

**FISHERIES  
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**Re: Fish Protection: The U.S. Department of Energy (DOE) - American Made Water Prize**

**Concept Stage: "Sweeping CHIRPs, Looming Darkness: In-Sync Stimuli"**

**Presented by: The Fisheries Technology Associates, Inc. (FTAI) Team of Ted Ground and Bill Mancini.**

**6 March 2020**

Dear Fish Protection Prize Evaluation Team, at DOE, and the Bureau of Reclamation:

It is a pleasure to have this opportunity to introduce ourselves and our proposal for this Fish Protection Prize competition. We learned about the DOE Fish Protection Prize through Ted Ground, who was the Solver and 1<sup>st</sup> prize winner of the 2019 Bureau of Reclamation InnoCentive Challenge on Fish Exclusion. Ted helped form this FTAI Team.

Founded in 1982 by Bill Mancini, Fisheries Technology Associates, Inc., (FTAI) is a full-service aquaculture, fish farming, aquaponics, and wild- and commercial-fisheries consulting company, based in Fort Collins, Colorado. Representing FTAI as members of the FTAI Solvers Team for this DOE Fish Protection Prize are:

**Ted Ground**, Project Manager, FTAI, Keller, Texas. Email: [tgroundservices@yahoo.com](mailto:tgroundservices@yahoo.com). LinkedIn Profile: <https://www.linkedin.com/in/ted-ground-a5a06a16/> Background: Master of Science, Aquatic Biology, Texas State University, San Marcos, Texas, and,

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**The title of our proposal is: A Multi-sensory, Non-physical Barrier (NPB): Broadband Sonic, Ultrasonic, and Looming Light-Dark Patterns Stimulate C-Start Escape Reflexes in Fish.**

**Brief Description:** Pulsating low frequency sound (< 20 kHz) and modulated ultrasonic (20 kHz-200 kHz) frequencies ("CHIRP") can deter many species, sizes, and ages of fish from water diversions and intakes. These pressure and acoustical stimuli operate on the mechanosensory lateral line, the auditory otolith-inner ear, and the mechanosensory/auditory swim bladder – components of the sensitive sensory systems of fish. This proposal is **innovative** - by synchronizing low frequency sonic and modulated ultrasonic signals with pulsating light/dark patterns which mimic predatory threat, inducing perceptions of "looming" dark moving objects. Synchronized mechanosensory, auditory, and visual stimuli induce reflexive escape behavior in many species of fish, across a range of sizes and ages. There is a substantial neurological basis for these sensory and reflexive systems, which we document extensively in the Technical Narrative for this Concept Stage of the DOE Fish Protection Prize Competition.

***We welcome this opportunity to submit our FTAI Team proposal for Fish Protection in the waters of the USA!***

Sincerely,  
FISHERIES TECHNOLOGY ASSOCIATES, INC.

A handwritten signature in black ink that reads "Bill Mancini".

Bill Mancini, CFP  
President and Senior Biologist