

# Western Pond Turtle Head-starting and Reintroduction

Annual Report 2005 - 2006

November 2006

DOE/BP-00023926-1



This Document should be cited as follows:

*Van Leuven, Susan, Harriet Allen, Kate Slavens, David Anderson, "Western Pond Turtle Head-starting and Reintroduction", 2005-2006 Annual Report, Project No. 200102700, 15 electronic pages, (BPA Report DOE/BP-00023926-1)*

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This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

**Annual Report**  
**BPA Project #2001-027-00**  
**Contract #00023926**

**Western Pond Turtle**  
**Head-starting and Reintroduction**

**Annual Report**  
**October 2005 thru September 2006**

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November 2006

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# **Western Pond Turtle Head-starting and Reintroduction, Oct. 2005 thru Sept. 2006**

## **Progress Report**

**Abstract:** This report covers the results of the western pond turtle head-starting and reintroduction project for the period of October 2005 – September 2006. Wild hatchling western pond turtles from the Columbia River Gorge were reared at the Woodland Park and Oregon zoos in 2005 and 2006 as part of the recovery effort for this Washington State endangered species. The objective of the program is to reduce losses to introduced predators like bullfrogs and largemouth bass by raising the hatchlings to a size where they are too large to be eaten by most of these predators. Twenty-six turtles were placed at the Woodland Park Zoo and 62 at the Oregon Zoo in fall 2005. These turtles joined two that were held back from release in summer 2005 due to their small size. All 90 juvenile turtles were released at three sites in the Columbia Gorge in 2006. Twenty-eight juvenile turtles were released at the Klickitat ponds, 22 at the Klickitat lake, 21 at the Skamania site, and 19 at Pierce National Wildlife Refuge (NWR). This brought the total number of head-start turtles released since 1991 to 944; 285 for the Klickitat ponds, 158 for the Klickitat lake, 227 for the Skamania pond complex, and 274 at Pierce NWR. In 2006, 20 females from the Klickitat population were equipped with transmitters and monitored for nesting activity. Fifteen nests were located and protected; these produced 55 hatchlings. The hatchlings were collected in September and transported to the Oregon and Woodland Park zoos for rearing in the head-start program. One wild hatchling captured in spring 2006 was placed in the head-start program to attain more growth in captivity. During the 2006 field season trapping effort, 414 western pond turtles were captured in the Columbia Gorge, including 374 previously head-started turtles. These recaptures, together with confirmed nesting by head-start females and visual resightings, indicate the program is succeeding in boosting juvenile recruitment to increase the populations. Records were also collected on 179 individual painted turtles captured in 2006 during trapping efforts at Pierce NWR, to gather baseline information on this native population.

## **Acknowledgments**

This project is a federal/state/private cooperative effort that has been in progress since the late 1980s. Activities conducted during this report period were primarily funded by BPA in cooperation with Washington Department of Fish and Wildlife (WDFW), the U.S. Fish and Wildlife Service (USFWS), the Woodland Park Zoo and The Oregon Zoo. Sarah Branum provided oversight of this project for the Bonneville Power Administration. Additional funding was provided by the Aquatic Lands Enhancement Account for support of volunteers to assist with field activities in 2006. Kate Slavens, WDFW, and Frank Slavens, Woodland Park Zoological Society, coordinated and led the trapping and monitoring of female turtles to obtain hatchlings for head-starting. Dana Payne directed the head-starting of turtles at the Woodland Park Zoo. David Shepherdson and Michael Illig facilitated the head-starting of hatchling turtles at The Oregon Zoo in Portland. Eric Holman and Lauren Ridenour, WDFW, and Northwest Service Academy volunteer Leah Estep conducted trapping at the Skamania County site. Susan Van Leuven was assisted in trapping turtles at Pierce NWR by Eric Holman and Jeff Azerrad of WDFW; Sarah Branum of BPA; and volunteers Leah Estep, Kelly Jenkins, Michelle Barta, Sharon Ralston, and Cory Whitmore. A number of volunteers, including Jerry Novak, Walter English, David Swanson, Karen Lewis, Andrew Reid, Leah Estep, Diane Yoshimi, Peter Murphy, Brenda Green, and others from The Oregon Zoo assisted WDFW staff in monitoring female pond turtles. Habitat improvement projects were completed with the assistance of USDA Forest Service Scenic Area staff Chuti Fiedler, Doug Lampe, and

Sarah Prince, and Stevenson-Carson School District Forest Youth Success crews. The labors of all of these individuals were and are essential to the success of the 2006 field season for western pond turtle recovery in Washington.

## **Introduction**

The western pond turtle (*Clemmys marmorata*) has been classified since 1993 as an endangered species in Washington and is considered a Species of Concern by the U.S. Fish and Wildlife Service. The western pond turtle is declining throughout its range and is highly vulnerable to extirpation in Washington. The species was once well distributed in southern Puget Sound lowland lakes and ponds and in the Columbia River Gorge. The western pond turtle has been essentially extirpated from Puget Sound. Within the Washington portion of the Columbia River Gorge, only two small, isolated populations remained in Skamania and Klickitat counties by year 2000.

The Washington Department of Fish and Wildlife (WDFW) wrote the Washington State Recovery Plan for the Western Pond Turtle in 1999 (Hays et. al 1999). The plan calls for establishing a total of 7 populations of more than 200 turtles each – 4 in the Columbia Gorge and 3 in Puget Sound. Achieving this recovery objective will require an ongoing program of head-starting hatchling turtles, captive breeding, and reintroduction until population numbers are increased to ensure the species' survival in Washington. Population size must be sufficient to overcome the effects of juvenile mortality by introduced predators such as bullfrogs and warmwater fish, and such sources of juvenile mortality must be reduced or eliminated. The total number of western pond turtles in Washington is estimated at between 1100 and 1200 individuals, many of them young turtles that went through the head-start program at the Woodland Park Zoo or The Oregon Zoo. The WDFW and the Woodland Park Zoo have been working cooperatively on this recovery effort since 1990, and were joined by The Oregon Zoo in 2000.

WDFW manages approximately 200 acres of habitat in Klickitat County containing the most important western pond turtle population remaining in the state. This land is currently being maintained as part of the Klickitat Wildlife Area. The U.S. Forest Service (USFS) owns approximately 200 acres of western pond turtle habitat at the Skamania County site. In 2004, WDFW and USFS developed a Memorandum of Understanding (MOU) for the management of this species on USFS lands in Skamania County. The agreement outlines specific agencies' responsibilities for the recovery of the western pond turtle.

The first western pond turtle reintroduction site in the Columbia Gorge was formally identified in 2000. The 2002 MOU between WDFW and US Fish and Wildlife Service describes mutual agreements and responsibilities of each agency for western pond turtle management at Pierce National Wildlife Refuge. The refuge features a complex of creeks, ponds, and sloughs, plus adjacent upland habitat suitable for pond turtles. The reintroduction effort is monitored to evaluate progress and enhance success of the program.

## **Project Area**

The project area consists of three sites in the Columbia River Gorge in Klickitat and Skamania counties. The largest naturally occurring population of western pond turtles is in Klickitat County. The Klickitat population consists of a lake group and a pond complex group. Although the lake and pond complex are connected geographically, turtles have only rarely been documented moving between them. The WDFW owns and manages these critical wetlands. In 1994, the population at this site was estimated at 117

individuals. Since then, 418 head-started juvenile turtles have been released at the Klickitat County site, substantially boosting the population there.

The second site, in Skamania County, contains the only other naturally occurring population in the Columbia River Gorge. This site is a mosaic of private and public land ownership. The USFS manages all public lands associated with this site, in cooperation with WDFW. The MOU between the USFS and WDFW defines goals and objectives as well as responsibilities for the future management of western pond turtles on these lands within the Columbia River Gorge. The western pond turtle population at this location was estimated at 39 individuals in 1994. A total of 224 head-started turtles have been released at the Skamania County site since 1994.

The third site in the project area, in western Skamania County, is the Pierce NWR. This area is the first reintroduction site for western pond turtles in the Columbia River Gorge. The goal is to establish the third of four populations needed to recover the pond turtle in the Columbia River Gorge. The site is managed by the USFWS. A total of 274 turtles have been released at Pierce National Wildlife Refuge since the summer of 2000.

## **Work Description**

The goal of this project is to establish four self-sustaining populations of western pond turtles in the Columbia River Gorge recovery zone. Bonneville Power Administration (BPA) funding currently provides primary support for this long-term effort. The work conducted and results for each objective for the 2006 field season are described below.

### **Objective 1: Inventory and Mark-Recapture Western Pond Turtles in the Columbia River Gorge.**

**Methods:** A mark-recapture program was conducted to evaluate population trends at the three sites. WDFW captured a representative number of western pond turtles in selected ponds and lakes at each site using two types of live traps (hoop and basking). Trapping was conducted continuously from 1 May through 23 May at the eastern Skamania county site, and 1 April through 29 May at the Klickitat County site. At Pierce NWR, traps were placed in the ponds from 8 May through 26 May, 4 or 5 days per week. Traps were checked daily when in service. Turtles were also captured opportunistically by dipnet and by hand during the trapping period. At all sites, individual animals were identified by previously marked notches on the carapace. Identities of head-started juvenile western pond turtles captured at Pierce NWR were verified by checking the implanted microchip numbers, when possible. Unmarked animals were given a number by filing notches in the carapace for future identification.

In fulfillment of an agreement with USFWS for use of Pierce NWR as a western pond turtle reintroduction site, and to gain information on potential issues relating to interspecific competition between western pond turtles and western painted turtles, a mark-recapture program for western painted turtles was integrated with the pond turtle trapping activity. Painted turtles occur naturally at this site, and while the two species are expected to coexist in relative harmony, studies are being conducted to monitor the painted turtle population and use of habitat, so that changes resulting from introduction of pond turtles may be detected. Both species were trapped concurrently using the same techniques and equipment. Captured painted turtles were also marked with notches but using a different numbering system, and a more limited set of data were collected for painted turtles.

**Results:** A total of 414 western pond turtles were captured in 2006 (Table 1). Head-start turtles comprised 90% of the total number of turtles captured at the two wild population sites in Klickitat and Skamania counties, revealing the importance of the program in adding recruits to the extant populations. At Pierce NWR, the western pond turtles present are the result of head-start reintroductions, except for one adult wild turtle captured for the first time in May 2006.

Table 1. Columbia River Gorge western pond turtle trapping results for 2006.

Location	# turtles	# head starts	# adult females
Klickitat County	257	223	22
Skamania County	82	77	1
Pierce NWR	75	74	0
Total	414	374	23

At Pierce NWR, 75 western pond turtles were captured over 14 days of trapping. Seventy-three of the turtles were captured over the first 10 days of trapping. Unfavorable weather during days 11-14 of the trapping session likely reduced the efficacy of the traps; therefore, our population estimates were derived from captures in days 1-10 only. The estimate of population size from this capture effort is 92 ( $\pm 8.1$  se) animals. This value is below the number we know to have been released on the site. Given the low mortality rate estimates from telemetered turtles, we expect the actual population to be higher. The low population estimate suggests that we are not sampling the entire population across the site. The data do show an increase from 2003-2005 (expected from our annual releases), suggesting that our mark-recapture effort is capable of documenting relative trends. The population estimates for 2005 and 2006 do not differ significantly (the 95% confidence intervals overlap), which likely reflects the small number of turtles (5) added in summer 2005 and the shorter effective trapping period in 2006. Comparison of these indices over time provides a means of gauging variation in the population size.

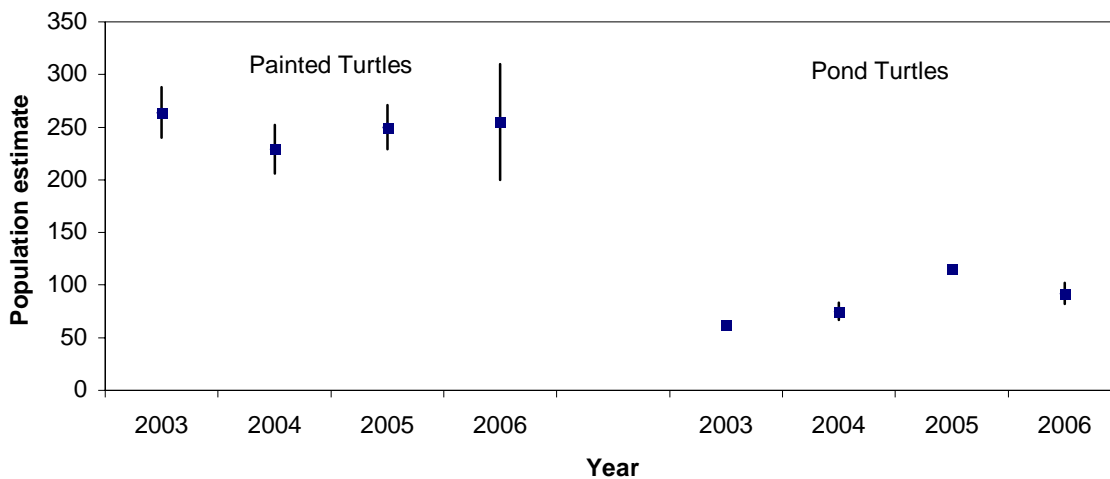


Figure 1. Estimated population size ( $\pm$  95% CI) for western painted turtles and western pond turtles at Pierce National Wildlife Refuge, 2003-2006.



One hundred and seventy-seven painted turtles were captured during the same 10-day period, with an estimated population size of 255 ( $\pm 54.28$  se) animals. As these turtles were captured with the same trapping arrays used for the pond turtles, it is likely that this estimate too may be low. The estimates for painted turtles suggest a stable population that is neither increasing nor declining (Figure 1).

Trapping results for the Klickitat and Skamania county sites have been entered into the western pond turtle database. Estimates of population size for those sites will be generated by a population model currently being developed by WDFW.

## Objective 2: Maintain Head-start Program: Field Effort

**Methods:** The program of head-starting wild hatchlings, and evaluating their survival and growth using mark-recapture, was maintained. Adult female western pond turtles were captured at the Klickitat site between 1 April and 29 May using hoop traps, basking platform traps, and submerged open-top net traps designed by WDFW staff. In addition, some adult females were captured upland during the winter dormancy period, or in June near nesting sites. All captured pond turtles were identified, weighed, and measured. Adult females were equipped with Advanced Telemetry System model 7PN radio transmitters, which have an expected life of 344 days and weigh 14 g. Transmitters were attached to the carapace using epoxy adhesive. The females were monitored until egg laying occurred. Nest sites were identified and protected from predation with wire mesh exclosures.

**Results:** A total of 20 female western pond turtles were monitored for nesting during the 2006 breeding season (Table 2). Weights of the captured female turtles ranged from 450 to 867 g; the mean weight was 598 g. Carapace lengths ranged from 145 to 173 mm (mean = 159 mm).

The females were monitored for nesting activity from 20 May – 15 July 2006. Turtles began laying eggs on 7 June and continued until 29 June. Of the monitored females, 15 were documented to nest (13 at the Klickitat ponds and 2 at the Klickitat lake). Although 1 adult female was captured at the Skamania site, this animal was not monitored in 2006 because in recent years very few viable nests have been located at this site despite a considerable expenditure of effort. No adult female western pond turtles are known to be present at Pierce NWR, therefore no turtles were monitored for nesting there. The first turtles released at Pierce NWR are expected to reach maturity in 2009.

Table 2. Western pond turtle nesting results in the Columbia Gorge, Washington, 2006.

Location	# Females		Date Laid	# Nests	# Eggs	# Fertile	# Hatched
	Monitored	Capture Dates					
Klickitat County ponds	17	24 February – 24 June	6 June – 29 June	13	61*	47*	43
Klickitat County lake	3	25 February – 17 June	18 – 23 June	2	13	12	12
Total	20			15			55

\*One nest containing an unknown number of eggs was entered by a predator. One egg from this nest remained and later hatched.

The 15 nests were protected with wire exclosures and checked in September for hatched eggs. Predicted hatching dates were 90 to 96 days from the date of laying, and hatching occurred from 6 September to

1 October 2006. The nests produced 55 hatchlings out of 74 eggs laid (74% hatching success). Average clutch size for the intact nests was 4.93 eggs per nest; the average number of hatchlings per nest was 3.67.

### **Objective 3: Maintain Head-start Program: Zoo Participation**

**Methods:** The second phase of the head-start program involves raising the hatchling turtles in captivity over the winter, so that by accelerating growth the turtles attain sufficient size at the age of 9 months to avoid being taken by nonnative predators. Following the summer incubation period, hatchlings were removed from nests in September. These turtles were taken to The Oregon Zoo and Woodland Park Zoo for rearing. Juveniles were released into the Klickitat ponds and lake, the Skamania ponds, and ponds at the Pierce NWR for population augmentation following the period in captivity for hatchlings collected in 2005.

**Results:** Hatchlings collected in 2005 were raised in captivity for release in 2006. In fall 2005, 26 turtles were placed at the Woodland Park Zoo in Seattle and 62 at The Oregon Zoo in Portland. In summer of 2006, 90 head-start turtles were released in the Columbia Gorge: 28 at the Klickitat ponds, 22 at the Klickitat lake, 21 at the Skamania site, and 19 at Pierce NWR. These include two slow-growing turtles held back from the 2005 release at Woodland Park Zoo. This brought the total number of head-start turtles released since 1991 to 285 for the Klickitat ponds, 158 for the Klickitat lake, 227 for the Skamania pond complex, and 274 at Pierce NWR. One young turtle captured in the wild in 2006 was placed at The Oregon Zoo to attain more growth before returning it to the wild in 2007. The 55 hatchlings (43 from the Klickitat ponds and 12 from the Klickitat lake) collected from the nests in 2006 were transported from the field to the head-start program at the two zoos.

A database is maintained on all western pond turtles that have been handled and marked in Washington, with an individual specimen page noting all observations and capture information for each turtle. The database is maintained by WDFW's wildlife data management system, located at the agency headquarters in Olympia. There are now a total of 1500 individual specimen pages for Washington turtles, including wild caught, captive-bred, head-started, and opportunistically obtained captive breeding stock. These records cover the years from 1985-2006.

### **Objective 4: Establish New Populations of Turtles**

**Methods:** Some of the juvenile western pond turtles reared in the head-start program were released at Pierce NWR to establish a new population of turtles in the Columbia Gorge. A total of 274 turtles were released during the first six years of the reintroduction program (40 in 2000; 38 in 2001; 59 in 2002; 51 in 2003; 62 in 2004; 5 in 2005; and 19 in 2006). Some of the juvenile turtles released in 2000, 2001, 2002, and 2003 were fitted with transmitters, and monitored by telemetry throughout the year to record activity patterns and habitat preferences. In July – September 2004, vegetation characteristics were described for 140 randomly assigned plots at Pierce NWR. Characteristics of the randomly selected plots will be compared to characteristics of overwintering sites selected by turtles, to determine whether the turtles are scattering in a random fashion, or choosing specific habitats as observation suggests.

Trapping was conducted at Pierce NWR in May 2006. Turtles captured during the trapping effort were weighed and measured to obtain information on health and growth rates of released juveniles.

**Results:** Radio tracking of instrumented turtles has yielded detailed information on habitat use and survival of western pond turtles at Pierce NWR. Reports on two key elements of the pond turtle research at Pierce NWR currently are in preparation and will be available later this year. The first will describe annual survival of head-start turtles released on the refuge beginning in 2000. Survival data are available

for 69 turtles radio-tagged and monitored on the refuge from 2000-2004. The second report will describe use and selection of upland wintering sites by head-start turtles. Data are available for 56 wintering sites (some are repeated sites for the same animal) over 3 winters and for 140 random sites.

In May 2006, 75 pond turtles were captured and measured at the Pierce NWR, and their weights compared to records from previous years (Table 3). A review of measurements taken on turtles captured repeatedly in the telemetry study and during trapping revealed that body weights vary by up to 12% depending on how long the animals have been active following winter dormancy, and how long they were in upland hibernacula. Therefore, the only records used in evaluating growth of head-start turtles at Pierce were those taken in May through July, after nearly all animals had resumed warm-season activities.

Turtles released in 2000 gained an average of 33.1 g/yr in approximately 6 years, for a mean weight gain of 201% since release. Turtles released in 2001 gained an average of 166% in approximately 5 years, and the mean weight gain among the 2002 cohort was 117% over the 4 years since release. Turtles released in 2003 gained an average of 55%, while turtles released in 2004 showed a mean weight gain of 35%. None of the 5 turtles released in 2005 were recaptured in 2006, so no data on growth are available for that cohort.

Table 3. Mean weight gain for western pond turtles released at Pierce National Wildlife Refuge, Washington, and recaptured in 2006\*.

Cohort	Number of Animals	Mean Wt. at Release	Mean Wt. Gain	Range in Wt. Gain
2000	13	98.9 g	33.1 g/yr	25 to 43 g/yr
2001	18	96.3 g	31.9 g/yr	18 to 41 g/yr
2002	14	77.4 g	22.6 g/yr	12 to 27 g/yr
2003	11	91.4 g	16.7 g/yr	10 to 24 g/yr
2004	17	91.5 g	16.1 g/yr	1 to 47 g/yr
2005	0			

\*Two of the 75 captured were not included due to incomplete records.

In 2005, turtles released 5 years previously had grown 187% by weight since release. The figure for 2006 (166%) shows a 21% reduction in growth for animals onsite for 5 years. Similarly, turtles released 4 years ago attained 11% less growth (117% versus 128%) than turtles onsite for the same duration in 2005. Turtles released 3 years ago attained 25% less growth (55% vs. 80%) than turtles at the refuge for 3 years as of 2005. The downward trend is offset with turtles released 2 years ago showing an increase of 9% in growth compared to turtles on the refuge for 2 years in 2005 (35% vs. 26%). Growth rates for animals in their first year since release can not be compared for 2006 since no representatives from this group were captured. This is the second consecutive year of generally declining growth rates among turtles of similar age classes at Pierce NWR. Habitat quality or quantity relative to the population size, or competition from other species may be influencing western pond turtle growth rates. Small sample sizes necessitate caution in interpretation of results, and growth can vary greatly among individuals and across years. The captured animals appear to be in good health and are continuing to grow, so progress is considered satisfactory although worthy of observation.

Data from previous years has suggested stagnant growth during the first year following release. When a separate set of figures were compiled for growth after the first anniversary since release, annual growth was much more consistent across the different cohorts. Table 4 shows growth rates after the first anniversary of release, using data collected during 2006. These results contrast with those observed earlier in that the rates of weight gain are similar to gains reported for the entire time since release. The

adjustment period during the first year for these turtles was not a special hardship; some of the turtles have grown slowly even after their first year. The relative importance of factors influencing observed growth rates are unclear, and apparent growth rates may in fact be a product of random variation within small sample sizes. Comparison with growth records from other Washington sites may offer a means of interpreting patterns observed at Pierce NWR.

Table 4. Mean weight gain for western pond turtles excluding the first year following release at Pierce National Wildlife Refuge, Washington\*.

Cohort	Number of Animals	Mean Wt. Gain	Range in Wt. Gain
2000	13	38.2 g/yr	20 to 56 g/yr
2001	16	35.3 g/yr	21 to 49 g/yr
2002	13	30.2 g/yr	6 to 40 g/yr
2003	10	21.7 g/yr	6 to 42 g/yr
2004	14	21.9 g/yr	9 to 38 g/yr

\*Only turtles captured and weighed at least twice in different years, after the first anniversary of release, were included.

Results from the annual trapping effort provide a basis for monitoring trends in the western pond turtle population at Pierce NWR. The goal is to establish a self-sustaining population of at least 200 animals, comprised of no more than 70% adults. To date, 274 turtles have been released with trapping results showing corresponding population expansion each year, as expected with annual releases. The turtles released in 2000 should attain maturity in 2009.

The Washington State Recovery Plan for the Western Pond Turtle calls for establishment of a population at one additional site in the Columbia Gorge as a condition for downlisting this species from endangered to threatened. An existing wetland at Beacon Rock State Park has been identified as a possible release site based on evaluation of habitat quality, security for turtles, landowner interest, and other variables critical to success of the program. WDFW is working with Washington State Parks to formalize a plan for this site.

The program for reintroduction of western pond turtles at Pierce NWR includes studies to establish baseline population demographics of western painted turtles, and to determine whether and how the native population of western painted turtles are affected by the addition of pond turtles. Measurements of turtles trapped in years 2002 through 2006 are being compared with measurements taken by USFWS staff between 1999 and 2001. To date, there are 899 entered records of measurements for approximately 410 individual turtles, plus raw data from field seasons 2005 and 2006. Marking practices for very small turtles utilize nonpermanent identifiers (in order to avoid injury), resulting in uncertainty regarding actual number of individual animals in the collective records. Physical size has not proven a reliable indicator of animal maturity due to variation among individuals. However, measurable dimensions of adult turtles change very little. Therefore, the mark-recapture trapping protocol is effective for getting standardized measurements annually, which allow a review of growth rates. Turtles which have attained a stable size can generally be identified as adults.

#### **Objective 5: Enhance, Restore, and Manage Habitat to Maximize Western Pond Turtle Survival and Productivity.**

**Methods:** Habitat improvements are being carried out according to priority of need on each specific site. At the Skamania County site, mechanical mowing is being used to restore and maintain suitable short-

grass nesting habitat. Bullfrog eradication efforts continued in 2006 at the Klickitat pond complex, where the efficacy of such work has been demonstrated. Ponds were regularly surveyed for egg masses, which were skimmed from the water surface and disposed of. Adult bullfrogs, tadpoles, and nonnative fish incidentally caught during turtle trapping activities at all of the sites were removed. More basking structures were added to selected ponds to better accommodate the expanded population of turtles.

**Results:** At the Skamania County site, approximately 10 acres were mowed during fall 2006. Woody nonnative plants and tall grass were removed to preserve turtle nesting habitat adjacent to critical wetlands. In September, twelve logs were added to two ponds in the core management area to provide more basking structures for turtles there. Western pond turtles were observed using the logs shortly afterward.

At Pierce NWR, one of the primary ponds used by western pond turtles was lost in spring 2005. The Beaver Pond apparently drained as a result of beaver dam failure. Trapping results indicate that many turtles that were in Beaver Pond prior to 2005 sought refuge downstream in Pierce Lake. Observations at Pierce NWR indicated that basking structures there were inadequate for the large number of turtles present in the remaining ponds. In July and August 2006, logs and rootwads were placed in Pierce Lake and Domestic Spring Pond. The eighteen pieces were anchored to keep them in the desired locations. Some of the newly placed logs were occupied by turtles later the same day. WDFW and USFWS are considering the possibility of closing the breach in the beaver dam using large pieces of wood, which are available from USFS. Natural materials are preferred for this project. The goal is to impound water within the original Beaver Pond basin for western pond turtles. This work will be subject to access conditions and risks to water quality.

At the Klickitat ponds and lake, 24 egg masses and 22 adult bullfrogs were collected and removed in 2006. The egg masses were collected from 1 June to 2 August. Four adult frogs and 2 tadpoles were incidentally captured at the Skamania pond complex and eliminated.

Additional work scheduled for fall 2006 at the Klickitat ponds includes ditch cleaning to maintain water flow to one of the ponds. The lower end of the ditch is to be cleared of vegetation by hand, and the upper section by heavy equipment. The ditch requires routine maintenance every two to three years.

## Summary and Conclusions

The cooperative effort to augment the two existing pond turtle populations in the Columbia River Gorge and establish western pond turtles at Pierce NWR has been highly successful. Trapping results for 2006 show that the head-start program has made a very large contribution toward recruitment of young turtles into the population. Of the 257 turtles captured at the Klickitat sites, 223 (87%) were head-start turtles. At the Skamania site, 94% of the 82 turtles captured were head-starts of various ages.

Trapping results also suggest that survival of head-started turtles is high. At the time trapping was conducted, a total of 443 head-start turtles had been released since 1991 at the Klickitat sites. Fifty percent of these were recaptured in 2006. At the Skamania site, 34% of the 227 head-start turtles released there were recaptured. The 2006 trapping effort at Pierce NWR captured 74 (29%) of the 255 turtles that had been released at the site. Actual survival rates are higher; not all turtles present are captured in traps.

The monitoring of wild adult female western pond turtles during the nesting season is the foundation of the head-start program. The 15 nests identified in 2006 were found by regularly locating females by radio telemetry and by visual observation of nesting areas. These nests are the source of the eggs for head-

starting. The 24 nests found in 2005 yielded 88 hatchlings, which were reared for the 2006 release by Woodland Park Zoo and The Oregon Zoo. The 15 nests found in 2006 produced 55 hatchlings. In spring 2006, 1 wild hatchling was captured in a trap at the Klickitat lake and placed in the head-start program, for re-release in 2007.

The reintroduction of western pond turtles at Pierce NWR is in its seventh year. Annual trapping results suggest that survival rates are high, and that the turtles are doing satisfactorily well. Turtles released in 2000 gained an average of 33.1 g/yr in approximately 6 years, for a mean weight gain of 201% since release. Turtles released in 2001 gained an average of 166% in approximately 5 years; turtles released in 2002 gained an average of 117% in 4 years, and turtles released in 2003 gained an average of 55% in 3 years. Turtles released in 2004 showed a mean weight increase of 35%. No figures for the 2005 cohort are available as none of these 5 animals were captured in 2006. Turtles in most age classes grew slowly between May 2005 and May 2006 compared with similar aged animals from earlier years, while animals onsite for 2 years in 2006 had greater gains than those onsite for 2 years in 2005. Captured turtles from all age classes did show progress and appeared healthy. For the first time since the inception of the turtle project at Pierce NWR, a wild, unmarked, adult western pond turtle was captured there. This exciting discovery supports the conviction that a population of this species once occupied the site, and that present efforts serve to restore that population.

Monitoring juvenile pond turtle movements from 2000 to 2004 at Pierce NWR has shown a pattern of seasonal migration to and from the water. Records of habitat use and survival of western pond turtles were collected, and reports on these two key elements of pond turtle research are in preparation. Both reports will be available later this year.

Trapping results indicate that the native population of painted turtles at Pierce NWR is large, and that these animals also move around the refuge. Examination of turtle measurements in capture records from 1999 through 2005 will reveal demographic and growth information, including the baseline condition of the painted turtle population prior to the release of pond turtles. This information will aid in detecting any future changes in the painted turtle population that may be related to presence of western pond turtles. Field observations suggest that two species of turtles coexist in relative harmony, sharing the same basking spots and other favored habitats.

Removal of nonnative predators is a key objective for improvement in survival rates for hatchling pond turtles. A program of eliminating tadpoles and adult bullfrogs, surveying ponds every other day for presence of egg masses, and skimming egg masses from the ponds has proven effective in reducing the bullfrog population at the Klickitat sites. In 2006, bullfrog control efforts there eliminated 22 adults and 24 egg masses. These measures were also implemented at wetlands in Skamania County as opportunities arose incidental to other work, resulting in the removal of 4 adults and 2 tadpoles.

Habitat improvement projects vary according to site-specific needs. About 10 acres were mowed by a Department of Natural Resources Corrections crew to restore and maintain grassy nesting habitat at the Skamania County site. Logs were added to two of the ponds at the Skamania County site to provide more safe basking areas for the expanded population of turtles there. Logs and rootwads were also added to two of the wetlands at Pierce NWR. The placement of these basking structures partially offsets the loss of an important pond which drained in 2005. The Beaver Pond contained an abundance of logs and hosted many turtles. WDFW and USFWS are evaluating options for restoration of this wetland. At the Klickitat County site, ditch cleaning is scheduled for fall 2006 to maintain adequate water flow to one of the ponds in the core conservation area.

The success of the western pond turtle project in the Columbia Gorge is due to the interest and commitment of effort and resources by many people and organizations. The contributions of all parties are gratefully acknowledged.

## Summary of Expenditures

The following summary covers the contract period of 1 October 2005 to 30 September 2006. The total budget allocation was \$89,000.

Table 5. Summary of BPA funded expenditures October 1, 2005 – September 30, 2006 (approximate)

Object A – Salary	\$39,598
Object B – Benefits	10,710
Object C – Contract/Goods - Services	10,671
Object E – Equipment	0
Object G – Travel	581
Total Expend	\$61,560
Agency OH	17,723
Contract Total	\$79,283

## Funding Sources

The western pond turtle recovery program is carried out through a number of funding partnerships. These include BPA, USFWS, the Pacific Northwest Zoo Alliance, the Zoological Society, USFS, and WDFW.

Table 6. Estimated annual budget for western pond turtle recovery in Washington

Source	Contribution
BPA	\$89,000
USFWS State Wildlife Grants	\$58,000
Zoological Society	\$28,000
WDFW ALEA	\$10,000
WDFW	\$47,000
Woodland Park and Oregon zoos	\$32,000
US Forest Service	\$25,000
Total	\$289,000*

\* Approximately 70% of the funding is used for the Columbia Gorge recovery effort; 30% for the Puget Sound recovery effort.