DRAFT

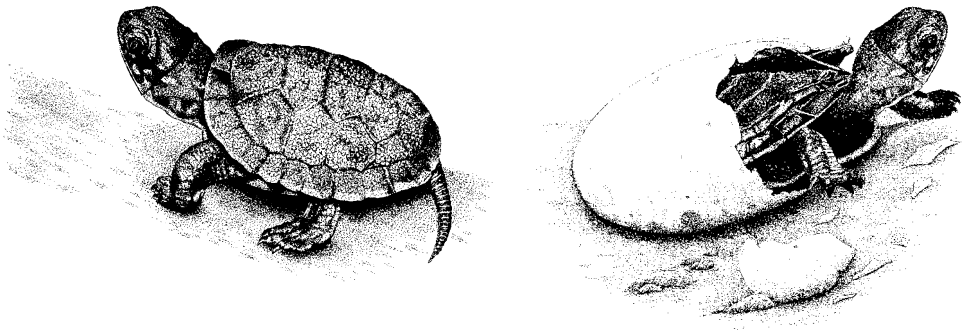
Washington State Recovery Plan

for the

Western Pond Turtle

by

David W. Hays, Kelly R. McAllister, Scott A. Richardson, and Derek W. Stinson



Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, Washington 98501-1091

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In 1990, the Washington Wildlife Commission adopted procedures for listing and delisting species as endangered, threatened, or sensitive and for writing recovery and management plans for listed species (WAC 232-12-297, Appendix A). The procedures, developed by a group of citizens, interest groups, and state and federal agencies, require preparation of recovery plans for species listed as threatened or endangered.

Recovery, as defined by the U.S. Fish and Wildlife Service, is "the process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival are neutralized, so that its long-term survival in nature can be ensured."

This document summarizes the historic and current distribution and abundance of western pond turtles in Washington and describes factors affecting the population and its habitat. It prescribes strategies to recover the species, such as protecting the population, evaluating and managing habitat, and initiating research and education programs. Target population objectives and other criteria for reclassification are identified and an implementation schedule is presented.

This is the Draft Washington State Recovery Plan for the Western Pond Turtle. It is available for a 90 day public comment period. **Please submit written comments on this report by July 1, 1999 to:**

Endangered Species Program Manager,
Washington Department of Fish and Wildlife,
600 Capitol Way N, Olympia WA 98501-1091.

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ACKNOWLEDGMENTS

Western pond turtle conservation in Washington has benefitted from the dedication and hard work of Frank and Kate Slavens, without whom much of the work detailed in this report would not have happened.

Funds for work with western pond turtles have come from many sources. A 10-year partnership between the Washington Department of Fish and Wildlife (WDFW) and the Woodland Park Zoo has made much of the pond turtle conservation work possible. Funds for the captive breeding and head start programs have come, in part, through the Center for Wildlife Conservation. Many of the expenses for equipment, mileage, and per diem for volunteers was made possible through a grant from the WDFW Aquatic Lands Enhancement Account, which supports the activities of volunteers. The Woodland Park Zoological Society, Foley/Frischkorn Wildlife and Conservation Fund, and WATER (Western Aquatic Turtle Education and Research) have also provided funds. The U.S. Fish and Wildlife Service has allocated Endangered Species Act Section 6 funds as well as funds from the Partnerships for Wildlife Program.

Habitat acquisition has been accomplished with funds from the state-funded Washington Wildlife and Recreation Program, administered by the Interagency Committee for Outdoor Recreation. The Nature Conservancy has assisted in a number of ways, including in acquisition and habitat improvement. The U.S. Forest Service purchased transmitters for use in the Columbia River Gorge. We thank Richard Larson for helping us get these transmitters. Forest Service employees also assisted with Scot's broom removal at the Skamania ponds. Dennis and Sondra Clark provided funds for the removal of bullfrog egg masses from ponds.

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We appreciate the continued support of Tom Juelson and Harriet Allen, who have helped with the administrative and funding aspects of the project, and Jim Stevenson, Center for Wildlife Conservation, who has been a key supporter and has helped find funding.

This recovery plan is drawn in part from a report prepared by Dan C. Holland (1991c) for the Department of Fish and Wildlife, and a subsequent status report (WDW 1993). It was improved after reviews by Frank Slavens, Kate Slavens, David Anderson, Bruce Bury and Marc Hayes.

The cover illustration was drawn by Darrell Pruett. Kate Slavens contributed cumulative data from the head-start and captive breeding programs.

Thanks to the many individuals, including numerous volunteers, who contributed hundreds of hours to re-build and restore the western pond turtle population in Washington.

EXECUTIVE SUMMARY

The western pond turtle (*Clemmys marmorata*) is listed by Washington State as an endangered species. The species is not listed under the federal Endangered Species Act. It was petitioned in 1992 for federal listing, but the Fish and Wildlife Service found that listing was not warranted in 1993.

This highly aquatic turtle occurs in streams, ponds, lakes, and permanent and ephemeral wetlands. Although pond turtles spend much of their lives in water, they require terrestrial habitats for nesting. They also often overwinter on land, disperse via overland routes, and may spend part of the warmest months in aestivation on land. Pond turtles are generally wary, but they may be seen basking on emergent or floating vegetation, logs, rocks, and occasionally mud or sand banks. In Washington, the species overwinters in mud bottoms of lakes or ponds or in upland habitats adjacent to water bodies. Nesting occurs from May to mid-July in soils with scant vegetative cover. They usually nest within 100 meters from water, but occasionally up to 400 m from water. Western pond turtles are long-lived, with some reaching an estimated maximum life-span of 50 to 70 years, though most individuals may not live that long. They require more than 10 years to attain sexual maturity.

The range of the western pond turtle extends from the Puget Sound lowlands in Washington south to Baja California. Western pond turtles were essentially extirpated in the Puget lowlands by the 1980's. Their present range in Washington is thought to be composed of two small populations in Skamania and Klickitat counties, and a small pond complex in Pierce County where they were recently reintroduced from captive bred stock.

The initial cause of the decline in western pond turtle numbers in Washington may have been commercial exploitation for food. Western pond turtle populations cannot be sustained under exploitation, due to their low rate of recruitment and lower densities at the northern portion of the range. Pond turtles never recovered from this decline in part due to concurrent or subsequent alteration and loss of habitat. Wetlands were filled for residential and industrial development, particularly in the Puget Sound region. Dam construction and water diversion projects reduced available habitat and isolated populations. Exotic predators such as bullfrogs and warm-water fish, which were introduced to lakes and ponds, probably took a toll on hatchlings and young turtles. Human disturbance may have kept females from crossing over land to lay eggs, or may have reduced the amount of time spent basking, which in turn, may be important for egg maturation. Loss of lakeside riparian vegetation to grazing and trampling may have made habitat less suitable for hatchlings and juveniles. Successional changes through fire suppression on native grasslands may have resulted in excessive shade on nesting grounds.

An unknown disease killed at least 36 turtles in Klickitat County in 1990, an estimated one third of the population. A captive breeding program has been underway to build a population of turtles for release into suitable Washington habitat. A head-start program is being used to enhance the survival of hatchling turtles from wild nests. Control of exotic predators and habitat enhancement efforts are ongoing where western pond turtle populations are found. The

Department of Fish and Wildlife has acquired land in Klickitat County which supports one of the key surviving western pond turtle populations in the state.

The western pond turtle has been extirpated from most of its range in Washington. Two populations remain in the Columbia River Gorge. The total number of western pond turtles in known Washington populations is estimated at only 250-350 individuals, approximately half of which went through the head-start program at the Woodland Park Zoo. Additional turtles may still occur in wetlands that have not been surveyed in western Washington and the Columbia Gorge.

The western pond turtle is declining throughout most of its range and is highly vulnerable to extirpation in Washington. They are still abundant in northern California and southern Oregon wherever there are relatively few people. The species requires a continued recovery program to ensure its survival in the state until sources of increased mortality can be reduced or eliminated.

The goal of the recovery program is to re-establish self-sustaining populations of western pond turtles in the Puget Sound and Columbia Gorge regions. The recovery objectives are to establish at least 5 populations of $\geq$200 pond turtles composed of no more than 70% adults, and which occupy habitat that is secure from development or major disturbance. It is also necessary that the populations show evidence of being sustained by natural recruitment of juveniles. The core pond turtle sites should be wetland complexes that may be less susceptible to catastrophes than sites of a single water body. The recovery objectives need to be met before the western pond turtle would be considered for downlisting to threatened. Objectives for downlisting to sensitive are similar, except 7 populations of $\geq$200 pond turtles will be needed.

TAXONOMY

The western pond turtle (*Clemmys marmorata*) has been known variously as the Pacific pond turtle, western mud turtle, Pacific mud turtle, Pacific terrapin, and Pacific freshwater turtle. It is a member of the order Testudines and the family Emydidae.

The type specimens of the western pond turtle were collected during the U.S. Exploring Expedition in 1841 in the vicinity of Puget Sound, and were described by Baird and Girard (1852) as *Emys marmorata*. The first use of the combination *Clemmys marmorata* was by Strauch (1862). Based upon examination of 158 specimens from throughout the range of the species (Washington and Nevada excluded), Seeliger (1945) divided the species into two subspecies: the northwestern pond turtle (*Clemmys marmorata marmorata*) and the southwestern pond turtle (*Clemmys marmorata pallida*). The northwestern subspecies is found from the Sacramento Valley, California northward to Puget Sound. The southwestern subspecies is found from the vicinity of Monterey, California southward to Baja California Norte. The area of the San Joaquin Valley, California is considered a zone of inter-gradation.

The taxonomy of the species may be revised with further investigation. Janzen et al. (1997) reported that southern populations, particularly in Baja California, may be genetically different enough to warrant designation as a separate species. Holland (1992) examined 5,137 specimens and distinguished three morphologically distinct forms. One form is restricted to the Columbia River Gorge; another is found in the Willamette Valley. Puget Sound animals were similar to turtles from the Willamette Valley drainage.

In 1992, the Washington Department of Wildlife (WDFW) supported a study of genetic variation within western pond turtle populations using DNA fingerprinting (Gray 1995). The results indicated a significant genetic difference between northern populations in Washington and Oregon, and southern California populations. There was no genetic subdivision found between turtles from the Puget Sound region and the Willamette Valley. A small genetic subdivision was found between Puget Sound- Willamette Valley turtles and Columbia Gorge turtles. Considering the work of both Gray (1995) and Janzen et al. (1997), there is an indication that the Willamette Valley turtles are more similar to Puget Sound turtles than Columbia Gorge turtles. In addition, these genetic studies support morphological differences suggested by Holland (1992) between Columbia Gorge and Puget Sound turtles.

DESCRIPTION

The western pond turtle is a medium-sized turtle, dark brown or olive above without dark reticulations or streaking and a yellowish plastron (underside), sometimes with dark blotches in the centers of the scutes (Storm and Leonard 1995). Maximum size varies geographically, with the largest animals (210 mm or 8.2 in) occurring in the northern part of the range. Turtles become sexually mature at a carapace length of about 120 mm (Nussbaum et al. 1983). Large

animals may exceed 1 kg (2.2 lb) in mass. In a series of 45 adults from Klickitat County the mean weight of males was 554 g (1.2 lb) and the mean weight of non-gravid females was 504 g (1.1 lb) (D. Holland, unpubl. data). Non-gravid females of a given carapace (dorsal or top shell) length are usually significantly heavier than males (Holland 1985a). Hatchlings are 25-31 mm (1.0-1.22 in) in length and weigh from 3-7 g (0.11-0.25 oz) (D. Holland and F. Slavens, unpubl. data).

Color varies geographically and with age. In general, animals in the northern part of the range are darker in overall coloration. The ground color of the carapace (dorsal or top shell) is generally dark brown or black, but may be reddish in a small percentage of females. In some extremely old males the melanin in the carapace appears to disappear in a patchy manner, producing a piebald or mottled appearance. The carapace may be unmarked, or may possess a series of fine black radii or lines extending outward from the growth center of each shield. These lines may be darker than the ground color of the carapace and often surround small yellow-gold flecks. The plastron is generally cream to yellow in color, with varying degrees of black or brown mottling (see Storm and Leonard 1995).

Head and neck coloration varies sexually and geographically and changes during the life cycle. Small animals and females typically have dark flecks or rosette-like markings (often referred to as a "paisley print") on the head, sides of the neck, and throat that vary in number (see Storm and Leonard 1995). Females tend to retain these markings throughout life, whereas males usually become progressively darker on the head and sides of the neck, while the throat becomes white or cream-yellow. Hatchlings are generally dark brown-olive in color, with prominent mottling on the head and neck.

Western pond turtles are sexually dimorphic. In general, the female has a smaller head, less heavily-angled snout, relatively higher and rounder carapace, and a thinner tail. Males have a slightly concave plastron. In northern populations, males reach a larger maximum size than females (Holland and Bury 1998).

DISTRIBUTION

North America

The western pond turtle historically ranged from the vicinity of Puget Sound in Washington south to the Sierra San Pedro Martirs in Baja California Norte (Fig. 1:inset). Most populations occurred west of the Sierra-Cascade crest.

Figure 1. Approximate historic range of the western pond turtle in Washington (circa 1850), and in North America (inset). ?= records that may have resulted from human transport.

Washington

Past. Fossils assigned to this species are known from Pleistocene strata in the vicinity of White Bluffs in south-central Washington (Brattstrom and Sturn 1959 *in* Gustafson 1978), indicating that western pond turtles once had a wider range than present. The past distribution along the Columbia River is not known, because additional populations along the Columbia River may have been lost in recent decades. Construction of dams along the river and alteration of historic patterns of water flow may have eliminated many suitable habitats within the last 70 years.

Areas surrounding Puget Sound probably were incapable of supporting western pond turtles prior to approximately 10-11,000 years ago due to extensive glaciation. D. Holland (pers. comm.) suspects turtles in this area arrived about 9-10,000 years ago through the Puget Trough from the Willamette drainage, and suggests a pyroclastic event from Mount Rainier about 4,700 years ago isolated the Puget Sound population. Reconstructing the range of this species is difficult because turtles are often transported by people and they may be found in areas where native populations have never existed. Western pond turtle populations have been documented from the south Puget Sound lowlands (Suckley and Cooper 1860) and the Columbia River Gorge (Slater 1962). Reliable records of western pond turtles suggest a broad distribution in the western half of

Washington State, but most records pertain to single turtles, either collected or observed, and some unknown subset of these records probably reflect human translocations.

There are 19 western pond turtle specimens from Washington in museum collections (Table 1). Sixteen are from the Puget Sound area (Fig. 2)(representing eight distinct locations), two are from the vicinity of Lyle, Klickitat County, and one is from San Juan Island, San Juan County. The turtles collected in San Juan and Clark counties may have been moved by people, because they were quite distant from any known populations. A. Flynt obtained the first record of the species from the Columbia River Gorge when he found the turtles near Lyle (Slater 1962).

There are reports of two animals from the vicinity of Vancouver Lake, Clark County and a photograph of an animal was taken in Lewis County (Table 1). D. Blackburn (pers. comm. to D. Holland) was shown the shell of an animal found dead in 1989 in this area and one specimen exists in the collection of Clark Community College. The Lewis County and San Juan Island records came from areas where no populations have ever been found (Table 2.). Another record

Table 1. Western pond turtle specimens collected in Washington. Information assembled from Milner (1986), Holland (1991b), and WDFW data.

Locality	County	Date	Collector	Comments	Specimen [a]
Steilacoom, Puget Sound		1841	U.S. Exploring	Holotype	USNM 007700
Puget Sound		1841	Expedition	Cotype	USNM 008800
Puget Sound		1841	"	Cotype	USNM 00759400
Puget Sound		1841	"	Cotype	USNM 00759500
Puget Sound		1841	"	Cotype	USNM 00759600
Puget Sound		1841	"	Cotype	USNM 00131830
Fort Steilacoom		1853-1860	J. G. Cooper	Gravid female	MCZ 42200
Lk Washington, Tacoma	Pierce	Apr 1891			ANSP 3986
Talbot Marsh, McChord AFB	Pierce	23 May 1937	J. R. Slater	Imm. female	PSM 3020
Talbot Marsh, McChord AFB	Pierce	18 April 1939	H. Myhrman		PSM 3621
Meridian Lake	King	20 Jun 1948	W. Hagerman		PSM 4992
Long Lake	Thurston	10 May 1950	S. M.		PSM 6300
Sportsman's Lake	Pierce	12 Oct 1951	H. Myhrman		PSM 4971
Meydenbauer Bay, Lk Wash	King	9 Aug 1952	M. Johnson		PSM 8189
Bay Lake	Pierce	23 Mar 1956	Anon.		CRCM 57-244
San Juan Island	San Juan	26 Aug 1960	J. Berger	Transported?	UI 48370
W of Lyle	Klickitat	7 June 1960	A. Flynt		AMNH 84331
W of Lyle	Klickitat	7 June 1960	A. Flynt		PSM 8233
Lake Washington	King	1963	Anon.		UWBM 20332
Salmon Crk, Vancouver Lk	Clark	1963	E. Nelson	Found dead	CCC
Salmon Crk N of Kid Valley	Lewis	10 June 1993	B. Bicknell	Photo voucher	UWBM

[a] Holdings as follows: American Museum of Natural History, New York (AMNH); Academy of Natural Sciences, Philadelphia (ANSP); Clark Community College (no museum), Vancouver, Washington (CCC); Charles R. Conner Museum, Washington State University, Pullman (CRCM); Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZ); James R. Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington (PSM); University of Illinois, Urbana-Champaign (UI); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); Thomas Burke Memorial Washington State Museum, University of Washington, Seattle (UWBM).

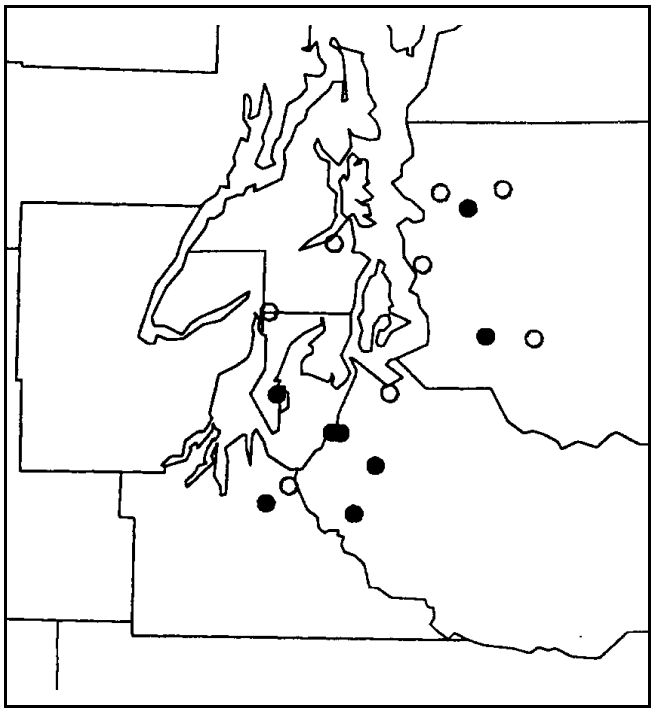

Figure 2. Museum records (solid dots) and recent sightings (open dots) of western pond turtles in the Puget Sound region.

Table 2. Western pond turtle sight records in the Puget Sound lowlands, Washington, 1980-1997.

Locality	County	Date	Observer	Comments
Kitsap Lk roadside	Kitsap	1983/84	L. Bomstead	Taken to pond at Bomstead home.
Crossing hwy 901[a]	King	30 Oct 1987	J. Pryal	Released in Lk Sammamish
Tacoma City waterway[b]	Pierce	15 July 1987	J. Slipp	Adult male
Lake Garret, Brien	King	July 1988	M. Jolivet	Old bullet hole in carapace, died
Port Orchard[b]	Kitsap	May 1991	G. McIntyre	Died 30 June, 1991
McAllister Crk, under I-5[a]	Thurston	May 1991	R. Van Deman	Released at Nisqually NWR
Wapato Creek, Fife[b]	Pierce	May 1992	S. Siebers	Adult female
Kent Kangley Rd[b]	King	7 July 1992	M. Flatt	Estimated 5 years, male
Under Hwy 520, Lk Wash	King	21 June 1992	L. Shaftel	Ad female, 7 inches long
Koeneman Lk (Fern Lk)	Kitsap	1 June 1992	D. Payne	Ad male
Salmon Crk road[a]	Lewis	7 June 1993	B. Bicknell	Crossing road, returned

[a] Photos examined by WDFW biologist [b] Captive breeding Program [c] Animal examined by WDFW biologist

consists of a plastron fragment found during archaeological excavation of 500 year old shell middens at Cornet Bay on the north end of Whidbey Island (Weasma 1991). This location is 50 miles north of the northernmost historical records, and may have been transported and eaten at

the site. A conservative interpretation of historic distribution relies on accounts which give observations of turtles in significant numbers and locations with multiple records (Fig. 1). However, with little information available, an accurate depiction of the species distribution is impossible.

NATURAL HISTORY

Behavioral Characteristics

General. When not disturbed, western pond turtles spend a considerable amount of time engaged in thermo-regulatory behavior. When out of water, turtles seek warmth from the sun in an activity known as emergent basking. Emergent basking has been noted in all months of the year in some areas, but generally increases in frequency through the spring to a peak in early to mid-June. Emergent basking declines in summer until September, when another peak is observed. Turtles also seek thermally-suitable micro-habitats in the water to engage in an activity known as aquatic basking (Holland 1985a). In these situations turtles are typically found concealed in or under masses of floating vegetation or algae, or in shallow water relatively close to shore. This behavior varies by site and season. In general, aquatic basking peaks in early to mid-July in most areas and declines by early September.

Western pond turtles often engage in aggressive interactions while emergent basking (Bury and Wolfheim 1973). A ritualized intention to bite called the "open-mouth gesture" is the most common aggressive behavior. Aggressive behavior seems to maintain spacing on basking sites and may be used to settle disputes over preferred sites (Bury and Wolfheim 1973).

Western pond turtles are wary, with a well-developed sense of sight and a moderate sense of hearing (Holland 1985a). The initiation of escape behavior varies with the individual and circumstances, but often occurs when a perceived threat is 100 m (330 ft) distant or more. If turtles are surprised in shallow water with no nearby refugia, they may remain motionless. Turtles surprised while engaged in aquatic basking simply withdraw their heads and limbs and remain motionless. As with many wildlife species, pond turtles can be habituated to human presence in certain circumstances with repeated disturbance (R. B. Bury, pers. comm.).

In the spring, early summer, and autumn most turtle activity is diurnal. Nocturnal activity primarily occurs in the summer (Holland and Bury 1998). During the summer the species may be most active in early morning and evening, and inactive during the heat of the day. Western pond turtle activity may persist throughout the year in some parts of their range.

Overwintering. "Overwintering" refers to periods of reduced or no activity during the winter which may include periods of a hibernation-like state of reduced physiological activity. Western pond turtles overwinter from mid-October or November to March or April. Pond turtles may overwinter on land up to 500 m from the nearest watercourse, and they sometimes change sites during the season (Holland 1994, Slavens 1992a). During a study in California, 10 of 12 pond

turtles overwintered at upland sites (Reese and Welsh 1997). Preliminary observations from turtles in a pond environment suggest that juveniles overwinter in the water (Slavens 1995). Turtles that overwinter under water may change sites and may form aggregations. Holland (1994) observed pond turtles in winter swimming under ice, and recorded an aggregation of 43 turtles in a 1 m^2 area in the Willamette Valley of Oregon. Aggregations in shallows under ice was also described at Old Fort Lake in Pierce County in the mid 1800's by an employee of the Hudson's Bay Company (see Strahle 1994). Stream-dwelling pond turtles may be more likely to over-winter on land than pond-dwelling turtles (R. B. Bury, pers. comm.)

Aestivation. Aestivation is an inactive state that turtles may enter in the hottest weeks of the year. Aestivation is also a way to avoid short-term drought conditions or drying of a water body. During a telemetry study in Washington, pond turtles moved onto land and burrowed under logs or leaves and remained inactive for days or months (Slavens 1995). One female went onto land 5 times between 9 Aug - 1 Oct and returned to water after 2-9 days each time. Aestivation merged with hibernation for one female who was in the same upland location from 11 Aug - 2 Feb, and was next found in the water on 29 March (Slavens 1995).

Foraging. Western pond turtles locate food by sight or by smell, and appear to spend considerable amounts of time foraging. Under normal conditions feeding behavior is solitary. However, large numbers of animals may collect at a vertebrate carcass and aggressive interactions are common under these conditions (D. Holland, unpubl. data). Western pond turtles are apparently incapable of swallowing in air, so food must be swallowed in the water. Animals normally forage along the bottom of water bodies, searching carefully in submerged leaf litter and other detritus. They may also forage on items on the surface or feed in the water column under special circumstances (Holland 1985b). Nocturnal foraging has been observed during the summer months in central California (Holland 1985a).

Diet

The western pond turtle is a dietary generalist. They prey heavily on aquatic invertebrates, such as the larvae of beetles, stoneflies, caddisflies, dragonflies and other insects (Bury 1986, Holland 1994). Bury (1986) notes that pond turtles in a stream environment in northern California may occasionally take small fish and frogs. Holland (1985a) found two vertebrate prey items in over 500 stomach flushings of animals from the central coast of California, but it is thought that these were scavenged because turtles frequently feed on carrion. Scavenging has been noted on the carcasses of various mammals, birds, reptiles, amphibians and bony fishes. Where bullfrogs (*Rana catesbeiana*) occur with western pond turtles, there is no evidence that turtles feed on either larval or post-metamorphic bullfrogs, although they may feed on their carcasses (D. Holland, pers. comm.). Unpalatable elements in the skin of bullfrogs may deter predation by pond turtles.

Use of plants appears to be limited except in the case of post-partum females, who may ingest large quantities of cattail (*Typha* spp.) or bullrush (*Scirpus* spp.) roots at certain seasons (Holland 1985a). Water lily pods and alder (*Alnus* spp.) catkins are also eaten (Holland and Bury 1998).

In certain circumstances, turtles may eat large quantities of filamentous green algae (Holland 1991b), and may ingest the algae while trying to eat live prey (R. B. Bury, pers. comm.).

Home Range

Western pond turtles in a stream environment in northern California had average home ranges of about 1 ha (2.47 ac) for adult males, 0.25 ha (0.62 ac) for adult females, and 0.4 ha (1 ac) for juveniles (Bury 1979, Holland and Bury 1998). Considerable overlap in home ranges of individuals of both sexes occurred in this area. Preliminary information from the Columbia Gorge indicates turtles may have larger home ranges in Washington.

Movements

Most western pond turtles are somewhat sedentary, although they are capable of moving significant distances and occasionally travel several hundred meters in just a few days (Bury 1979). Daily movements in a California stream averaged 150 m/day for males, and only 21 m/day for gravid females (Holland 1994, summarized in Holland and Bury 1998). In an Oregon lake, daily movements averaged 194.5 m/day for males, 185.5 m/day for gravid females, and 188.7 m/day for non-gravid females. Some turtles have moved over 5 km within a stream (Holland 1994).

Most movements on land are associated with nesting, overwintering, or aestivation, although other types of movements also occur. Gravid females typically make multiple trips onto land (Reese and Welsh 1997, K. Slavens, pers. comm.). Reese and Welsh (1997) reported travel to overwintering sites as far as 500 m from a California river, and speculated that overwintering away from the river may have been an adaptation to avoid winter flooding. Slavens (1995) reported movements between wetlands in Washington: a male turtle that was captured and then released in a different wetland moved 800 m back to the original site. Male turtles have been encountered moving overland in spring, possibly searching for females. K. Slavens (pers. comm.) reports capturing males several times in different ponds during April of the same year. A juvenile turtle moved 200 m between ponds either overland or through a stream, and another juvenile was observed moving overland between ponds. Some turtles move between ponds on an annual basis, moving to larger ponds as water levels recede (Slavens 1995).

Females may move considerable distances from the water to nest. In Washington distances of up to 187 m (614 ft) are known (Holland 1991a), but distances of 20-100 m are more typical (Slavens, unpubl. data). Distances as little as 3 m and as great as 400 m (1,300 ft) away from and 92 m (300 ft) above the watercourse have been recorded (Storer 1930, Holland 1994).

Interspecific Relationships

The western pond turtle occurs sympatrically with the western painted turtle (*Chrysemys picta belli*) in northern Oregon and at one of the two Columbia River Gorge localities in Washington (Nordby 1992; D. Holland, pers. comm.). The two species are frequently observed basking

together, and they may utilize the same prey base, but if competition occurs it has not been documented. Competition for available prey may occur between western pond turtles and introduced fish species (Holland and Bury 1998). Western pond turtles may also interact with introduced turtles (D. Holland, pers. obs.) and other animal species. Aggressive interactions with two-striped garter snakes (*Thamnophis hammondi*) and several species of birds have been noted in California (Holland 1985a). Western pond turtles are preyed on by a variety of species (see *Predation*, page 13).

HABITAT REQUIREMENTS

The western pond turtle is found associated with a variety of aquatic habitats, both permanent and intermittent. They are found from sea level to approximately 1,375 m (4,500 ft), but all records for Washington are below 300 m in elevation. The name western "pond" turtle is something of a misnomer, as ponds are relatively scarce throughout most of the range of this species, and in those areas turtles are more often associated with rivers and streams. However, in Washington and many areas of Oregon the species is found in ponds and small lakes.

Historically, western pond turtles occurred in large numbers in the warm, shallow lakes and sloughs on the floor of the San Joaquin and Sacramento valleys of California (Holland 1991b). It is in the few remaining areas that approximate these habitat conditions that this species reaches its highest densities (see Population Density, page 16). Western pond turtles are usually rare or absent in reservoirs, impoundments, canals, or other bodies of water heavily altered by humans.

Western pond turtles inhabit some of the larger rivers within their range (e.g., the Sacramento, Klamath, and Willamette), but are usually restricted to areas near the banks or in adjacent backwater habitats where the current is relatively slow and abundant emergent basking sites and refugia exist. They may be found in slower moving streams where emergent basking sites are available, but generally avoid heavily shaded areas. In some areas of California, intermittent streams hold sizeable populations. Turtles are also known to use ephemeral pools. They tolerate brackish water, and along the California coast they often coexist with brackish-water fish species such as sculpins (*Leptocottus armatus* and *Cottus* sp.) (Holland 1991b).

Substrate and Vegetation

Habitats used by western pond turtles may have a variety of substrates including solid rock, boulders, cobbles, gravel, sand, mud, decaying vegetation, and combinations of these. In many areas turtles are found in rocky streams with little or no emergent vegetation. In other areas they occur in slow-moving streams or backwaters with abundant emergent vegetation such as cattails or bulrush (*Scirpus* spp.)(Holland 1991c). In certain coastal streams of California they occur in areas with no emergent vegetation but abundant submerged vegetation, most typically ditch grass (*Ruppia maritima*). In the northern parts of the range, pond lilies (*Nuphar* spp.) or arrow weed (*Sagittaria* spp.) are often the dominant aquatic macrophytes. In disturbed habitats large mats of

filamentous algae may be the only aquatic vegetation present. Dense growths of woody vegetation along the edges of a watercourse, which may shade potential emergent basking sites, and make otherwise suitable habitats unsuitable for pond turtles.

Basking Sites

Western pond turtles spend a considerable amount of time engaged in emergent basking, and they are more abundant in habitat that have basking sites (Holland and Bury 1998). Turtles may use a variety of sites for emergent basking, such as rocks, sand, mud, downed logs, submerged branches of near-shore vegetation, and emergent or submerged aquatic vegetation. Turtles are also known to bask on planks, barrels, abandoned autos, the carcasses of large mammals, and other items. In areas where thermally desirable emergent basking sites are limited, competition for these sites may occur when population densities are high (Bury and Wolfheim 1973, D. Holland, unpubl. data).

Refugia

Western pond turtles are associated with areas that contain underwater refugia, and are rarely found more than a few meters from a refuge of some sort (Holland and Bury 1998). These refugia may consist of rocks of various sizes, submerged logs or branches, submerged vegetation, or holes or undercut areas along the bank. When engaging in escape behavior, turtles swim rapidly toward the bottom of the water body and hide in or under nearby refugia. In some cases animals attempt to burrow into the substrate. Turtles also occasionally hide in thick vegetation or holes at the edge of the watercourse.

Water Conditions

Turtles have been observed to be active in water temperatures as low as 1-2°C (37°F) and as high as 38°C (100°F) (Holland 1991c, Holland 1994). In general, turtles avoid prolonged exposure to water above 35°C (95°F). Visibility through water in areas inhabited by turtles may range from less than 15 cm (6 in) to more than 10 m (33 ft).

Uplands

Western pond turtles use upland areas adjacent to water bodies for dispersal, to nest, to overwinter, and to aestivate. Other overland movements may be spring and fall migrations to and from upland overwintering sites, or may be in response to drying of the water body, or other reasons not presently understood (Holland 1991b). Males may make overland movements in search of females (K. Slavens, pers. comm.). In a California study, Reese and Welsh (1997) reported use of terrestrial habitats by male turtles in 10 months of the year, and by females in all months. Many turtles overwinter on land at sites up to 500 m from the water. Overwintering sites tend to have a deep layer of duff or leaf litter under trees or shrubs, and some turtles return to the same site each year (Holland 1994, Holland and Bury 1998, K. Slavens, pers. comm.). Reese and Welsh (1997) reported that 10 turtles overwintered at upland sites a mean distance of

203m from the water. Turtles burrowed into deep leaf or needle litter at sites beyond the riparian zone in woodlands with 15-90% canopy cover. Most of the overwintering sites were on relatively cool north or eastern slopes.

In Klickitat County, Washington, 10 of 15 overwintering sites were on slopes of 5-15°. Nine of these had an east or west aspect, and one had a north aspect (K. Slavens, pers. comm.). Of the five remaining sites; one was a west slope of 25°, and four were on south, east, or north slopes of 40-45°. One site was only 1 m from the high water mark in March. All the sites had 80-90% shrub and tree canopy coverage. Virtually all overwintering sites were beneath or near Oregon white oak (*Quercus garryana*). Two turtles were dug in under logs, and the remaining 13 were under small shrubs (K. Slavens, pers. comm.).

Reese and Welsh (1997) reported that gravid females in their study were highly terrestrial, though the presence of researchers may have affected turtle activities. They noted that during the nesting season, the air temperature was consistently higher than the water temperature. They speculated that female turtles may use uplands prior to oviposition for its thermal advantage. Most nest sites discovered have been in dry, well-drained soils with significant clay/silt content and low slope (<15 degrees) (Holland 1994, Reese and Welsh 1997).

In Washington, pond turtles are associated with wetlands that have open adjacent uplands, such as oak-pine savanna, prairie, or pastures. Human-caused fires may have been beneficial to turtles historically by maintaining open areas for nesting. Suppression has resulted in an increase in the distribution and cover of coniferous trees such as Douglas-fir. A reduction in fires with white settlement has dramatically altered native grassland habitat. For example, in the south Puget Sound region, a recent study found that approximately 8 percent of the area of historical grassland habitat remains (Crawford and Hall 1997). These successional changes in grassland and oak woodland habitat may have played a major role in the decline of western pond turtles.

Turtles usually nest in open areas with good sun exposure that are dominated by grasses and herbaceous vegetation, with few shrubs or trees close by. Exposure varies, but typically is south or southwest (Holland 1991b). The distance from water for 275 nests in California averaged 45.6 m (range 1.5-402 m)(Holland and Bury 1998). In Washington, nest sites have all been $\leq$ 187 m (614 ft) from the water (Holland 1991a). Some female turtles seem to exhibit nest site fidelity (Holland and Bury 1998). The degree of nest site fidelity exhibited in an area may be related to the relative abundance of nesting habitat (K. Slavens, pers. comm.).

POPULATION DYNAMICS

Reproduction

Courtship and mating behavior have been observed from February to November (Holland 1988, Holland and Bury 1998). Age and size at development of secondary sexual characteristics varies geographically (D. Holland, unpubl. data), but these are generally evident in both sexes by the

time an animal reaches 110 mm (4.3 in) carapace length. The time required for males to achieve sexual maturity is not known, but is thought to be at least 10-12 years in Washington. In a sample of 10 gravid females from the Klickitat County population, the smallest animal was 143 mm (5.63 in) carapace length, and approximately 14-17 years of age (Holland 1991c). However, females as small as 111 mm (4.3 in), with an approximate age of 6-7 years, have been observed carrying eggs in southern California (Holland 1994).

When preparing to lay eggs, females typically leave the water in late afternoon or early evening and travel a considerable distance. Females moisten the soil around the nest by urinating prior to digging the nest chamber. Excavation of the flask-shaped nest may require several hours to complete and the female commonly remains on or near the nest site overnight.

Holland and Bury (1998) report that in northern areas, most females only deposit eggs in alternate years. However, data from the Columbia Gorge populations suggest that most females that were monitored in successive years nested each year (K. Slavens, pers. comm.). In central and southern California females produce eggs every year and two clutches in some years (Holland and Bury 1998). Double-clutching by a wild female was first observed in Washington during 1996, and another female double-clutched in 1997, and another was observed in 1998 (K. Slavens, unpubl. data). In Washington, clutches have been laid between May 31 and July 9 (N=41) with a peak in mid-June (Figure 3). Clutch size ranges from 2 to 13 eggs and is positively correlated with body size. Mean clutch size for 36 wild nests from Washington was 6.64 (sd ±1.57, range 2-10) (F. & K. Slavens, WDFW, unpubl. data).

Eggs average 34 mm (1.34 in) in length, 21 mm (0.83 in) in diameter, and 8-10 g (0.28-0.35 oz) in weight (Holland 1994). Hatching rate of fertile eggs in the Pacific Northwest seems to be dependent on the weather during the incubation period. Unusually cold wet weather can cause total nesting failure (Slavens 1995). In 10 nests in Washington, incubation time varied from 95 to 127 days (Holland 1991a, Slavens 1995). Incubation time in captivity is 73-132 days (Lardie 1975, Feldman 1982). Hatchlings from Washington average 5-7 g (0.18-0.25 oz) in weight and 27-31 mm (1.1-1.2 in) in carapace length (F. Slavens, unpubl. data). In southern California, some hatchlings leave the nest in early fall. Field observations to date indicate that in the northern parts of the species' range, hatchlings overwinter in the nest (Holland 1994, Reese and Welsh 1997, F. & K. Slavens, pers. comm.).

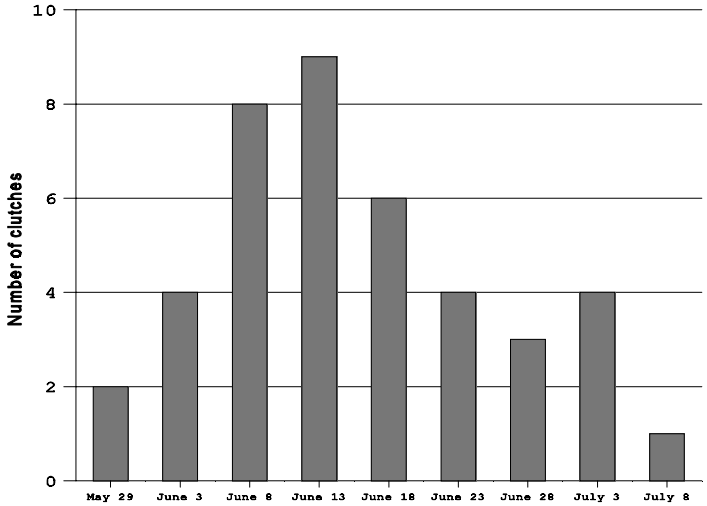

Figure 3. Timing of western pond turtle oviposition in five day intervals in the Columbia River gorge, 1990-1997.

Mortality

Preliminary analyses by D. Holland (unpubl. data) suggest mortality is high in the younger (less than 6-8 years) age classes. Under undisturbed conditions possibly only 10-15% of the animals that hatch in a given year survive until the end of the first year. Survival from the first to second and second to third year is similarly low, but increases slightly by the fourth and fifth years (Holland unpubl. data). Bury (pers. comm.) reports only slight mortality after year 3 for pond turtles in a northern California study. Survivorship apparently continues to increase until the attainment of sexual maturity. Exact rates of turnover in the adult portion of the population are not known, but probably average 3-5% per year in undisturbed populations (D. Holland, unpubl. data). The average life expectancy of adults is not known. The maximum age achieved by animals in the wild is not known, but is at least 42 years (D. Holland and R. B. Bury, unpubl. data). The estimated maximum life-span based upon an extrapolation from known adult growth rates is 50-70 years (D. Holland, unpubl. data), which approximates that of the ecologically similar Blandings turtle (*Emydoidea blandingi)* in Michigan (Congdon et al. 1993).

Predation. Bullfrogs prey on juvenile western pond turtles (Moyle 1973) and other small turtles (Bury and Whelan 1985). Bullfrogs are native to the eastern United States, but have become abundant and widely distributed in the west since their introduction to Idaho in the 1890's, and to Oregon in the 1920's (Lampman 1946). They currently are found throughout the range of the western pond turtle (Bury and Whelan 1985). Bullfrogs may be an important predator on hatchlings because both frequent shallow water habitat. Holland (1991b) has observed a reduction in the abundance of juvenile western pond turtles in areas with bullfrogs (Fig. 4). Predation by bullfrogs and other predators may be responsible for the lack of juveniles in many pond turtle populations (Figure 4). Largemouth bass (*Micropterus salmoides*), another widely introduced species, is also known to prey on juvenile pond turtles (Holland 1991b). However,

observations by Holland (1991b:43) indicate that the impact of bass may not be as important as that of bullfrogs, perhaps because bass do not frequent the shallows as much as juveniles and bullfrogs. Hatchling red-eared sliders (*Trachemys scripta elegans*) and painted turtles have a behavioral anti-predator mechanism, scratching the gill apparatus, that makes bass avoid them (Britson and Gutzke 1993). It is unknown if western pond turtle hatchlings exhibit the same behavior since they evolved in the absence of gape-and-suck predators like bass (Holland 1991b:43).

Black bears (*Ursus americanus*) and coyotes (*Canis latrans*) completely eliminated a southern California pond turtle population when drying of a stream forced overland movement by the turtles (S. Sweet, pers. comm. to D. Holland). Raccoons (*Procyon lotor*) preyed on two adults from the Klickitat County population in 1991-92. In 1992, 97 of 106 western pond turtle nests monitored in Oregon were depredated, probably by raccoons or skunks (Holland 1993). River otters (*Lutra canadensis*) are known to prey on western pond turtles (Manning 1990). Holland and Bury (1998) reported 10 pond turtle carcasses and >20 live turtles with missing limbs along a 3 km stretch of stream and attributed this to river otters. Holland (1994) lists five additional known predators: bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), gray fox (*Urocyon cinereoargenteus*), mink (*Mustela vison*), and dog.

Predation by humans may take the form of wanton shooting, capture by hook and line fishing or entanglement in nets, collection for the pet trade (Bury 1982; D. Holland, pers. obs.) or collection for food (M. P. Hayes and S. Sweet, pers. comm. to D. Holland).

Suspected predators include bobcat (*Lynx rufus*), great blue heron (*Ardea herodias*), black-crowned night-heron (*Nycticorax nycticorax*), golden eagle (*Aquila chrysaetos*), red-shouldered hawk (*Buteo lineatus*), giant garter snake (*Thamnophis gigas*), two-striped garter snake, California red-legged frog (*Rana aurora draytonii*), rainbow trout (*Oncorhynchus mykiss*) and channel catfish (*Ictalurus punctatus*) (Holland 1994).

Drought. A prolonged drought in California (1985-1990) apparently resulted in declines of up to 85 percent in some populations and the outright elimination of others (D. Holland, unpubl. data). Drought may function as a direct mortality factor by eliminating the habitat or prey base required by turtles for survival. Without adequate body fat reserves normally produced by late-season feeding, turtles may be unable to survive the stress of overwintering.

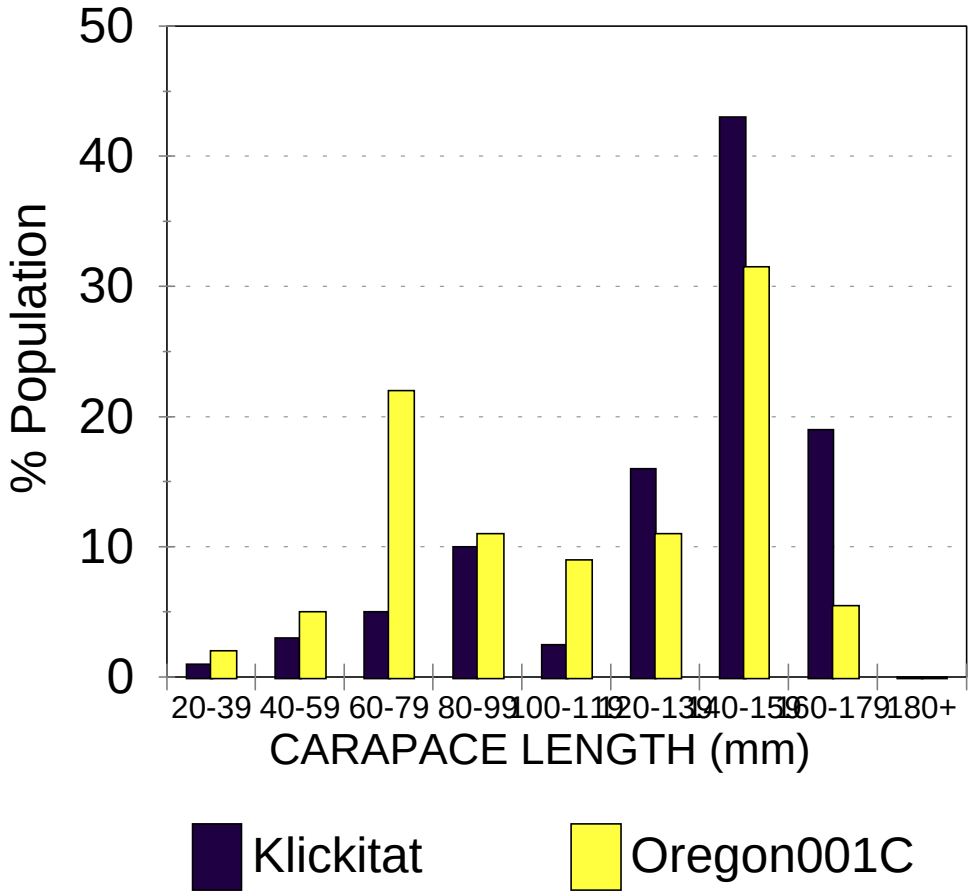

Figure 4. Size class composition of western pond turtles where bullfrogs are present (Klickitat County,n=84, 1987-90) and absent (Oregon site 001C,n=54, 1991)(from Holland 1991b:42)

Disease and parasites. A syndrome similar to upper respiratory disease caused a decline in the Klickitat County population in 1990. The causal agent is not known with certainty, but may have been a virus or mycoplasma. Western pond turtles essentially have evolved in isolation from most other turtle species for most of their history. Therefore exotic species may introduce pathogenic agents to which western pond turtles have never been exposed, and thus have had no chance to evolve any level of resistance. If this is the case, the introduction of exotic species, particularly from unhealthy captive situations, (e.g. red-eared slider) may have catastrophic consequences for western pond turtle populations. A herpes-like virus has been reported to kill captive western pond turtles in California (Frye et al. 1977).

The effect of parasites on western pond turtle populations is unknown. The only known ecto-parasites are leeches (*Placobodella* sp.) found on specimens from northern California and central Oregon (Holland 1991b). Endo-parasites include nematodes (Bury 1986) and lungworms (Holland 1991b). Ingles (1930) reported a trematode (*Telorchis* sp.) from western pond turtles. Thatcher (1954; not seen, in Holland 1994), reported 7 species of helminthes from western pond turtles.

Population Density

Western pond turtles may reach the highest densities of any emydid turtle and may have been the dominant element of the vertebrate biomass of some aquatic communities on the west coast (Holland 1991b). They historically occurred in large numbers in warm shallow lakes and sloughs such as in the San Joaquin and Sacramento valleys of California. Pond turtle densities range widely, from a low of 2 turtles/ha, to at one site, an estimated at 3700 turtles /ha (1,500/ac) (Holland 1991b). Pond turtle densities in a few sites have been calculated at over 1000 turtles/ha (405 turtles/ac) of water surface (Holland 1991b), but typically are found at much lower densities.

POPULATION STATUS

The western pond turtle is declining in numbers throughout its range, particularly in Washington, northern Oregon, southern California, and Baja. It is now common only in a fraction of its original range (Holland and Bury 1998).

Past

The western pond turtle was once abundant in California, Oregon, and locally in Washington. They were commercially marketed for food with average annual sales in San Francisco in the 1890's of 18,000 (Smith 1895). Exploitation and habitat destruction dramatically reduced pond turtle populations.

No historic data are available on the size or dynamics of populations in the Columbia River Gorge or Puget Sound regions. Cooper (1860) noted that turtles were "common in freshwater ponds and rivers west of the Cascades," a point questioned by Storer (1937), who stated that if this was the case, "specimens should be forthcoming." Three possibilities may explain the scarcity of specimens: 1) the wary nature of the species precluded extensive collection; 2) the species was uncommon or present in low numbers due to various limiting factors at the terminus of its range; and/or 3) a dramatic reduction in the size of population(s) in this area occurred prior to the initiation of extensive collecting efforts that began with the activities of J. Slater in the 1930's.

Puget Sound. Western pond turtles were probably locally common to abundant in the south Puget Sound area. Edward Huggins (Strahle 1994) gave an account of securing dozens of turtles that could be seen “congregated in large numbers” under the ice at Old Fort Lake, near Dupont,

Pierce County. Indians recall accounts of gathering turtle eggs at Nisqually Lake where turtles were abundant, and the Nisqually name for the lake translates to "place where the turtles came from." The Puget Sound population was apparently large enough to support commercial collecting activities for the restaurant trade during the late 1800's (M. Jennings, pers. comm. to D. Holland). Due to the low rate of recruitment, pond turtle populations cannot sustain the increased mortality to adults from exploitation. Holland (1991c) examined historic localities in the Puget Sound area and concluded that commercial collection could easily have eliminated or severely reduced populations in certain habitats. Habitat alteration probably also played a significant role in localized declines. By the 1930's populations were probably severely reduced from levels present 50-100 years earlier (Owen 1940).

Pond turtles appear to have continued to decline throughout this century. In King County, turtles were seen during the 1950's at each end of Sammamish Slough, and one was collected at Lake Meridian (Milner 1986). Meydenbauer Bay near Bellevue supported turtles in the 1960's. In Seattle, individuals were reported near Northgate, in West Seattle, and at Haller Lake during the 1960's and 1970's. In Pierce County, western pond turtles were found on and around Fort Lewis and McChord Air Force Base. Spanaway and Halvorson marshes, and Muck, Sequalitchew, American, Lewis, Spanaway, Bay, and Chambers lakes all had resident turtles (Milner 1986). The south Tacoma swamp and Talbot Marsh on McChord Air Force Base both supported turtles. Another turtle site, the headwaters of Murray Creek, was inhabited in the 1940's but was altered and channelized later. A specimen was collected in 1951 at "Sportsman's Lake", which Milner (1986) identified as Shaver Lake, but this location is not certain. Turtles observed at several other Pierce County sites were not identified to species (Milner 1986). In Thurston County, a pond turtle was collected at Long Lake, eggs were collected from a site north of Olympia, and adults were observed in Lacey during the 1940's and at Patterson (also called Pattison) Lake in 1969. In Kitsap County one was found near Kitsap Lake in the early 1980's (Milner 1986).

Western pond turtles had effectively been extirpated in the region by the 1980's. Surveys of 56 wetlands by Milner (1986) failed to find any western pond turtle populations in the Puget Sound area. An old male with a bullet hole in its carapace was found at Lake Garret in Burien in 1988, but died in captivity. Another adult pond turtle was found crossing a road under I-5 near McAllister Creek in May 1991. This turtle was released on Nisqually National Wildlife Refuge. This individual, which was identified by a chipped shell, was recaptured in April 1992 (Vicencio and Van Deman 1992). Extensive surveys and incidental sightings in 1991-92 revealed a few isolated individual turtles in King, Kitsap, and Thurston counties; no turtles were detected in Mason County (Table 3) (Nordby 1992). Forrester and Storre (1992) reported three possible western pond turtle sightings at Sequalitchew Lake on Ft. Lewis, Pierce County in 1991, but follow-up surveys found no pond turtles (R. B. Bury, pers. comm.). Subsequent surveys of 24 wetlands on Fort Lewis involved a total of 303 site visits and 258 trap nights, but no additional western pond turtle sightings were recorded (Stringer 1992, Bury 1993). An animal seen on several occasions near Stan Sayres hydroplane pits on Lake Washington was reported to be a western pond turtle (P. D. Boersma and S. Andelman, pers. comm.); however, follow-up trapping at this location in 1995 produced many introduced turtles, but no western pond turtles. In recent years Washington Department of Fish and Wildlife staff obtained five western pond turtles: near

Tacoma--1987; Port Orchard--1991; Fife--1992; Ravensdale--1992; and Kid Valley--1993. These individual turtles have to be considered of unknown origin, because any or all of them may have been transported to the area by people from Oregon or California. Genetic comparisons with museum specimens may determine their origins. No functioning populations were found anywhere in the Puget Sound region and it was concluded that the species was effectively extirpated from the area.

Table 3. Results of 1992 western pond turtle surveys in Washington (compiled from Nordby 1992).

County	Sites surveyed	Sites with pond turtles	Adult pond turtles	Juvenile pond turtles	Painted turtles	Red-eared Sliders
Skamania	39	10	23	2	288	-
Klickitat	6	2	33	8	4	-
Clark	15	0	-	-	150	-
King	14	1	1	-	5	5
Pierce	7	0	-	-	-	7
Kitsap	5	1	1	-	3	-
Thurston	1	1	1	-	-	-
Mason	1	0	-	-	-	-
Totals	88	15	59	10	450	12

Columbia Gorge. The Klickitat population was estimated to total about 108 turtles in 1986 (Zimmerman 1986). At the beginning of 1990, the Klickitat County population was estimated to number between 60 and 80 animals (Holland 1991a). Subsequent data indicate the 1990 population was $\geq$96 turtles. Measurements of carapace lengths indicated the population was moderately adult-biased, with about 78% of the animals $\geq$120 mm (Holland 1991a), compared to 55-70% under normal circumstances (Holland and Bury 1998). This indicated that recruitment may be low and the population may be in decline (Holland 1991a). Head-starting of juvenile turtles was initiated in an effort to augment juvenile survival (see Head-start Program, page 26). In early to mid-1990, the Klickitat County population was decimated by an unknown pathogen, and at least 36 animals died. To curb the spread of the disease and to treat sick animals, 32 adult and subadult animals were removed from the ponds and treated at the Woodland Park Zoo (WPZ). Based on spring 1991 surveys, at least 45 turtles survived the 1990 disease outbreak at the Klickitat County lake/pond complex (Slavens 1992a). Fourteen of the turtles that were treated at WPZ survived. These, along with 17 head-started juveniles were returned to the wild in July and August 1991. After the release of an additional 9 head-starts in 1992 and 4 known mortalities (2 killed by a raccoon, 1 by an auto, 1 unknown; Slavens 1992b) the Klickitat population was estimated at 70 in 1992. In 1994, 52 turtles were captured in the pond complex and 12 were observed at the lake. This resulted in an estimate of 117 turtles in the Klickitat population (Scott 1995a).

The Skamania County population was surveyed repeatedly between 1990 and 1994 (Scott 1995b). During 1992 surveys, 25 turtles were detected and during 1994, 38 turtles were found at over 14 different sites. The 1994 estimate for Skamania and Klickitat counties combined was 155 turtles.

Present

Only about 250-350 western pond turtles are known to remain in the wild in Washington (Table 4). Most of these are in the Columbia Gorge, and approximately half of the number are young turtles from the head-starting and captive rearing program. Of 21 turtles released at a Puget Sound reintroduction site in Lakewood, at least 14 turtles remained alive in spring 1998, and an additional 5 were released in summer 1998. Two old males of unknown geographic origin were released to wetlands at Northwest Trek in 1996. A few additional scattered old adults may remain in the Puget Sound area, but no reproductive populations have been found.

Table 4. Numbers of western pond turtles at three locations in Washington, 1998.

Location	No. turtles present, 1996	Releases, 1997-98 (head-starts & captive bred)	Total
Columbia River Gorge			
Klickitat	89[a]	87	176
Skamania	49[b]	60	109
Puget Sound lowlands			
Lakewood	15(head-starts, 1996)	11	≤26
Total	153+	158	311± [c]

[a] 1996 estimate using the Jolly-Seber mark-recapture method.
[b] High count from 1984 - 1994 basking surveys (Scott 1995)
[C] Plus unknown number of unmarked turtles, minus at least 3 known mortalities.

HABITAT STATUS

Past

A number of factors have contributed to the decline in habitat for western pond turtles. Wetland draining, filling, and development eliminated much habitat during the past century. Milner (1986) reported that several historic western pond turtle sites were altered or the shoreline was developed in the past 50 years. Many have been dredged, channelized, filled, or drained. According to conservative estimates, 33-50% of wetlands present during pre-settlement times were lost in Washington (Canning and Stevens 1990). Wetland losses in urbanized areas around Puget Sound were 90-98%. Historical analysis indicates an 82% loss of wetlands for Pierce County, and 70% for the Lake Washington area (Boule et al. 1993). Diversion of water for

irrigation and other purposes has also eliminated or altered turtle habitat. The construction of dams and creation of reservoirs has been detrimental to western pond turtles by altering water flow in drainages, inundating habitat behind dams and reservoirs, and creating habitat suitable for the spread of exotic species (bullfrogs, warmwater fishes) that are harmful to western pond turtles. Additionally, dams and their associated reservoirs may have fragmented populations by creating barriers to dispersal (Holland 1991b). On the Trinity River, California, a dam increased sedimentation, decreased water temperatures, increased canopy cover, and increased water velocities (Reese and Welsh 1998a). These factors may negatively impact juvenile turtles (Reese and Welsh 1998b). Grazing or trampling of emergent vegetation may have modified aquatic and riparian habitats to the extent that they became less suitable for hatchlings and juveniles (Holland 1991b).

The harmful effects of habitat alterations were not limited to watercourses, because western pond turtles nest and overwinter in the uplands. Urban, residential, and agricultural development of upland habitats within 100 meters of water bodies effectively eliminated historical nesting areas. Pond turtles need open sunny locations for basking and nesting. Fire suppression may have reduced the amount of habitat available by allowing the invasion of Douglas-fir into Puget prairies and oak-pine woodlands and increasing the shading of the forest floor.

Present

The area occupied by known populations of western pond turtles in Washington totals slightly over 2.4 km^2 (1.5 mi^2). One population is restricted to a complex of ponds in Skamania County and the other occurs in a lake and pond complex in Klickitat County. Most of the Klickitat County habitat has been purchased by the Department of Fish and Wildlife. The Skamania County habitat is in private and U.S. Forest Service ownership and most of it is within the Columbia River Gorge National Scenic Area. The two populations are separated by a road-distance of about 27 km (17 mi).

Klickitat County. The Klickitat County lake site can be characterized as moderately disturbed. The lake was slightly modified within the last 20-30 years to increase its size and water storage capacity. The area surrounding the lake was historically grazed by livestock, which has been limited in recent years. The area immediately surrounding the lake shows signs of prolonged human use in the form of a small abandoned pump-house, vehicle track-ways, and footpaths. A road located about 5 m (16 ft) above and 10-15 m (35-50 ft) east of the eastern shore of the lake allows a direct view of the lake and potential access. Traffic on this road was observed to average 2-3 vehicles per hour during late May to early June 1990, and shooting in the general vicinity of turtles was observed at least once in this period. Similar activities were noted previously by the former landowner. To a limited extent, turtles appear to be somewhat acclimated to the presence of traffic on this road and the effects of disturbance of this type are unknown.

The lake has contained brown bullheads (*Ictalurus nebulosus*) since at least the 1940's and was stocked with largemouth bass and bluegill (*Lepomis macrochirus*) by a local sportsman in the

late 1970's or early 1980's (D. Anderson, pers. comm.). The presence of fish encouraged recreational use of the lake by local fishers, which was permitted by the landowner until summer 1990. Recreational fishing may have had a significant effect on the turtle population through incidental capture and interruption of normal basking activities.

Large numbers of bullfrogs also occur at the lake and may be responsible for the apparent lack of recruitment in this population. Despite control efforts (see *Predator removal*, page *30*), frogs and tadpoles remain in the lake. Emergent vegetation in the lake is limited in extent. There are relatively few areas where water depth and clarity allow for growth of emergents. Emergent basking sites for turtles in the form of logs or fallen trees were very limited at this location before artificial rafts were installed in 1991-92.

Immediately south of the lake site are five ponds which hold the majority of the turtles in this population. The ponds, like the lake, are located in a mixed oak/pine/grassland habitat, with Oregon white oak and ponderosa pine (*Pinus ponderosa*) dominant. Bullfrogs exist in all ponds on this site and brown bullheads are present in the two largest ponds described below. While the area around the lake lacks surface rock formations, numerous basalt outcrops and rock piles are present throughout the pond site. Of the five ponds that hold turtles on this site, one is artificial (permanent) and four are natural (two are permanent ponds formed by natural basaltic sinkholes and two are ephemeral). Studies of the turtles in this population have revealed only one instance of a turtle moving the 500 m between the lake and the pond complex; however, it is probable that turtles historically moved freely within this system. The lake and pond complex are considered an ecological unit.

The artificial pond was created by excavation in the mid-1970's. It is relatively shallow, with a depth in most areas of about 1-1.4 m (3-5 ft), and currently has a thick growth of native and exotic water lilies. There is a small patch of emergent vegetation in the form of cattails on the north shore and it is surrounded by a fringe of willows (*Salix* sp.) and oaks. The area immediately around the pond is lightly disturbed.

The four natural ponds are located south of the artificial pond. Three of them occur along the base of a small basalt bench. This area was historically used for seasonal cattle grazing which was discontinued in the early 1980s. The two westernmost ponds are permanent but the smaller eastern pond is ephemeral, and frequently dries up by July. All of these ponds are used by turtles. The eastern pond is less than 1-2 m deep, covers about 150-180 m^2 (500-600 ft^2) and has abundant emergent vegetation in the form of rushes and sedges, as well as seasonal growths of aquatic angiosperms (*Ranunculus* sp.). There is a horse trail about 20 m (66 ft) south of the south shore of the pond. This area can be categorized as lightly disturbed.

The middle and western ponds are considerably larger, at 0.25-0.32 ha (0.6-0.8 ac) and 0.4 ha (1 ac), respectively, and deeper, at about 2.5 m (8.2 ft). They support abundant growths of pond lilies and arrow weed. Small patches of cattails exist on the south and west shore of the western pond. Emergent basking sites in the form of downed logs are present in both ponds, but are more

abundant in the western pond. The area around both ponds can be characterized as lightly disturbed to undisturbed.

On the basalt bench above these three ponds, and about 100 m (330 ft) north-northwest of the western pond, is an ephemeral pond that is seasonally utilized by turtles. It is <1 m (3 ft) deep, covers more than 1,500 m^2 (5,000 ft^2), and has abundant emergent vegetation. This pond usually dries up by July.

Skamania County. The Skamania County population exists in an extensive lake, pond and wetland complex within a forest and pastureland environment. The area can be characterized as lightly to moderately disturbed. Nearly all of the wetlands contain bullfrogs. Some of these ponds were colonized by a native water fern (*Azolla* sp.) in 1997-98 that rapidly formed a thick mat over the ponds' surfaces. The affect that this habitat change will have on the turtles is unknown.

Although turtles have been seen in a number of places in this complex, there are four primary ponds occupied by western pond turtles. At least two of the ponds are artificial. These are relatively small, between 2,000 and 3,000 m^2 (6,500-10,000 ft^2), with mud substrates, abundant submerged vegetation, limited emergent vegetation and relatively few emergent basking sites.

Approximately 0.4 km (0.25 mi) west are two additional ponds. One covers less than 500 m^2 (1,650 ft^2), is at least 4 m (13 ft) deep, and apparently holds water on a year-round basis. The area can be characterized as moderately disturbed. Approximately 150 m (500 ft) north of this pond is another pond of about 2500-3000 m^2 (8,000-10,000 ft^2) in area that holds both painted turtles and pond turtles. The origin of this pond is uncertain, as it may represent a natural pond that has been enlarged by diking. The grassland around the pond was moderately grazed until recently and there is little or no emergent vegetation on the periphery. Emergent basking sites in the form of downed logs are abundant.

Puget Sound. Many of the wetlands at Fort Lewis have a history of human alterations such as drainage, farming, and re-flooding. Stringer (1992) found that many wetlands have few or no natural emergent basking sites and most marshes have banks overgrown with reed canary-grass (*Phalaris arundinacea*) and cattails. Most wetlands also have populations of bullfrogs and/or introduced warmwater fish. Recreational use may be a factor at some lakes. American and Sequalitchew lakes are heavily used for recreation and are surrounded by residential areas, though Sequalitchew has coves that are relatively isolated from disturbance (Forrester and Storre 1992). In spite of these factors, Bury (1993) believed several waterways on the military reservation had fair to excellent habitat conditions for western pond turtles and the reasons for their rarity or absence are unknown.

A small complex of three man-made ponds near Lakewood, Pierce County, was selected for the first re-introduction in the Puget Sound area. It is located in a 5 ha (12+ ac) fenced compound owned by WDFW. The ponds are fed by a small perennial creek. The ponds are small (total <1 ha) and the reintroduction project is considered a pilot for future projects.

CONSERVATION STATUS

Legal Status

In Washington, the western pond turtle was listed as a Sensitive species by the Department of Wildlife in 1981. This status was changed to Threatened in 1983. The pond turtle was classified under WAC 232-12-014 as an Endangered species in November 1993. Unless allowed by special permit, western pond turtles may not be collected, harassed, held in captivity (live or dead), or sold.

The Columbia Gorge National Scenic Area Management Plan has placed a number of identified pond turtle habitats in categories which will protect them from development and alteration. Wetland protection regulations, such as Section 404 of the federal Clean Water Act that regulates the discharge of fill, also applies to wetland habitat of pond turtles.

In 1992, the U.S. Fish and Wildlife Service conducted a status review for the western pond turtle in response to a petition (USFWS 1992) to list the species as threatened or endangered under the Endangered Species Act (ESA). This petition to list the species was denied, because although the turtle has declined and is affected by human activity, it still occurs in 90% of its historic range and is not in danger of extinction or likely to become so in the foreseeable future (USFWS 1993). Though the western pond turtle is not protected under the federal ESA, it is a species of special concern for the Pacific Ecosystem office of the U. S. Fish and Wildlife Service.

The western pond turtle is listed as Sensitive in Regions 5 (California) and 6 (Washington and Oregon) by the U.S. Forest Service. The western pond turtle is considered a Critical species by the Oregon Department of Fish and Wildlife (their designation with most concern for a species), and a species of special concern by the California Department of Fish and Game. In these states and Nevada, western pond turtles may not be taken without a scientific collecting permit. In Baja California Norte, Mexico the southwestern pond turtle *C. m. pallida* is protected by Fauna Silvestre and may not be taken without a scientific collecting permit.

Management Activities

The Washington Department of Fish and Wildlife is actively engaged in management and recovery efforts for the western pond turtle. Western pond turtle conservation activities are being conducted in cooperation with the Woodland Park Zoo and the Center for Wildlife Conservation. Surveys to determine the status of the pond turtle constituted most of the early work in Washington (Milner 1986, Zimmerman 1986). In 1990, the Department funded an intensive study of the Klickitat County population (Holland 1991a).

Habitat Acquisition. Habitat for the Klickitat County population was purchased by the Department in the early 1990s. The Klickitat pond complex was purchased in 1992

and the lake was purchased in 1994. Current plans are to purchase additional small parcels of habitat in the Gorge for western pond turtles.

Habitat Enhancement. Grazing was discontinued at the Klickitat lake site after it was acquired by WDFW. Also, at the request of WDFW, the landowners of the Skamania County sites have reduced or discontinued grazing of uplands adjacent to some of the wetlands. The Nature Conservancy provided assistance to WDFW and private landowners for habitat enhancement in Skamania County. The Lakewood reintroduction site was enhanced through the addition of emergent basking sites. These consisted of Oregon white oak trees cleared from a nearby development that were donated by the Weyerhaeuser Company. Scot's broom (*Cytisus scoparius*) was removed around the ponds, and native shrubs and Oregon white oak were planted.
Artificial rafts have been placed at a number of sites to improve opportunities for emergent basking. During 1991 and 1992, 45 rafts were distributed at 31 sites in five counties (Nordby 1992). In 1992, 24 rafts were placed in 22 lakes and marshes at Fort Lewis (Stringer 1992). Use of the wooden-plank rafts by western pond turtles in Klickitat County appears to be high.

Surveys. In 1991, 128 wetlands in western Washington and the Columbia River Gorge were surveyed for western pond turtles (WDFW, unpubl. data). The following year, 88 sites in eight counties were surveyed by a group of biologists and 30 trained volunteers using a standardized survey protocol (Nordby 1992). Surveys were completed over an extensive area within the known range of the species based on historical pond turtle records and recent sighting reports (Nordby 1992; Scott 1995a, 1995b). Surveys were conducted during the annual peak of emergent basking activity March 15 through June 15. Each site was visited prior to this time to assess habitat, scout for observation points, and install artificial rafts. Basking rafts were constructed of 2" × 12" wooden planks nailed together to form a triangle or square. Such platforms can increase the probability of observing turtles and increase the number observed. Most sites were surveyed three times during the peak emergent basking period. Observations of suitable emergent basking sites were completed during times when basking was expected (Nordby 1992). Surveys in the Columbia River Gorge were continued in 1993 and 1994 (Scott 1995a, 1995b). The highest count of turtles simultaneously visible, air and water temperatures, weather conditions, a gross habitat assessment, land uses, and other wildlife observed were recorded on a standard form.

The results of these surveys reinforced previous impressions that western pond turtles are no longer present in many lakes and ponds within their historic range. However, knowledge of the distribution of turtles within the Skamania ponds population was greatly enhanced (Nordby 1992, Scott 1995b). These surveys identified potential reintroduction sites, sources of animals for captive propagation, and habitats used.

In August 1995, trapping was conducted for one week to determine if Lake Washington was still inhabited by western pond turtles. Large funnel traps constructed of hoops and netting were baited and anchored in the lake. They yielded 58 red-eared sliders and two northern snapping

turtles (Slavens 1995). The large number of exotic turtles made the trapping effort time-consuming so trapping was suspended.

Toxicology research. Following the disease outbreak in the Klickitat population in 1990, a toxicology study was conducted to assess water quality in the lake/pond complex. The lake had higher levels of aluminum than the ponds (Landis and Storch 1991) but the level was not high enough to cause acute toxicity, and there was no other evidence of chemical contamination.

Genetics research. In 1992, the Washington Department of Wildlife supported a study of genetic variation within western pond turtle populations using DNA fingerprinting. Gray (1995) found that turtles in the Columbia Gorge region of Washington and Oregon had very high genetic similarity within sites and significant genetic divergence between sites. She concluded this was an indication of lack of dispersal and gene flow between sites. Her results indicated a significant genetic difference between northern populations in Washington and Oregon, and southern California populations. She found no genetic subdivision between turtles from the Puget Sound region and the Willamette Valley, and a small genetic subdivision between Puget Sound-Willamette Valley turtles, and Columbia Gorge turtles. She also stated that the level of genetic variation within the Puget Sound region may have been overestimated due to small sample sizes.

Janzen et al. (1997) used a mitochondrial DNA technique to evaluate the molecular phylogeography of the western pond turtle. They found low levels of genetic differences among populations of northern pond turtles. They conducted a more detailed analysis of turtles in Oregon, and found that there were small genotypic differences within Oregon populations of turtles. Of particular note, turtles in the Willamette Valley were slightly different from turtles in the Columbia Gorge in Oregon.

Considering the work of both Gray (1995) and Janzen et al. (1997), there is an indication that the Willamette Valley turtles are more similar to Puget Sound turtles than Columbia Gorge turtles. In addition, these genetic studies support morphological differences suggested by Holland (1992) between Columbia Gorge and Puget Sound turtles.

Captive Breeding. In 1991, the Department of Wildlife, the Woodland Park Zoo, and the Center for Wildlife Conservation initiated a captive breeding program for western pond turtles. The objective of the program was to produce about 40 hatchlings per year for eventual release into suitable habitat in the state. The sex of hatchling turtles in part is determined by incubation temperature (Ewert et al. 1994), and the pond turtle eggs are incubated at a temperature that will produce mostly females.

The captive breeding program has included 9 adults from Washington and 3 adults from Oregon. Three groups of breeding turtles have been established: one of Columbia River Gorge origin, one of Puget Sound lowlands origin, and one of out-of-state origin. These stocks differ morphologically and genetically (Holland 1992, Gray 1995). Adults of Columbia River Gorge origin (3 ♀, and 1♂) have been obtained from extant populations and four captive-bred sub-adults are being kept at the zoo for future captive breeding. Turtles from the Puget Sound

lowlands were opportunistically obtained when turtles were found by private citizens and reported to the Department. This included: a male found in Tacoma, a female (now deceased) from Port Orchard, a female from Fife, and a male from Ravensdale (released at Lakewood in 1996; found dead in 1997). The third captive breeding group, composed of turtles from outside of Washington, has been assembled from zoos, veterinarians, and wildlife rehabilitators. This group included the 3 turtles from Oregon, and two males of unknown origin that were later released at a pond at Northwest Trek near Eatonville. This third group was used to help refine captive breeding techniques, and has not been used to provide juveniles for release in Washington.

Over the 7-year history of the captive breeding program all 38 juveniles released to the wild were the progeny of 6 adults (4 females and 2 males)(Table 5). Twelve were released into ponds in the Columbia River Gorge and 26 at the Lakewood pond complex in the Puget Sound lowlands.

Head Start Program. The Woodland Park Zoo, Center for Wildlife Conservation, and Department of Wildlife initiated a joint project in 1990 to improve recruitment in the Columbia Gorge populations. The objective of the program is to increase the survival chances of young turtles in the wild by "head starting" them at Woodland Park Zoo to a size where they can escape predation by bullfrogs. Head-starting has been demonstrated to improve survival of hatchling freshwater turtles where predation by bullfrogs is a problem (Haskell et al. 1996). Hatchlings are captive reared in an environment optimally suited for rapid growth. Juvenile turtles kept in these conditions year round can attain the size of a 2-year old wild turtle in a single year.

To obtain hatchlings from wild nests, adult female turtles are trapped in the spring and equipped with transmitters. All captured turtles (except for the smallest juveniles) are marked for individual identification by filing notches in the marginal scutes of the carapace according to the system described by Bury (1972a). Transmitter-equipped turtles are monitored at two-hour intervals from 8:00 a.m. until dark starting on May 15 each year, and monitoring is continuous when a female is discovered to have left the pond. Monitoring of transmitter-equipped females continues until the turtle has laid eggs or until July 15, whichever comes first. This program relies heavily on volunteers to monitor the transmitter-equipped females.

Table 5. Numbers of captive bred juvenile western pond turtles released at four sites in Washington, 1995-98.

Release Site Year	No. Released (hatch year)	Parentage
COLUMBIA GORGE		
Klickitat ponds		
1995	6 (1994)	Dallesport♀, Dallesport♂
1996	1 (1995)	Bergen♀, Dallesport ♂
1997	3 (1996)	PondC♀, Dallesport ♂
Klickitat lake		
1995	1 (1994)	Dallesport♀,Dallesport ♂
Skamania ponds		
1998	1 (1997)	Bergen♀, Dallesport or Pond B ♂
PUGET SOUND LOWLANDS		
Lakewood ponds		
1996	15 (7-1994, 8-1995)	Fife♀, Tacoma ♂
1997	6 (1996)	Fife♀, Tacoma ♂
1998	5 (1997)	Fife♀, Tacoma ♂
Total	38	

Once a female has nested, a frame is placed over the nest to exclude predators and hold in any hatchlings that might emerge. Expected hatching dates are calculated based on the known dates on which the eggs are laid. Arrangements are made to visit nests at the appropriate time to check on the status of the eggs. Once hatching is underway, the hatchling turtles are taken to the zoo to begin a one to two-year stay in captivity. Prior to release back to the wild, juvenile turtles are individually marked with notches in the marginal scutes of the carapace and a Passive Integrated Transponder (PIT tag) is inserted under the skin of a hind leg. The PIT tag is a computer chip encapsulated in medically safe glass that is pre-programmed with an identifying number that can be read with a portable reader.

The Woodland Park Zoo has successfully reared and released 187 juvenile western pond turtles under the head-start program (Table 6). The 187 head-start and 38 captive reared juveniles were

Table 6. Numbers of nests found and wild juvenile western pond turtles head-started and released in Washington, 1990-98.

Year	#♀ monitored	Nests	Eggs	Hatched	# Released (hatch yr)
Klickitat ponds					
1990	9	6	37	23	0
1991	0	0	0	0	14 (1990)
1992	0	0	0	0	9 (1990)
1994	8	1	7	7	0
1995	5	3	19	11	4 (1994)
1996	8	6	37	31	11 (1995)
1997	4	4	26	22	43 (1996)
1998	7	8	51	45	26 (1997)[3]
Klickitat lake					
1991	0	0	0	0	3 (1989)[1]
1995	3[2]	0	0	0	3 (1994)
1996	5	3	23	16	0
1997	4	3	25	24	0
1998	5	6	49	41	15 (1997)[3]
Skamania ponds					
1995	4	0	0	0	0
1996	8	6	40	18	0
1997	9	9	58	32	21 (1996)
1998	6	4	27	19	38 (1997)
Totals	85	59	399	289	187

[1] Three wild one-year old turtles were captured and zoo-reared for 1 year.
[2] These females were equipped with radios in late June, possibly after nesting had occurred.
[3] One of these was hatched in 1996, the rest in 1997.

released at the Klickitat (139) Skamania (60) and the Lakewood, Pierce County (26) sites (Tables 5,6). Of 142 juveniles released by fall 1997, 61 had been recaptured at least once by fall 1998 (K. Slavens, unpubl. data). Each was weighed and found to have grown significantly since release. Visual surveys suggest that the survival of these head-started turtles is better than is indicated by the recapture information. Re-sightings of juveniles indicate that the program is likely to be successful at producing recruits that will eventually bolster the breeding population. Size distribution of captured turtles appears to be showing an increase in the smaller size classes (Fig. 5).

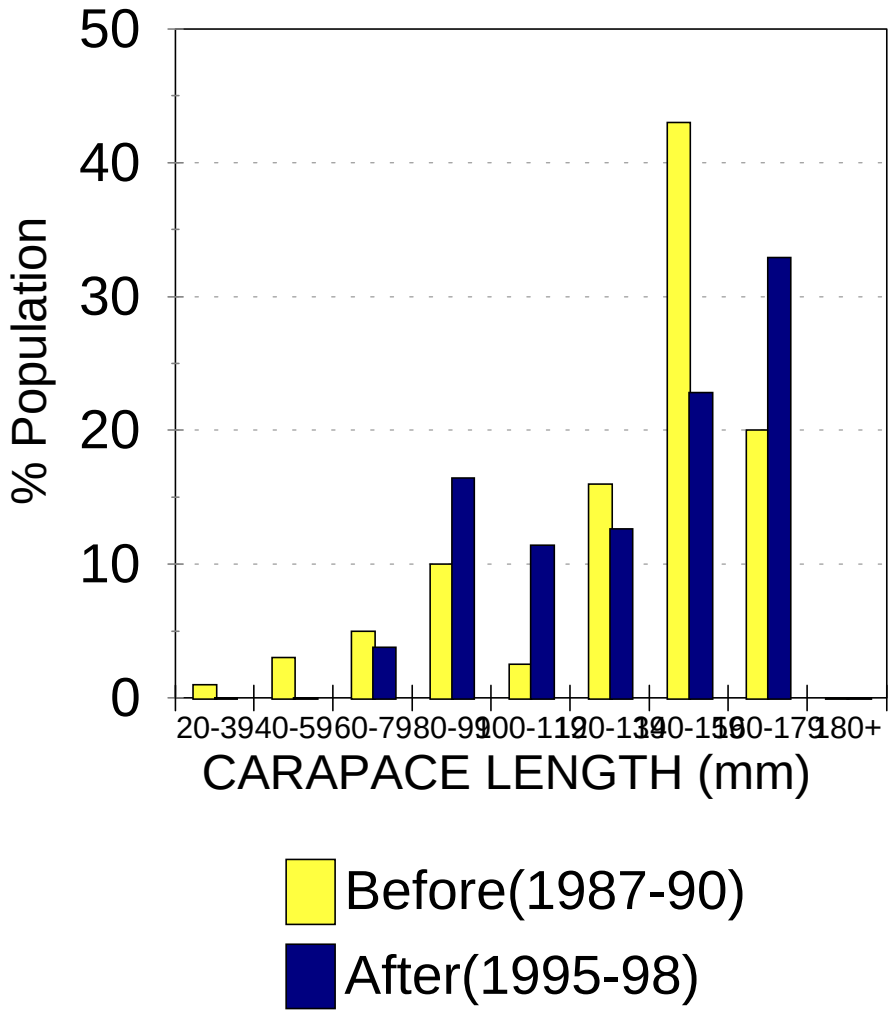

Figure 5. Carapace length of pond turtles in Klickitat County before (n=82, Holland 1991b) and since initiation (n=79) of headstarting of hatchlings.

Predator removal. To further improve the survival of juvenile turtles, considerable effort has been directed toward the removal of exotic predators such as bullfrogs and warmwater fish. Bullfrog control efforts were initiated under permit from the Department in the summer of 1990 Slavens (1992a). Bullfrogs were killed using a variety of techniques including spear and fishing gear. Bullfrogs and bullfrog tadpoles were also removed opportunistically in the course of other work such as when tadpoles were captured in hoop traps set for turtles. During May and June, the shorelines of ponds were searched for bullfrog egg masses and those discovered were removed using a dip net. Introduced warmwater fish (bass, bullheads, pumpkinseed, and bluegills) were gill-netted and removed from the Klickitat lake during a one-time seining operation in 1991. Other fish, primarily bullheads, were removed when caught in hoop traps incidental to turtle trapping. Control efforts at the Klickitat County sites have resulted in the removal of about 500 bullfrogs, 250 bullfrog tadpoles, over 175 bullfrog egg masses, over 400 kg (850 lbs) of
warmwater fish, and 2 red-eared sliders. In addition, a local aquaculturist was employed by Woodland Park Zoo in 1998 to find and remove bullfrog egg masses.

Habitat use research. The climate and vegetation at the Skamania County pond complex are similar to areas in the south Puget Sound region, so the area was studied to answer questions about habitat use in a moist, forested environment. This information was also used to help characterize types of sites that should be considered for future reintroductions in the south Puget Sound area.

Since 1995 pond turtles have been trapped and equipped with transmitters, and their movements monitored from May through December and data collected on nest and overwintering sites. Monitoring was limited to twice per week in early summer and once per week after that continuing into December.

Because grazing had recently been discontinued at the Skamania ponds, the grass in the open pasture areas had grown tall and thick. In an attempt to determine how turtles might use these areas, broad paths were mowed through the tall grass. It was expected that turtles might show preference for mowed areas for both travel routes and, possibly, for nesting. The turtles often moved through the tallest and densest of grass rather than the paths that had been mowed.

Reintroduction. An investigation was conducted in 1995-96 to locate a site for the first reintroduction of captive-bred western pond turtles to the Puget Sound lowlands. Survey forms from previous turtle surveys were reviewed and sites were selected for field evaluation. In addition, areas of the south Puget Sound region with naturally open vegetation, such as the oak woodlands of Pierce and Thurston County, were reviewed. National Wetlands Inventory maps were used to find additional potentially suitable wetlands.

Criteria were developed to evaluate potential reintroduction sites. Desired conditions were:

- a complex of small ponds near sea level,
- abundant emergent basking sites,
- isolated by at least one half mile from busy roads and other centers of human activity,

- isolated from large bodies of water and streams
- emergent vegetation and a mud bottom,
- abundant invertebrate and larval amphibian prey,
- few or no exotic predators like largemouth bass and bullfrogs,
- diversity of upland habitats, including open, grassy areas for nesting and dense clumps of deciduous trees or shrubs for overwintering.

Twenty-one sites were visited and evaluated during 1995-96 (Appendix B). Several sites had habitat conditions conducive to successful reintroduction including Camp Pond in Mason County, Nisqually Lake on Fort Lewis in Pierce County, and a pond complex near Lakewood. The Lakewood pond complex was selected for the first reintroduction in part because the property is owned by the Department of Fish and Wildlife. The ponds are permanent, free of exotic aquatic predators, surrounded by open, grass-dominated vegetation, and are beginning to develop a deep silt bottom with abundant emergent and aquatic vegetation. The fence surrounding the site was repaired and a new section of fence was constructed so turtles would be retained within a 5 ha (12+ acre) area. A screen was installed over the stream outflow culvert and emergent basking logs were installed.

Releases were conducted in summer to give the turtles time to acclimate to the ponds prior to overwintering. During July and August 1996, 16 captive bred pond turtles at least one year of age were released into the pond complex. Seven of the 15 juveniles selected for release were large enough to carry transmitters which were glued to their carapaces prior to release. Additional captive bred turtles were released at the site in 1997 (6), and 1998 (5). Behavior, growth, and survival are being monitored.

Interagency survey plan. A draft *Western Pond Turtle Survey and Monitoring Plan* has been developed by the Interagency Western Pond Turtle Working Group (Barkhurst et al. 1997). The plan describes techniques and a standard protocol for inventorying and monitoring western pond turtle populations.

FACTORS AFFECTING CONTINUED EXISTENCE

Natural Factors

The western pond turtle has a long life span, requires 10 or more years to reach reproductive age, and has a low rate of recruitment. The vagaries of Pacific Northwest weather probably result in high variation in hatching success. The combination of these factors makes this species especially sensitive to any increase in chronic sources of mortality or other factors that affect reproduction and recruitment. Even relatively minor reductions in recruitment can affect the long term viability of a population, but due to the long life span of this species, changes of this nature

may not be immediately evident. Turtles may persist in an area for extended periods even after the population is no longer successfully reproducing.

Habitat Loss and Degradation

In the Puget Sound region, the western pond turtle was reduced to near extirpation by historical habitat loss and exploitation. Though wetlands are now generally protected by regulation, there are few wetlands suitable for pond turtles left in Puget Sound. Wetlands become unsuitable as the adjacent uplands that turtles need for nesting continue to be altered. Human population increases and concomitant development will continue to alter or eliminate habitat for nesting, increase the rate of predation on nesting females, nests, or hatchlings, and/or expose hatchlings to hazardous post-hatching conditions. Though depredated nests have not (either with or without predator exclosures) been found in the Columbia Gorge study areas, predation on nests of other turtle species is higher near ecological edges (Temple 1987), such as those created by human activities.

Alteration of aquatic habitats, by water diversion projects or similar situations, may impose considerable hazard and hardship on moving turtles and result in higher than normal levels of mortality. Overland movements by western pond turtles increase their vulnerability to predators and other mortality sources. Vehicular traffic on roads which traverse western pond turtle habitat may cause significant mortality.

Interspecific Relationships

Introduced species have changed the ecological environment in the region for pond turtles. As significant predators on hatchling and small juvenile western pond turtles, exotic species such as bullfrogs and warm water fish seem to reduce survivorship and alter recruitment patterns (see discussion under Mortality, page 13). Raccoons are major predators on turtles and turtle eggs (Christiansen and Gallaway 1984), and may be abundant in suburban areas due to the absence of larger native predators and the availability of refuse, pet food, and other man-associated food sources.

The introduction of opossums from the southeastern United States added another potential predator of turtle nests and hatchlings. Opossums are known to eat hatchling painted turtles and snapping turtles (Hamilton 1958; cited in Gardner 1982), and they are a major predator of ground nesters, such as waterfowl (VanDruff 1971; cited in Gardner 1982). Opossums seem to be particularly suited to the mix of urban/suburban/rural habitat that now exists in the Puget Sound area; they are now very abundant and may pose a serious problem for recovery efforts. Opossums are not presently a problem for the Columbia Gorge populations.

Sunfish compete for invertebrate prey. Carp muddy previously clear waters (Lampman 1946). This can influence the densities of zooplankters that can be important in the diet of hatchlings and young turtles (see Holland 1985b). Carp alter aquatic habitat when feeding on submerged and emergent vegetation. Introduced turtles, such as sliders, snapping turtles (*Chelydra*

serpentina), and painted turtles (in western Washington) may compete with pond turtles and expose them to diseases for which pond turtles have no resistance. The potential for disease is greatly increased when sick pet turtles are released. In California, Oregon, and Nevada, a total of 17 species of exotic aquatic or semi-aquatic turtles have been found in pond turtle habitats (Holland and Bury 1998).

Cattle trample and eat the microhabitat required by hatchlings along watercourses and may crush nests. Dogs occasionally mutilate turtles (D. Holland, pers. obs.).

Disturbance. The western pond turtle appears to be relatively sensitive to disturbance. Disturbance may affect the frequency and duration of basking or foraging behavior, which may be particularly important for gravid females. Interruption of basking may lead to a delay in the maturation and deposition of eggs, leading to a decrease in hatching success or overwinter survival (Holland 1991c). Boat traffic and fishing may influence western pond turtle behavior or cause direct mortality.

Contaminants

The effect of biocontaminants on western pond turtles is largely unstudied. Bury (1972b) reported on the effects of a diesel spill on a California stream fauna. One western pond turtle was among the nearly 4,500 vertebrates killed and 30 pond turtles captured over one month after the spill had swollen necks and eyes, and sloughed off pieces of epidermis on their appendages. Given the long lifespan of turtles and their position as a tertiary consumer in the food chain, they may act as bio-accumulators of certain contaminants such as PCBs and heavy metals, a situation known to occur in other turtle species (e.g. common snapping turtle [Helwig and Hora 1983]).

CONCLUSIONS

The number of western pond turtles in Washington is critically low and populations have been extirpated from most of the species' historic range. Significant factors causing decline of pond turtle populations are still unknown. The species now has a very restricted distribution and is highly vulnerable to natural and catastrophic events, such as extreme weather or disease outbreaks.

The Klickitat and Skamania County populations of western pond turtle are both small, totaling only 250-350 individuals. Bullfrog predation of juveniles may limit recruitment and render both populations unviable. Most small turtles observed in these populations are marked turtles that were head-started at the Woodland Park Zoo and released at a size too large for bullfrogs to swallow (McAllister et al. 1996). Captive bred-turtles released at the Lakewood pond complex may be the only remaining population with juveniles in the Puget Sound lowlands.

Population stability that does not require continued human intervention will likely only be achieved with major reductions in sources of turtle mortality. Many sources of mortality have

been created or exacerbated by humans, including the introduction of bullfrogs, opossums, and warmwater fishes, the removal of turtles for pets or food, the building of roads through uplands used by turtles, and the creation of conditions that support high numbers of native nest predators such as raccoons and skunks. These mortality sources may need to be reduced to provide for future growth and stability of western pond turtle populations.

The population growth and the security that comes with larger population size will require continued human involvement. Maintenance of extant populations will require habitat acquisition, protection and restoration, predator control to eliminate bullfrogs and exotic fishes from turtle habitat, captive breeding and reintroduction, and head-start programs for hatchlings. In the absence of management, it is highly unlikely that western pond turtle populations would recover, and the population would likely slowly decline to extinction because of inadequate recruitment.

PART TWO

RECOVERY

RECOVERY GOALS

The goal of the western pond turtle recovery program is to re-establish self-sustaining populations of western pond turtles in the Puget Sound/Puget Trough and Columbia Gorge recovery zones (Fig. 6)

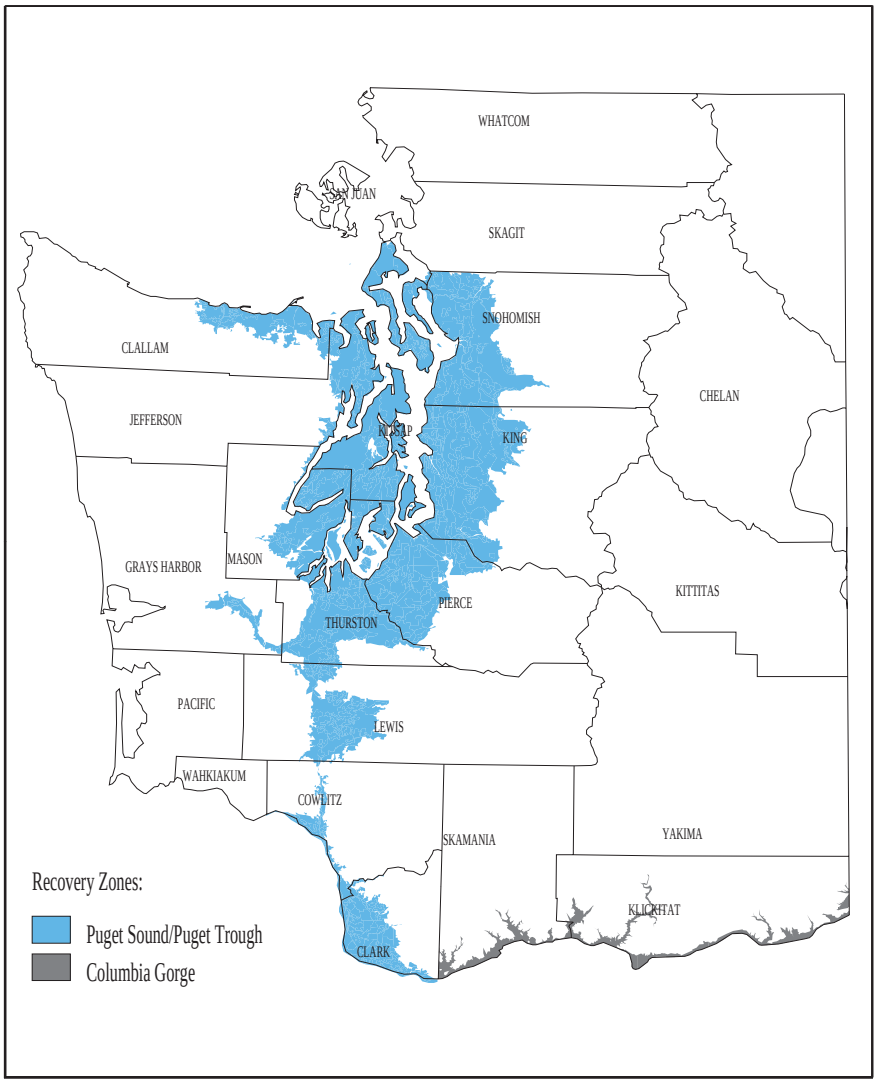

Figure 6. Western pond turtle recovery zones in Washington

RECOVERY OBJECTIVES

The western pond turtle will be considered for downlisting to State Threatened status when:

1. The Puget Sound/Puget Trough recovery zone supports at least two sub-populations of ≥200 western pond turtles, comprised of no more than 70% adults (≥120 mm carapace length) that are sustained through natural recruitment. One of the two sub-populations must inhabit a wetland complex of >2 wetlands.

2. The Columbia River Gorge recovery zone supports at least three sub-populations of ≥200 western pond turtles, comprised of no more than 70% adults (≥120 mm carapace length) that are sustained through natural recruitment. Two of the three sub-populations must inhabit wetland complexes of >2 wetlands.

3. The wetland and surrounding upland nesting habitat is secure from development and excessive human disturbance.

The western pond turtle will be considered for downlisting to State Sensitive when:

1. The Puget Sound/Puget Trough recovery zone supports at least three sub-populations of ≥200 western pond turtles comprised of no more than 70% adults (≥120 mm carapace length) that are sustained through natural recruitment. One of the two sub-populations must inhabit a wetland complex of >2 wetlands.

2. The Columbia River Gorge recovery zone supports at least four sub-populations of ≥200 western pond turtles, comprised of no more than 70% adults (≥120 mm carapace length) that are sustained through natural recruitment. Two of the four sub-populations must inhabit wetland complexes of >2 wetlands.

3. The wetland and surrounding upland nesting habitat is secure from development and excessive human disturbance.

Rationale

Recovery objectives call for establishing populations of 200 or more turtles with a relatively normal age-class distribution. Areas selected for re-establishment and recovery will have the potential to support these numbers. Populations of 200 may be the minimum that could be expected to be more or less viable (D. Holland, pers. comm.). Stable and healthy populations in Oregon and California typically are about 50-70% adults (Holland 1994, R. B. Bury, pers. comm.). Stability indicates that these populations have had sufficient recruitment to sustain the population.

Recovery objectives require that pond turtle populations be sustained through natural recruitment of wild juveniles. This can be determined by mark-recapture methods, or by the presence of all size classes of juveniles 15 years after the cessation of headstarting or captive-rearing. Female pond turtles in the wild may be 14 or more years of age before they produce their first eggs.

The establishment of multiple sub-populations that are relatively isolated from each other (e.g. separate watersheds) may slow or prevent the spread of disease during an outbreak, and reduce the likelihood that all the sub-populations would be affected by infestations of exotic plants, predators, or competitors at the same time. Populations that inhabit large complexes of multiple bodies of water (ponds and lakes) may be less likely to be wiped out by a single catastrophe (e.g. chemical spill). Pond and lake complexes may offer a greater variety of micro-sites for wintering, aestivation, and hiding cover. Dry native oak/prairie uplands in the vicinity of pond and lake complexes will provide higher quality habitat with less intensive management requirements than
other upland sites.

Habitat would be considered secure if it is publicly owned or protected from development by permanent conservation easements or other covenants, and managed with the protection of turtles and other wildlife as a priority.

The recovery zones (Fig. 6) cover a larger area than the conservative depiction of the pond turtle's historic range (Fig. 1, page 4) to allow consideration of additional potential reintroduction sites. Some turtle populations may never have been reported. The Puget Sound/Puget Trough recovery zone encompasses the Woodland/Prairie Mosaic and Puget Sound Douglas Fir Zones described by Cassidy (1997). We excluded those counties north of Snohomish County for which we have no pond turtle records. This region may be unsuitable for pond turtles. The Klickitat and Skamania County turtle populations are located in ecologically very different areas and were not well captured by any described vegetational zones. The Columbia Gorge recovery zone encompasses areas of Klickitat and Skamania counties from 0-300 m in elevation, with the upper elevational limit established after review of the elevational range of Washington pond turtle records.

RECOVERY STRATEGIES AND TASKS

1. Inventory and monitor the western pond turtle in Washington.

1.1. Follow up sightings at new locations with surveys or trapping to confirm western pond turtle presence.

Determine the ability of the observer to distinguish pond turtles from other species, and follow up highly reliable sightings with emergent basking surveys and trapping.

1.2. Monitor western pond turtle numbers through periodic surveys.

Conduct annual emergent basking surveys to derive an estimate of minimum population size and to assess the number of turtles in adult and subadult age classes (ages 3 and older). Conduct mark-recapture at each site at least every 5 years, and each year at sites where intensive head-start work is conducted.

2. Conserve and enhance the western pond turtle population.

Head-starting and captive breeding should be continued until populations are sustainable without such intervention. Factors limiting the numbers and breeding success of western pond turtles should be identified and management strategies developed and implemented to reduce or eliminate their effects. Remove predators or manipulate habitat characteristics to reduce habitat suitability for the predator species.

2.1. Maintain head start program to improve survival of hatchlings.

Continue head starting of wild hatchlings, and evaluate their survival and growth using mark-recapture methods.

2.2. Continue captive breeding to provide juveniles to re-establish a breeding population in Puget Sound/Puget Trough Recovery Zone.

Produce and head-start hatchlings for release at reintroduction sites in the Puget Sound/Puget Trough recovery area. Evaluate and improve methods and monitor annual survival of released juveniles. Increase the number of breeding adult turtles in the program through augmentation from Willamette Valley populations in Oregon or discovery of additional turtles in the Puget Sound region.

2.3. Establish new populations of turtles.

Establish additional turtle populations in both the Puget Sound/Puget Trough and Columbia Gorge recovery zones. Release of head-started captive bred and wild hatchlings, and translocations of adult wild turtles from the closest populations will be needed to establish new populations.

2.4. Control bullfrogs and other predators.

Until better methods are developed, bullfrogs can be reduced in number by killing adults through gigging (spearing), gun shot, angling, trapping and other methods. Egg masses can be dip-netted and removed from the ponds. Tadpoles can be captured in funnel traps or netted and removed. These techniques, used in combination, can reduce bullfrog densities and increase survival of turtle hatchlings. In areas that are isolated from large source populations, complete eradication should be attempted.

2.5. Control nest predation.

Site specific control should be implemented when needed which might include: 1) fencing nesting area to inhibit movements of raccoons and opossums, 2) protecting nests with predator excluding wire covering, and 3) trapping of mammals.

2.6. Evaluate and reduce human disturbance in turtle habitat where necessary.

Where observations indicate that human activity seriously inhibits basking, or causes mortality, minimize impacts through road closures, or controlling access, fishing, or boating where possible.

3. Identify and manage habitat to maximize western pond turtle survival and productivity.

Habitat management for western pond turtles includes maintenance of open vegetation structure in the uplands to allow high sun exposure for incubating underground nests. Aquatic habitat should include logs or other emergent platforms for basking. Extensive shallow water areas with emergent and aquatic vegetation also contribute to ideal habitat conditions for western pond turtles.

3.1. Identify wetlands that are suitable for western pond turtles.

To achieve recovery goals for western pond turtles in Washington, populations must be established in lake and pond complexes where the species is now absent. Complete habitat surveys of both recovery zones and evaluate sites so that the best habitat available can be used to re-establish turtles from the captive breeding program or from other wild populations. Rank and select sites based on suitability, ownership, size, and security from predation and disturbance.

3.2. Influence management of western pond turtle habitats.

3.2.1. Review local and agency land use plans and recommend measures to protect pond turtles and their habitats.

Assist local governments in fulfilling the intent of the Growth Management Act for conservation of endangered species including the pond turtle. City and county land use plans or critical wildlife habitat designations provide one tool for achieving these landscape objectives.

3.2.2. Influence management of public and private lands containing the best potential western pond turtle habitat.

After identifying the best sites for western pond turtles recovery, begin efforts to influence land use decisions. Discuss specific conservation recommendations and management actions with owners and managers.

Coordinate and cooperate on habitat protection and improvement. Work with adjacent landowners to minimize activities that might harm western pond turtles. Provide management recommendations to land owners and managers.

3.2.3. Evaluate and, if possible, obtain easements or title to lands through purchase, land exchange, or charitable donation.

Acquire parcels with wetlands and adjacent uplands used by pond turtles as opportunities arise. Landowners of sites with good potential habitat for reintroductions and recovery should be contacted to determine if they are willing to have pond turtles established on their land. Investigate offers of potential reintroduction sites by interested landowners.

3.2.4. Update the Department's Priority Habitats and Species Management Recommendations for western pond turtle.

3.3. Enhance, restore, and manage habitat for western pond turtles.

Western pond turtle habitat areas should be managed to provide the best possible conditions for western pond turtle nesting, foraging, and basking.

3.3.1. Maintain upland nesting and wintering areas.

Upland areas adjacent to ponds inhabited by turtles should be maintained in a relatively open condition, with grassy areas for nesting, and areas with trees (such as oak-pine) and shrubs for overwintering. Evaluate the affect of introduced blackberries on nesting areas and institute mowing, grazing, or chemical control if necessary.

3.3.2. Add logs or rafts for emergent basking sites where needed.

4. Undertake scientific investigations that will facilitate and enhance recovery efforts.

Much remains to be learned in Washington and throughout the range of the western pond turtle about causes of population decline, habitat requirements, sensitivity to disturbance, life span, and other biological processes. Washington biologists should refine survey methods to monitor western pond turtle abundance and the age structure of populations. They should also remain abreast of research and management activities elsewhere in western pond turtle range. Washington should be a supporter and, where possible, active participant in research designed to better understand western pond turtles and their needs.

4.1. Implement experimental reintroductions.

The reintroduction project initiated at the Lakewood pond complex should continue to develop to evaluate reintroduction methods and techniques that can be used to establish additional populations as habitat is identified and becomes available.

4.2. Determine whether genetic diversity in the Columbia River Gorge is of management concern.

Research conducted in the Columbia River Gorge indicated that genetic diversity is low. Determine, over the long term, whether this is of management concern. Evaluate the appropriateness of genetic analysis techniques and weigh the benefits of establishing additional populations to ameliorate concerns associated with low genetic diversity.

4.3. Determine how to efficiently assess population size and age structure.

4.3.1. Evaluate the use of emergent basking surveys to estimate numbers by comparing results with more intensive trapping, hand capture and mark-recapture efforts at different types of sites.

4.4. Identify the most important predators on turtles and nests and other sources of mortality and investigate methods of reducing mortality.

4.4.1. Determine the relative impact of different predators on turtle populations. Confirm that species thought to have significant adverse impacts on pond turtle populations really are detrimental.

4.4.1. Evaluate the population response to bullfrog control efforts.

4.4.2. Determine or develop the most effective means of bullfrog control, including removal or male sterilization programs.

4.4.3. Identify nest predators at each site and investigate control methods.

4.5. Determine if there are habitat features or population characteristics that contribute to maintaining a western pond turtle population in the presence of introduced aquatic predators.

4.6. Determine vegetation, soil, and other habitat features important to successful nesting by western pond turtles.

5. Establish information management systems and provide for information sharing.

Ready access to information gathered during surveys and investigations will be critical for management decision makers. A centralized information system, Wildlife Survey Data Management, exists at the Department of Fish & Wildlife. Summaries of data should be prepared periodically and distributed to interested persons and agencies.

5.1. Maintain repository for western pond turtle records.

Survey data should be submitted to Wildlife Survey Data Management at the earliest opportunity following data collection. Data entry, manual storage, and incorporation into a Geographic Information System should be done as appropriate.

5.2. Produce an annual western pond turtle status summary.

A report summarizing the status of the western pond turtle population, as well as management activities and their effects, should be updated every year.

5.3. Create information exchange network between appropriate individuals and agencies.

Regular exchanges of information between individuals and state and federal agencies involved in western pond turtle research and management will assist in assessment of local and regional trends and improvement of methods. This could be accomplished through a newsletter or web page. The Interagency Western Pond Turtle Working Group should meet periodically to discuss pertinent conservation issues.

6. Develop and initiate appropriate public information and education programs.

6.1. Evaluate education requirements of particular groups.

Investigate the need for development of education materials and programs for schools, community groups, and other special groups.

6.2. Promote media contact.

Produce news releases, public service announcements, and articles for newspapers and magazines.

6.3. Develop educational materials and participate in education programs.

Local support for efforts to enhance western pond turtle populations and their habitat may be gained through development of quality educational materials. Fact sheets should be developed for distribution within communities. Posters could also serve to communicate messages about the western pond turtle's special needs and the field

marks that distinguish western pond turtles from other turtles sometimes encountered in the wild in Washington. A video and/or slide show describing the plight of the western pond turtle and recovery efforts should be produced.

6.4. Develop identification guide to Washington turtles.

Produce a guide that includes the most commonly encountered introduced species and the two native turtles in Washington.

7. Evaluate and enforce restrictions designed to protect western pond turtles.

At this time, harming, harassing, or killing western pond turtles or destroying nests or eggs are the primary activities prohibited by law.

7.1. Evaluate regulations pertaining to release of exotic pets into wetlands.

The release of exotic turtles poses the threat of disease and the establishment of additional competitors to our native turtles. Investigate feasibility of a requirement to distribute educational materials with any pet turtle sold.

7.2. Evaluate regulations and their enforcement in pet turtle trade.

Wildlife regulations need to be revised to more effectively regulate exotic pets, to prevent the release and establishment of species with potential for depredating, competing with, or otherwise harming native wildlife species. The public needs to be educated on the impacts of releasing turtles.

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PERSONAL COMMUNICATIONS

David Anderson, District Wildl. Biol.
Washington Department Fish & Wildlife
White Salmon, Washington

D. Blackburn
Clark Community College
Vancouver, Washington

P. D. Boersma, Ecologist
University of Washington
Seattle, Washington

R. Bruce Bury, Ecologist
Biological Resources Div, USGS
3080 SE Clearwater Dr.
Corvallis, Oregon 97333

Justin D. Congdon, Research Ecologist
Savannah River Ecology Lab
Aiken, South Carolina

Marc P. Hayes
Department of Biology
Portland State University
Portland, Oregon

Dan C. Holland
334-A East Fallbrook
Fallbrook, California

Mark R. Jennings, Research Associate
California Academy of Sciences
San Francisco, California

Ruth Milner, District Wildlife Biologist
Washington Department Fish & Wildlife,
Mill Creek, Washington

Frank Slavens, Curator of Reptiles
Woodland Park Zoological Gardens
Seattle, Washington

Kate Slavens
Washington Dept. Fish & Wildlife
Seattle, Washington

Steve Sweet
Department of Biology
University of California
Santa Barbara, California

PART THREE

IMPLEMENTATION

IMPLEMENTATION SCHEDULE

The outline of strategies and tasks on the following pages identifies Washington Department of Fish and Wildlife responsibilities, provides estimates of annual expenditures, and assigns priority to recovery tasks. All tasks identified herein are subject to the availability of funding for their completion.

Priority 1: Actions necessary to halt the decline and prevent the extirpation of the species in Washington and to monitor the population.

Priority 2: Actions meant to maintain the benefits of Priority 1 tasks and to enhance recovery efforts by stabilizing and rebuilding the population.

Priority 3: Actions that provide direction for future conservation needs.

Acronyms and symbols used to indicate WDFW and cooperator responsibilities are:

WLM Wildlife Management
RES Wildlife Management-Research
WSDM Wildlife Survey Data Management
HAB Land & Habitat Resources
ENF Enforcement
VSE Volunteer Services & Education
WPZ Woodland Park Zoo

Step-down Outline and Implementation Schedule for Washington State Recovery Plan for the Western pond turtle, including Objectives, Strategies, and Tasks.

	Priority	Duration	Responsibility	Annual cost in thousands of $[a] 99	00	01	02	03
Monitor the Washington western pond turtle population.	1	-	-	-	-	-	-	-
1.1. Conduct follow-up surveys to detect western pond turtle presence	1	ongoing	WLM	1	1	-	-	-
1.2. Monitor western pond turtle numbers	1	ongoing	WLM	4	4	4	4	4
Totals				**5**	**5**	**4**	**4**	**4**
Conserve and enhance the Washington western pond turtle population.	1	-	-	-	-	-	-	-
2.1. Continue cooperative headstart program to improve survival of hatchlings.	1	ongoing	WPZ/WLM	10	10	10	10	10
2.2. Continue cooperative captive breeding to further boost the younger age classes.	1	ongoing	WPZ/WLM	3	3	3	3	3
2.3. Establish new pond turtle populations.	1	ongoing	WPZ/WLM	3	3	3	3	
2.4. Control bullfrogs and other predators.	1	ongoing	WLM	2	2	2	2	2
2.5. Control predation on nests	1	ongoing	WLM	0	0	1	1	1
2.6 Evaluate and reduce disturbance if necessary	2	periodically	WLM	.5	-	-	-	.5
Totals				**17**	**16**	**17**	**16**	**17**
Identify and manage habitat to maximize turtle abundance and productivity.	1	-	-	-	-	-	-	-
3.1. Identify wetlands that are suitable for western pond turtles.	1	2 years	WLM	2	2	-	-	-
3.2. Influence management of western pond turtle habitats.	2	ongoing	WLM, HAB	3	3	3	3	3
3.3. Enhance, restore, and manage habitat for western pond turtles.	2	ongoing	WLM, HAB	2	3	4	4	4
Totals				**7**	**8**	**7**	**7**	**7**
Undertake scientific investigations that will facilitate and enhance recovery efforts.	1	-	-	-	-	-	-	-
4.1. Continue experimental reintroductions.	1	ongoing	WLM	2	2	2	2	2
4.2. Determine advisability of increasing genetic diversity.	2	2 yr	WLM	5	5	-	-	-
4.3. Determine how to efficiently assess population size and age structure.	2	2 yr	WLM	-	3	3	-	-
4.4. Identify predators and other mortality sources, develop control methods	1	4 years	RES/WLM	3	15	20	20	20
4.5. Determine if habitat features allow coexistence of turtles and introduced aquatic predators	2	3 years	RES	-	2	10	10	-
4.6. Characterize habitat features important to successful turtle nesting	2	when feasible	RES	3	3	3	-	-
Totals				**13**	**30**	**38**	**32**	**22**
Establish information management and retrieval systems.	3	-	-	-	-	-	-	-
5.1. Maintain repository for western pond turtle records.	3	ongoing	WSDM	.5	.5	.5	.5	.5
5.2. Produce a biennial western pond turtle status update.	3	biennial	WLM	.7		.7	-	.7
5.3. Create information exchange network between appropriate agencies.	3	ongoing	WLM	-	-	-	-	-
Totals				**1.2**	**.5**	**1.2**	**.5**	**1.2**

	Priority	Duration	Responsibility	Annual cost in thousands of $ 99	00	01	02	03
Develop and initiate appropriate information and education programs.	3	-	-	-	-	-	-	-
6.1. Evaluate education requirements of particular groups.	3	periodically	VSE	1	-	-	1	-
6.2. Promote media contact.	3	ongoing	VSE	.5	.5	.5	.5	.5
6.3. Develop educational materials.	3	2 years	WLM, VSE	6	-	-	6	-
6.4 Develop identification guide.	3	1year	WLM,VSE					
Totals				**7.5**	**.5**	**.5**	**7.5**	**.5**
Enforce restrictions designed to protect western pond turtles.	3	ongoing	HAB, ENF	.5	.5	.5	.5	.5
7.1. Evaluate regulations pertaining to release of exotic pets into wetlands.	3	1 year	HAB, ENF	-	3	-	-	-
7.2. Evaluate regulations and their enforcement in pet turtle trade.	3	1 year	HAB, ENF	-	3	-	-	-
Totals				**.5**	**6.5**	**.5**	**.5**	**.5**
Grand Total			**46.2**	**66.5**	**61.2**	**67.5**	**52.5**	

[a] Estimated costs identified are those incurred by WDFW only.

APPENDICES

Appendix A. Washington Administrative Code 232-12-297. Section 11 addresses Recovery Plans.

WAC 232-12-297 Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the forseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g., food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g., survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

8.1.1 The agency shall allow at least 90 days for public comment.

8.1.2 The agency will hold at least one Eastern Washington and one Western Washington public meeting during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a

management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within five years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended. [Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]

Appendix B. Summary of reconnaissance surveys of possible reintroduction sites, 1995.

Name of Site	Known historic site?	Comments
South Tacoma Game Farm (Lakewood ponds), Pierce Co.	Yes	Good open nesting habitat, 3 shallow ponds, access control; permanent water.
Camp Pond, Kitsap, Co.	No	Good potential, needs emergent basking sites, open nesting habitat present.
Nisqually Lake, Fort Lewis, Pierce Co.	Yes	Excellent, open oak/grassland surroundings; excellent aquatic habitat; bullfrogs present.
Northwest Trek, Pierce Co.	No	Good pond habitat, lots of open nesting habitat; bullfrogs present; intensive ungulate use.
Bald Hill Lake, Thurston Co.	No	Open oak/grassland area on N side; a little high in elevation; Largemouth Bass present.
Old Fort Lake, Pierce Co.	Yes	Shallow, no emergent basking sites; very open around margins.
Chambers Lake, Fort Lewis, Pierce Co.	No	Good aquatic and potential nesting habitat; bullfrogs abundant; high recreational use.
Bensten Marsh, McChord AFB, Pierce Co.	No	Shallow, may dry up occasionally; few emergent basking sites, rare plant site.
Talbot Marsh, McChord AFB, Pierce Co.	Yes	Partially filled, little open water, forested wetland.
Fern(=Koeneman) Lake, Kitsap Co.	No[a]	Numerous emergent basking sites, little potential nesting habitat.
Bay Lake, Pierce Co.	Yes	Forested and developed along much of shore; public access; poor site.
Headquarters pond, Kapowsin Tree Farm, Pierce Co.	No	Good aquatic habitat, many emergent basking sites; regenerating clearcuts only nesting habitat.
Fox Creek pond, Kapowsin Tree Farm, Pierce Co.	No	Good aquatic environment; forested-no nesting habitat.
Ehinger pond, Thurston Co.	No	Dries up periodically; assoc. with creek; thick reed canary-grass.

Name of Site	Known historic site?	Comments
Oak Patch Lake, Mason Co.	No	Good aquatic habitat, little nesting habitat, close to main road; bullfrogs abundant.
Long Marsh pond complex, Mason Co.	No	Good emergent basking, little open nesting habitat; bullfrogs present.
Unnamed ponds, Mission Creek headwaters, Mason Co.	No	Open water; good emergent basking sites;many bullfrogs and bass; shooting might be a problem.
Stimson Creek pond, Mason Co.	No	Shrub-scrub wetland, little open water.
Oyster Bay Road pond, Thurston Co.	No	tiny pond, fenced in back yard, surrounded by pasture; no emergent basking sites.
Whidbey Island pond, East Freeland, Island Co.	No	Good aquatic habitat and emergent basking sites; little open nesting habitat; bullfrogs present.
Whidbey Island pond, Island Co.	No	Surrounded by tall trees, few emergent basking sites; poor nesting conditions.

[a] site of 1992 record.