



Western Pond Turtle (*Actinemys marmorata*)

Conservation Status— The western pond turtle is classified as an ISSSSP Sensitive Species and an Oregon Conservation Strategy (OCS) Species (ODFW 2006) and as a Sensitive-Critical species in OR (ODFW 2008). In Washington, it is classified as a State Endangered Species (Hays et al. 1994), and in California it is listed as a Species of Special Concern. It is considered a Species of Concern by USFWS; a petition for listing under the ESA was found not warranted (USFWS 1993). Factors cited as limiting western pond turtle populations predominately include loss of wetland and adjacent upland habitat for nesting, and lack of juvenile recruitment due to high nest and hatchling predation (Hays et al. 1994, Bury and Germano 2008, Rosenberg et al. 2009). Natural Heritage Global Rank: G3G4 (not immediately imperiled); Oregon State Rank: S2 (imperiled).

Systematics & Distribution— Two subspecies of western pond turtles have been recognized. The northwestern pond turtle (*Actinemys marmorata marmorata*) occupied the range from northern California north to Washington and the southwestern pond turtle (*Actinemys m. pallida*) occupied the southern portion of the range, from San Francisco Bay south to Baja California (Seeliger 1945). Although recent research is in disagreement with delineation of clades, there is general agreement that northern populations show sufficient genetic differentiation from southern populations to be considered a distinct clade (Spinks and Shaffer 2005), and all of the populations in Oregon belong in the northern clade (reviewed in Rosenberg et al. 2009).

The range of the western pond turtle includes northwestern Baja California, Mexico, north to Puget Sound of Washington, restricted with few exceptions to areas west of the Sierras and the Cascade Mountains. In Oregon, the western pond turtle is most abundant in the drainages of the Willamette, Umpqua, Rogue and Klamath but occurs in lowland aquatic habitats throughout western Oregon (Rosenberg et al. 2009). In the Willamette River Basin, western pond turtles are most abundant south of Salem (Holland 1993, 1994; Adamus 2003), consistent with findings in the late 1930s and 1940s (Graf et al. 1939, Evenden 1948). Given both historical and recent understanding of distribution and abundance, the core of the range in Oregon has not contracted but some local populations have declined, especially in urban areas (Rosenberg et al. 2009).

Ecology— Western pond turtles (WPT) are found in both intermittent and permanent aquatic habitats. They inhabit moving water environments including sloughs, streams, and large rivers where deep pools exist, and still bodies of water including human-made ponds, irrigation canals, small lakes, reservoirs, marshes, as well as in oxbow lakes formed from larger rivers (Bury and German 2008, Ernst and Lovich 2009). From the few hatchlings that have been observed outside of the nest, shallow and slow moving waters may be habitat requirements (Rosenberg et al. 2009). WPT inhabit relatively remote landscapes (e.g., Reese and Welsh 1998b), rural (Holland 1994,

Adamus 2003), and urban (Spinks et al. 2003) environments throughout its range. WPT spend considerable time on land for overwintering, basking, dispersal, and searching for nesting sites (Bury and Germano 2008, Ernst and Lovich 2009). Adults may spend up to 7 or more months of the year on land, with the majority of the time spent at overwinter refugia (Reese and Welsh 1997, Rosenberg et al. 2009). WPT have been reported to travel up to 1.4 km (Ryan 2001) from their aquatic habitats to overwinter sites, but most movements to overwinter sites are <200m (Rosenberg et al. 2009). Western pond turtles overwinter at the bottom of the substrate of aquatic habitats, in undercut banks along streams, or in terrestrial refugia typically buried under 5-10 cm of leaf litter (Rathbun et al. 1992, Holland 1994, Reese and Welsh 1997, Rathbun et al. 2002, Vander Haegen et al. unpublished ms). Shrubby, open, and forested environments have all been used by WPT, although access to some solar radiation is important (Rathbun et al. 1992, Holland 1994, Rathbun et al. 2002). Oak savannas and upland prairies would provide the appropriate habitat if within approx. 200 m of water, and historically may have been a commonly used habitat type for nesting and overwintering.

Western pond turtles require terrestrial habitats for nesting. Nest habitat is usually nearly adjacent to or within 50 m of aquatic habitat in areas with compact soil and sparse vegetation consisting of primarily bare areas, grass, and/or forbs (Reese and Welsh 1997, Rathbun et al. 1992, Holland 1994, Rathbun et al. 2002). Suitable nest habitat near aquatic environments may often be limited (Holland 1994), particularly in urban settings (Spinks et al. 2003).

In Oregon, female western pond turtles construct and lay eggs from May – August, with most nesting conducted from June to mid-July (Rosenberg et al. 2009). Nests are shallow, approximately 7-12 cm below the surface (Ernst and Lovich 2009). Several clutches may be laid in a season, and some years an individual may not nest (Ernst and Lovich 2009). Clutches contain 1-13 eggs (Ernst and Lovich 2009), but averaged 7 in a study that included over 50 nests in the Willamette Valley (Holte 1998). Young hatch typically in 90-120 days (Lucas 2006, Bury and Germano 2008), and is related to temperature (Ernst and Lovich 2009). Although hatchlings may emerge in the fall, most overwinter in their natal nest, emerging the following spring (Rosenberg et al. 2009). Thus, many western pond turtles spend nearly a year on land from the egg stage to emerging as hatchlings, indicating important management considerations at their nest areas. Western pond turtles are sexually mature by 5-9 years (males) and 7-10 years (females), and may live up to 40 years or more (Bury and Germano 2008).

Western pond turtles are omnivorous and opportunistic feeders. Animal matter constitutes the majority of the diet, including larvae of aquatic insects, earthworms, mollusks, and crustaceans, and vertebrates such as tadpoles, frogs, and small fish. Plankton are common in many of the habitats where western pond turtles occur and this may be an important nutrient source (Bury 1986). Observations of western pond turtles scavenging fish and wildlife carcasses suggest that western pond turtles have a very opportunistic diet (Rosenberg et al. 2009).

Habitat Management/Restoration— There are several key issues that management and restoration activities could modify to improve conditions for western pond turtles. Factors limiting populations are not well understood. However, in some areas road mortality, area and quality of nest habitat, elevated nest and hatchling predation, and poor aquatic conditions may be most limiting. Competition and disease transmission from introduced pet turtles remains an

important threat, especially near urban areas. Management actions that have been recommended (Rosenberg et al. 2009) include:

- Provide sparse vegetation structure adjacent to aquatic habitat for nesting within 200 m of aquatic habitat; remove all woody plants in designated nesting areas and maintain good solar exposure
- Provide shallow water habitats with abundant aquatic vegetation for hatchling rearing habitat
- Maintain and increase deep pools in streams
- Provide open or open-woodlands for over-wintering within 200m of stream and river habitats
- Consider juxtaposition of terrestrial and aquatic habitat in relation to roads and recreation uses to minimize negative effects
- Manage recreation to minimize disturbance near turtle-use areas
- Remove invasive turtle species and improve education to eliminate releases of pet turtles

Non-Habitat Limiting Factors— Introduced species of turtles, usually released from the pet trade (Rosenberg et al. 2009) are a threat due to potential transmission of disease and increased competition for limited resources. Introduced smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and bullfrogs (*Rana catesbeiana*) have been speculated to cause declines in western pond turtles through predation of hatchlings but we are not aware of any studies that evaluated the magnitude of the predation and there is no evidence that these species are causing declines in western pond turtle populations (Rosenberg et al. 2009).

Western pond turtles live in many aquatic environments that are known to have high levels of contaminants, including major rivers that go through urban centers (e.g., Willamette River), and impoundments such as waste water treatment ponds and effluent ponds from lumber mill operations. A large number of contaminants were found in eggs collected near Fern Ridge Reservoir in the Willamette Valley, including organochlorines, PCBs, and metals (Henny et al. 2003). There is a potential for contaminants to affect the population dynamics of western pond turtles, particularly in areas subject to high contaminant loads.

Survey Methods— The two primary methods of surveys are trapping and visual surveys. Trapping surveys require permits and may harm turtles and should only be conducted by trained personnel and when the objectives of the study require capture. Most surveys for western pond turtles have used one or more protocols for visual surveys that were developed by the Interagency Western Pond Turtle Working, with the most recent iteration of the protocols reported in 2001 (Bury et al. 2001). Horn (2001) evaluated the protocols and concluded that the maximum number of turtles observed during any of 6 replications of visual surveys at 3 sites ranged from 40.3 % to 53.5% when compared to population estimations from captures. Standardized protocols using count data from either trapping or visual surveys will be limited in their rigor to allow for factors that affect the ability to detect turtles in a broad array of habitats and conditions, and this needs to be considered before designing and conducting population surveys. Given the difficulty in detecting western pond turtles, particularly in some habitats and

especially for younger age-classes, it is important to recognize that occupancy can be confirmed, but that the lack of detections may not indicate the absence of turtles.

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