

or whether they are influencing sturgeon reproductive success. There is concern that contaminants in water and the food chain may be causing these pathologies. Through laboratory studies in progress at the CERC, researchers are beginning to evaluate whether chemicals measured in the Missouri River at levels of concern for other species may be affecting reproduction in shovelnose (*S. platyrhynchus*) and pallid sturgeons.

Migration and Spawning: Are pallid sturgeon spawning successfully in the Missouri River?

Scientists at the CERC use physiological assessments in conjunction with telemetry tags and advanced microsensors to monitor pallid sturgeon migrations and track pallid sturgeon to their spawning locations. Adult pallid sturgeon are implanted with transmitters and small data storage devices that record temperature and depth. Researchers follow the fish as they move upstream to spawn, thus recording habitats used during migration and at the eventual spawning destination. Results with limited numbers of pallid sturgeon show that females in the Lower Missouri River exhibit spawning behavior characterized by rapid upstream movement, stopping then spawning within hours, followed by a variable intermittent downstream movement (DeLonay and others, 2009) (figs. 2 and 3). Spawning is verified by the recapture of females that have released their eggs after spawning and by observation of spawning aggregations with high-resolution sonar imagery. The CERC studies show

that wild and hatchery-origin pallid sturgeon are spawning at multiple locations in the Lower Missouri River, however, it is as yet unknown how many adults are spawning and whether any young are surviving to contribute to the population. Comparisons between adult sturgeon that do spawn and those that do not provide insight into the possible factors that may promote spawning success. Data from these studies provide information that managers may use to facilitate migration or create conditions at spawning sites that are optimal for aggregation of adults, egg deposition, and survival of young.

Habitat Use and Availability: What types of habitats do sturgeon use, and how much is available?

Hydrologists use advanced sonar and hydroacoustic depth, velocity, and substrate mapping tools to assess habitats where sturgeon are found (fig. 4). Research at the CERC has shown that sturgeon may integrate information at multiple spatial scales when choosing which habitats to occupy or move through. Transitional zones between habitat types and the arrangement of habitat patches and features may be among the more significant factors in determining where sturgeon are found and how they migrate (Reuter and others, 2009). All female pallid sturgeon tracked during reproduction appeared to have spawned in areas of swift, converging flow on outside bends, over or adjacent to gravel and cobble (DeLonay and others, 2009). Hydraulic models developed from these data can

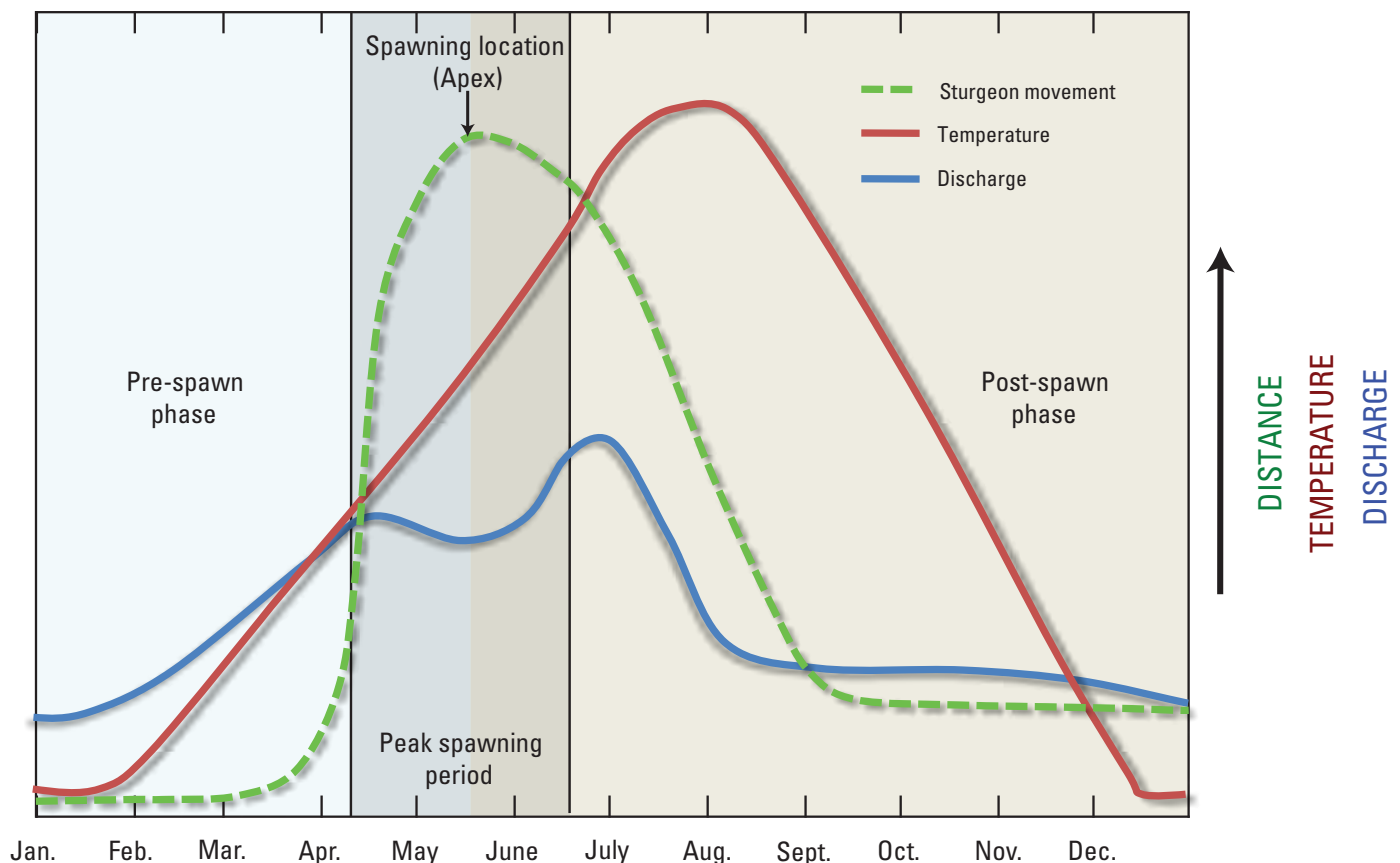
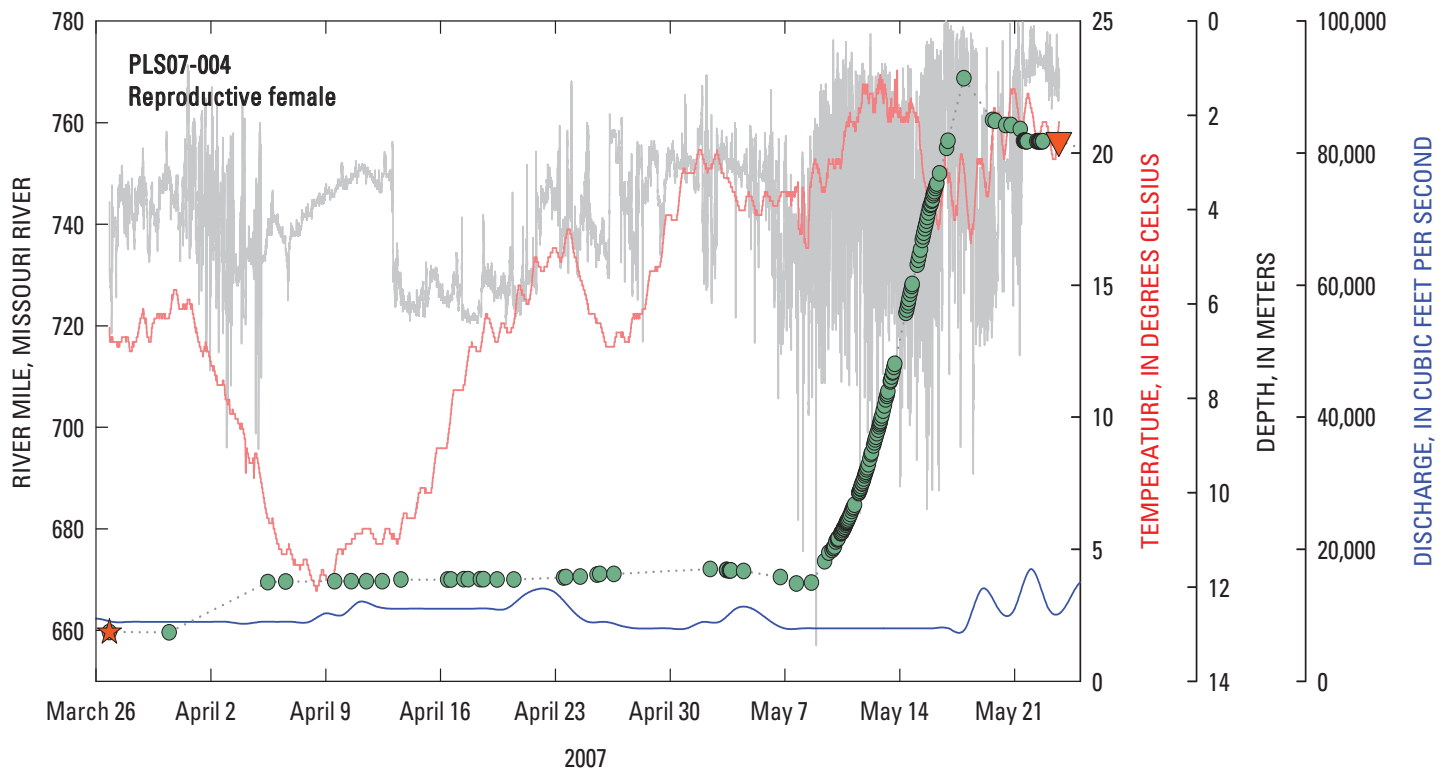


Figure 2. Conceptual model of migration and spawning behavior of female pallid sturgeon (*Scaphirhynchus albus*).



EXPLANATION

- Fish depth from data storage tag
- Water temperature from data storage tag
- Discharge from Gavins Point Dam, South Dakota, river mile 811
- Telemetry location
- ★ Initial release
- ▼ Recapture

Figure 3. Pallid sturgeon (*Scaphirhynchus albus*) females in the Missouri River move rapidly upstream to spawn in spring.

be used to quantify how flow and channel morphology alterations combine to change habitats used by sturgeons. These same models also provide insight into larval transport, barriers or pathways for migration, and processes of sediment transport—a critical component of the environmental conditions that create and maintain quality habitat. Managers can use this information to determine if critical habitats are limiting, to assess relative habitat quality, and to evaluate the trade-offs between flow change and channel re-engineering to achieve habitat goals for the pallid sturgeon.

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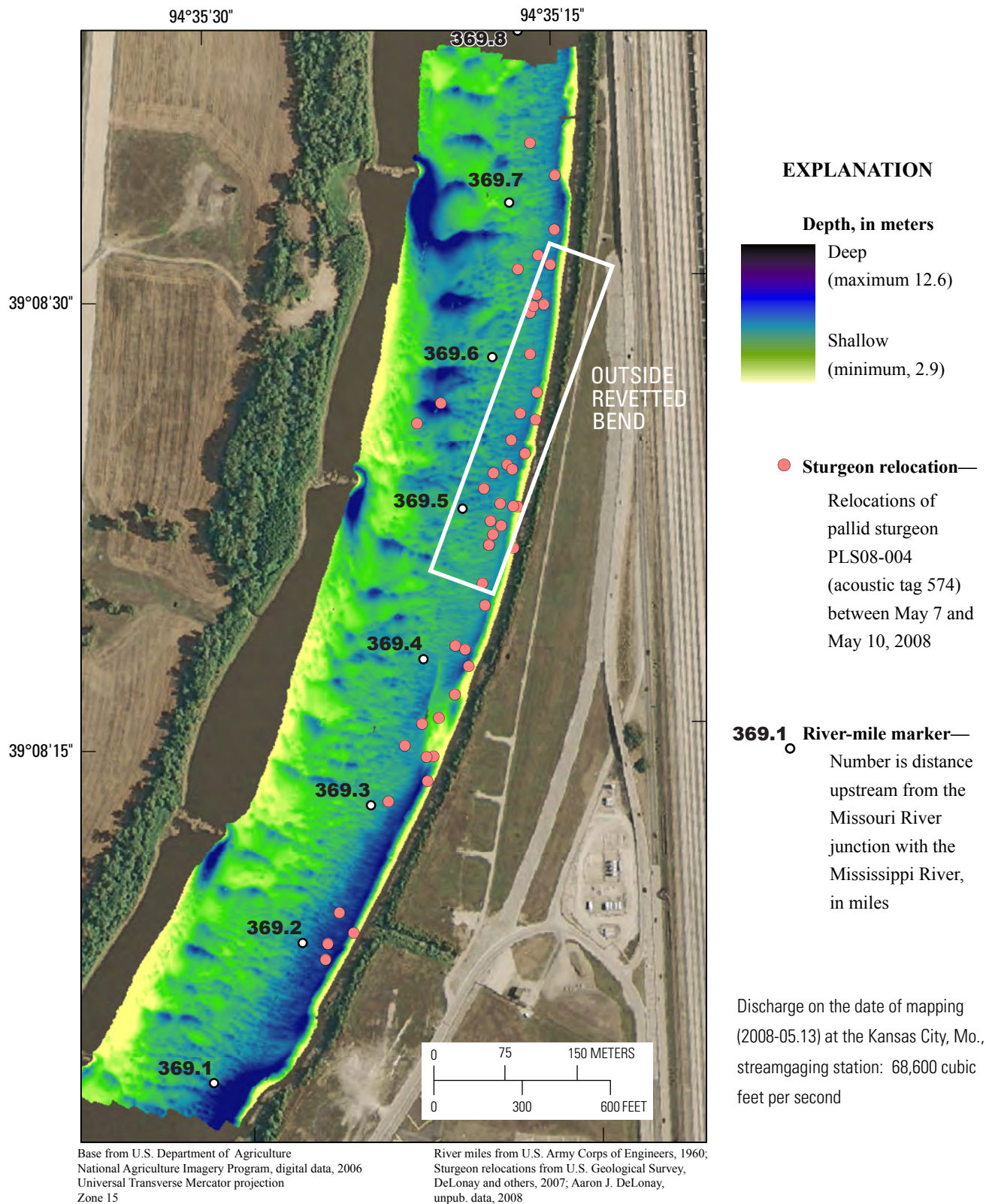


Figure 4. Multibeam bathymetric map showing location of a female pallid sturgeon (*Scaphirhynchus albus*) during spawning in the Missouri River.

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