Aquatic Invasive Species (AIS) Control Plan: Pond Slider

This control plan is a living document and will be updated, as needed, to reflect the status of the species within Pennsylvania.

Natural History

Description: Pond Sliders (*Trachemys scripta*) are medium to large freshwater turtles in the family Emydidae and native to portions of the southern United States. Three subspecies are recognized: *Trachemys scripta scipta* (Yellow-bellied Slider), *T. s. troostii* (Cumberland Slider) and *T. s. elegans* (Red-eared Slider). This account for *T. scipta* will largely focus on the subspecies *T. s. scripta* and *T. s. elegans*, as both have been introduced into Pennsylvania, particularly the Red-eared Slider.

Taxonomy

Common Name: **Pond Slider**
Family: **Emydidae**
Species: ***Trachemys scripta***
Integrated Taxonomic Information System (ITIS) Serial Number: **173819**

Morphology: Pond Sliders may reach a maximum size of approximately 30 cm in carapace (shell) length and possess a slightly keeled, olive to brown shell with yellow stripes, and green to brown skin with yellow stripes (Ernst and Lovich 2009). Red-eared sliders contain a red stripe behind the eye (Figure 1) which is lacking in Yellow-bellied Sliders (Figure 2). Individuals of both subspecies may become significantly melanistic (darken) with age (Ernst and Lovich 2009; Figure 3).

Figure 1. Red-eared Slider (*Trachemys scripta elegans*). Note indicative red stripe behind the eye. Photo courtesy of Marlin Corn.

Figure 2. Yellow-bellied Slider (*Trachemys scripta scripta*). Photo courtesy of Marlin Corn.

Figure 3. Older adult Red-eared Slider (*Trachemys scripta elegans*) with melanistic coloration. Photo courtesy of Marlin Corn.

Origin: Pond Sliders are naturally distributed broadly throughout much of the southern United States (Ernst and Lovich 2009). Yellow-bellied Sliders range in the southeastern U.S. from southeastern Virginia to northern Florida, and Red-eared Sliders are native to the Mississippi basin from Illinois to the Gulf of Mexico (Ernst and Lovich 2009).

Food Preferences: Ponds Sliders have a broad, generalist omnivorous diet and have been documented to consume a wide variety of algae, aquatic and terrestrial plants, aquatic and terrestrial invertebrates, small fish, amphibians, reptiles, and carrion (Ernst and Lovich 2009). As individuals mature and age, their diet generally shifts from a predominance of animal material to plant material, as is typical among many other freshwater turtle species (Bouchard and Bjorndal 2005).

Reproduction: Mating occurs in Spring and Fall (Ernst and Lovich 2009). Females typically produce clutches containing an average of 10 eggs in late spring and early summer; females may lay more than once clutch per season (Ernst and Lovich 2009). In a study of Red-eared Sliders in Harrisburg, Pennsylvania, average clutch size was 9.2 eggs, and females likely produced at least two clutches per season (Russell et al. 2014). Hatchlings emerge from nests (buried by the mother and abandoned as with all aquatic turtle species) in the late summer or early fall, but in some cases may overwinter and emerge in the spring (Ernst and Lovich 2009). Length of time to reach sexual maturity varies considerably among populations, but typically takes three to five years, with males maturing faster than females (Ernst and Lovich 2009). In an introduced population of Red-eared Sliders studied near Harrisburg, Pennsylvania, estimated age to sexual maturity was 2-3 years for males and 5-6 years for females (Russell et al. 2014). For comparison, sexual maturity is estimated to be reached at 9 years in male Northern Red-bellied Cooters (PA Threatened) and upwards of 15 years in females (Graham 1971).

Notable Characteristics: Longevity of wild individuals is typically thought to be a maximum of 30 years, but some exceptional individuals within wild populations studied may live to be over 40 years of age (Ernst and Lovich 2009).

Historic/Current Vectors: Introduction and establishment of Pond Sliders outside of their native range is typically attributed to releases of captive animals as unwanted pets, particularly with Red-eared Sliders, which are commonly sold at pet stores (Ernst and Lovich 2009; Somma et al. 2021a). Pond Sliders are long-lived may

attain large sizes, can be aggressive to owners, and often foul tanks; therefore, turtles which were purchased as younger and smaller individuals may become unwanted over time. Additionally, Pond Sliders may be released during certain religious practices such as during Buddhist life release ceremonies, although increased awareness of the impacts of invasive species among religious communities in recent years has reduced this vector risk (Liu et al. 2013).

Preferred Habitat: Pond Sliders are a freshwater generalist species but most typically occupy still or slow moving warmwater environments such as lakes, ponds, canals, the backwaters of large rivers, swamps, and wetlands (Ernst and Lovich 2009). Important habitat characteristics include the presence of abundant aquatic macrophytes and ample basking habitat such as sun-exposed banks, rocks, and logs (Ernst and Lovich 2009).

Distribution and Status

Distribution: Pond Sliders are native to portions of the southern United States (see Origin section above) but have been introduced widely outside of their native range in many parts of the world, particularly Red-eared Sliders, which are common in the global pet trade (Ernst and Lovich 2009). Records of Red-eared Sliders introduced outside of their native range in the United States are known from at least 35 states (Somma et al. 2021a; Figure 3). Records of Yellow-bellied Sliders released outside of their native range in the United States are recorded from at least 13 states (Somma et al. 2021b; Figure 4).

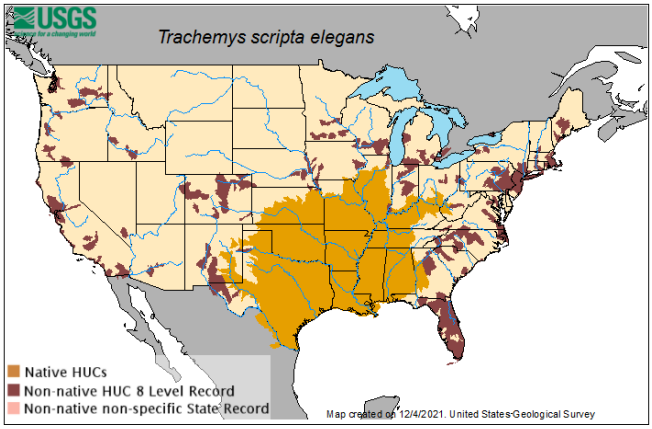

Figure 3. Native range (yellow) and non-indigenous range (red) of Red-eared Sliders (*Trachemys scripta elegans*) in the continental United States. Source: USGS. (July 2022).

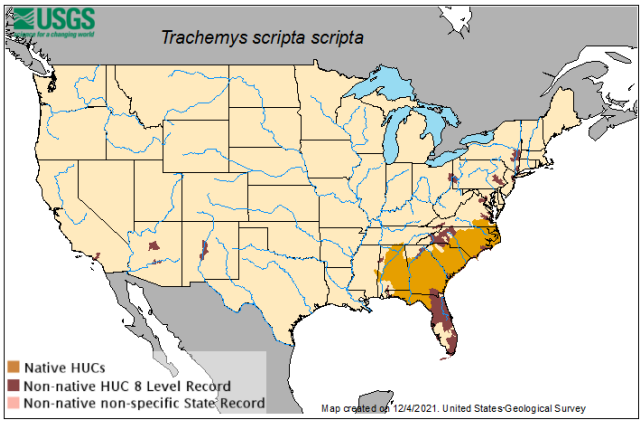

Figure 4. Native range (yellow) and non-indigenous range (red) of Yellow-bellied Sliders (*Trachemys scripta scripta*) in the continental United States. Source: USGS (July 2022).

Within Pennsylvania, records of introduced Pond Sliders, primarily Red-eared Sliders, have been documented for several decades (Hulse et al. 2001; PFBC, unpublished data). Recent data from the Pennsylvania Amphibian and Reptile Survey (PARS) project (primarily encompassing records from 2013-2021) shows Red-eared Sliders

have been reported from at least 48 counties (Figure 5). Records of Red-eared Sliders appear to be clustered primarily in areas of dense human populations (e.g., southeastern Pennsylvania, State College, Pittsburgh, and Erie), which is typical of records in other nonindigenous regions (Heidy Kikillus et al. 2012).

Populations may be establishing in more rural regions of the Commonwealth as well. For example, Briar Creek Lake, a public impoundment in rural Columbia County, appears to have an establishing population of Red-eared Sliders (S.M. Hartzell, pers. obs.). However, the population status (i.e., establishing population vs. non-reproducing individuals) is unknown for many areas where records of Red-eared Sliders exist in Pennsylvania. This should be evaluated further.

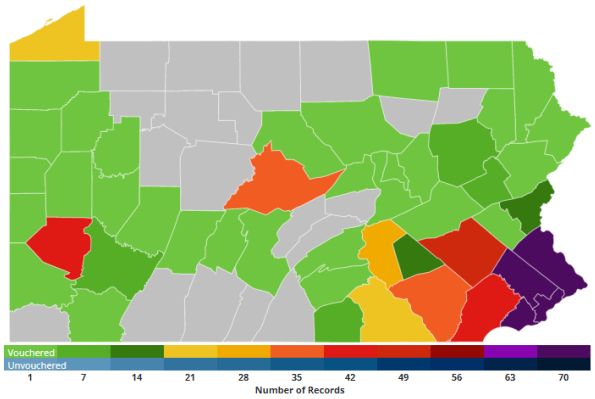

Figure 5. County level heat map of Red-eared Slider (*Trachemys scripta elegans*) records for Pennsylvania from the Pennsylvania Amphibian and Reptile Survey (July 2022)

Data from PARS suggests Yellow-bellied Sliders in Pennsylvania are much more limited, with occurrences documented in at least 14 counties (Figure 6) primarily associated with dense human population centers. Typically, few records are known from each county (Figure 6) suggesting the releases of isolated individuals in most locations rather than established populations. However, it is possible that populations of Yellow-bellied Sliders may establish in Pennsylvania, especially where records are more common (e.g., Bucks County). It should also be noted that evidence of possible hybridization between introduced Yellow-bellied Sliders and Red-eared Sliders is known from at least one location in southeastern Pennsylvania (Maiese and Stone 2014).

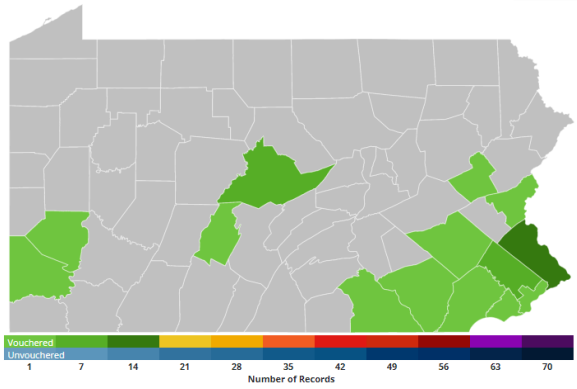

Figure 6. County level heat map of Yellow-bellied Slider (*Trachemys scripta scripta)* records for Pennsylvania from the Pennsylvania Amphibian and Reptile Survey (July 2022).

Pennsylvania Legal Status: Pond Sliders and Pond Slider subspecies (e.g., Red-eared Sliders, Yellow-bellied Sliders) are presently (as of January 2022) not regulated under 58 Pa. Code §71.6 and §73.1. However, all non-native amphibian and reptile species are banned from introduction into the natural environment of the Commonwealth under 58 Pa. Code

§79.11. Additionally, juvenile Pond Sliders less than 4 inches (10 cm) are banned for sale in the United States by the Food and Drug Administration; this legislation is primarily attributed to the risk of salmonella transfer between small turtles and children (Ernst and Lovich 2009).

Threats

Ecological: It is well documented that Pond Sliders, where established, have the potential to compete with native turtle species (Ernst and Lovich 2009). This can be exacerbated by the slider's relatively accelerated growth to sexual maturity and greater reproductive potential than certain native turtle species (Russel et al. 2014). Studies show that invasive Pond Sliders compete with native turtles for basking habitats (e.g., Cadi and Joly 2003) and food resources (e.g., Polo-Cavia et al. 2011; Pearson et al. 2013). Invasive Pond Sliders may also compete with native turtles for nesting habitats (Cadi and Joly 2004). Additionally, Pond Sliders have the potential to spread pathogens or parasites to native turtle populations where introduced (Mayer et al. 2015). Competition by invasive Pond Sliders has been implicated as a factor in the decline of native turtle populations (e.g., Cady and Jolly 2004; Pitt and Nickerson 2013; Drist et al. 2021).

Of specific concern in Pennsylvania are the potential impacts invasive Pond Sliders may have on native turtle species of conservation concern, such as the state listed (Threatened) Northern Red-bellied Cooter (*Pseudemys rubriventris*) and state listed (Candidate Species) Blanding's Turtle (*Emydoidea blandingii*), which occur in regions of the Commonwealth where Pond Sliders have become established. Juvenile Northern Red-bellied Cooters have been shown to contain significant dietary overlap with juvenile Red-eared Sliders (Pearson et al. 2013) and Red-eared Sliders outcompete Northern Red-bellied Cooters in habitats where resources are limited (Pearson et al. 2015). No studies appear to have evaluated the potential impacts of Pond Sliders on the Blanding's Turtle; however, related species in the genus *Emys* are known to be displaced by Red-eared Sliders (Cady and Joly 2003; 2004; Lambert et al. 2021).

Besides negative impacts to native turtle species, the broader potential impacts of invasive Pond Sliders on other taxa and ecosystems appears to have had little study. Thus, it is largely unknown to what extent that invasive Pond Sliders have on other (non-turtle) organisms and broader ecosystems.

Economic: No estimates or data are available on the potential negative economic impacts of invasive Pond Sliders. Because the ecological impacts of this species primarily affect native turtle populations, it is unlikely that they cause significant economic impacts other than costs of attempted control (see below; Garcia-Diaz et al. 2017).

Management

Management Goals: Pond Sliders have a relatively widespread and expanding range in the Commonwealth, although the status of many introductions (i.e., established populations vs. isolated introductions) is

presently unknown. Major goals should include:

1. Management of Pond Sliders populations (when feasible) that are at risk of establishing or have established where native turtle species of conservation concern occur.

2. Public outreach efforts to prevent further introductions of Pond Sliders into Commonwealth waters.

3. Further research to evaluate the population status of introduced Pond Sliders in Commonwealth waters as well as to evaluate the specific impact risks towards native turtle species, particularly those of conservation concern (i.e., turtles considered to be Species of Greatest Conservation Need).

Containment and Prevention Actions:

- Increase education efforts geared towards the public on the risks of Pond Slider introduction into Commonwealth waters, particularly in regions where native turtle species of conservation concern occur. This could be achieved with means such as pamphlets, presentations, or social media posts. Regulations within 58 Pa. Code §79.11 should be emphasized. Many materials on this have been developed by others and could be used or adapted.

- When feasible, support pet surrender/adoption events to help reduce the risk of unlawful release of Pond Sliders into Commonwealth waters, such as the "Be a Hero, Release Zero" campaign. Events should be targeted in regions where the risk of Pond Slider introductions is high, such as major cities in Pennsylvania.

- Design and install signs spreading awareness about the impacts and consequences of Pond Slider release into Commonwealth waters, especially at areas which may be of high-risk for introductions (i.e., based on prior records and/or in close proximity to urban population centers).

- Encourage the incident reporting of aquatic invasive species such as Pond Sliders within Pennsylvania. Online reporting can now be conducted at the following PFBC website: https://pfbc.pa.gov/forms/reportAIS.htm as well as PA iMapInvasives at: https://www.paimapinvasives.org/ and to the Pennsylvania Amphibian and Reptile Survey (PARS) https://www.paherpsurvey.org/. At the national level, records can be submitted to the USGS Nonindigenous Aquatic Species website: https://nas.er.usgs.gov/SightingReport.aspx

- Strictly enforce regulations within 58 Pa. Code §79.11 related to the unlawful introduction of non-native amphibians and reptiles into Commonwealth waters.

- Where feasible, coordinate with partner agencies and organizations to monitor for Pond Slider introductions or population increases in at-risk areas and determine the populations status of waters where records occur.

- Initiate and/or support research on the population status of introduced Pond Slider in the Commonwealth, and potential impacts to Pennsylvania native turtle species. Research could also quantify the benefits of Pond Slider removal to native turtle species, to evaluate if removal efforts contribute to measurable conservation impact (Lambert et al. 2021).

Rapid Response Options:

- Once introduced into a novel ecosystem, the only option for the control of Pond Sliders appears to be manual removal. Turtles may be trapped by baited "hoop net" style turtle traps or via floating basking traps. Removal efforts may take a significant amount of staff time (i.e., long term trapping over weeks or months), particularly as some individuals may be wary of traps and difficult or unfeasible to capture (Garcia-Diaz et al. 2017). Further research is needed on the effectiveness of Pond Slider removal in Pennsylvania in terms of elimination or significant reduction of feral individuals. Some data available in reports of Pond Slider removal efforts associated with Northern Red-bellied Cooter management projects in Pennsylvania suggest Pond Sliders can re-establish rapidly after removal.

- When feasible, control efforts should be prioritized in areas where Pond Sliders threaten native turtle species of conservation concern. For example, Pond Sliders are typically removed during Northern Red-bellied Cooter management projects in Pennsylvania, and targeted removal efforts have focused on areas in northwestern Pennsylvania where Blanding's Turtles may co-occur with Pond Sliders.

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