

Improving Reservoir Releases

Two conditions related to hydropower production can be harmful to fish and other forms of aquatic life: low concentrations of dissolved oxygen in the water released through the dam during generation, and dry riverbeds that result when hydroelectric generation is shut off. These conditions can result in a loss of aquatic habitat and impact fish and insect communities below hydropower dams.



Rainbow Trout
Source: U.S. Fish and Wildlife Service
Illustrator: Tim Knepp

Since the early 1990s, the Tennessee Valley Authority has spent over \$50 million to address these problems. In the first stage of the improvement effort, TVA installed equipment at 15 dams to add life-sustaining oxygen to the water released into the tailwater (the area downstream of the dam) at 16 projects. At the same time, TVA made operational changes and installed additional equipment to sustain minimum water flows below its dams.

TVA currently is completing a second round of improvements. Oxygen systems have been installed or enhanced at nine projects, and improvements at three more projects are under study. The additional oxygenation capacity is needed to offset increased oxygen demands associated with delaying the seasonal drawdown of TVA reservoirs until Labor Day under a new operating policy approved by the TVA Board in June 2004.

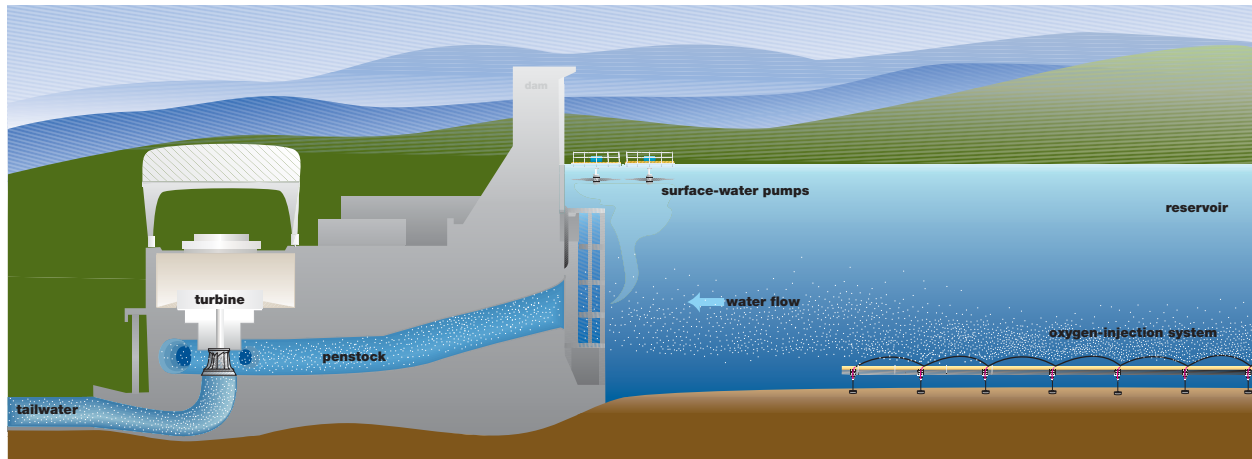
Since TVA's reservoir releases improvements program was implemented, dissolved-oxygen concentrations have increased dramatically in more than 300 miles of river downstream from TVA dams, and wetted habitat is maintained in 180 miles of river, previously impacted by intermittent drying. Studies show an increase in the number and diversity of fish and aquatic insects in these areas, as well as a significant growth in tailwater fishing, which aids local economies.

TVA's reservoir releases improvements program has received national recognition from the Wildlife Habitat Council and the National Hydropower Association and has been applauded by state resource agencies, Trout Unlimited, and other organizations. The program also has been credited with making the reintroduction of lake sturgeon to the upper Tennessee River system possible. Reintroductions of mussels and snails, including some federally listed endangered species, also are proceeding or proposed for the tailwaters of Cherokee, Douglas, Nickajack, and Wilson Dams.

Improving Dissolved-Oxygen Concentrations

Because conditions are different at each dam, TVA uses a wide range of methods to improve dissolved-oxygen concentrations. In some cases, more than one approach is necessary to reach oxygen targets, which vary depending on whether the tailwater is a warm- or cold-water fishery.

Aerating weirs are located a short distance downstream from South Holston and Chatuge dams. Aerating weirs are small dams designed to mimic a natural waterfall, creating oxygen in the water as it plunges over the top of the weir walls when turbines are running. A different type of weir, designed to regulate the water's flow, also helps to improve oxygen levels in the tailwater below Norris Dam.



Oxygen-injection systems are used at Blue Ridge, Cherokee, Douglas, Fort Loudoun, Hiwassee, Norris, Nottely, Tims Ford, and Watts Bar dams. These systems bubble oxygen into the water through perforated hoses suspended near the reservoir bottom upstream of the dam.

Surface-water pumps are used at Douglas and Cherokee dams. These pumps, which resemble large ceiling fans, push warm, oxygen-rich surface water downward, where it is mixed with low-oxygen bottom water and then drawn in by the turbines during generation.

Aerating turbines are used at Apalachia, Boone, Cherokee, Douglas, Fontana, Hiwassee, Norris, South Holston, and Watauga dams. Aerating turbine technologies use low-pressure areas to draw air into the turbine as power is being generated. At some dams, TVA has modified the existing turbines to draw air into the water. At other dams, TVA has installed new turbines specifically designed for this purpose.

Before minimum flow improvements



Sustaining Minimum Flows

TVA uses three different methods to maintain water levels in the riverbed below tributary dams when hydroelectric generation is shut off.



After minimum flow improvements

Turbine pulsing is used at Wilbur, Cherokee, Fort Patrick Henry, Douglas, Apalachia, Ocoee 1, and Fontana dams.

Water is released, or pulsed, through the turbines periodically, creating a steady flow and maintaining a constant wetted habitat downstream of the dam.

Reregulating weirs are located downstream of South Holston, Chatuge, and Norris dams. These weirs operate like small dams, holding back some of the water when power is being generated, then slowly releasing it when generation stops.

Small hydroelectric units are used at Nottely and Blue Ridge dams. These units run when the main turbine is not operating, so that water is continuously released downstream.