Western Pond Turtle (*Clemmys marmorata*)

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Status

State: Species of Special Concern
Federal: None

Population Trend

Global: California State endemic; declining (Bury 1986)
State: Unknown
Within Inventory Area: Unknown

Data Characterization

The location database for the western pond turtle (*Clemmys marmorata*) within the inventory area includes 27 data records dated from 1981 to 2002. Of the 27 records, all are considered extant, and 9 are mapped at a "specific" precision level (within 80 meters) (CNDDB 2004).

All populations are recognized as western pond turtle, with two recognized subspecies: northwestern pond turtle (*C. m. marmorata*) and southwestern pond turtle (*C. m. pallida*). Genetic research supports the distinctiveness of the two subspecies (Gray 1995; Janzen et al. 1997). In this report, information applicable to the species overall is signified by the epithet *western pond turtle*.

There is ample information on the ecology of the western pond turtle and many peer-reviewed research studies; however current sizes and densities of western pond turtle populations in California are not well known. Information on dispersal, population structure, population dynamics, and the nature and dynamics of environmental factors affecting populations (including edge effects) is needed to effectively design and implement conservation plans. In addition, the current genetic diversity of existing populations should be investigated to determine metapopulation status, gene flow between populations, and long-term population viability.

Range

Western pond turtle is the only species in its genus that occurs in the western United States (Figure 1). Northwestern pond turtle occurs from Puget Sound in Washington south through the Oregon River drainage in central California, generally west of the Cascade-Sierra crest to the American River. The area of the Central Valley of California between the American River drainage and the

Transverse Ranges is considered a zone of intergradation between the two subspecies (Seeliger 1945; U.S. Fish and Wildlife Service [USFWS] 1999).

Today, western pond turtle occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada, but in greatly reduced numbers (Jennings and Hayes 1994).

Occurrences within the ECCC HCP/NCCP Inventory Area

Extant populations of the western pond turtle occur within the ECCC HCP/NCCP inventory area. This species is commonly found in Marsh Creek through Round Valley south to Morgan Territory. Within the inventory area the western pond turtle is also known from Black Diamond Mines and potential habitat occurs in ponds throughout the Vasco Caves area (S. Bobzien pers. comm.). According to the California Natural Diversity Database (CNDDB) there are 27 documented observations of western pond turtle within the inventory area, primarily in the Marsh Creek Watershed and in Kellogg Creek at Los Vaqueros Watershed (CNDDB 2004).

Biology

Habitat

Western pond turtles occur in a variety of aquatic habitats from sea level to elevations of 1,980 meters (6,500 feet). They are found in rivers, streams, lakes, ponds, wetlands, reservoirs, and brackish estuarine waters. (Holland 1994; Jennings and Hayes 1994.) Western pond turtles use aquatic habitats primarily for foraging, thermoregulation, and avoidance of predators. They prefer habitats with large areas for cover (logs, algae, vegetation) and basking sites (boulders or other substrates) and have been observed to avoid areas of open water lacking these habitat features (Holland 1994). The turtles use basking sites for thermoregulation. Western pond turtles can be found in waters with temperatures as low as 1ºC (34ºF) or as high as 39–40ºC (102–104ºF) (Jennings and Hayes 1994).

Western pond turtles overwinter in both aquatic and terrestrial habitats. Aquatic refugia consist of rocks, logs, mud, submerged vegetation, and undercut areas along banks. Terrestrial overwintering habitat consists of burrows in leaf litter or soil. The presence of a duff layer seems to be a general characteristic of overwintering habitat.

Foraging Requirements

Western pond turtles are omnivorous feeders, opportunistic predators, and occasional scavengers (Holland 1985a, 1985b, Bury 1986). The majority of their diet consists of crustaceans, midges, dragonflies, beetles, stoneflies, and

caddisflies, but pond turtles also feed on mammal, bird, reptile, amphibian, and fish carrion. Western pond turtles will eat plant matter and have been observed foraging on willow and alder catkins and on ditch grass inflorescences (Holland 1991b). Partial herbivory in adults may provide an important source of readily available nutrients and some proteins when animal food is unavailable. Adults, especially females, consume a greater percentage of plant material than juveniles (Bury 1986).

Reproduction

Western pond turtles first breed at 10–14 years of age (USFWS 1999). Most females lay eggs in alternate years. Clutch size ranges from one to 13 eggs, with larger females generally laying larger clutches (Holland 1985a, 1991a). Gravid females leave drying creeks from May through July to oviposit in sunny upland habitats, including grazed pastures. Nesting has been reported to occur up to 402 meters (1,391 feet) from water (Jennings and Hayes 1994), but is usually closer, averaging 28 meters (92 feet) from aquatic habitat (Rathbun et al. 2002). Incubation lasts 80–100 days, and the normal hatch success is approximately 70%. Nest predation rates are high and complete failure of nests is common.

Demography

Survivorship in western pond turtles is apparently dependent on age and sex. Hatchlings and first-year juveniles average only 8–12% survivorship; this rate may not increase significantly until turtles are 4–5 years old (USFWS 1999). Once the turtles reach adult size, survivorship increases dramatically, with an average adult turnover rate of only 3–5%. Adult males generally have a higher probability of survivorship than adult females, with skewed sex ratios reaching 4:1 (males to females). The apparent cause for this difference is a higher mortality experienced by females from predation during overland nesting attempts (Holland 1991a).

Behavior

Western pond turtles are not known to be territorial, but aggressive encounters—including gesturing and physical combat (Bury and Wolfheim 1973)—are common, and may function to maintain spacing on basking sites and to settle disputes over preferred spots. Competing individuals may push and ram each other, threaten one another with open-mouthed gestures, and occasionally bite one another.

Measured home ranges of western pond turtles average 1 hectare (2.5 acres) for males, 0.3 hectare (0.7 acre) for females, and 0.4 hectare (1 acre) for juveniles (Bury 1972). Males generally move farther than females or juveniles (Bury 1972), but there is little movement between drainages (Holland 1991b).

Western pond turtles commonly forage in late afternoon or early evening. They also bask intermittently throughout the day to maintain a body temperature of 24–32ºC (75–90ºF). In general, these turtles typically become more active in water that consistently reaches 15ºC (60ºF) (Jennings and Hayes 1994). They avoid extreme heat by moving to cooler areas on the bottom of pools.

In some parts of their range, western pond turtles are seasonally active, overwintering from October and November through March and April. However, in the Central Valley and along the California coast, they may be active throughout the year (Holland 1991a).

Ecological Relationships

Introduced species have altered the ecological conditions of many areas inhabited by western pond turtles. Sunfish compete for invertebrate prey and carp can cause turbidity (Lampman 1946), which can influence the densities of zooplankton important in the diet of hatchlings and young turtles (Holland 1985b). Introduced turtles, such as sliders (*Pseudemys scripta*), snapping turtles (*Chelydra serpentina*), and painted turtles (*Chrysemys picta*) may compete with pond turtles, exposing them to diseases for which they have no resistance (Hayes et al. 1999). In California, Oregon, and Nevada, 17 species of exotic aquatic or semiaquatic turtles have been found in pond turtle habitats (Holland and Bury 1998). Hatchlings and juveniles are preyed upon by a variety of vertebrate predators including certain fishes, bullfrogs, garter snakes, wading birds, and some mammals. Competitive interactions with other species have not been reported (Zeiner 1988).

Threats

Numerous factors, including loss, degradation, and fragmentation of habitat; disease; introduced predators and competitors; and other natural and anthropogenic conditions present ongoing threats to western pond turtle throughout 75–80% of its range (USFWS 1999; Holland 1991a).

Recent studies describe populations that have adults but few juveniles, indicating that little or no recruitment is taking place. Because pond turtles are long-lived, nonreproducing populations may persist in isolated wetlands long after recruitment of young has ceased (Holland 1991a; USFWS 1999).

Threats to this species specific to the ECCC HCP/NCCP inventory area include agricultural activities, habitat conversion in upland nesting habitats, and presence of non-native predators. Western pond turtle nesting sites could be affected during the incubation period by agricultural activities, leading to annual nesting failures (Jennings and Hayes 1994). In addition, cattle may trample and eat aquatic vegetation that serves as habitat for hatchlings, and they may crush pond turtle nests (Hayes et al. 1999). Bullfrogs, large mouth bass, and catfish are significant predators on hatchlings and small juvenile western pond turtles within

the inventory area (S. Bobzien pers. comm.). Stock ponds are common in the inventory area and likely provide important breeding sites for the species. A lack of maintenance of stock pond spillways can lead to ponds drying up silting in, reducing available habitat for western pond turtles.

Conservation and Management

The western pond turtle is a species of special concern in California. There are no recovery plans for this species. Recruitment is one of the major limiting factors for this species within the inventory area, therefore measures should be taken to protect upland nesting habitat from agricultural activities and habitat conversion. Suitable nest sites include sunny slopes within 150-feet of perennial aquatic habitat and containing egg laying substrate. Some biologists believe that grazing practices within the inventory area do not significantly reduce suitability of nesting habitat for pond turtles (S. Bobzien pers. comm.), but others believe cattle can reduce survivorship through trampling of eggs (Hayes et al. 1999).

To further improve the survival of juvenile turtles, effort should be made toward the removal of non-native predators such as bullfrogs and warm water fish from all aquatic habitats within the ECCC HCP/NCCP inventory area.

Modeled Species Distribution in HCP Study Area

Model Description

Model Assumptions

1. Core Habitat. All perennial streams, ponds, sloughs/channels and wetlands in all land cover types within the inventory area are considered core breeding habitat for western pond turtle. In addition, areas within a 150-foot radius of perennial aquatic and wetland habitats, excluding rock outcrops, vineyard, orchard and developed land cover types are considered suitable (core) nesting habitat for western pond turtles. Seasonal wetlands may not provide suitable breeding habitat for western pond turtles. However, these features were not separated from perennial wetlands in the land cover mapping so all wetlands are considered suitable breeding habitat.

2. Movement Habitat. All intermittent streams within the inventory area provide suitable movement habitat for western pond turtles. In addition, areas within 100-feet of seasonal streams provide suitable overwintering habitat for this species, excluding those seasonal streams and wetlands found in cropland, orchard, vineyard, and all developed land cover types.

Rationale

Core Habitat: The western pond turtle is a thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation (CNDDB 2004). Gravid females oviposit in sunny upland habitats, on grassy banks and in grazed pastures. Nesting has been reported to occur up to 402 meters (1,391 feet)

from water (Jennings and Hayes 1994), but is usually closer, averaging 28 meters (92 feet) from aquatic habitat (Rathbun et al. 2002). Nests have been observed in many soil types from sandy to very hard. Soil must usually be at least 10 cm (4 in) deep for nesting and nests must have a relatively high internal humidity for eggs to develop and hatch properly (Zeiner 1988). A female was observed laying eggs in grassland habitat approximately 150-meters (492-feet) from Marsh Creek in Round Valley (S. Bobzien pers. comm.).

Movement and overwintering habitat: Pond turtles overwinter in both aquatic and terrestrial habitats. Although the turtles need to live around water bodies, they can survive drought in the more arid regions by digging into the mud in dried up riverbeds. Terrestrial overwintering habitat consists of burrows in leaf litter or soil. In woodland and sage scrub habitats along coastal streams in central California, most pond turtles leave the drying creeks in late summer and return after winter floods. These turtles spend an average of 111 days at upland refuges that are an average of 50 meters (164 feet) from the creeks (Rathbun et al. 2002).

Model Results

Figure 2 shows the modeled potential habitat of the western pond turtle within the HCP/NCCP inventory area. Core habitat includes large reaches of Marsh Creek and Kellogg Creek, and the many ponds throughout the inventory area. Movement habitat is found throughout the western and central portions of the inventory area in intermittent streams. The documented occurrences of western pond turtle in this area correspond well to locations within core areas or in adjacent movement habitat and corridors.

Results of the habitat distribution model are based on application of the assumptions provided above using GIS. The model provides reasonable and conservative estimates for both core habitat and movement and overwintering habitat.

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Personal Communication

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