

A large sea turtle, likely a hawksbill, is shown swimming underwater. The turtle's head is on the right, facing right, with its mouth slightly open. Its front flipper is extended upwards and to the left. The turtle's shell is a mix of yellow and brown with distinct scutes. A small, yellowish fish is swimming near the bottom left of the turtle's shell. The background is a deep blue ocean with some light filtering through from the surface.

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Weapons Testing and Endangered Fish Coexist in Florida

by Howard Jelks, Bill Tate, and Frank Jordan

Okaloosa darters (*Etheostoma okaloosae*) are small fish found only in a few streams in the Florida panhandle. This species has been listed since 1973 as endangered due to habitat alteration resulting from erosion, the potential competition from brown darters (*E. edwini*), and a limited geographic distribution. In recent years, however, Okaloosa darters have benefited from improved resource management and adaptive population monitoring techniques developed collaboratively by the U.S. Fish and Wildlife Service (FWS), U.S. Geological Survey (USGS), Loyola University New Orleans, and Eglin Air Force Base. As a result, the FWS reclassified the Okaloosa darter to the less critical category of threatened in March 2011.

Okaloosa darters are found in only six coastal stream systems, with a combined length of about 230 miles (400 kilometers), which flow through longleaf pine sandhills. The low nutrient, sandy soils of the region produce relatively clear groundwater-fed streams, interspersed with woody debris and patches of aquatic vegetation. Unfortunately, these sandy soils also are relatively unstable, and certain land use practices resulted in severe erosion and smothering of Okaloosa darter stream habitat.

Over 95 percent of the species' geographic range is on Eglin AFB, where the Air Force conducts its primary mission of full-service air armament development through weapons system research, development, testing, and evaluation.

While fulfilling its military mission, Eglin also manages its natural resources, acting as a steward to protect plants and animals for future generations. Weapons testing and Okaloosa darter recovery may sound incompatible, but Eglin has established partnerships to develop and implement effective natural resources management programs. Working with the FWS and Eglin AFB, USGS and Loyola University researchers provided leadership in helping to form the Okaloosa Darter Recovery Group and draft the 1998 Revised Recovery Plan. Members of the Okaloosa Darter Recovery Group monitor, manage, and direct recovery actions for the species, including the adoption of new techniques for monitoring status and trends.

Beginning in the mid-1990s, USGS and Loyola personnel have worked to develop and refine innovative methods for population monitoring that are more accurate and cause less habitat disturbance than traditional methods (e.g., electrofishing or seining). Researchers using masks, snorkels, and plastic nets have been visually monitoring Okaloosa darter populations on Eglin AFB. The improved estimates indicate that there are currently 300,000 to 800,000 Okaloosa darters, many more than originally thought. In addition to providing long-term abundance data, visual methods are used to evaluate habitat restoration projects and inform recovery decisions.

Growing only to 2 inches (50 millimeters) in length, Okaloosa darters typically live in waters around plants, roots, or woody debris along the margins of shallow, sandy streams which are 3-30 feet (1-10 meters) wide.



The Okaloosa Darter Recovery Group initially focused on examining threats to Okaloosa darters and advising natural resources managers on recovery strategies. Many of the threats identified in the recovery plan have been eliminated or substantially reduced. Eglin AFB has made a considerable investment to correct erosion problems, restoring borrow pits and road crossings by contouring the landscape and planting vegetation. As stream habitat has improved, the recovery group's monitoring shows that numbers of Okaloosa darters have increased significantly.

Currently, Eglin is actively removing impediments to darter movements, such as impoundments and elevated culverts, which reduce the available stream habitat. Mill Creek, which traverses the fairways of Eglin's golf course, is the smallest Okaloosa darter stream. Where the creek had become a series of rusting culverts and muck-filled ponds, there is now a restored stream channel with emergent plants and embedded woody debris. The one culvert that remains is large enough to support four plexiglass portals, so plants and darters can now



USGS researcher surveying Okaloosa darters. Photo by USGS.

exist underneath the fairway with its roving golf carts and flying white balls. Golfers appreciate the new look, even if a few balls stray into the stream. The recovery group is monitoring Okaloosa darter colonization of the repaired stream and assessing the stability of the newly established aquatic community.

By developing innovative approaches to population monitoring, the Okaloosa Darter Recovery Group assisted the FWS in making informed recovery decisions, leading to the proposal to reclassify the Okaloosa darter as threatened. This demonstrates that endangered species recovery can take place on America's active military lands.

Hellfire weapon test at Eglin Air Force Base. Photo by DoD.



For more information, see http://sesc.usgs.gov/freshwater_fauna/okaloosa_darter.html.

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