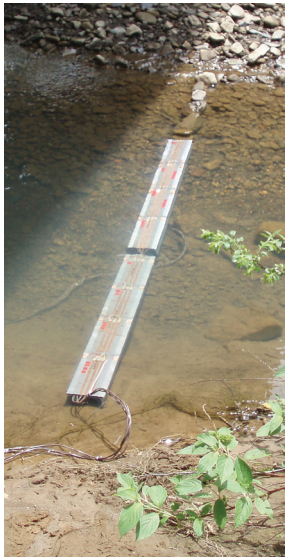
Low-Impact Fish Monitoring



San Dimas Technology and Development Center (SDTDC) and Sensatech Research Ltd. (www.sensatech.com) have developed a device for monitoring the presence, abundance, approximate size, and movement habits of fish in natural streams. The device uses very low-power electric fields to sense living organisms at a distance. Unlike competing products, the device can be installed without modifying the natural waterway, and it operates without influencing fish behavior before, during, or after detection.

As of December 2008, this device is in an advanced development stage. A prototype is operating in remote streams on the Ouachita National Forest, and Sensatech is analyzing collected data to build fish-size to signal-strength correlations. A second prototype will be installed on the Stanislaus River near Sacramento, CA, by the end of the month. Data from this installation will be combined with the Ouachita data to validate the correlations. Once the correlations reach an acceptable confidence level, Sensatech will create a software interface with data analysis tools for the average user.

Advantages

The device is virtually immune to turbidity-induced error and requires no lighting considerations. The electronics and sensors consume less electricity than any other fish detection device. The device has proven less sensitive to surface turbulence and debris than other electric-field devices. An investigation of fish response to the induced electric field showed no response from a variety of electrically-sensitive fish at the device's operating frequency.

Expected Availability

Sensatech will release a commercial product based on the final prototype. The final cost is not set, but will depend on certain options, such as desired power source and width of the measurement area. Average price will be comparable to other non-contact fish detection devices. The commercial offering should be available by fall 2009.

Pre-Commercial Opportunities

The utility of the commercial product will be improved by extensive beta testing of the advanced prototypes. An additional two prototypes will be installed in progressively more demanding field conditions under the current project, but additional prototypes may be acquired outside the project for testing against local conditions and species of interest. Manufacturer support will be available but limited before the current project is completed. Data collected from all sites during beta testing will be used to build, test, and validate the length correlations as well as refine the user interface.

A school of 2-inch-long fish passes the detector. The school produced a strong signal.

Areas of Continued Investigation

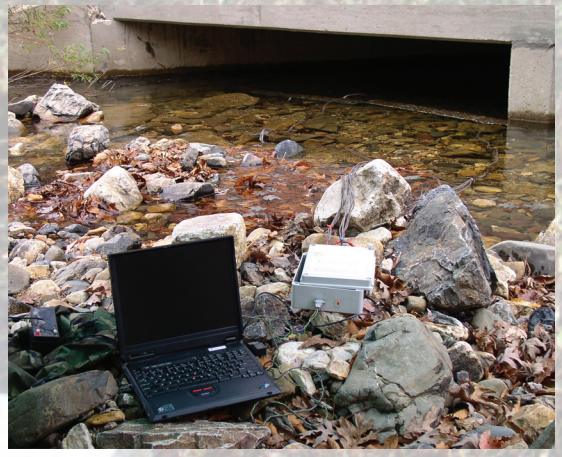
The current system uses a two-dimensional array of sensors. The array deduces direction of travel from the timing of signals in one dimension and approximate size from the magnitude and duration of the signal. Concurrent crossings are identified, to a limited extent, by simultaneous detection from multiple sensors across the width of the stream. While the ability to detect multiple simultaneous crossings is limited by the width of the existing pads, the opportunity exists to reconfigure the sensors into a more complex two-dimensional arrangement that would virtually eliminate ambiguity from simultaneous crossing. The more complex arrangement also allows a limited ability to apply tomographic imaging to the received signals, which can reveal information beyond mere presence or absence of an object.

At the present time, the tomographic imaging component is a proposal with proof-of-principle support. If it is developed, the component may be an accessory to the current device, rather than a replacement, that operates during specific events. The imagery may include sufficient information to enable species differentiation in certain situations.

Targeted Applications

The sensitivity and range of the device are determined by the spacing of the sensors; the greater the spacing, the greater the range, but the lower the sensitivity. The planned field trials will test different configurations in small and large streams. The sensors are cheap and simple enough that users may choose to modify their arrangement to suit different conditions as they arise.

The currently planned installations will use battery-backed solar power and onboard data storage. Future configurations can include remote communication and alternative power sources.



The device consists of a weatherproof control box connected to a series of sensor pads. The computer is only required for initial setup.

U.S. Forest Service
San Dimas Technology & Development Center

The U.S. Forest Service, San Dimas Technology & Development Center applies scientific knowledge and advanced technology to create new or substantially improved equipment, systems, materials, processes, techniques, and procedures to provide solutions to natural resource issues for Forest Service employees and its partners.

T&D has specialists in disciplines such as civil, mechanical, aerospace, electronic, sanitary, and logging engineering; and architects, landscape architects, hydrologists, soil scientists, biological scientists, physical scientist, and foresters.

The Coordinated Federal Lands Highway Technology Implementation Program (CTIP) is a cooperative technology deployment and sharing program between the FHWA Federal Lands Highway office and the Federal land management agencies.

In partnership with:

U.S. Department of Transportation **Federal Highway Administration**

Coordinated Federal Lands Highway Technology Implementation Program

U.S. Forest Service
San Dimas Technology & Development Center

Ryan Becker
444 East Bonita Ave
San Dimas, CA 91773
Phone: (909) 599-1267 ext. 260 • Fax: (909) 592-2309
E-mail: ryanbecker@fs.fed.us
Access to additional publications:
http://www.fs.fed.us/eng/pubs/

Caring for the land.... and serving people

Fish Detection Device

U.S. Forest Service
San Dimas Technology & Development Program