

## *Actinemys marmorata* (Baird and Girard 1852) – Western Pond Turtle, Pacific Pond Turtle

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**SUMMARY.** – *Actinemys marmorata* (Family Emydidae) occurs in the Pacific States of North America from Baja California Norte north through Washington and, possibly, into southernmost British Columbia, Canada. Recent genetic studies indicate the presence of four groups or clades within the species, although historically there were two recognized subspecies. The species appears to be declining in abundance in the northernmost and southernmost portion of its range, but not in the core of its range from central California to southern Oregon. The primary threats are loss and alteration of both aquatic and terrestrial habitats. These losses fragment remaining populations and, perhaps, magnify the effects of introduced species through predation, competition, and epidemic disease(s). Historically, *A. marmorata* was collected for the food and pet trades. Most states now protect the species and, in Washington, it is listed as Endangered. Research is ongoing on many aspects of the species' ecology, but not all of the studies are published. Greater effort is needed to protect and manage aquatic habitats as well as nesting and overwintering sites in adjacent uplands.

**DISTRIBUTION.** – Canada (?); Mexico; USA. Pacific States of North America from Baja California Norte, Mexico, north through Washington and, possibly, into southernmost British Columbia, Canada.

**SYNONYMS.** – *Emys marmorata* Baird and Girard 1852; *Actinemys marmorata*; *Clemmys marmorata*; *Geoclemmys marmorata*; *Chelopus marmoratus*; *Melanemys marmorata*; *Clemmys marmorata marmorata*; *Actinemys marmorata marmorata*; *Emys marmorata marmorata*; *Emys nigra* Hallowell 1854; *Clemmys wosnessenskyi* Strauch 1862; *Geoclemmys wosnessenskyi*; *Clemmys hesperia* Hay 1903; *Clemmys marmorata pallida* Seeliger 1945; *Actinemys marmorata pallida*; *Emys marmorata pallida*.

**SUBSPECIES.** – None currently recognized, previously two: *A. m. marmorata* (Northern Pacific Pond Turtle) and *A. m. pallida* (Southern Pacific Pond Turtle). Genetic data suggest four phylogenetic clades.

**STATUS.** – IUCN 2007 Red List: Vulnerable (VU A1cd) (assessed 1996, needs updating); CITES: Not Listed; US ESA: Not Listed.



**Figure 1.** Adult female *Actinemys marmorata* from San Mateo Creek, Camp Pendleton, San Diego Co., California, USA. Photo by Dan C. Holland.



**Figure 2.** Adult male *Actinemys marmorata* from Fresno, San Joaquin Valley, California, USA. Photo by David J. Germano.

**Taxonomy.** — The phylogenetic relationships of the western pond turtle, *Actinemys marmorata*, are in a state of flux. Recent evidence suggests that the species is distinct from the other three species of the former group *Clemmys* in eastern North America (Bickham et al. 1996; Feldman and Parham 2001; Holman and Fritz 2001). Feldman and Parham (2002) and Parham and Feldman (2002) presented evidence that the western pond turtle should be placed in the genus *Emys*, along with the European pond turtle (*Emys orbicularis*) and the Blanding's turtle (*Emys* [= *Emydoidea*] *blandingii*), and this view has been adopted by others (Spinks et al. 2003; Spinks and Shaffer 2005). In contrast, Holman and Fritz (2001) and Stephens and Wiens (2003) believed that the western pond turtle is not closely related

to any extant species and should be placed in its own genus, *Actinemys*. The Turtle Taxonomy Working Group (2007) recorded it as “*Emys* or *Actinemys marmorata* Baird and Girard 1852 [formerly in *Clemmys*].”

The genus *Actinemys* is used in both of the most recent standardized names of North American herpetofauna (Collins and Taggart 2002; Iverson et al. 2008) and globally (Fritz and Havas 2007), which we follow here.

The first specimens of *A. marmorata* were collected in 1841 in the vicinity of Puget Sound (Washington) and described by Baird and Girard (1852) as *Emys marmorata*. *Emys nigra* was described by Hallowell (1854) from “Posa (Poso) Creek, Lower California,” which is in Kern County in the Central Valley of California (Bury, 1970), but this taxon has not been recognized recently. Seeliger (1945) described two subspecies: the northwestern pond turtle (*Clemmys* [= *Actinemys*] *marmorata marmorata*) and the southwestern pond turtle (*Clemmys* [= *Actinemys*] *m. pallida*). The northwestern subspecies has a relatively large inguinal scute compared to a smaller or no inguinal scute in the southwestern subspecies. In *A. m. marmorata*, the throat is light and contrasts with the darker sides of the head and neck; whereas *A. m. pallida* has a more uniform coloration of the throat and neck, often with dark vermiculations. A broad range of intergradation occurs from the American River south through the San Joaquin Valley, California (Seeliger 1945; Stebbins 2003).

Based on morphology, Holland (1992) found three groups in the taxon: a Columbia River form; a northern form occurring from Puget Sound to central California; and a southern form along the central coast of California south to Baja California. However, there are no published descriptions of these taxa. Using DNA fingerprinting, Gray (1995) reported low levels of genetic variation within and among several populations throughout the range, although significant differences were present between northern and southern populations.

Recently, Spinks and Shaffer (2005) reported genetic differences indicating four un-named clades within *A. marmorata*, with the following distributions: 1) From the



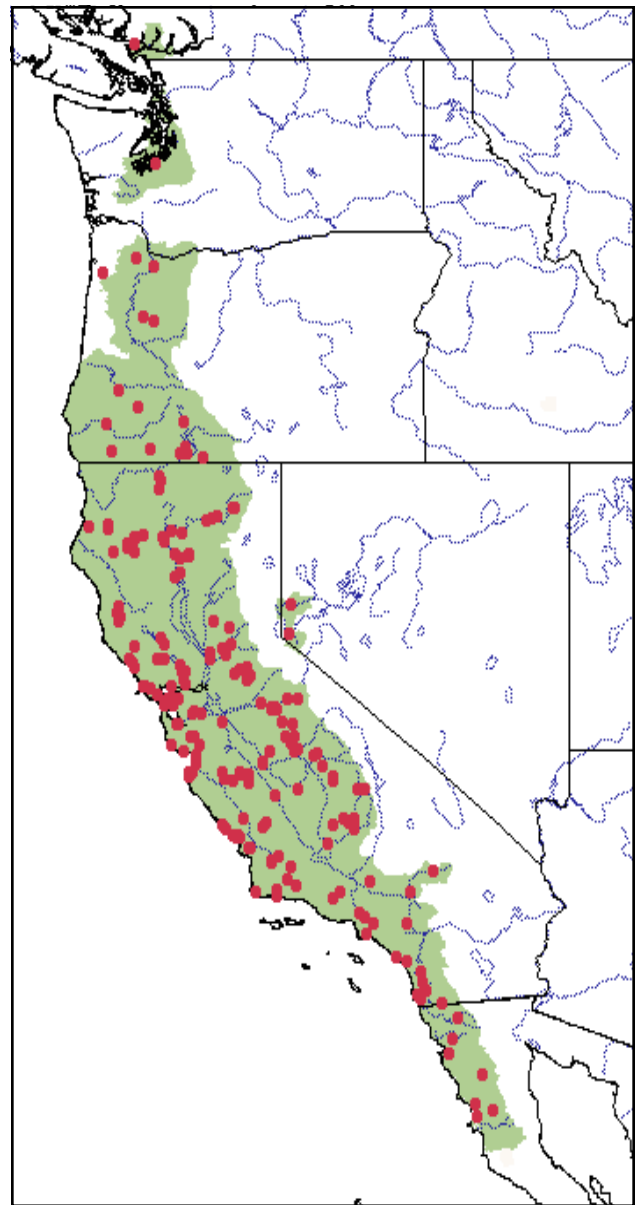
**Figure 3. Top:** Adult female *Actinemys marmorata* from Whiskeytown National Recreation Area, Shasta Co., California, USA. Photos by R. Bruce Bury. **Bottom:** Adult female *A. marmorata* from Fresno, San Joaquin Valley, California, USA. Photo by David J. Germano.

Traverse Mountains of southern California south into Baja California Norte; 2) The San Joaquin Valley and adjacent foothills; 3) Ventura and Santa Barbara counties in central coastal California; and 4) All the remaining populations to the north. These data suggest considerable genetic fragmentation within the species, especially in the southern half of the range. The new groupings do not follow the pattern of the earlier described subspecies, and we suggest waiting for additional data before these new groups are recognized as taxonomic units.

**Description.** — Male *A. marmorata* can be distinguished from females usually by a size of 120 mm carapace length (in some populations by 110 mm), when individuals are considered adults. Generally, adults range in size from 140–190 mm CL (Bury 1995; Lubcke and Wilson 2007). Hatchlings are 20–30 mm CL (Storer 1930; Feldman 1982; Lovich and Meyer 2002). Shell metrics appear to be related to geographic location, water temperatures and, perhaps, diet (Lubcke and Wilson 2007). The shell is low and broad, generally widest posterior to the middle (across the 8th marginal). Turtles in cool flowing waters, such as streams, may be more elongate than those living in standing waters, such as ponds and lakes (Lubcke and Wilson 2007). The carapace in adults is smooth and lacks a keel or serrations. Vertebral scutes are broader than long, and the first touches four marginals and the nuchal (Carr 1952; Ernst et al. 1994). The hind foot is webbed to the base of the claws (Ernst et al. 1994). The carapace coloration is usually dark brown or dull yellow-olive, with or without darker streaks or vermiculations. Many males in the Central Valley of California develop distinct yellow coloring on all or part of each marginal and costal scutes of the carapace. The plastron is cream or light-yellow in color, sometimes with dark areas on parts of the scutes.



**Figure 4.** Juvenile *Actinemys marmorata* showing growth rings; from Klamath Lake region, southern Oregon, USA. Photo by R. Bruce Bury.



**Figure 5.** Distribution of *Actinemys marmorata* in western North America. Red points = museum and literature occurrence records based on Iverson (1992) plus more recent and authors' data; green shading = projected distribution based on GIS-defined hydrologic unit compartments (HUCs) constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs (Buhlmann et al., unpubl. data), and adjusted based on authors' data.

Males differ from females in size, shell and soft-body characteristics. Males have a concave plastron in the femoral region, while the plastron in females tends to be flat. When the tail is extended, the cloaca is usually posterior to the edge of the carapace in males, but usually at or anterior to the margin in females. In males, the tail is thicker, the head slightly larger, and the snout more angular than in females. Males usually have light-colored throats that become lighter with age. Most females have a brown or yellow-brown throat with moderate to extensive flecking, essentially keeping the pattern and coloration of

juveniles. Males average a larger size than females in most populations, and reach a larger maximum size (241 mm CL) than females (192 mm CL; Lubcke 2006).

Although *A. marmorata* is the only native freshwater turtle from northern Baja California Norte to the central Willamette Valley in Oregon, it occurs with the western painted turtle (*Chrysemys picta bellii*) in northern Oregon and western Washington. The painted turtle is distinctively marked with a reddish plastron, olive-green or blackish-green carapace, and bright red and yellow stripes on the neck and legs. *Actinemys marmorata* is easily differentiated from the painted turtle; however, field identification of turtles is becoming complicated with the introduction of non-native turtles (Bury and Luckenbach 1977; Jennings 1987; Bury, in press). In particular, melanistic red-eared sliders (*Trachemys scripta elegans*) viewed from a distance may resemble adult *A. marmorata*.

**Distribution.** — *Actinemys marmorata* occurs from northern Baja California Norte, Mexico, north to the Puget Sound region of Washington, USA (Bury 1970; Nussbaum et al. 1983; Iverson 1986; Stebbins 2003). In Baja, they are only known from the Pacific slopes of the San Pedro Martir (Smith and Smith 1979; Welsh 1988; Lovich et al. 2007). Isolated populations occur in the Mojave River in the western Mojave Desert, California; the Carson River in Nevada; east of the Cascade Mountains in or near the Columbia River in Oregon-Washington; and the Puget Sound area in Washington. Records in the Truckee, Carson, and Humboldt rivers in western Nevada (LaRivers 1942; Banta 1963) are likely turtles originally imported as a source of human food (Cary 1889). Their genetic relationships are under study (Spinks and Shaffer 2005). There are other outlying locality reports that may represent introduced individuals or populations, or are mis-identified or mis-labeled specimens: one male collected along Canyon Creek, Grant County, Oregon (Black and Storm 1970); one juvenile taken in 1894 from along the Snake River, Jerome County, Idaho (Slater 1962); and two turtles collected in coastal British Columbia, Canada (Gregory and Campbell 1984; Matsuda et al. 2006).

**Habitat and Ecology.** — *Actinemys marmorata* occurs in a variety of permanent and intermittent aquatic habitats, including rivers, streams, lakes, ponds, marshes, vernal pools, and human-constructed environments such as ponds associated with waste-water, stock, and logging operations (Storer 1930; Germano and Bury 2001; Buskirk 2002). Prior to human settlement, there were few natural ponds or lakes within the range of the species, but some notable exceptions include the Klamath Lakes in Oregon and California, Clear Lake in northern California, the Tulare-Buena Vista-Kern Lake complex in the southern San Joaquin Valley of California, and back-dune ponds in coastal sand-dune complexes in central California. Streams, rivers, and artificial small ponds are the most common habitats for this species. Because much of the range of *A. marmorata* has a Mediterranean climate (mild,

wet winters; dry, hot summers), many natural watercourses and ponds are intermittent or exhibit greatly reduced flows in summer. Although considered an aquatic form, this turtle may spend considerable time on land every year. Based on radio-tracking studies, some turtles occur on land up to seven months out of each year (Reese and Welsh 1997; Rathbun et al. 2002). Turtles may aestivate in upland areas, but physiological studies are needed to confirm this. Turtles may also travel across terrestrial habitats at distances in excess of 1 km from water.

Habitats with abundant basking sites, underwater refugia, and standing or slow-moving waters are preferred conditions for this species. Along a stream in northern California, there was a high correlation between turtle abundance and the number of available basking sites such as logs or boulders (Bury 1972). Turtles in streams often take refuge in plunge pools, perhaps because these pools provide deep water for escape and lack swift currents. Turtles aggregate in these microhabitats at densities often several times that observed in swifter moving sections of creeks. In rivers, the species is most abundant in slower waters (e.g., pools) that are deep and have basking sites (Reese and Welsh 1998a). Emergent basking sites may include mats of vegetation, floating logs, or mud banks just above the water line. *Actinemys marmorata* in all habitats also engages in aquatic basking by moving into the warm thermal environment on top of submerged mats of vegetation or in shallow water. Basking sites can become crowded with turtles and, at these times, turtles may display frequent aggressive interactions (pushing, open-mouth gestures, biting) among all size and sex classes (Bury and Wolfheim 1979; Holland 1985a).

The species is omnivorous and a dietary generalist (Evdend 1948; Holland 1985a, b; Bury 1986; Goodman and Stewart 1998), feeding on the larvae of dragonflies, mayflies, stoneflies, caddisflies, midges, beetles, and other insects, as well as crayfish and other aquatic invertebrates (Holland 1985a; Bury 1986). Native fishes and anurans also are eaten, but these are minor items (< 10%) in the diet and may represent animals scavenged when dead or weakened (Holland 1985a; Bury 1986). Further, they may eat small to large amounts of vegetation, including filamentous green algae, tulle and cattail roots, water lily pods, and alder catkins (Holland 1985a; Bury 1986). *Actinemys marmorata* can employ neustophagia (modified gape-and-suck feeding) to obtain small prey items (such as *Daphnia*) off the water surface or in the water column (Holland 1985b; Bury 1986).

*Actinemys marmorata* occupies relatively small home ranges in stream habitats and moves over large areas in other habitats (Bury 1979; Goodman and Stewart 2000). In a California stream during one summer, males had a home range that averaged 1 ha of water surface, while the home range size over the yearly activity period (mostly summer) of females averaged only 0.3 ha and juveniles 0.4 ha (Bury 1972, 1979). Movements up and down this stream (based on mark-recapture from one summer to the next) differed

between adult sexes (mean values): males, 367 m; females 149 m; juveniles 145 m. *Actinemys marmorata* occasionally moves long distances within or among watercourses; a few turtles moved over 1 km in a three-year period, and one marked turtle moved more than 1.5 km in a two-week period (Bury 1972).

In the wild, *A. marmorata* are usually wary and secretive. Most individuals rapidly depart basking sites when disturbed by either visual or auditory stimuli of people (e.g., waving an arm, shouting) at distances of over 100 m. When resting or hiding, turtles often seek underwater refugia such as under rocks, boulders, root masses, in undercut banks, or under other debris, where they wedge themselves into the most inaccessible crevices available. Turtles disturbed in shallow water often remain motionless, or attempt to hide in or under floating vegetation or occasionally dig into the substrate.

Individuals appear to grow more slowly in the northern half of their range than towards the south. In northern California, males display secondary sexual characteristics at 110–120 mm CL (Bury 1972) and are 5–9 yrs old, and females are reproductive at 7–10 yrs old (Germano and Bury 2001). Females in the southern part of the range may reproduce at 4–8 yrs of age (Germano and Rathbun, in press; D. Germano, unpubl. data).

Like most turtle species, ages of young *A. marmorata* can be determined using scute annuli (Bury and Germano 1998; Germano and Bury 1998). At warmer sites, scute annuli are discernible for 6–10 yrs; whereas, at colder sites annuli form up to 16 yrs (Bury and Germano 1998). However, mark-recapture is the only way to age older individuals. Adult turtles may reach an age of more than 40 yrs in the wild. For example, we have recaptured adult turtles 30 yrs after they were first marked (Bury 1972, unpubl. data). One turtle marked as an adult in central Oregon in 1958 was recaptured in 1993 (D. Holland, unpubl. report). However, the relative proportion of “old” turtles in most populations appears low (Germano and Bury 2001). Most *A. marmorata* populations that we have studied consist of equal numbers of males and females and a large proportion of adult turtles (> 120 mm CL). However, most of these populations have a large proportion of turtles < 12 yrs of age, often with a number of turtles in the 1–4 yr age group (Germano and Bury 2001; Germano and Rathbun, in press; D. Germano and B. Bury, unpubl. data).

Parasites include external leeches and internal nematodes (Ingles 1930; Thatcher 1954; Bury 1986), although external parasites are rare. Hundreds of nematodes may occur in the intestine of a single individual (Bury 1986). Colonial protozoans may attach to some turtles in warm waters (Germano 2000). Predators include many carnivorous mammals (Bury 1972; Manning 1990): river otter, mink, raccoon, gray fox, coyote, and black bear. Avian predators may include bald eagle, osprey, great blue heron, and gulls (Holland 1994). Introduced bullfrogs (*Lithobates* [= *Rana*] *catesbeiana*) and fishes such as largemouth bass (*Micropterus salmoides*) are predators (Moyle 1973;

Nussbaum et al. 1983) on young turtles, but their effect on populations, if any, is unknown, and the two species often co-exist (Germano and Bury, pers. obs.).

The activity cycle of *A. marmorata* is largely determined by temperature (Bury 1972; Reese and Welsh 1998b; Rathbun et al. 2002). The species becomes most active when water temperatures are above 15°C. Turtles may be active year-round in warmer areas, but on a reduced level in the late fall and winter. Courtship and mating behavior has been observed from February–November (Holland 1988). Turtles have been observed emergent-basking on warm days in February, and have even been observed and radio-tracked moving under the ice in frozen montane lakes in central Oregon when water temperatures were approximately 1–2°C (D. Holland, unpubl. report). Turtle activity is usually observed throughout the day, but nocturnal activity may occur during the summer (S. Cross, pers. comm.).

During atmospheric basking, adult turtles elevate and maintain body temperatures near 32°C through a repertoire of thermoregulatory behaviors (Bury 1972, 1979; Holland 1985a). They expose the shell to direct sun (heating) and then may dunk the head, limbs, or entire body in water for cooling. Turtles often rotate the body axis, extend or retract the head and/or limbs, and change diurnal patterns (time of emergence). In northern California, most atmospheric basking occurs early in the day (0900–1100 hrs) when water temperatures are low; many turtles hide or rest during warmer parts of the day (Bury 1972). *Actinemys marmorata* also may raise their body temperature by burying themselves in warm sand (Rathbun et al. 2002) and under algal mats that are much warmer than the surrounding water (Bury and Germano, pers. obs.; G. Rathbun, pers. comm.).

*Actinemys marmorata* display a “mixed-mode” strategy when overwintering. Although some animals may be active on a year-round basis, other animals may enter overwintering sites in October–November and reemerge in March–April. In most slack-water habitats, many turtles appear to overwinter in the substrate or in undercut areas along the bank (D. Holland, unpubl. report). Turtles may aggregate in a small area; 43 animals were found in an area of approximately 1 m<sup>2</sup> in a pond in western Oregon (D. Holland, unpubl. report). Turtles from flowing-water habitats often leave the watercourse in late fall and move up to 480 m into upland habitats, where they burrow into leaf litter, usually under trees or shrubs (Rathbun et al. 1992; Reese and Welsh 1997). Further, they may emerge from these sites to bask on warm days, and may move among several overwintering sites over the course of several months. Turtles will move to upland sites when waters disappear in streams (G. Rathbun, pers. comm.).

The temperature of egg development affects sex determination in many species of chelonians (Vogt and Bull 1982), and *A. marmorata* eggs exposed to high temperatures (> 27°C) result in a higher proportion of female hatchlings (Ewert et al. 1994). Some females in this species display some nesting-area fidelity (Goodman

1997a; K. Beal, unpubl. data). Females are noted for long overland treks to deposit eggs, moving as much as 402 m away from water and up to 90 m in elevation above it (Storer 1930; Rathbun et al. 1992). However, most nests are within 50 m of the edge of water (Holland 1994).

Clutch size varies from 2–13 eggs, and mean clutch size is from 4.5 to 7.3 eggs, depending on location (Feldman 1982; Rathbun et al. 1992; Goodman 1997a; Pires 2001; Lovich and Meyer 2002; Germano and Rathbun, in press). Females can produce two clutches in one season (Goodman 1997b; Pires 2001; Lovich and Meyer 2002; Germano and Rathbun, in press), and some may produce three clutches in the Central Valley of California (Germano, unpubl. data). Eggs of *A. marmorata* are off-white in color, elliptical-oval in shape, and range from 32–42 mm long and 18–25 mm diameter. Mass of eggs range from 7–11 g. The egg shell is hard or shelled with a “bone-china” texture. The time from ovulation of eggs to deposition in a nest is unknown. Incubation time ranges from 73–132 days under artificial conditions (Lardie 1975; Feldman 1982) and from 94–122+ days in the wild (D. Holland, unpubl. report; Goodman 1997a). Hatchlings from northern and central California northward overwinter in the nest (Reese and Welsh 1997; Rathbun et al. 2002).

Populations can reach high densities. Bury (1979) reported densities of approximately 400 turtles/ha in a stream population. Some small ponds may have high densities of turtles equal to or exceeding this level (Holland 1994), but turtles tend to aggregate in shrinking bodies of water during late summer and droughts (Storer 1930; R. Bury, pers. obs.). The largest populations of *A. marmorata* occur in Mediterranean-climate areas where there are warm to hot summers, but the same conditions often result in scarce surface water due to increased evaporation rates and lack of precipitation in a relatively long dry season. In most areas, the turtle occurs in disjunct populations over large areas (e.g., aggregations of turtles along long segments of rivers and streams or in isolated ponds or lakes).

**Population Status.** — The species occurs in many areas and often is abundant in hill and mountain habitats in many parts of their range where turtles have invaded stock tanks, logging ponds, and other standing waters created by humans over the last century. Three areas, however, that show marked declines in populations are southern California from Baja up to Ventura; the Central Valley of California; and the northernmost populations in Washington State and, perhaps, in northern Oregon. Today, only isolated clusters of turtles remain in most of southern California (Brattstrom 1988), which now are separated by inhospitable areas of cities and roads. Also, these isolated populations occur in aquatic habitats that humans are drawn to, especially in the summer. Much of the natural habitat for the species in the Central Valley of California, especially the southern portion (San Joaquin Valley), has been eliminated. The original complex of lakes, rivers, streams, wetlands, and sloughs was estimated to cover at least 787,000 ha in the Central Valley (Harding 1960). Most

of this habitat has been drained or channelized to support a massive agricultural system and urban centers; however, the species has not been extirpated from the San Joaquin Valley. There remain a number of areas in the valley that support relatively large populations of turtles with population structures that indicate successful reproduction and long-term stability (Germano and Bury 2001). Besides these areas, *A. marmorata* also appears to be uncommon in northernmost Oregon and into Washington State (Bury 1995; Hays et al. 1999).

**Threats to Survival.** — In the 19th and early 20th centuries, *A. marmorata* was exploited for food (Storer 1930; Buskirk 1990; Bettelheim 2005). This began as early as the 1860s (Lockington 1879) and commercial exploitation peaked in the 1890s. Smith (1895) noted that at least 18,000 turtles/year were sold in the markets in San Francisco. Records of the U.S. Bureau of Fisheries indicate that the catch peaked in 1897 at 48,534 kg (107,000 pounds). In 1895 the catch was 42,638 kg, consisting of approximately 63,000 animals. Collecting efforts in the 1880s included the use of a small schooner operated on Tulare Lake (now a groundwater recharge facility and cropland) in the San Joaquin Valley, California. The commercial trade continued until at least the 1930s, and this activity exacerbated population declines caused by habitat losses and other factors.

Commercial overharvest of this species followed closely the pattern noted for the California red-legged frog, *Rana draytonii* (Jennings and Hayes 1985). Although there are no reliable estimates of the total take for pets, in the early 1960s, one of us (RBB) was asked by a reptile dealer in southern California to help collect this species. When asked for an approximate number to collect, the dealer replied that they had just exported 500 of this species to Europe, and needed that many additional turtles to fill orders. Collecting is now greatly reduced due to protective regulations.

Now and in the future, habitat destruction and alteration are the primary threats to the continued existence of this species. This is a problem that besets most species around the world. Massive water development projects have changed the location, flow, and use of water across much of the range of *A. marmorata*, particularly in the Central Valley of California. Construction of dams on many rivers results in cooler water temperatures and faster flowing water below dams, which may be detrimental to turtle populations (Reese and Welsh 1998a, b). Also, the reservoirs behind these dams may not be especially suitable habitat because recreational activities such as fishing, skiing, or swimming likely disturb normal behavioral routines of the turtles. Further, some of these reservoirs have large draw downs seasonally, which inhibits growth of aquatic vegetation and associated invertebrate populations that are prey for turtles. However, we have studied a population of *A. marmorata* in one large reservoir (Whiskeytown National Recreation Area in northern California) where we found turtles to be relatively abundant and the population was composed of a

stable age distribution (R. Bury and D. Germano, unpubl. data). Elimination of water bodies of any kind reduces habitat for this species. Still, small impoundments with permanent or intermittent water are inhabited by turtles, and numbers can be quite high, particularly if vegetation (e.g., trees, tules, cattails) and basking sites are allowed to become established along shorelines (Cook and Martini-Lamb 2004).

Other impacts can have local effects on *A. marmorata*, but are not expected to have significant population consequences. Fire can cause mortality in turtles overwintering in terrestrial habitats, turtles are sometimes deliberately shot while basking, or are inadvertently caught while fishing. They also have to contend with predators and competitors in some situations, especially urban waters (Bury, in press). The native raccoon (*Procyon lotor*) can be a problem in situations where turtle habitat occurs in urban environments because of artificially high raccoon populations associated with supplemental food from human habitations (G. Rathbun, pers. comm.). The introduction and spread of the red-eared slider, a potential competitor, is occurring in California (Spinks et al. 2003; Patterson 2006) and the Pacific Northwest (Bury 1995, in press).

**Conservation Measures Taken.** — *Actinemys marmorata* is protected by state law within its entire native range: it is listed as State Endangered in Washington; Sensitive - Critical in Oregon, and a Species of Special Concern in California. However, none of these laws confer effective protection of the habitat. Some habitat is partly to fully protected in waters designated as Wild and Scenic Rivers, but these are relatively few. The turtle occurs in some state and federal parks at low elevations, including Humboldt Redwoods State Park (northern California), Point Reyes National Seashore (north of San Francisco) and Pinnacles National Monument (south of San Francisco). Some limited habitat occurs in wilderness areas, but many of these are located in montane or high-elevation localities (e.g., Yosemite National Park, California), and turtles are generally uncommon above 1200 m. A small series of ponds at one site in southwestern Washington State are protected specifically for the turtle. The species was proposed for Federal listing as a threatened species, but it was found not warranted (U.S. Fish and Wildlife Service 1993).

**Conservation Measures Proposed.** — We believe that conservation efforts need to focus on protection of turtles in their native habitats. There have been attempts to translocate the species away from construction projects in California and Oregon, but none of the results have been published. This practice needs serious scrutiny. It is imperative to rigorously monitor the results of these efforts to evaluate the potential effectiveness of this mitigation strategy. Translocated turtles are known to return to the original site (L. Hunt, unpubl. data), which subjects them to increased stress and the likelihood of mortality. Additionally, this practice may mix stocks of genetically differentiated forms. Most attempts to translocate amphibians and reptiles have been ineffective as conservation strategies (Dodd and Seigel 1991).

**Captive Husbandry.** — There are successful efforts to captively breed this species in Washington, and to head-start young individuals for reintroduction into the wild in California, Oregon, and Washington. Except for rare instances, we question the expense of captive breeding of this species and point out that there are potential adverse effects (e.g., mixing gene pools) that need to be carefully considered before this is tried on other than an experimental basis. The long-term plight of the species must be considered in that these actions, if applied incorrectly, may dilute efforts to effectively protect and manage wild populations and their habitat.

**Current Research.** — Several meetings have been organized to discuss the status and needs of the species. For example, a workshop with 110 attendees on the biology and status of the turtle sponsored by the Western Section of The Wildlife Society was held in 2004 in northern California. A Western Pond Turtle Group was established in 1991 to foster communication and coordinate research on the species. Interested parties included representatives from federal and state agencies, several universities, zoos, industry, and private citizens. A primary goal of the Western Pond Turtle Group is to develop a strategic plan for the conservation of the turtle. Many members of this group are preparing a handbook on the species, including sampling protocol, summary of ecology, and management considerations. Recently, the California Department of Fish and Game commissioned a “Conservation Strategy” to summarize known information, identify threats, hold regional workshops, and other efforts for this turtle statewide.

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