

# Radiocesium in Fish From Steel Creek

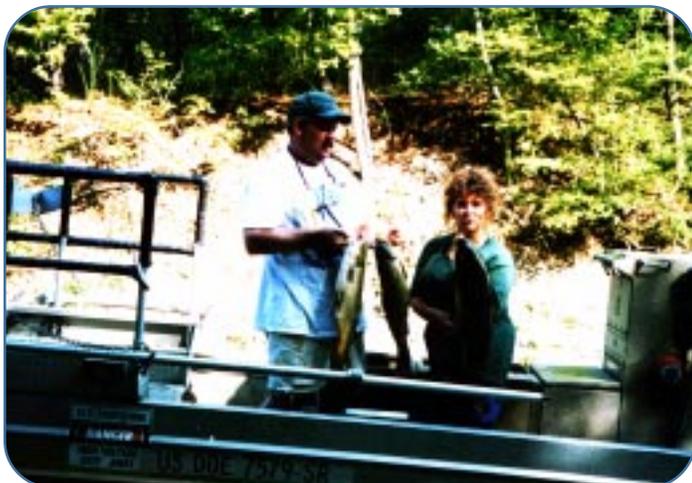
## *Why study radiocesium in fish from Steel Creek?*

### **Risk assessment:**

Potential risks exist for both humans and wildlife because of the presence of cesium-137 in Steel Creek. For example, cesium-137 may be transferred to humans consuming fish that enter the Savannah River from Steel Creek delta. Likewise, cesium-137 may be transferred to wildlife that consume fish from this system. Most other isotopes of concern have decayed away or have migrated from the creek. Research at Steel Creek will be used to develop reliable risk assessments for humans and wildlife, especially endangered forms.

### **Assessment of cleanup needs:**

Data from research at Steel Creek will allow DOE to better assess potential cleanup needs by providing baseline information regarding the presence and availability of cesium-137 in the aquatic food chain. In addition, newly collected data, when compared with previous data, will allow determination of the ecological half-life of cesium-137 in Steel Creek. This, in turn, allows predictions to be made regarding the future availability of this contaminant for uptake into food chains. Much of the cesium-137 is no longer available to biota in the creek.



*SREL researchers, in collaboration with CRESP (Consortium of Risk Evaluation with Public Involvement) personnel, collect fish from the Savannah River and the Steel Creek delta.*



*The federally endangered Wood Stork is known to feed in the Steel Creek delta.*

### **Furthering knowledge in the field of radioecology:**

Research at Steel Creek will contribute to a better understanding of the complex processes of bioaccumulation of cesium in aquatic food chains and the “behavior” of cesium-137 in aquatic systems. This understanding should enable future questions about radiocesium in fish to be answered more easily and models for its dynamics to be constructed.

### **Past research at Steel Creek**

Previous research by the Savannah River Ecology Laboratory (SREL) at Steel Creek focused on questions concerning cesium-137 levels in fish from the Steel Creek Corridor. During 1981, cesium-137 levels were determined in fish and water samples collected from four locations along the lower reaches of Steel Creek between the delta and Highway 125. Results of this earlier investigation provided valuable baseline information regarding cesium-137 levels in fish that can be used in future investigations.

Perhaps the most important finding of this investigation was that the ratio of radioactivity in fish vs. radioactivity in the creek water was much higher than had generally been reported in other aquatic systems. This high “concentration factor” (~3,000) was attributed to the soft water and relatively low potassium levels in Steel Creek. In addition to increased uptake of cesium-137, results also suggested that bioaccumulation of cesium-137 occurred in fish from Steel Creek, with top level predators like largemouth bass having more cesium-137 than the fish they fed upon. Exposure of wildlife depends, in part, upon the type of fish they feed upon.

## Current and future research at Steel Creek

SREL researchers currently are determining cesium-137 levels in several species of commercially and ecologically relevant fish species collected from the Steel Creek delta and corridor during January -- May 1998. The objective of this investigation is to address the following questions concerning cesium-137 in fish from Steel Creek:

- What levels of cesium-137 currently are found in fish from Steel Creek?
- What risk is associated with humans consuming fish from Steel Creek?
- What risk is associated with wildlife consuming fish from Steel Creek?
- What is the ecological half-life of cesium-137 in Steel Creek?
- What is the magnitude of bioaccumulation of cesium-137 at higher trophic levels?

Several important species (i.e., species consumed by humans) from the Steel Creek delta will be used in the development of human risk assessments. Many of these species may migrate between Steel Creek and the Savannah River. For select species, the equation for the frequency distribution will be calculated to predict the probability that a fish of a particular species will have a given level of cesium-137. Along with information about fish body size, these data will be used to determine the risks to humans consuming fish from Steel Creek delta.

Risk assessments for wildlife consuming cesium-137 contaminated fish will focus on Wood Storks (federally



*Fish species such as sunfish, which are tolerant of conditions associated with the more open canopies typical of thermally impacted streams, are found in high numbers in Steel Creek and are a preferred catch of fishermen in the Savannah River.*

endangered species) and Bald Eagles (federally threatened species). These risk assessments will be based on cesium-137 levels in several ecologically relevant fish species (i.e., species consumed by wildlife).

Levels of cesium-137 levels currently found in fish from the Steel Creek corridor will be compared to cesium levels in fish recorded during the 1981 SREL investigation to estimate the ecological half-life of this radionuclide in the Steel Creek system. Tissue from each fish also will be analyzed to determine the ratio of stable nitrogen isotopes. These ratios will allow each fish species to be assigned to a trophic position within the food chains of Steel Creek.

Future research needs include the continuation and completion of cesium-137 determinations and nitrogen isotope analyses for fish that already have been collected. Furthermore, additional fish of several different species will be collected from the Steel Creek delta during the fall of 1998 to provide adequate sample sizes for determining frequency distributions. Samples from these collections also will permit analyses for seasonal variation in cesium-137 levels and will be available for future analyses to determine levels of mercury in fish. The mercury data will be used to refine the risk assessment calculations.

## Deliverables from research at Steel Creek

- An archived data set, including frequency distributions of cesium-137 levels in fish species from Steel Creek Delta that could be consumed by the public or wildlife.
- Risk assessments for humans and wildlife that might be consuming fish from Steel Creek.
- Estimation of the ecological half-life of cesium-137 in the Steel Creek system.
- Contributions to the scientific community that include an increased understanding of bioaccumulation of cesium-137 in aquatic food chains.
- Peer-reviewed publications reporting the results of research conducted at Steel Creek.
- An informational brochure outlining risks associated with fish consumption, to be distributed to the general public.