directly into existing vegetation (early approach in 1998-2000) was not a viable approach. This included the approach of planting large tree stocks in tractor mowed rows where growth was too slow to meet maintenance cost expectations.
 - The pilot study (B4, planted in 2002) showed remarkable growth with about 75% survival. Weed maintenance between the rows was a significant problem.
 - The planting area labeled B5 on the map, which was prepped in 2003, was seeded with native grasses (*Deschampsia elongata*, *D. caespitosa*, and *Agrostis exarata*) over the entire area to reduce weed problems and to build up native seed bank. The native grasses were seeded in late Spring, grown to maturity by July and mowed later in the summer. The grasses grew very well and produced a remarkable seed crop. Originally, we were to spray out the entire area again and replant native grasses, but due to short falls in funding this idea was abandoned. Planting rows were sprayed out in early Fall in anticipation of planting during the winter. This approach seemed to be very successful in reducing weed management costs which were such a problem in the pilot area (B4).
 - As we begin to appreciate the benefits of this new approach (eliminating the present vegetation and replacing with native grasses and trees with agricultural methods) we are evaluating the need and cost/benefits of replanting some of our earlier efforts. This is not an easy decision considering the effort so many volunteers put into the plantings. Nonetheless, we did decide to replant 25 acres (B6 and s. half of B3) which had been planted in 2000 and which had become severely infested with blackberries once again. This area was disced, contoured and sprayed in preparation of planting in 2005-6. B2 and north half of B3 would be kept for another years to gather more data on growth.
- 2005
- Maintenance of previous year's plantings was completed.
 - Monitoring data was again collected by Youth Corps and FS personnel. Data collected from the original planting A1-4 was not collected considering that the data from 2004 was conclusive in showing that this approach was not viable.
 - The larger tree stocks planted in tractor mowed rows (B2 and B3) likewise were not meeting expectations. These units were identified to be replanted.
 - The pilot study, B4, and the area to the west, B5, continued to show remarkable response and growth. The methods (planting native grasses after one season of site prep, followed with

planting of tree in later winter) used in B5 were more economical (reduced weed infestations) and equally effective.

- The shrubs planted under the power lines were not performing well due to severe deer predation and large areas still open for weed infestation. It was becoming clear which shrubs the deer were not favoring, such as Oregon grape, thimbleberry, and to a lesser degree spirea; and these were the species that we should be emphasizing in our plantings.
- A new approach accommodating the partnership with a local farmer who could till the land, plant and harvest winter barley, was explored but the mechanism was not solved until after the season was over. This was identified as a good approach for the future.
- The US Army Corps decided to fund restoration of some 100 acres on Sundial Island north of the slough, including the earliest planting in 1997-2000 (A1-4) which need to be re-planted. Discussions continued throughout the year.

Photo 1. This shows a typical scene of Sundial Island prior to any work. Heavy infestation of reed canary grass and blackberries, along with other weeds, such as thistles, dominated the vegetation, even where some cottonwoods were growing..

Photo 2. Area B4 (planted in 2003) in March 2004 after one year of growth. This exemplifies our new approach where all the vegetation is removed and planted to trees and native grasses. Although this site had the native grasses planted after the trees, this is not our preferred approach (in which we plant the grasses prior to the trees to help out-compete the weeds).

Photo 3. Area B4 in March 2005 after two years of growth. Note the young native grasses between the rows and the vigorous growth of the trees.

Photo 4. Area B4 (planted in 2003) taken in 2007. Trees are too large to permit tractor access and no longer need maintenance except for blackberry spot treatment. Native grasses are still able to keep out most of the weedy species such as thistle, although reed canary grass is slowly getting re-established in some places.

- 2006: - Maintain the current plantings, and interplant in B4 and B5 with tall (6-8 ft) cottonwood poles.
- Shrubs and trees were planted to offset losses during the past 2 years within the 175 acres of B4 and B5.
 - 15 acres were planted on the south bank of the slough through Sundial Island.
 - Additional plantings through a grant from LCREP will emphasize the riparian areas along the old and new channels of the Sandy River.
 - Concurrent with this effort was the work funded by the COE on the northern portion of Sundial Island where similar work is commencing. Much of this area was being re-planted where early efforts (1997-2000) had failed for one reason or another (see map below). The approach being used is that which had been developed with BPA funds over the past 10 years.
 - The trees in portions of B4 were growing so well that this year would be the last year requiring regular maintenance.

Figure 5. The map above illustrates those areas being re-forested with COE funding. Many of these areas had been planted prior to 2000 using experimental methods which, for one reason or another, did not work and were identified for re-planting.

2007: - B4 trees are over 30 ft in height and are on their own. Some inter-planting between the rows with shrubs and/or trees will help increase diversity and randomize the appearance.

- B5 plantings are doing well and a small area destroyed by fire was replanted.
- Power lines planted with deer resistant shrubs, such as Oregon grape, in higher densities in B4 and B5.
- BPA funding was leveraged by ASH Creek Forest Management to obtain \$50,000 from a NFF grant to help with 35 acres of shrub plantings.
- COE continued to restore the north portion of Sundial. 120 acres were planted and maintenance began.
- COE agreed to fund the remaining 45 acres in center of Sundial for restoration. As a result, BPA funding in 2008 would go to the last remaining area along the Columbia, Columbia River Banks (CRB) of over 150 acres.

2008 Accomplishments

With the added funding from OR150 and LCREP grants totaling close to \$150,000, this year's efforts focused on the CRB, the last portion yet to be restored on Sundial Island. 70 acres were initially site prep'ed and sprayed, but with additional funding another 50 acres were tackled. These areas were mowed, sprayed with care trying to protect all established natives. In the late winter, January and February, 70 acres were planted to trees and shrubs. This effort was modeled after the restoration that was completed with excellent results along the old channel of the Sandy (south portions of Sundial Island). Thus a lot of red elderberry, dogwood, and other small trees and shrubs were used in the plantings. Thus far it appears that this effort is working well. Quite a strong weed maintenance schedule has been established using a combination of mowing and spraying to counter the re-growth of blackberries.

Meanwhile, maintenance of the 200 acres of in-land Sundial was continued. These forests are progressing very well. Inter-planting, of which some has occurred but the bulk will occur in 2010, in B4 will essentially be the end of all maintenance for that portion. B5 and others will follow within the next year or so. B4 was planted in 2003 and has taken about 6-7 years of maintenance to be considered established and restored.

Table 2. Summary: Riparian Forest Restoration, Acres per Year by Activity; All Funding (not including COE)

Activity	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Site Prep	21	43	30	130	90	115	57	90	40	--	15	70
Planting	7	14	34	25	20	65	67	50	65	15	35	70
Inter-planting									115	175	10	20
Maintenance	--	7	14	55	80	100	213	115	182	190	160	205

Wetland Restoration

The wetland enhancement work was identified to occur in the southern portion of the Delta for several reasons, the most important being that there were more positive hydrologic conditions present. These wetland areas were severely infested with monocultures of reed canary grass that had displaced essentially the entire native wetland flora. The FS developed a partnership with DU and obtained funding from BPA and foundations to initiate the enhancement work.

The objective of this wetland work was to create more functional wetlands by increasing the amount of open water/emergent wetlands and thereby decreasing the amount of red canary grass dominated wetlands. This would in turn create more favorable habitat for waterfowl and water dependent birds, herptiles, and other wildlife and native plants.

The work began in 1997 and is briefly summarized below (see Annual Report for 2001 for more details). The management approach was similar to the re-forestation effort in that we attempted to be as flexible as possible to respond to lessons learned from previous years using the adaptive management concept.

- 1997: - Water control structures were built to retain all surface water in the four ponds identified for this project.
- 1998: - Pond B, C, and D were disked in attempts to control reed canary grass as detailed by the USFWS. This operation was not successful although wetland flora did germinate from the soil seed bank.
- 1999: - The ponds did fill up during the winter ('98 – '99) but did not retain water beyond July. To obtain good control of reed canary grass, longer water retention will be required. Monies that were to be used for diskings were instead used to deepen pond B in hopes of retaining more water for longer time.
- 2000: - The ponds were well flooded during the winter ('99-2000). Again the water receded rapidly in July 2000. We recognized that quantity of water was a problem. Ponds disked in '98 had become completely infested with reed canary grass once again; illustrating that diskings in conjunction with the water quantities available at the delta will not give any control of this invasive species.
- 2001: - The winter of 2000-2001 was very dry and the ponds did not fill. In 2001 pond A and B were further deepened. We began to explore the possibilities of establishing a well capable of supplementing the water for the wetlands during a couple of months of the summer, long enough to get control of the reed canary grass.

Figure 6. Sandy River Delta Wetland Restoration Units.

Three water control structures (#1, 2, and 3) and wetland areas that were excavated at the Delta (pond A, B, C, and D). Red shaded areas adjacent to pond B and C were disked and not excavated. The source of the water for the wetlands is Broughton Bluff located south of the ponds.

2002: - The ponds did not fill to over-flow capacity during the winter of 2001-2002. Pond D never even began to fill. However, a very good wetland vegetation (predominantly spike rush spp) did germinate from the soil seed bank in pond A and B (which had been deepened during the summer of 2001). Monitoring transects completed by PSU wetland students and Americorps were established in pond A. Pond C did fill but has become re-infested with reed canary grass. It was decided to concentrate on pond A and B and leave pond C infested until after completion of ponds A and B. A 60 ft buffer zone around ponds A and B was sprayed with glyphosate and Garlon in Oct 2002 followed by disking. This buffer would be treated repeatedly until the reed canary grass was controlled and then planted to shrub. During the summer of 2002 we explored the possibilities of getting a well dug near pond A. A water right was obtained and the necessary NEPA and consistency documents were completed in 2003. Final approval and financing of the well would be decided in 2004.

Photo 5. Pond A in 2002.

- 2003: - Ponds A, B, and C did briefly fill up to overflow capacity and the spread of cattails was alarming and will require careful monitoring.
- The buffer zones around pond A and B were disked and sprayed in prep for planting.
 - Approximately 3 acres of wetland A were disked to help maintain the rich early seral wetland flora. Other portions were left untreated for comparison. The purpose of this was to counter the rapid expansion of cattails which were threatening to dominate the whole pond.
- 2004: - Ponds A, B, and C did briefly fill up to overflow capacity and the spread of cattails was alarming and will require careful monitoring.
- The buffer zones around pond A and B were disked and sprayed in prep for planting.
 - Approximately 3 acres of wetland A were disked to help maintain the rich early seral wetland flora. Other portions were left untreated for comparison. The purpose of this was to counter the rapid expansion of cattails which were threatening to dominate the whole pond.
- 2005: - Due to drought conditions the wetlands did not fill and reed canary grass continues to re-invade the wetlands. Some control work is envisioned in the near future.
- The pump and delivery system was in place but technical problems prevented its use.
 - Spot spraying of the plantings along the edges of pond A (10 acres) were completed. Some of the planting have shown good growth, but generally the weed problems within these plantings were becoming severe and would require a concentrated effort. In the meantime, there was a conscious decision to put more emphasis on completing the north island reforestation first and then concentrating on the wetlands.
 - Continued monitoring by PSU students illustrated how the wetland flora is changing over time. Their results can be seen on their web page: www.cse.pdx.edu/sandy_river_delta

- 2006: - Fixed water control structure 2 which had suffered erosion problems.
- Pump was operational, although some problems lingered.
 - Reed canary grass and cattails continued to re-infest the wetlands.
 - Looking at the restoration work in its whole, and in terms of possible dam removal, we decided to put most of our efforts into the Sundial Island restoration and to postpone serious wetland work for several years. Meanwhile, the wetlands would be maintained and some control work completed, as needed.
- 2007 - Wetlands partially filled using the pump. Rainfall good, so little was required.
- Wetland was mowed to help keep down the reed canary grass and encourage other natives
 - Wetlands will be disced in 2009-2010.

2008 Accomplishments

No work was done on the wetlands other than mowing the increasingly invasive reed canary grass. Although discing was not completed, it is scheduled for winter of 2009.

Table 3. Summary: Wetland Restoration, Acres per Year by Activity with All Funding

Activity	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Structures	3	--	--	--	--	--	--	---	--	1	--	--	
Disking/mowing	--	200	75	--	--	30	50	30	--	--	20	20	
Deepening	--	--	8	40	30	--	--	--	--	--	--	--	
Spraying	--	--	--	--	--	60	50	30	10	--	--	--	
Planting	--	--	--	---	--	--	--	10	--	--	--	--	

Restoration of the Original Sandy River Channel (Dam Removal or Breaching)

In the 1930's, a small dam was placed across the original (east) channel of the Sandy River, and the flow redirected to the west channel (originally called the Little Sandy River). The purpose was to concentrate the flow into one channel to improve fish passage. The east channel has since partially filled with sediment and dense riparian vegetation, including aged cottonwoods. A sediment plug has accumulated on the west side of the dam. Although once the main channel, the east channel now typically flows under high flows on the Sandy or Columbia Rivers. The channel dries to isolated pools in the summer.

The Forest Service wanted to investigate removal of this dam in order to restore a more natural hydrologic condition, improve fish habitat and improve overall aquatic habitat. Preliminary Forest Service scoping and analysis revealed a number of issues and potential impacts of dam removal/breaching that need to be addressed. A sand and gravel mining company is currently operating downstream of the confluence of the left tributary

channel and the Columbia River. There is concern as to how the removal of the dam would affect the volume and timing of sediment to the sand and gravel mining operation. There are also concerns related to a railroad bridge and two freeway bridges located upstream of the division of tributary channels on the Sandy River. The dam has been found eligible for the National Register of Historic Places.

Hydrologic Model

The Forest Service contracted with the U.S. Bureau of Reclamation to model hydraulics (volume of flow, velocity of flow), and sediment transport if the dam were removed. For more details, please view the Annual Report 2005. The findings will be summarized here.

Key Questions

Key questions of the modeling were potential effects of dike removal to:

1. The flow volume and extent of erosion in the east channel. The east channel would erode but no more than 7 ft which would be the same elevation as the Columbia. The flow would slowly shift from the west channel to the east channel over time.
2. A mining operation on the Columbia River, just downstream of the confluence of the Sandy and Columbia Rivers. The sediment deposits are primarily from the west channel and as the flow changes to the east channel, the sediments would decrease.
3. Channel scour at upstream railroad bridge and two freeway bridges. The model showed no effects on the upstream scour at the bridges.
4. Bank erosion along the right bank of the west channel. Removal of the SRD dam is not anticipated to accelerate bank erosion along right bank of the west channel; conversely, it may marginally allay erosion of the west channel.
5. Qualitative analysis of the effect of planned Marmot Dam removal (48 km upstream) on the accuracy of the numerical model. The impact of Marmot Dam removal varies depending on whether its removal occurs either before or after the Sandy River dam removal. If Marmot Dam is removed before the Sandy River dam removal, it is likely that the resulting sediment would only accumulate in the west Sandy River Delta channel. If Marmot Dam is removed after the Sandy River dam removal, it is likely that the resulting sediment would accumulate in both the east and west channels.

For more information see the following web page:

<http://www.fs.fed.us/r6/columbia/forest/projects/documents/SandyRiverDamRemovalSedimentModel.pdf>

Historic Resource Mitigation

The dam has been determined to be eligible for inclusion on the National Register of Historic Places. The Forest Service contracted HABS photography of the dam as mitigation for dam removal. The photography was completed in December 2005, and appears to satisfy the State Historic Preservation Officer as mitigation.

Accomplishments

-- 2006

The Forest Service initiated the NEPA process in late summer 2006, after waiting for the completion of the Hydrological Modeling Report. The NEPA was not completed in 2006 as new issues, such as the need

for a bridge across the original channel to replace the dike, surfaced and required unexpected analysis. The discussions required careful coordination with all interested parties and landowners.

--2007

The draft EA was delayed again to allow the COE to complete some additional work to help them decide on possible funding of this project. The completed EA was anticipated to be complete in mid 2008 but was further delayed. It is anticipated that the EA will be completed prior to the end of 2008. On-going discussions on cost-benefits and scope of work continue.

--2008

After lengthy discussions, the COE and FS agreed that the COE would finish the EA using their NEPA which would permit them to be in a position to fund this project. Their NEPA would need to be consistent with the NEPA already developed by the FS. This will then terminate this portion of the planned work with BPA funding.

Conclusions

This year continued the efforts on Sundial so as to be finished within the time frame being established for the removal of the dike. Continued maintenance on existing restored areas, most of Sundial except for the 45 ac. in the middle (C, on fig.5), was the top priority. COE agreed to fund the restoration of the remaining 45 ac, which were put under a new innovative approach using agriculture to help eliminate weeds and prepare the site for restorative planting in 2010. With additional grant funding, a major effort was initiated to restore the native plantings along the Columbia shore line (Columbia River Banks) which is the last portion of Sundial Island. This area lies east and north of units A4 and B4 (shown in Fig. 4).

Of note this year was the sighting at SRD of the yellow billed cuckoo, a bird believed to be extirpated from Oregon. This may be an indication that our restoration efforts have been successful for providing good habitat for neo-tropical migrants, a goal that was established in 1992 with the EIS for this site. Next year the Forest Service will begin to re-monitor bird use at SRD to study the impacts of the restoration efforts.

The approach that has been developed at SRD over the past 10 years has demonstrated tremendous potential and will be instrumental in future endeavors.

These pictures show the innovative approach using a local farmer to help with site preparation in eliminating weedy species. He farms the area, treating weeds and obtains a crop. The land becomes site prep'ed for restorative planting with natives after a year or two depending on severity of weed infestation. This approach saves close to \$1500 per acre per year and meanwhile stimulates local economy. This approach appears to be working well and will be initiated on a regular basis in future restoration work at SRD.