



HI-Z TURB'N-TAG®

Core Values

Results-oriented
environmental services

Respect for stakeholders,
the public and our natural
environment

Ethical work conduct and
scientific integrity at all times

Safe and positive work
environment

Pride, investment, and
accountability through
employee ownership

Corporate Office

25 Nashua Road
Bedford, NH 03110
603.472.5191

Nationwide Offices

California
Delaware
Florida
Maine
Massachusetts
New Hampshire
New York
North Carolina
Pennsylvania
South Carolina
Vermont
Washington

www.normandeau.com

Innovative Techniques That Address Fish Passage Survival

For decades, fisheries scientists have worked to obtain reliable survival estimates of fish as they traverse turbines and other passage routes at hydroelectric stations. Reliability of this information is of paramount importance for project owners and state and Federal agencies who determine the safest routes for downstream fish passage; this is especially true for migratory fishes.

In an effort to make a significant contribution to the quantitative measurement of hydro turbine effects on fisheries and to the development of turbine operational strategies, Normandeau scientists developed an innovative technology to assess turbine, spillway and natural falls fish passage survival. This approach has led to the reevaluation of spillways to develop fish-friendlier bypass structures. Results of our studies have been integrated into operational procedures for many of our clients, and have reduced costs without jeopardy to the fish resources.

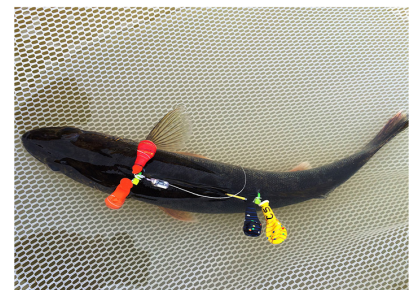
Offering Reliable Estimation of Fish Passage Survival

The HI-Z Turb'N Tag® is a unique recovery technique which can be used to reliably estimate the survival rate of fish as they travel through various passage routes. Developed by Normandeau, the HI-Z Turb'N Tag® inflatable tag is affixed to the fish prior to passage and activates after passage, bringing the fish to the surface where it can be recovered. Independent laboratory simulated experiments have shown little effects of the tag on fish behavior and stamina.

Providing Decades of Tag-Recapture Advantages

HI-Z Turb'N Tag® offers the following significant advantages:

- Small sample size (important for scarce resources),
- High statistical reliability,
- In-hand examination of fish for injuries,
- Applicable for a wide range of fish sizes and species including sensitive ones (e.g., juvenile American shad),
- Estimation of cumulative passage effects,
- Minimum handling and tagging-related fish mortality,
- Ability to delineate causative mechanisms for mortality in passage (e.g., shear related, mechanical, or pressure),
- Development of new statistical models for analysis of tag-recapture data, and
- Opportunities to assess post-passage physiological or behavioral fish responses.



Fish with HI-Z tag before turbine passage



Fish with HI-Z inflated tag after passing turbine