

# IMPROVED COLLABORATION AND INFORMATION SHARING IN TAGGING, TELEMETRY AND MARKING

## *Recommendations for Fish Population Monitoring*

### FIRST CALL FOR AUTHORS

*Initial manuscript applications are due by November 16, 2007 from the AFS Meeting (later deadlines apply to subsequent symposia)*

*Please submit to both: Keith Wolf and Jennifer O'Neal  
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The Pacific Northwest Aquatic Monitoring Partnership (PNAMP) is a compact of twenty (20) state, federal, tribal agencies and private organizations and their Executives. The PNAMP steering committee has tasked the Fish Population Monitoring (FPM) committee of 156 regional scientists and agency representatives to produce a **Tagging, Telemetry and Marking** (TTM) guide that unites distinct and individual programs, projects and research uses. The goal is to produce technical information suitable for use by all aquatic (and some terrestrial), biologists, researchers and decision-makers.

#### **The goal of this project is:**

*Use global expertise to combine the disparate tactical and individual efforts regarding the science of tagging, telemetry and marking into a single technical manual and long-term program strategy for recommendation to the Executive Network by PNAMP. (See: [Background](#) for more information on PNAMP).*

#### **Summary:**

Since early 2006, PNAMP has been successful in its initial outreach stages aimed at identifying the substantial number of people and the sheer volume of *tactical* efforts aimed at TTM across and outside the Pacific Northwest. This only reinforces our vision of need and our conscientious intent to expand our geographic scope. Ultimately, we will publish applicable manuscripts into a single *strategic* compilation. This will produce a useful and organized resource for use by scientists, researchers, and practitioners for the next twenty years. Finally, this project is intended to provide for better informed policy level discussions and actions.

**Therefore, we are asking presenters at these conferences and others engaged in research and application to consider providing presentations in manuscript form for formal peer-review and publication into a single volume of TTM science.**

Currently, we have a large number of [potential chapters proposed and a draft outline](#) identified describing some of this expert work in progress. **If you are interested in having**

**your work published, we ask that you provide a two-three page description of your proposed chapter with:**

- A 150-200 word abstract generally describing:
  - Title of the work.
  - Authors and their affiliation(s) and the **Lead Author** contact information.
  - Approximation of the topical area that the chapter would address (see [general list](#)).

Many of these topics/presentations are very likely suitable for use in this project as the TTM helps with editing, publication and world-wide distribution. Symposia have already occurred and are already scheduled in New Zealand, San Francisco and Portland where authors will be convening and presenting work that could potentially be included as ~5-12 page chapters. Much work has already been completed in draft form. It is from the following events that we hope to attract the majority of additional authors.

These are:

1. Anadromous Salmonid Tagging and Identification Techniques in the Greater Pacific Region (PCMFC)—<http://www.rmpec.org/2007-marking-symposium.html>
2. The Sept. Annual AFS Conference—San Francisco—<http://www.fisheries.org/sf/>.
3. Summary of Fish Tagging and Evaluation Techniques Currently Used in the Columbia River Basin (NPCC and ACOE)—<http://www.fisheries.org/sf/>.
4. Recent Advances in PIT-tag Technology for Fisheries (<http://www.fisheries.org/sf/>).
5. The Tagging and Telemetry Focus Group White Paper (various agencies)--  
[https://www.nwp.usace.army.mil/pm/e/afep\\_system.asp](https://www.nwp.usace.army.mil/pm/e/afep_system.asp)
6. The Imaging and Geospatial Information Society ([asprs.org](http://asprs.org) annual meeting in Portland, OR., April 2008).
7. Advances in Fish Tagging and Marking Technology—Auckland, New Zealand., February 2008)—<http://www.fisheries.org/units/tag2008/> (AFS/ASOB)

The June issue of the American Fisheries publication of “**Fisheries**” (Vol. 32 No 6) provides ample and concrete rationale to continue and expand organized efforts and ask for your contributions.

*Measurement is the key component in most investigations of fish and shellfish. The ability to identify individual and groups of fishes, as well as their habits, movements, and mortality, is crucial to effective fisheries science. The methods used must be appropriate, accurate, and repeatable.*

*While uncertainty is an integral part of dealing with biological systems, as scientists it is crucial that we use methods that minimize uncertainty in order to improve the conservation and sustainability of fisheries and aquatic resources. In June 1988, over 400 fisheries and aquatic scientists gathered in Seattle, Washington, for the "International Symposium and Educational Workshop on Fish-Marking Techniques." This landmark event included presentations on virtually every fish tagging method in use at that time. The ultimate product was the 1990 publication Fish Marking*

*Techniques, American Fisheries Society Symposium 7, arguably one of the most influential fisheries publications in decades. In the nearly 20 years since that symposium, the world of fisheries science has changed dramatically; the technologies and analytical procedures available for marking and monitoring fisheries have evolved as well. Fish marking technologies on the cutting edge two decades ago are now commonplace, and new technologies are developed yearly. **Clearly, the time has come to bring together again global expertise on fish tagging techniques and data analysis [emphasis added].***

This *Fisheries* column states categorically what PNAMP is doing and why we are coordinating and collaborating with you and asking for your manuscript proposals.

We are also responding to the strong and persistent recommendations of state, federal, tribal and private organizations including our Executive Network and its Steering Committee. Additionally, this project was deemed a high priority by PNAMP's Fish Population Monitoring work group and is also acting in response to other calls for this product from the Northwest Power and Conservation Council's Independent Scientific Review Panel (ISRP) call for action and reports in their [first report in 1997](#):

1. The ISRP Preliminary Review of 2007-09 Proposals [Report No. 2006-4](#)
2. The ISRP Retrospective Report. [Report No. 2005-14](#)
3. The ISRP 2006 Fiscal Year Proposals for Acoustic Tracking. [Report No. 2005-19](#)
4. The ISRP Database Review. [Report No. 2000-3](#)
5. The ISRP2006 Retrospective Report  
<http://www.nwcouncil.org/library/isrp/isrp2007-1.htm>

These chapters will assist improved coordination and sharing of technical designs, analytical & decision techniques. This will result in improvements in the science obtained and derived from the broadest possible group of global TTM experts. We will also bring about improvements to analyses provided to decision-makers. Thus, the beneficiaries will be all sectors of fish management using TTM, but who may be doing so in an uneven and possibly inefficient manner that inhibits or excludes information sharing and exceedingly valuable collaboration.

Moreover, current programs and uses of TTM are designed to answer individual questions not produce regionally comparable or robust population information. With that kind of investment on the line, project managers and policy makers rightfully insist that what is being implemented is necessary and not duplicative or deficient. We propose that it is not enough to gather isolated data or use sub-region information for regional or population inferences. It is also necessary, even compulsory in some cases, for securing continued program support for PSC, the PCSRF, ESA implementation and monitoring, (e.g., the pending FCRPS Biological Opinion, the Pacific Salmon Treaty) and other vital programs aimed at improving science, promoting stewardship, implementing actions and informing long-term national and international policy development.

## Scope

Specifically, a number of [technical chapters](#) will focus on the measurement of in-river reach and route-specific fish survival in terms of both juvenile survival and smolt-to-adult returns. This means the program itself must be coordinated and done in a programmatic fashion such that projects and programs can scale and implement TTM efforts of sufficient spatial and population extent to make reasonable inferences and conclusions for management purposes. These programs also need to better coordinate and share comparable long-term data on survival, movement, etc. and provide improved model and decision inputs, for example. This publication will increase the capability for data to be shared and read through routes of passage in the outmigration corridor and again as the adults return. Ideally, the systems and techniques that are developed will describe, for example, handling of the fish after initial capture, anesthetization and tagging occurs and techniques for achieving minimal deleterious effects would be emphasized.

Also, complimentary technologies such as: green (bathymetric) LiDAR and several forms of remote sensing, data processing and GIS technologies are also being considered. We seek to broaden the technology discussion to the full realm of technologies currently being used. For instance we are specifically asking for chapter contributions on satellite tags, archival tags, acoustic tags, chemical and biological markers, radio telemetry, transponder and non-electronic tags. We will then incorporate *Foreword* and *After Foreword* chapters describing history, integrated approaches and briefly describe data management methods and challenges.

The final form of this product will be vetted by the PNAMP and the FPM, in coordination with an international subcommittee to maximize the value and content of the product.

## **Background: The Pacific Northwest Aquatic Monitoring Partnership and the Fish Population Monitoring Work Group:**

*PNAMP provides a forum to enhance the capacity of multiple entities to collaborate to produce an effective and comprehensive network of aquatic monitoring programs in the Pacific Northwest based on sound science designed to inform public policy and resource management decisions.*

See: <http://www.pnamp.org>

*The function of the Fish Population Monitoring Workgroup (FPM) is to advance the science of monitoring & evaluation for aquatic species and provide well-developed recommendations for monitoring fish populations.*

### **The project objectives are:**

1. Integrate & compile information from the large & disparate discipline of TTM designs & practices;

2. Compile & publish the sum total of TTM information available as resources allow;
3. Provide a standardized set of design recommendations & methods for interpretation of the science;
4. Create a durable & enduring pathway & process for future amendments to the science;
5. Improve TTM cost-effectiveness through resource sharing & elimination of duplicative efforts, and,
6. Establish a web-based TTM program resource for practitioners & managers.

### **Project Principles:**

1. Information sharing is essential for coordinating many national, international, treaties, agreements, adjudications, and the network of regional and local programs and projects supporting decisions within these fora.
2. Consistent standards and similar protocols are necessary for efficient project, program and resource allocation.
3. A technical manual/framework complete with methods, protocols, design standards and training and implementation elements is needed to ‘*connect the dots*’ for achieving successful implementation, information durability, and increased scientific rigor.

### **Participation:**

This project is aimed at priority stocks of interest as adopted in recovery, conservation, production and harvest plans for Puget Sound, B.C., Alaska, the Lower, Mid and Upper Columbia, Snake River, Oregon Coast, portions of Northern California, and beyond. Our need and value metrics are consistent with all fifty-three recently completed subbasin plans and the Northwest Power and Conservation Council’s amended Fish and Wildlife Program. BPA, PSC, PFMC, CBFWA and NPCC use these plans to prioritize ESA and other “at risk” stocks under named ecosystem-based mitigation and conservation programs. Further, the burgeoning Puget Sound Partnership, the POST and Ocean Tracking Network and the Governor’s Monitoring Forum in Washington State also advocate these project principles. The project objectives span the entire region under the PST, PFMC and the North and South of Falcon processes under US v. Canada and are designed to have worldwide implications and application by seeking input from experts around the World.

The **Bonneville Power Administration** is currently providing funds for this project and is assisting PNAMP in meeting its mission and the Fish Population Monitoring work group in identification of opportunities for resource sharing, data comparability, cost effectiveness and overall improvement of estimating their obligations and role in providing individual TTM project support.

Also, we are working with the **Pacific Salmon Commission** seeking support through the Southern Panel Enhancement Fund. Specifically, this project addresses eight of their strategic goals such as: “*Develop tools, technologies and Improve Stock Identification Techniques.*”

## **EXAMPLE Topical Chapters:**

*NOTE: Many of these topics are already culled from the several symposia and meetings that have occurred or are currently planned. We are asking scientists at these multiple technical conferences to consider submitting manuscripts given that a high amount of work that has already gone into presentation preparation.*

### **PART I—OVERVIEW OF TAGGING, TELEMETRY AND MARKING (~6 PAPERS/CHAPTERS)**

- THE STATE OF THE SCIENCE, POLICY AND USE OF TAGGING, TELEMETRY AND MARKING PROGRAMS FOR AQUATIC RESOURCE MANAGEMENT IN CANADA AND THE UNITED STATES
- HISTORICAL OVERVIEW: THE EVOLUTION OF BIOTELEMETRY
- RADIO TRACKING IN FRESH WATER: BASIC THEORY AND PRACTICE
- UNDERWATER ACOUSTICS APPLIED TO BIOTELEMETRY
- TELEMETRY SYSTEM ARCHITECTURES
- DESIGN AND STATISTICAL CONSIDERATIONS

### **PART II—TECHNIQUES AND APPLICATIONS (~11 PAPERS/CHAPTERS)**

- TECHNIQUES FOR TRANSMITTER IMPLANTATION AND EVALUATION OF TRANSMITTER EFFECTS ON FISH PERFORMANCE
- USE OF REMOTE RADIO TELEMETRY STATIONS FOR FISHERIES STUDIES
- DESIGN OF INTEGRATED RADIO-TELEMETRY ARRAYS AT HYDRO DAMS
- OPTIMIZING RADIO TELEMETRY RECEIVING SYSTEMS
- OPTIMIZING THREE-DIMENSIONAL ACOUSTIC TELEMETRY RECEIVING SYSTEMS
- EVALUATING JUVENILE SALMONID PASSAGE AND SURVIVAL AT LOWER MONUMENTAL DAM USING
- JUVENILE SALMONID PASSAGE AT LARGE HYDROELECTRIC DAMS USING ACOUSTIC TELEMETRY
- APPROACHES FOR SMALL AND LARGE-SCALE FISH TRACKING IN LARGE RIVER DRAINAGES
- USING TELEMETRY FOR CONDUCTING BASIN-WIDE ASSESSMENTS OF LONG-DISTANCE MIGRANTS
- USING BIOTELEMETRY FOR CATCH-AND-RELEASE ANGLING RESEARCH: APPLICATIONS, OPPORTUNITIES AND CHALLENGES
- SPECIAL CONSIDERATIONS FOR ESTIMATING HOME RANGES OF FISH AND AMPHIBIANS

### **PART III—DATA MANAGEMENT (~3-5 PAPERS/CHAPTERS)**

- MANAGING TELEMETRY DATA IN A CHANGING TECHNOLOGICAL ENVIRONMENT
- DATA CONSIDERATIONS OF USING CONTINUOUS REMOTE PIT TAG INTERROGATION SYSTEMS IN STREAMS
- KATZ, TOSHACH ET.,AL., ON REPORTING STANDARDS PAPER (NEED PERMISSION)
- DATA PROCESSING, METADATA, ANALYSIS TECHNIQUES AND SOFTWARE

### **PART IV— RECENT ADVANCES IN PIT-TAG TECHNOLOGY FOR FISHERIES (~12-15 PAPERS/CHAPTERS)**

- THE DEVELOPMENT OF IN-STREAM MONITORING OF PIT-TAGGED WILD JUVENILE SALMONIDS IN TWO IDAHO STREAMS: SUCCESSES, FAILURES, AND FUTURE DIRECTIONS

- IMPLEMENTING REMOTE PIT TAG DETECTION SYSTEMS INTO CAPTURE-RECAPTURE STUDY DESIGNS TO IMPROVE OUR UNDERSTANDING OF FISH POPULATION DYNAMICS
- PASSIVE INTEGRATED TRANSPONDER TAG LOSS IN HEADWATER POPULATIONS OF COASTAL CUTTHROAT TROUT
- THE IMPLEMENTATION OF REMOTE PIT TAG DETECTION STATIONS TO IMPROVE PRECISION OF ANNUAL SURVIVAL RATES OF ENDANGERED SUCKERS IN THE UPPER KLAMATH BASIN, OREGON
- USING PIT TAGS TO DISENTANGLE SIZE-DEPENDENT GROWTH, MOVEMENT AND SURVIVAL IN STREAM-DWELLING SALMONIDS
- USE OF PIT-TAG INTERROGATORS TO MEASURE FISH RESPONSE TO RESTORATION OF STREAMS
- MOVEMENT, GROWTH, AND SURVIVAL OF JUVENILE COHO SALMON AND TROUT IN THE EAST TWIN RIVER, WASHINGTON
- RESIDENCY, GROWTH, AND SURVIVAL OF PIT-TAGGED CHINOOK SALMON REARING IN A TIDAL CHANNEL
- USING PIT TAGS TO EVALUATE FACTORS AFFECTING TROUT SURVIVAL IN HEADWATER STREAMS
- EVALUATION OF CULVERT INFLUENCE ON SEASONAL MOVEMENTS OF JUVENILE SALMONIDS, AN IN SITU PIT TAG STUDY IN ALASKA
- MOVEMENTS OF BROOK TROUT IN STANLEY BROOK, A SMALL COASTAL STREAM IN MAINE
- EVALUATION OF COMMERCIALY AVAILABLE PASSIVE INTEGRATED TRANSPONDER SYSTEMS USED FOR FISH IDENTIFICATION AND INTERJURISDICTIONAL FISHERIES MANAGEMENT

**PART V—NEW TECHNIQUES, PROGRAMS AND THE FUTURE (~4-6 PAPERS/CHAPTERS)**

- NEW QUANTITATIVE STANDARDS FOR FISH PASSAGE EVALUATION: APPLICATION OF EVENT-TIME ANALYSIS TO FISH PASSAGE TELEMETRY DATA
- OPERATIONAL CONSIDERATIONS IN IMPLEMENTING POST, A PERMANENT CONTINENTAL-SCALE ARRAY FOR THE WEST COAST OF NORTH AMERICA: MEASURING SALMON SMOLT MOVEMENTS AND SURVIVAL ON THE VERY LARGE SCALE
- REAL-TIME DATA PROCESSING AND GEOSPATIAL ANALYSIS OF RADIO-TELEMETRY DATA COLLECTED FROM LARGE RIVER SYSTEMS IN BRITISH COLUMBIA, WASHINGTON AND ALASKA
- RECOMMENDATIONS FOR IMPLEMENTATION, TRAINING, AND FUTURE NEEDS (WILL BE DONE BY AN INDEPENDENT SCIENCE PANEL WITH PNAMP PARTICIPATION)

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