Session: Below the Surface

Presentation Title: Current Research & Monitoring of Native and Non-Native Fishes in Glen & Grand Canyons.

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Abstract: The Glen Canyon Dam Adaptive Management Program is a federal advisory committee comprised of 25 stakeholder groups that advises the Secretary of Interior on the effects of dam operations and related management actions on Colorado River resources in Glen and Grand Canyons. The program's research and monitoring efforts for fish, overseen by the US Geological Survey's Grand Canyon Monitoring and Research Center (GCMRC), are focused on native humpback chub, an endangered species, and nonnative rainbow trout, which provide a popular sport fishery. Research and monitoring activities conducted by GCMRC and its cooperators (US Fish and Wildlife Service, Arizona Game and Fish, and others) provide information on:

- fish population status and trends,
- species distribution and habitat use,
- identifying and understanding factors that control humpback chub and rainbow trout population dynamics,
- determining the implications of interactions between native and nonnative fishes, and
- evaluating the effects of dam operations on the aquatic ecosystem.

Methods most commonly used to sample fish in the Colorado River in Glen and Grand Canyons are electrofishing (applying electrical current to the water to stun fish) and setting nets that either entangle (trammel nets) or trap fish (hoop nets). Captured fish are counted by species and many are weighed, measured, tagged with a small microchip called a passive integrated transponder or PIT tag (veterinarians use similar tags in pets and livestock), and released. Marking fish with PIT tags allows scientists to track individuals and populations over time. For example, information on the movement and growth of individuals is gathered when marked fish are recaptured, while recapture data collected over time from larger groups of fish can be used to estimate population-level parameters including abundance, survival rates, and spawning frequency.

Long-term monitoring of humpback chub shows that the abundance of this endangered species has been increasing in Grand Canyon over the last decade. Most humpback chub are found in or near the Little Colorado River while smaller numbers are known to exist in discrete groups called aggregations at other locations including 30 Mile, Middle Granite Gorge, and in and near Shinumo and Havasu Creeks. Almost all humpback chub spawning occurs in the Little Colorado River in the spring with many young fish rearing in this tributary while others move to the mainstem Colorado River, often in late summer. Growth rates in the mainstem are slow due to colder water temperatures with humpback chub taking up to 10 years to reach maturity. In contrast, the warmer water in the Little Colorado River allows fish to mature in as little as three or four years.

Data for rainbow trout indicates their abundance is highest in Glen Canyon and Upper Marble Canyon and decreases sharply as one gets closer to the confluence of the Little Colorado River. Recent management actions and river conditions, including an experimental flood in the spring of 2008 and high flows throughout much of 2011, produced conditions favorable to rainbow trout reproduction and survival of young fish in Glen Canyon. These events resulted in 2012 having the highest abundance of rainbow trout observed in Glen Canyon since monitoring began in the early 1990s. Abundance has declined since 2012, but continues to be high in comparison to past years. Large numbers of rainbow trout are of concern, because these fish do eat native fish including the endangered humpback chub. Fortunately, rainbow trout abundance is generally low near the Little Colorado River where most humpback chub live.

Information gathered from research and monitoring of fish populations is analyzed and provided to managers and stakeholders to support the ongoing adaptive management process. This process is designed to protect and benefit downstream resources by improving Glen Canyon Dam operations and to implement management actions when necessary. Past actions directly related to fish have included nonnative fish removal, establishment of a refuge population of humpback chub, and implementation of experimental flows intended to benefit native fish in the mainstem Colorado River.