

Western Pond Turtles

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Western Pond Turtle at Bushy Lake (photo by Alexandra von Ehrenkrook)

Background

The Western Pond Turtle (WPT) (*Actinemys marmorata*) is California's only native freshwater turtle species. In 2015, the U.S. Fish and Wildlife Service initiated a status review for listing the Western Pond Turtle under the U.S. Endangered Species Act (USFWS 2015). The Western Pond Turtle is currently listed as a "species of special concern" in California (Thomson et al. 2016), "endangered" by the state of Washington, and "sensitive/critical" by the state of Oregon. Western Pond Turtles are listed and have final recovery plans in Washington (Hays et al. 1999) and conservation priorities in Oregon (Rosenberg et al. 2009). The taxonomy has been revised based on genetic research, and there are currently two recognized pond turtle species in California: Northwestern (*Actinemys marmorata*) and Southwestern (*Actinemys pallida*) (Spinks and Shaffer 2005; Spinks et al. 2010).

Bushy Lake has the Northwestern Pond Turtle species. This species is a Priority 1 Species of Special Concern in the southern part of the range (roughly corresponding to the range of the Southwestern Pond Turtle), and a Priority 3 Species of Special Concern elsewhere in California (roughly corresponding to the range of the Northwestern Pond Turtle (Thomson et al. 2016). Factors such as loss and degradation of aquatic habitat, habitat fragmentation, inadequate water

supply, wildfires, competition with non-native turtle species, disease, and nest depredation have resulted in the decline and local extirpation of pond turtles throughout the western United States (Ibid.). Changing climate conditions, especially ongoing drought and wildfires, magnify threats to pond turtle populations (Purcell et al. 2017). Urban populations of turtles are significantly threatened by the introduction of non-native turtles.

Pond Turtle Life History

Pond turtles are known to mate throughout the spring, summer and fall. Nesting occurs from mid-May through July (*Figure 1*) (USFWS 2015, Center for Biological Diversity 2021). Turtles hatch from eggs in August, and remain in their nests until late February-early March. Most female turtles create only a single nest, although there are records of double clutching (Goodman 1997, Germano and Bury 2001, Spinks et al. 2003, Germano and Rathbun 2008, Davidson and Alvarez 2020). At Bushy Lake, preliminary data indicates the probable peak nesting period for pond turtles is from late May through June. Clutch size ranges from 1-11 eggs per clutch (Holland 1994, Lovich and Meyer 2002, Germano and Rathbun 2008).

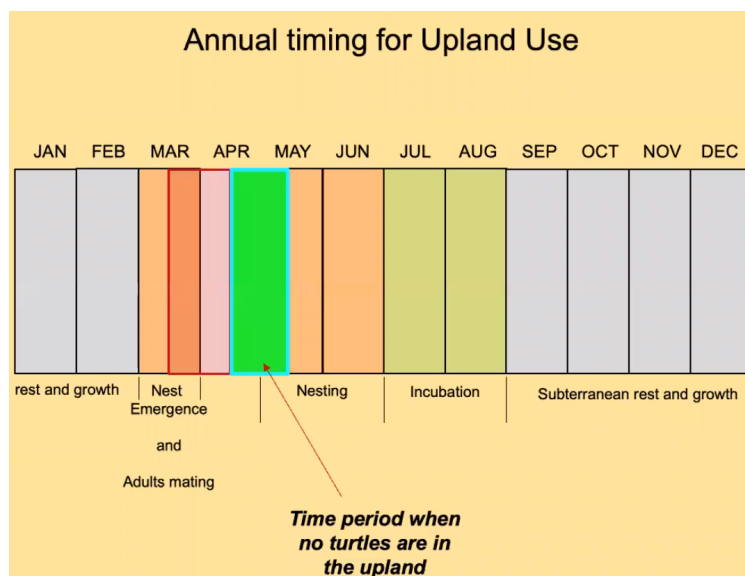


Figure 1. Annual timing of upland use for freshwater turtles (Alvarez 2020)

The distance to nests from the water for both the pond turtles and non-native (NNT) ranges from an average of 100 m to as far away as 500 m (Storer 1930, Holland 1994, Reese 1996, Holte 1998, Lovich and Meyer 2002, Davidson and Alvarez 2020). Upon emergence, it takes several weeks for hatchlings to reach the water due to their small size, large distance to the water, and the unknown direction of water (*Figure 2*) (Alvarez 2020). Hatchlings move between places of cover to avoid predators such as skunks, snakes, bullfrogs, and birds. They continue moving in arbitrary directions until a body of water is discovered (Ibid). A review of the literature on pond turtles indicates that there is a high degree of variability in life history characteristics;

inter-species variation; and highly variable habitat characteristics such as duration and frequency of precipitation and flooding; water temperature and chemistry, and predation, food web and competition characteristics of the aquatic ecosystem (Ernst and Lovich 2009, Bury et al. 2012, Davison and Alvarez 2020).



Figure 2. Western Pond Turtle (Actinemys marmorata) hatchling (photo by Jeff Alvarez)

Turtles at Bushy Lake

Sampling Procedures

At Bushy Lake, we utilize visual surveys, nesting surveys, and live trapping (catch and release) methodologies to assess the populations of native and non-native turtles. The results of our turtle monitoring indicate that Bushy Lake provides valuable habitat for a resident population of north-Western Pond Turtles. Our research showcases a resident population of pond turtles, with evidence of nesting activity.

Visual Encounter Surveys

For basking surveys, two or more trained individuals utilize binoculars and spotting scopes to determine how many individual turtles can be found at Bushy Lake on a given day. Data recorded includes date, time, weather conditions, number of turtles, size classes and identification of turtles if possible. Basking locations are recorded. Over two years of visual survey data has been recorded from the time turtles emerge from brumation (late February) to initiation of nesting in April. We have observed four individual pond turtles, and as many as 120 non-native turtles sited in one day. The majority of turtles observed are non-native Red-eared Sliders (*Trachemys scripta elegans*).

In 2020, four artificial, floating basking sites were created and installed at Bushy Lake. These platforms provide additional basking habitat, and wildlife cameras will be located to observe turtle use of the platforms. Northwestern Pond Turtles often avoid basking areas being utilized by more competitive, non-native turtle species (Jeff Alvarez, pers. comm). The concept of artificial basking substrate originated from the Moorhen Marsh Western Pond Turtle Enhancement Project with the Mountain View Sanitary District, Martinez, California (*Figure 3*).



Figure 3. Floating island at the Mountain View Sanitary District (MVSD) (MVSD 2020)

Visual Nesting Surveys

For nesting surveys, we observe nesting turtles in the upland areas surrounding the Bushy Lake aquatic habitats at different times of day. We observe the turtles behavior, specifically when turtles begin nesting and egg laying activity. We recorded turtle nests, including predated and exploratory nests, which are shallow, incomplete nests with no eggs (Alvarez and Davidson 2018). Field crews were trained in nest survey protocols by Jeff Alvarez of The Wildlife Project in May, 2021. Training included observing turtles exiting the water and moving across the upland area; observing turtles completing their nesting activities; and locating completed nests. The goal of nesting surveys is to identify active nests and protect the eggs from predators, such as skunks or racoons. When a nest is completed, biologists cover the nest with a wire fencing material to prevent predation (*Figure 4*). The June 6 fire disrupted nesting surveys. We were able to locate predated nests after this date, but did not observe new nests after the fire (*Figure 5*).

Three predated Northwestern Pond Turtle nests were identified: one in 2020 and two in 2021 (*Figure 6a*). Pond turtle nests and eggs are smaller in size than non-native turtle nests (*Figure 6*). Positive identification of predated pond turtle nests at Bushy Lake provides insight that successful Northwestern Pond Turtle nests may also exist.



Figure 4. Turtle nest at Bushy Lake covered with a wire screen to protect the eggs from predators (photo by Alexandra von Ehrenkrook)

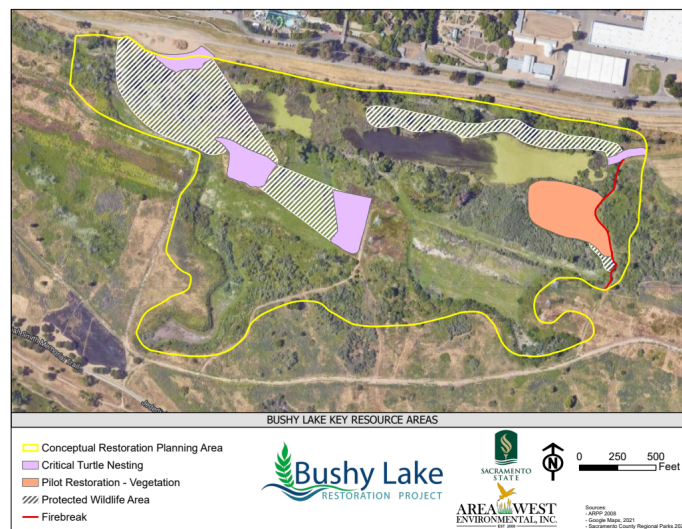


Figure 5. Map of key resources and turtle nesting habitat at Bushy Lake (map by Mikhela Maiken, Area West Environmental Inc.). Female turtles leave the aquatic area and move to these upland sites to lay their eggs. The beaveways south of Bushy Lake provide a conduit for mother turtles to move to the uplands to lay their eggs, and for hatchling turtles to return to the relative safety of Bushy Lake.

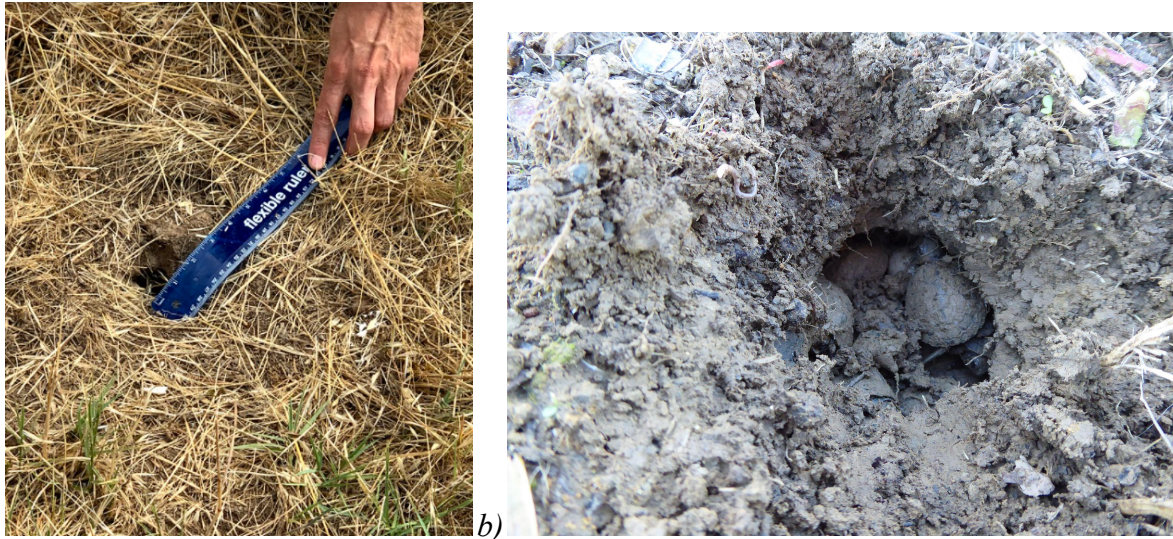


Figure 6. a) Predated Western Pond Turtle (*Actinemys marmorata*) nest observed in 2020 (photo by Alexandra von Ehrenkrook). You can see fragments of turtle egg shells rolled into little tortilla shapes above the nest, left after skunks ate the eggs. b) Western Pond Turtle (WPT) hatchlings in nest (photo by Jeff Alvarez)

Turtle Trapping - Live Capture-and-Release Surveys

For monthly live capture-and-release trapping surveys, hoop nets with bait are placed throughout Bushy Lake (Figure 7). The nets are retrieved within 24 hours for turtle processing. Measurements are taken for each turtle and include the carapace (top shell) and plastron (bottom shell) widths and lengths, shell height, and weight are measured (Figure 8). We additionally determine the sex of each turtle, if they are “gravid” and carrying eggs, and if they are a juvenile or adult. We utilize a file to create a small notch in the marginal scute, a hard peripheral shell layer. This marking informs future team members if a specific turtle has been previously captured. Lastly, turtles are released at their original point of capture.

Most notably, live capture-and-release studies have showcased a small resident population of male and female Northwestern Pond Turtles at Bushy Lake, and pond turtle nests have been documented.



Figure 7. Transporting hoop nets for live capture-and-release turtle surveys at Bushy Lake



*Figure 8. Measuring the max height of a non-native Red-eared Slider (*Trachemys scripta elegans*) at Bushy Lake (photo by Meredith Sierra)*

Threats to Northwestern-Pond Turtle

Additional threats to the pond turtles at Bushy Lake include habitat loss from competition from non-native turtles introduced into the ecosystem; nest predation; hydrosere succession (cattails and other vegetation encroaching into open water habitat); low water levels; wildfires; and collisions with bicycles or other obstacles.

Non-Native Turtle Species

One of the most dominant non-native turtles at Bushy Lake is the Red-eared Slider (*Figure 9a*), including a melanistic race of sliders and Yellow-bellied Sliders (*Trachemys scripta scripta*), which have been observed in abundance at Bushy Lake. Red-eared Sliders are native in eastern United States (Conant and Collins 1991). These turtles are larger and more aggressive than the pond turtles. In addition, another non-native turtle that has been observed at Bushy Lake is a

Peninsula Cooter (*Pseudemys peninsularis*) (Figure 9b). This turtle is native to Florida and grows up to 36cm in length, in comparison to the Northwestern Pond Turtle being only 14cm in length (Meylan 2006, Amiotte 2013). Lastly, a painted turtle (*Chrysemys picta*) has been observed at Bushy Lake; this species is native to eastern United States (Figure 9c) (Carr 1995).

We plan to reduce the competitive pressure on pond turtles through removing and permanently rehoming non-native turtles. Additionally, habitat restoration and management will help maintain a healthy, self-sustaining population of native turtles at the Bushy Lake site. We are considering an *in situ* protected nesting and hatching area to protect pond turtle reproduction. We also plan to educate the public about the problems with buying and releasing non-native turtles into the wild.

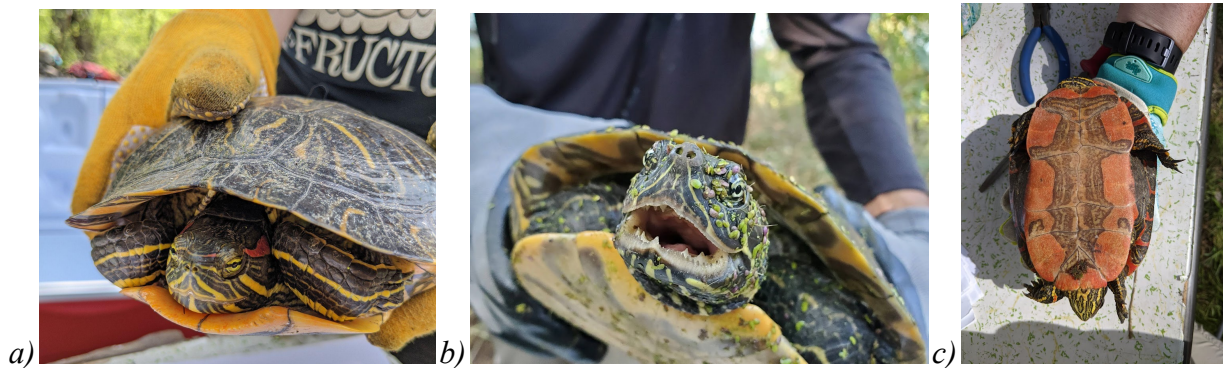


Figure 9. Left to Right: Red-eared Slider (*Trachemys scripta elegans*), Peninsula Cooter (*Pseudemys peninsularis*), and Painted Turtle (*Chrysemys picta*) at Bushy Lake (photos by Alexandra von Ehrenkrook)

Bicycle Collisions

Pond turtles face significant risk from human activity adjacent to Bushy Lake. We discovered significant pitting and shell damage on 65 newly captured turtles between March 2020 and June 2021 (Figure 10). Shell pitting is an indicator of bike strikes that occur when female turtles head to the uplands to lay their eggs, and are hit by bikes (Jeff Alvarez, pers. comm). The risk of collisions peak during turtle nesting season in late spring and early summer as female turtles emerge from the lake in search of upland nesting habitat. Bicycle strikes are harmful to turtles, disruptive to nesting processes, and dangerous to bicyclists. We hope to continue working with Sacramento County Parks to increase awareness of turtle nesting to the bicyclist communities in order to promote safety for individuals and Bushy Lake wildlife.

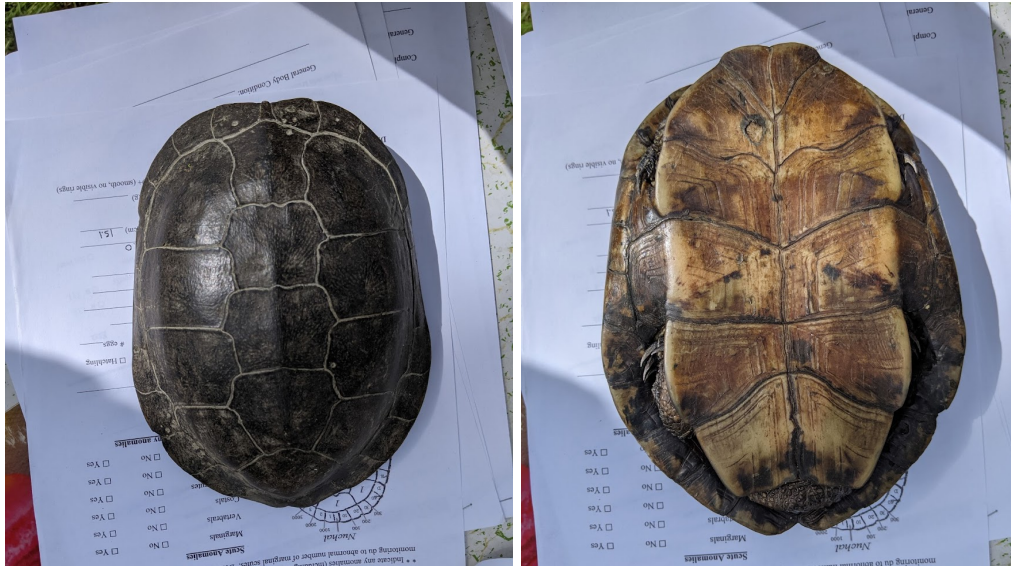


Figure 10. Female Western Pond Turtle (*Actinemys marmorata*) with pitting associated with bicycle strike (photos by Alexandra von Ehrenkrook)

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