Project Status
Report 99-06

Upper Mississippi River
Long Term Resource Monitoring Program
U.S. Geological Survey

Natural History of the Red-Eared Slider Relative to a Variable Hydrologic Regime

by
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The impacts of hydrologic regimes in large river systems on fish, birds, trees, and invertebrates have been the focus of many studies. As a result, we know for instance, that fish reproduction and recruitment benefit from the natural hydrologic pattern of high spring stages and lower summer stages. However, despite numerous studies, essentially nothing is known about the interactions found between hydrologic patterns and reptiles and amphibians.

Studies of the natural history of the red-eared slider (*Trachemys scripta elegans*) began in 1992 in Pool 26 of the Upper Mississippi River System (UMRS), including the lower Illinois River, as part of the Long Term Resource Monitoring Program (LTRMP). These studies are revealing important information to promote survival of reptiles and amphibians in the floodplains of the UMRS and other regulated rivers.

The red-eared slider (slider), a member of the Emydidae or pond turtle family, is widely distributed in the Central United States and occurs in the UMRS south of Pool 13. Turtles in this group commonly bask on logs to thermoregulate. When young, most individuals feed on aquatic invertebrates, but adults, and particularly sexually mature females, become more herbivorous with age. Thus, these turtles use two resources whose abundance is directly related to the health of the UMRS.

The sliders reproductive cycle begins in the fall when female ovarian follicles enlarge. Nesting occurs in late May through June and coincides with the falling flood pulse of the UMRS prior to lock and dam construction (Figure 1). The eggs incubate in a shallow nest (about 13 cm deep) and hatch in 60 to 90 days. Unlike most turtles, hatchling sliders do not leave the nest after hatching. Instead, they remain in the shallow nest cavity throughout the fall and winter. Emergence coincides with the rising flood pulse in early May or late April (Figure 1). The timing of nesting and emergence are made more critical because eggs and hatchlings will drown if the nest cavity is submerged prior to hatchling emergence.

I am continuing to examine the influence of flooding and other abiotic variables on reproduction in sliders from two backwater lakes of the Illinois River, Swan Lake and Stump Lake. Each year since 1994, female turtles have been captured on their nesting migrations that can be as far as 1 km from their aquatic habitats. They are induced to lay their eggs in the laboratory where the eggs are counted and weighed. The females are released at the original collecting areas after oviposition but their hatchlings are overwintered in captivity. The hatchlings are released after naturally emerging hatchlings are found. Using these

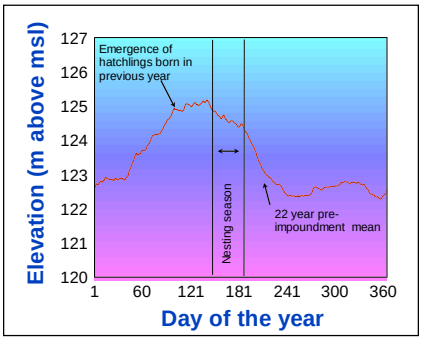

Figure 1. Pre-impoundment hydrograph with nesting season and normal date of hatchling emergence for UMRS mile 218 at Grafton, Illinois.

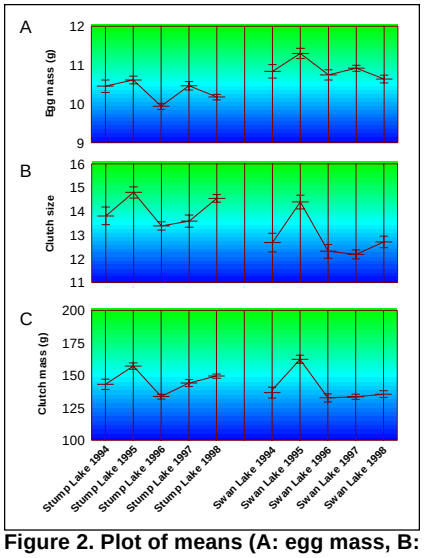

Figure 2. Plot of means (A: egg mass, B: clutch size, and C: clutch mass) determined from the reproductive output of 1,800 female red-eared sliders collected at Swan Lake, Calhoun County, and Stump Lake, Jersey County, Illinois.

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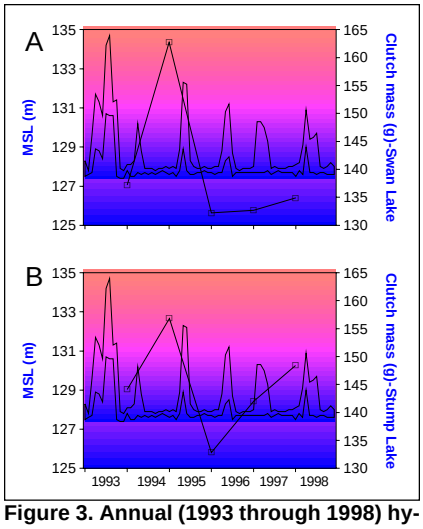

Figure 3. Annual (1993 through 1998) hydrographic plot of red-eared slider clutch mass from Swan Lake (A) and Stump Lake (B), Illinois.

methods, reproductive success at both sites is being determined. Reproductive output varies from year to year and from location to location (Figure 2). Generally, turtles from Swan Lake lay relatively fewer but bigger eggs than do turtles from Stump Lake.

Sliders become sexually mature after six years and store the energy needed for the next year's reproduction in the year before eggs are laid, i.e., reproduction in 1994 was most influenced by conditions in 1993. Presently, five years of reproductive output data have been gathered. Once sufficient data have been collected, the reproductive output of the turtles will be examined to determine which abiotic variables best predict variation in yearly reproductive output. Abiotic variables could include climatic data (e.g., mean monthly temperatures and rainfall), water regulation data (e.g., mean monthly stages at various river gauges), and data on human activities (e.g., planting and harvesting times).

Although preliminary, the relationship to flooding appears to be an important one. Sliders produced fewer and smaller eggs in the year following flood events (e.g., 1993, 1995, 1996) when minimum monthly stages exceed targeted regulated levels but produce larger and more eggs following years such as 1994 and 1997 when flooding was slight (Figure 3). The effect occurs at both study sites and can change reproductive output by as much at 20%. The causal factors for the effect on turtle reproductive output is uncertain but may be related to reduced availability of submersed aquatic vegetation during larger floods. Mean monthly stage and the three measures of reproductive output (egg mass, clutch size, and clutch mass) for both sites (a total of six correlations) tend to be negatively related during the active season of the turtles (Figure 4). All six correlations were negative with mean stage in May and July and five of the correlations were negative with mean stage for June suggesting that reproductive output decreases with increasing stage. This is a preliminary result but one that may be strengthened when sufficient data are accumulated to allow a multivariate study.

Regardless, the variation in reproductive output in turtles found by these studies is unique. The findings strongly support various optimal egg theories and previous poorly supported ideas about the importance of local conditions in turtle reproduction.

Even though turtle reproductive output may decrease in the year following a flood year, the net effect on turtle recruitment may be positive. Other studies that are in progress suggest that hatchling survivorship is related to the distance that hatchlings must travel to reach an aquatic habitat after emerging from the nests. During flood years, this

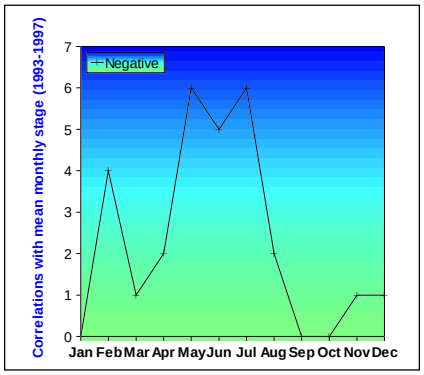

Figure 4. Correlation coefficients for mean monthly stage and reproductive output for red-eared sliders at Swan and Stump Lakes, Illinois.

distance is greatly reduced and survivorship may be increased. Even though reproductive output may decrease, recruitment may increase enough to counter the lower output.

Many of the relationships between the river and the natural history of the slider, noted above, have only recently been developed through studies carried out at Pool 26 by LTRMP field station scientists. These studies demonstrate the complex adaptations that allow turtles to maximize fitness in these variable environments. ❐

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