

# Western Pond Turtle Head-starting and Reintroduction

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Annual Report 2004 - 2005

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Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208

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**Progress Report  
BPA Project #2001-027-00  
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**Western Pond Turtle  
Head-starting and Reintroduction**

**Annual Report  
October 2004 thru September 2005**

Prepared by

Susan Van Leuven  
Harriet Allen  
Kate Slavens  
David Anderson

Washington Department of Fish and Wildlife

Wildlife Management Program  
600 Capitol Way N  
Olympia, WA 98501-1091

and

Region 5 Headquarters  
2108 Grand Blvd.  
Vancouver, WA 98661

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# **Western Pond Turtle Head-starting and Reintroduction, Oct. 2004 thru Sept. 2005**

## **Progress Report**

**Abstract:** This report covers the results of the western pond turtle head-starting and reintroduction project for the period of October 2004 – September 2005. Wild hatchling western pond turtles from the Columbia River Gorge were reared at the Woodland Park and Oregon Zoos in 2004 and 2005 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. Thirty-five turtles were placed at the Woodland Park Zoo and 53 at the Oregon Zoo. Of these, 77 head-started juvenile turtles were released at three sites in the Columbia Gorge in 2005. Four were held back to attain more growth in captivity. Eleven were released at the Klickitat ponds, 22 at the Klickitat lake, 39 at the Skamania site, and 5 at Pierce National Wildlife Refuge (NWR). This brought the total number of head-start turtles released since 1991 to 257 for the Klickitat ponds, 136 for the Klickitat lake, 206 for the Skamania pond complex, and 255 at Pierce NWR. In 2005, 34 females from the two Columbia Gorge populations were equipped with transmitters and monitored for nesting activity. Twenty-four nests were located and protected; these produced 90 hatchlings. The hatchlings were collected in September and transported to the Oregon and Woodland Park zoos for rearing in the head-start program. During the 2005 field season trapping effort, 486 western pond turtles were captured in the Columbia Gorge, including 430 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 216 individual painted turtles captured in 2005 during trapping efforts at Pierce NWR, to gather baseline information on this native population. Bonneville Power Administration (BPA) funded approximately 75% of program activities in the Columbia River Gorge from October 2004 through September 2005.

## **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 2005. 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 Blair Csuti facilitated the head-starting of hatchling turtles at The Oregon Zoo in Portland. Joe Engler, USFWS, facilitated the release of juvenile pond turtles at the Pierce NWR in the Columbia Gorge. Eric Holman and Mary McCallum, WDFW, and Western Washington University student Hannah Lucas conducted trapping at the Skamania County site. Susan Van Leuven was assisted in trapping turtles at Pierce NWR by Eric Holman, Jeff Azerrad, and Mary McCallum of WDFW; Sarah Branum and Jim Geiselman of BPA; Joe Engler and Jeremy Buck of USFWS; and volunteers Michelle Westerman, Sharon Ralston, and Cory Whitmore. A number of volunteers, including Hannah Lucas, Jerry Novak, Walter English, David Swanson, Mike Teller, Deanna Brown, Karen Lewis, Julie Tench, and others from The Oregon Zoo assisted WDFW staff in the

monitoring of female pond turtles. The labors of all of these individuals were and are essential to the success of the 2005 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 a recovery plan for the species in Washington 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 1000 and 1100 individuals, many of them young turtles that went through the head-start program at the Woodland Park Zoo. The WDFW and the Woodland Park Zoo have been working cooperatively on this recovery effort since 1990, and were joined in 2000 by The Oregon Zoo.

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) currently 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, 368 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 federal lands within the Columbia River Gorge. The western pond turtle population at this location was estimated at 39 individuals in 1994. A total of 203 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 255 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 2005 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 25 April through 23 May at the eastern Skamania county site, and 2 April through 11 May at the Klickitat County site. At Pierce NWR, traps were placed in the ponds from 9 May through 28 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. The same standard set of data was collected for both species during trapping, and turtles were marked in a similar fashion except that the painted turtles were notched using a different numbering system. Both species were captured concurrently using the same techniques and equipment.

**Results:** A total of 486 western pond turtles were captured in 2005 (Table 1). Head-start turtles comprised 85% 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, all western pond turtles present are the result of head-start reintroductions, and thus equal 100% of the captures.

Table 1. Columbia River Gorge western pond turtle trapping results for 2005.

Location	# turtles	# head starts	# adult females
Klickitat County	288	242	29
Skamania County	88	78	5
Pierce NWR	110	110	0
Total	486	430	34

At Pierce NWR, 110 western pond turtles were captured over 14 days of trapping. The estimate of population size from this capture effort is 115 ( $\pm 2.8$  standard error) animals. This value is lower than the number of western pond turtles released to date (255). Considering reported low mortality rates from telemetered turtles, we expect the actual population to be higher. Comparison of these indices over time provides a means of gauging variation in the population size. 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.

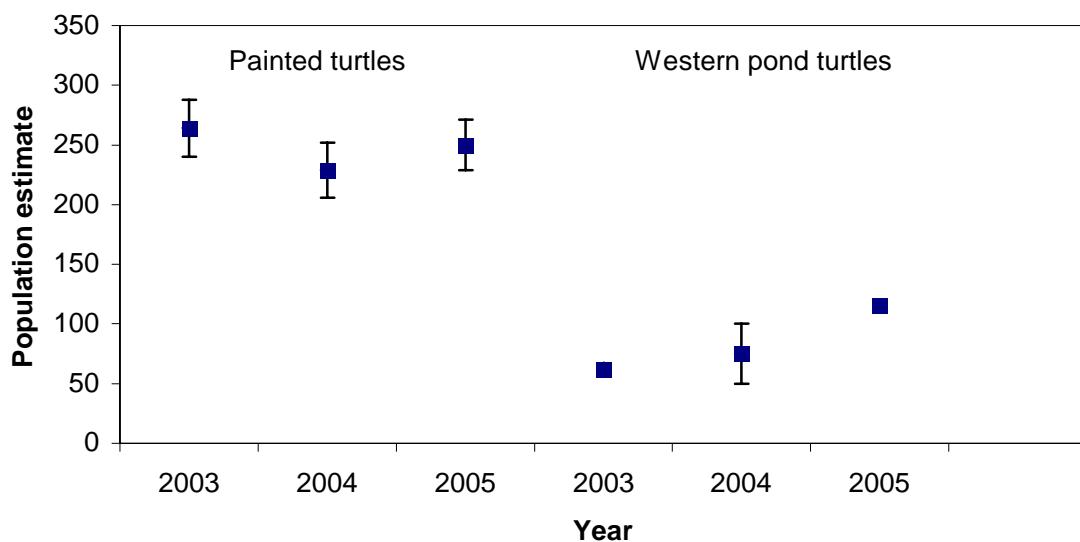


Figure 1. Estimated population size ( $\pm 95\%$  CI) for painted turtles and western pond turtles at Pierce National Wildlife Refuge, 2003-2005.

During the same trapping period, 216 painted turtles were captured, with an estimated population size of 250 ( $\pm 7.8$  se) animals. This estimate may be low, although no information exists from previous studies on the western painted turtle population at Pierce National Wildlife refuge. 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 population modeling program Capture, and estimates of population size for those sites will be presented in a separate report.

### 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 and Skamania sites during April and 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 34 female western pond turtles were monitored for nesting during the 2005 breeding season (Table 2). Weights of the captured female turtles ranged from 467 to 803 g. Mean weights were 622 g at the Klickitat sites and 639 g at the Skamania ponds. Carapace lengths ranged from 146 to 174 mm (mean = 159 mm at Klickitat sites; 162 mm at the Skamania ponds).

The females were monitored for nesting activity from 20 May – 15 July 2005, except for 9 turtles whose transmitters failed before the end of the season. Two additional transmitters failed but were replaced in time to locate a nest for those turtles. Turtles began laying eggs on 29 May and continued until 22 June. Of the monitored females, 24 were documented to nest (20 at the Klickitat ponds, 2 at the Klickitat lake, and 2 at the Skamania site). No adult western pond turtles are present at Pierce NWR, therefore no females 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, 2005.

Location	# Females Monitored	Capture Dates	Date Laid	# Nests	# Eggs	# Fertile	# Hatched
Klickitat County ponds	24	22 February – 10 June	29 May – 22 June	20	122**	106**	80
Klickitat County lake	5	6 – 26 April	10 – 18 June	2	14	12	10
Skamania County ponds	5	1 May – 24 June	18 June	2	Unkn**	Unkn**	0
Total	34*			24			90

\*Nine transmitters failed during the nesting season. Two dead transmitters were replaced resulting in location of the nests for those turtles. The other 7 turtles were lost to the monitoring effort.

\*\*One nest containing an unknown number of eggs was lost to predation.

One nest at the Skamania site contained only broken eggs. The other 23 nests were protected with wire exclosures and checked in September for hatched eggs. During the incubation period, 2 nests (1 at the Klickitat pond site and 1 at the Skamania site) were predated by fossorial mammals, probably moles. Predicted hatching dates were 100 days from the date of laying, and hatching occurred from 6 to 26 September 2005. The 21 intact nests produced 90 hatchlings out of 136 eggs laid (66% hatching success). Average clutch size for the 21 intact nests was 6.48 eggs per nest; the average number of hatchlings per nest was 4.28.

### **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 2004.

**Results:** Hatchlings collected in 2004 were raised in captivity for release in 2005. Thirty-five turtles were placed at the Woodland Park Zoo and 53 at the Oregon Zoo. Seven turtles died in captivity, prior to release. In summer of 2005, 77 head-start turtles were released in the Columbia Gorge: 11 at the Klickitat ponds, 22 at the Klickitat lake, 39 at the Skamania site, and 5 at Pierce NWR. Four young turtles collected in 2004 were held over for an extra year to attain more growth before release. This brought the total number of head-start turtles released since 1991 to 257 for the Klickitat ponds, 136 for the Klickitat lake, 206 for the Skamania pond complex, and 255 at Pierce NWR.

The 90 hatchlings (80 from the Klickitat ponds and 10 from the Klickitat lake) collected from the nests in 2005 were transported from the field to the head-start program at the Oregon Zoo in Portland and Woodland Park Zoo in Seattle. One hatchling from the Klickitat ponds and another hatchling from the Skamania site were captured by hand in spring 2005 and taken to Woodland Park Zoo for head-starting.

One unmarked two-year-old western pond turtle that had not been head-started was captured at the Klickitat ponds. It was measured, marked, and returned to the pond. Its size was equivalent to that of a one-year-old head-start turtle ready for release.

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 1403 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 1985-2005.

### **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 255 turtles were released during the first five years of the reintroduction program (40 in 2000; 38 in 2001; 59 in 2002; 51 in 2003; 62 in 2004; and 5 in 2005). 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 2005. Turtles captured during the trapping effort were weighed and measured to obtain information on 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 headstart 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 headstart 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 2005, 110 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 33.3 g/yr in approximately 5 years, for a mean weight gain of 187% since release. Turtles released in 2001 gained an average of 128% in approximately 4 years, and the mean weight gain among the 2002 cohort was 80% over the 3 years since release. Turtles released in 2003 gained an average of 26%, while turtles released in 2004 showed a mean weight gain of 11%, with 18 of the turtles experiencing a loss.

**Table 3.** Mean weight gain for western pond turtles released at Pierce National Wildlife Refuge, Washington, and recaptured in 2005\*.

Cohort	Number of Animals	Mean Wt. at Release	Mean Wt. Gain	Range in Wt. Gain
2000	15	89.2 g	33.3 g/yr	23 to 52 g/yr
2001	21	98.1 g	31.3 g/yr	12 to 43 g/yr
2002	23	73.9 g	19.6 g/yr	9 to 33 g/yr
2003	19	102.9 g	13.5 g/yr	5 to 23 g/yr
2004	28	103.9 g	11.0 g/yr	-13 to 67 g/yr

\*Four of the 110 captured were not included due to incomplete data.

In 2004, turtles released 4 years previously had grown 154% by weight since release. The figure for 2005 (128%) shows a 26% reduction in growth for animals onsite for 4 years. Similarly, turtles released 3 years ago attained 20% less growth (80% versus 100%) than turtles onsite for the same duration in 2004. Turtles released 2 years ago attained 19% less growth (26% vs. 45%) than turtles at the refuge for 2 years as of 2004. Only the turtles in their first year since release showed an improvement in growth rate. These turtles had gained 11% by weight in 2005, compared to 6% for similar animals captured in 2004. Small sample sizes necessitate caution in interpretation of results, but the western pond turtles do not appear to be growing as rapidly as in earlier years at Pierce NWR. It is unknown whether the western painted

turtles at Pierce NWR have experienced a difference in growth rate. Data collected in future years will help show whether growth rates are presently suppressed, or if earlier growth rates were above normal. 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 2005. These results contrast with those observed earlier in that the rate of weight gain is quite different among the cohorts. 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 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	14	41.0 g/yr	6 to 78 g/yr
2001	20	38.4 g/yr	20 to 62 g/yr
2002	16	28.0 g/yr	5 to 47 g/yr
2003	12	18.4 g/yr	-1 to 32 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 will provide a basis for determining future population trends of the western pond turtle population at Pierce NWR. The goal is to establish a self-sustaining population of pond turtles at Pierce NWR including 200 adults. To date, 255 turtles have been released with trapping results showing population expansion each year, as expected with annual releases. The turtles released in 2000 should attain maturity in 2009.

Other sites in the Columbia River Gorge are currently under review for their potential as reintroduction sites for western pond turtles. 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. A prioritized list of possible sites has been developed based on evaluation of habitat quality, security for turtles, landowner interest, and other variables critical to success of the program. The site selection process is ongoing with the goal of identifying a preferred site in 2006.

The plan for reintroduction of western pond turtles at the Pierce NWR includes studies that will determine whether and how the native population of western painted turtles are affected by the addition of pond turtles. Painted turtle population demographics on the Pierce NWR are being studied. Measurements of turtles trapped in 2002, 2003, 2004, and 2005 are being compared to measurements taken by USFWS staff between 1999 and 2001. To date, there are 899 records of measurements for approximately 410 individual turtles. 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. Baseline population information will also be useful in detecting any future changes due to interspecific competition with western pond turtles.

## **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 were undertaken in 2005 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.

**Results:** In 2004, WDFW completed an evaluation of the historic value of the old homestead on the parcel known as the Gunter property in Klickitat county as a prerequisite for removal of the building. In spring 2005 the building was burned by the local volunteer fire department and all remaining material was hauled away to a transfer station. The site was cleared and planted in a mixture of native grasses, shrubs and trees to encourage a return to natural habitat condition.

At the Skamania County site, approximately 3 acres were hand mowed during summer 2005. Scot's broom and grass were removed to restore and improve turtle nesting habitat adjacent to critical wetlands.

A \$20,000 grant was received from the USFS in 2005 for the development of wetland habitat in Skamania County. A shallow pond was created adjacent to an existing wetland on USFS lands to expand habitat for western pond turtles. The pond basin was completed in September. Further improvements involving placement of basking logs and planting of vegetation will be completed in the fall 2005.

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. The potential impacts of this temporary loss are being evaluated. Trapping results indicate that turtles that were in Beaver Pond prior to 2005 sought refuge downstream in Pierce Lake. Turtles probably also moved upstream, off the refuge. No turtle mortalities have been definitively linked to the loss of Beaver Pond. However, the fate of all turtles using this site is currently unknown. WDFW is currently discussing with USFWS plans for construction of a permanent water control structure. The goal is to impound water within the original Beaver Pond basin for western pond turtles. Construction will take place in the fall of 2005, subject to conditions of the permit for this work. Wet weather may delay construction until mid 2006.

At the Klickitat ponds and lake, 17 egg masses, 18 adult bullfrogs, and 8 tadpoles were collected and removed in 2005. The egg masses were collected from 2 June to 5 August. Ten adult frogs at the Skamania pond complex were eliminated. At Pierce NWR, bullfrog presence was markedly reduced compared to previous years. The agent is unknown. While bullfrogs and tadpoles of all ages were abundant during field seasons 2002 through 2004, only a few mid-sized frogs and large tadpoles were observed in May - June 2005. No egg masses were observed, and no frogs or tadpoles were captured there.

## **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 2005 show that the head-start program has made a very large contribution toward recruitment of young turtles into the population. Of the 288 turtles captured at the Klickitat sites, 242 (84%) were head-start turtles. At the Skamania site, 89% of the 88 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 360 head-start turtles had been released since 1991 at the Klickitat sites. Sixty-seven percent of these were recaptured in 2005. At the Skamania site, 47% of the 167 head-start turtles released were recaptured. The 2005 trapping effort at Pierce NWR captured 110 (44%) of the 250 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 24 nests identified in 2005 were found by regularly locating female turtles by radio telemetry and by visual observation of nesting areas. These nests are the source of the eggs for head-starting. The 21 nests found in 2004 yielded 88 hatchlings, which were reared for the 2005 release by Woodland Park Zoo and The Oregon Zoo. The 24 nests found in 2005 produced 90 hatchlings. In spring 2005, 2 wild hatchlings were captured in traps and placed in the head-start program, for re-release in 2006.

The reintroduction of western pond turtles at Pierce NWR is in its sixth year, and is showing positive results. Of the 250 juvenile pond turtles released from 2000 through 2004, 110 of them (44%) were recaptured in spring 2005. Turtles released in 2000 gained an average of 33.3 g/yr in approximately 5 years, for a mean weight gain of 187% since release. Turtles released in 2001 gained an average of 128% in approximately 4 years; turtles released in 2002 gained an average of 80% in 3 years, and turtles released in 2003 gained an average of 26% in 2 years. Turtles released in 2004 showed a mean growth of 11%. Turtles in their first year since release in 2004 fared better than first year turtles measured after release in 2003 and 2002. Turtles in other age classes grew somewhat slowly compared to earlier years, but did show progress.

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 at Pierce NWR 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. Turtle measurements in trapping records from 1999 through 2005 are being analyzed for demographic and growth information, to determine the baseline condition of the painted turtle population. Examination of painted turtle demographics and growth patterns will aid in detecting any future changes in the painted turtle population that may be related to presence of western pond turtles. The two species of turtles intermingle freely, 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 2005, bullfrog control efforts there eliminated 18 adults, 8 tadpoles and 17 egg masses. These measures were also implemented at wetlands in Skamania County as opportunities arose incidental to other work, resulting in the removal of 10 adult frogs.

Habitat improvement projects vary according to site-specific needs. About 3 acres were hand mowed by WDFW personnel to maintain grassy nesting habitat at the Skamania County site. A pond was also created to expand wetland habitat for western pond turtles at the Skamania County site, with further habitat improvements ongoing there. At the Klickitat County site, old buildings were removed and the cleared area replanted to native vegetation. The effects of the loss of an important pond at Pierce NWR