

**Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal**

Section 1. General administrative information

Columbia Basin Pit-Tag Information System

Bonneville project number, if an ongoing project 9008000

Business name of agency, institution or organization requesting funding
Pacific States Marine Fisheries Commission

Business acronym (if appropriate) PSMFC

Proposal contact person or principal investigator:

Name Carter Stein
Mailing Address 45 SE 82nd Dr. Ste. 100
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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name

NPPC Program Measure Number(s) which this project addresses.

5.0F.10

NMFS Biological Opinion Number(s) which this project addresses.

NMFS BO RPA Sec. 13

Other planning document references.

NMFS Snake River Salmon Recovery Plan: 2.1.d.5
Supplemental Biological Assessment on Federal Columbia River Power Operations,
Submitted to NMFS and USFWS by U.S. Army Corp of Engineers, U.S. Bureau of
Reclamation, Bonneville Power Administration, December, 1994: Section 4.7.

Subbasin.

Short description.

Develop, operate, maintain and enhance a long-term Columbia River Basin database on PIT tag information and provide operation and maintenance support for the collection of PIT Tag information at PIT tag interrogation sites.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction		Watershed
	Resident fish	X	O & M	+	Biodiversity/genetics
	Wildlife	+	Production	+	Population dynamics
	Oceans/estuaries	+	Research		Ecosystems
	Climate	+	Monitoring/eval.	*	Flow/survival
	Other	+	Resource mgmt	+	Fish disease
			Planning/admin.	+	Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

Data Management, PIT tag, Modeling

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
8331900	New Fish Tag System	R&D of deliverables deployed for operation of PIT tag interrogation systems
9701000	Essential M&E Infrastructure - PIT Tag Monitor Procurement and Installation	Procurement of components of ISO FDX-B based interrogation systems.
8906500		PIT tag marking project
9602004		PIT tag marking project
9102800	Monitoring the smolt migration of wild snake river spring summer chinook	PIT tag marking project
9403400	Assessing Summer Fall Chinook Restoration in the Snake River Basin	PIT tag marking project
8712700		PIT tag marking project
8332300	Smolt Condition and Arrival Timing	PIT tag marking project

	at Lower Granite	
9005500	Steelhead Supplementation Studies in Idaho Rivers	PIT tag marking project
9102900	Life History of Fall Chinook in Columbia River	PIT tag marking project
9602400	Changes in Gas Bubble Disease Signs & Survival of Migrating Juv. Salm./ Gas	PIT tag marking project
8909802	Salmon Supplementation Studies in ID Rv. Nez Perce Tribe.	PIT tag marking project
8335000		PIT tag marking project
9602610		PIT tag marking project
9107300	Idaho Natural Production Monitoring Evaluation 83-7 (ESA)	PIT tag marking project
9107200	Redfish Lake Sockeye Salmon - Captive	PIT tag marking project
8909800	Idaho Supplementation Studies	PIT tag marking project
9005200		PIT tag marking project
9302900	Survival Estimation for Dam Reservoir Passage.	PIT tag marking project
8812000		PIT tag marking project
9808001	PIT Tag Placeholder	PIT tag procurement and distribution
8401400	Smolt Monitoring at Federal Dams	PIT tag data consumer
9602000	1997 Hatchery PIT Tag Study; Comparative Survival Rate of Hatchery Chinook	PIT tag marking project
8906500	Annual Fish Marking Program-Missing Hatchery Production GroupsOR/WA/ID/FWS	PIT tag marking project

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Operate, maintain and enhance the PTAGIS database system and data collection software.	a	Acquire and process data from remote interrogation sites.
		b	Receive and process input files (tagging, monitored release, release information and mortality files).

		c	Update database in a timely manner. All files will be validated upon receipt by PTAGIS and immediate notification of errors shall be made on-line. Valid data will be loaded into the database within two hours from the time it is received.
		d	Perform backups, system management and general operation services on PSMFC computer and PTAGIS database to support on-going operations.
		e	Train personnel to detect problems and perform initial response procedure at remote interrogation sites.
		f	Build new and enhanced PTAGIS reports as required by users.
		g	Test for "year 2000" bugs.
		h	Update validation software.
		i	Maintain, enhance and document PIT tag interrogation system software.
		j	Maintain, enhance and document PIT tag system analysis software.
		k	Maintain, enhance and document PIT tag applications and all other PTAGIS software.
2	Install, operate and maintain interrogation systems in field locations	a	Operate and maintain interrogation equipment at established sites (BO1, BO2, JDA, MCN, LMN, LGO, LGR, PRJ)
		b	Perform pre-season installation and post season removal of interrogation equipment
		c	Implement modifications to detection equipment and software as required to optimize data integrity and system operations. Seasonal modifications shall be in place by March 15 of the outmigration year.
		e	Continue to implement the written preventative maintenance program

			for detection system equipment.
		f	Document maintenance activities at interrogation sites.
		g	Develop active process to determine detection system status in near-real time.
		h	Provide timely repair of defective equipment at interrogation sites.
		i	Operate and maintain interrogation system telephones, telephone lines and power backup equipment.
3	Administration, management and coordination	a	Coordinate User Requirements in collaboration with the Columbia River Basin PIT Tag Steering Committee.
		b	Coordinate operational issues with facility operators and interested parties.
		c	Coordinate the operational deployment of new PIT tag technologies with system users and the technology innovators.
		d	Coordinate with BPA Technical Management Team development staff and contractors to improve network (internet / WWW) access to validated and loaded PIT Tag data.
		e	Coordinate with Columbia River Basin PIT Tag Steering Committee (PTSC) to update and distribute the PIT Tag Specifications Document by February 1 st of the outmigration year.
		f	Coordinate with the PTSC to update and distribute the PIT Tag Tagging Procedures Document. Changes to this document are authorized and approved by the PTSC.
		g	Update, automate and distribute tagging system documentation.
		h	Act as central contact / liason between PTAGIS system users.
		i	Provide requested data to casual,

			ad-hoc users as needed.
		j	Provide training and informational pointers to users on tagging and validation and system analysis software as needed.
		k	Provide the day to day management, supervision and administrative support for the PIT Tag Operations Center (PTOC).
		l	Produce a newsletter for periodic, general distribution.
		m	Produce, manage and report the results of the PTAGIS annual workshop.
		n	Develop the Annual Work Plan for the following outmigration year.
		o	Write and distribute quarterly and annual reports within the fiscal year.
4	Additional Support Actions	a	Assist BPA in the planning, coordination, evaluation and management of the New Tag Frequency Transition Project as requested (9701000 – Essential M&E Infrastructure- PIT tag monitor procurement and installation).
		b	Install new or portable systems as required. E.g., provide inter-agency technical consulting on installation of PIT tag interrogation systems at new Bonneville smolt monitoring facilities.
		c	Continue to implement automated processes according to the Separation by Code Process and Data Flow Model in coordination with development work being conducted by NMFS under 8331900 – New Fish Tag System.
		d	Continue the process of developing world wide web interface to the PTAGIS database.

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Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	3/1999	2/2000	30.00%
2	3/1999	2/2000	30.00%
3	3/1999	2/2000	20.00%
4	3/1999	2/2000	20.00%
			TOTAL 100.00%

Schedule constraints.

This is an operations and maintenance project that supports PIT tagging projects throughout the migration year. Major milestones are March 1 of the year to be ready for data collection and December 1 of the year to perform post season maintenance activity

Completion date.

2020

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	Includes program manager, two programmers, two field system engineers, clerical staff, & overtime.	\$276,000
Fringe benefits	37% of salaries	\$102,120
Supplies, materials, non-expendable property		\$165,000
Operations & maintenance		\$259,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		\$ 0
PIT tags	# of tags: 0	\$ 0
Travel		\$41,350
Indirect costs		\$135,811
Subcontracts		\$61,940
Other		\$ 0
TOTAL		\$1,041,221

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	\$1,103,694	\$1,169,916	\$1,240,111	\$1,314,518
O&M as % of total	27.00%	27.00%	27.00%	27.00%

Section 6. Abstract

The Columbia River Basin Passive Integrated Transponder (PIT) Tag Information System (PTAGIS), provides for the operation and maintenance (O&M) of transponder interrogation systems located at juvenile fish bypass facilities located at hydro-electric dams on the Columbia and Snake Rivers. PTAGIS also provides data base systems management and operations for the collection and distribution of PIT data to all interested parties.

The PTAGIS program supports the PIT Tag Operations Center (PTOC) which maintains software and documentation and provides user support and training for PTAGIS related tools. The PTOC works with the Columbia River Basin PIT Tag Steering Committee (PTSC) to establish data standards, system development priorities, and operational priorities related to the operations and maintenance of the PIT tag interrogation systems at juvenile fish bypass facilities. The PTSC also provides PTOC with input and advice related to the operations and maintenance of the central PTAGIS database.

A PIT tag interrogation system is called for in NPPC planning documents. The PTAGIS O&M activities support the needs of the PIT tag research community represented by the PTSC. O&M activities are documented in the PTAGIS Database Administration Standard Operating Procedures Manual and the PTAGIS Field Interrogation System Standard Operating Procedures Manual. PTAGIS intends to provide 99.9% uptime of interrogation systems and data system as measured during the peak of the outmigration year. Target response time to problem situations is four hours from the time the problem is reported or detected.

Section 7. Project description

a. Technical and/or scientific background.

In 1984 Bonneville Power Administration (BPA) contracted with the National Marine Fisheries Service (NMFS) to research and develop a passive integrated transponder (PIT)

tag for use in the Columbia River Fish and Wildlife Program. With the PIT tag system, large amounts of data are produced with relatively few tags, in comparison to traditional tagging and marking systems. For NMFS to meet, in a timely manner, its contractual and verbal agreements involving PIT tag data, in 1988 and 1989, NMFS contracted PSMFC to develop and operate a prototype database system to meet the immediate needs and provide a framework for a formalized system for the Columbia River Basin PIT tag program.

In April, 1989, NMFS announced its intention to phase out the operation and management of the PIT tag system in the Columbia River Basin. Subsequently, BPA contracted with PSMFC because it was the only agency with experience in data management, had no vested interest in the interpretation of data generated from PIT tags, and was independent of water or fish and wildlife management responsibilities. The actions that PSMFC were to implement under the PTAGIS contract were the management of a long-term Columbia River Basin-wide database system accessible to all entities; maintenance and documentation of fish tagging and interrogation systems; operation and maintenance of equipment at remote interrogation sites; provision of technical support for the software and hardware required by the system and system users; provision of training to users and purchase of PIT tags and associated equipment. The PIT Tag Operations Center (PTOC) has been established at PSMFC office in Gladstone, OR to house PTAGIS and to utilize PSMFC data facilities.

b. Proposal objectives.

1. Provide 99.9% uptime availability of PTAGIS data system as measured during the peak of the outmigration season.
2. Provide 99.9% uptime availability of PTAGIS interrogation systems at dams as measured during the peak of the outmigration season.
3. Provide 95% reading efficiency of PIT tag fish at each interrogation monitor as measured by the Cumulative Efficiency Report program documented in the PTAGIS SOP manuals.
4. Provide 90% separation efficiency of PIT tagged fish at two coil diversion monitors and 97% separation efficiency of PIT tagged fish at four coil diversion monitors.
5. Provide training as requested.
6. Provide ad-hoc data to casual users as requested.

c. Rationale and significance to Regional Programs.

PTAGIS is an operations and maintenance action. As seen in Section 3 of this form, many PIT tagging projects continue to rely on the successful operation of interrogation systems located at juvenile and adult bypass systems in the Columbia River Basin and on the successful operation of the PTAGIS database system for the distribution of PTAGIS data.

The success of these projects depend, to a great extent, upon the success of the PTAGIS O&M project and the PIT Tag Operations Center.

PTAGIS maintains a continuous and cooperative relationship with the Columbia River Basin PIT Tag Steering Committee, the US Army Corps of Engineers (Portland and Walla Walla Districts), Bureau of Reclamation, US Fish and Wildlife Service, National Marine Fisheries Service, the States of Idaho, Oregon and Washington, Portland General Electric, Chelan PUD, Grant Co. PUD, the Direct Service Industries, University of Idaho, University of Washington, Oregon State University, other academic institutions and other agencies.

d. Project history

The PTAGIS project number has not changed. However, the procurement and distribution of PIT tags activity has been removed from this project and established as a separate project (9008001). PIT tag data, collected through the PTAGIS program is utilized by fisheries and water budget managers as part of the adaptive management strategy of the NPPC program.

The PTAGIS project produces quarterly and annual reports for BPA. Also, the PTAGIS program updates and distributes three user documents: 1) The PIT Tag Source Data Input Specification; 2) The PIT Tag Tagging Procedures Document; 3) The PTAGIS Database Users Manual. The PTAGIS produces a periodic newsletter, the PTAGIS Newsletter, nearly once per month. In addition, various PTAGIS internal O&M documents are maintained. These include: 1) PTAGIS Database Administration Standard Operating Procedures; 2) PTAGIS Field Interrogation Systems Standard Operating Procedures manuals. The PTAGIS project was initially contracted to PSMFC in 1990, therefore, the O&M of PTAGIS has been underway for seven years as of January, 1998.

Major results achieved include: 1) establishment of database systems and systems management infrastructure to support this highly technical and complex data system; 2) establishment of a field office based in Kennewick, WA to maintain interrogation systems at juvenile fish facilities on the Snake and Columbia Rivers; 3) infrastructure to provide for efficient operations and maintenance of interrogation systems; 4) effective coordination and cooperation of various system users.

Past Costs:

<u>Year</u>	<u>Total (Cumulative)</u>	<u>O&M</u>	<u>Pittag Purchases</u>
1990	\$650,768	\$293,668	\$357,100
1991	\$1,373,268	\$348,168	\$523,600
1992	\$2,248,535	\$333,767	\$541,500
1993	\$3,817,535	\$333,300	\$2,035,700

1994	\$5,877,091	\$59,456*	\$1,200,110
1995	\$7,376,739	\$815,741	\$683,907
1996	\$9,637,235	\$1,290,011	\$970,485
1997	\$11,770,857	\$1,108,104	\$1,025,518

*Note: Project Year changed

e. Methods.

PTAGIS is an operations and maintenance project. Data system operations are performed by experienced professional data processing staff according to the PTAGIS Database Administration Standard Operating Procedures document. Operation and maintenance of interrogation systems in the field is performed by experienced field system engineers according to the PTAGIS Field Interrogation Systems Standard Operating Procedures document.

Tagging projects utilize methods described in the PIT Tag Marking Procedures document. Data is collated in the format documented in the PIT Tag Source Data Input Specification that is updated annually by the Columbia River Basin PIT Tag Steering committee and distributed by the PTAGIS project.

Interrogation system reading efficiency is monitored three to four times per day by way of the Cumulative Efficiency Report. This report calculates the probability of missing a tag at a coil within a monitor (collection of PIT tag interrogation coils) based upon “seeing” the tag at other coil(s) within the monitor. See NMFS 1989 Annual Report to BPA, “A Study to Determine the Biological Feasibility of a New Fish Tag System”, Appendix B, “Statistical Method of Determining PIT Tag Coil Reading Efficiency”, (pp 140-144) for details of calculations performed by the Cumulative Efficiency Report.

PIT separation efficiency is determined by comparing the number of PIT tagged fish at “river” exits compared to the number of PIT tagged fish at “transport/raceway” monitors. These data are provided by the “Disposition by Day” reports for each transport facility on a daily basis.

f. Facilities and equipment.

The PTAGIS database is housed in the PSMFC data center located in Gladstone, OR. The database server computer is a Sun Enterprise 3000 with four SPARC processors, and 1GB of memory. In addition to six GB of system disk storage located on the E3000, the PTAGIS server utilizes a RAID 5 storage array configured with 60GB. The PSMFC data center utilizes a dedicated T1 link to the internet to allow high speed/high volume access for users with similar data communication capabilities.

The PTAGIS field office in Kennewick, WA, houses electronic test benches and equipment to facilitate the testing and repair of interrogation system electronics. The equipment includes test “tunnels” connected to a programmable logic controller (PLC) and frequency drive that allows highly accurate testing of reading efficiency of interrogation electronics and tags in a laboratory environment. Other equipment includes oscilloscopes, function generators, multimeters and other various electronic equipment. The field engineers are equipped with service vehicles for site visits which are scheduled weekly during the peak of the outmigration season. These vehicles accumulate over 20K miles each per year and are on a three year depreciation schedule.

The computer platforms located at the PIT interrogation sites utilize a Unix based file server connected via ethernet to primary and backup data collection computers (PC's). The Unix file server is connected through the Corps of Engineers internet connection to the PSMFC data center in Gladstone at three of the Walla Wall projects. The other projects rely on PPP telecommunications interface to transmit data between the field location and the PSMFC data center. The above data systems and electronic test equipment are suitable based upon contemporary standards.

However, interrogation system electronics used at juvenile fish facilities is antiquated and in need of replacement. The system is currently based upon a 400kHz tag. A separate BPA project (9701000—Essential M&E Infrastructure PIT Tag Monitor Procurement and Installation) is underway to replace this existing system with one based upon the International Standards Organization (ISO) radio frequency identification standards 11784 and 11785. The PTAGIS project is actively involved in the project planning, and testing of new electronics to replace the existing electronics in time for the year 2000 outmigration.

g. References.

PTAGIS Project, 1996-1997 Periodical. PTAGIS Newsletter. PSMFC, Gladstone, OR.
PTAGIS Project & PIT Tag Steering Committee, 1991-1997. PIT Tag Source Data Input Specification. PSMFC, Gladstone, OR.
PTAGIS Project and PIT Tag Steering Committee, 1993. PIT Tag Marking Procedures Manual. PSMFC , Gladstone, OR.
PTAGIS Project, 1996. PTAGIS Database Users Manual. PSMFC, Gladstone, OR.
PTAGIS Project, 1997. PTAGIS Database Administration Standard Operating Procedures Manual. PSMFC, Gladstone, OR.
PTAGIS Project, 1997. PTAGIS Field Interrogation System Standard Operating Procedures Manual. PSMFC, Gladstone, OR.
Prentice, et. al. March 1993. A Study to Determine the Biological Feasibility of a New Fish Tagging System. 1989 Annual Report to BPA. National Marine Fisheries Service, Manchester, WA

Section 8. Relationships to other projects

All PIT tag marking projects rely on the successful operation of both the PTAGIS database and the successful operation of the interrogation systems at field locations. All of the known BPA funded marking projects are reflected in Section 3 above. In addition, the Technical Management Team, and the DART, CRiSP, SERF (and other) project at University of Washington rely on the successful operation of both PTAGIS system components. PUD's in Washington State and Portland General Electric rely more and more on the PTAGIS data system for information about their PIT tag marking projects. The US Army Corp of Engineers relies on the PTAGIS system for its PIT marking programs.

The PTAGIS project collaborates and cooperates with NMFS to deploy enhancements to the PIT tag system. Recent system enhancements include the Separation by Code capability. This capability has been used to support project 9602000, Comparative Survival of Hatchery Chinook study at Lower Granite Dam. In addition, it has been used to support other projects related to Gas Bubble research and project 9102900, Life History of Fall Chinook in Columbia River Basin for the past three years.

Other areas of collaboration include support for the flat plate detector installed at DSM1 at Bonneville Dam and in 1998, the installation of adult PIT tag detectors at the Fisheries Engineering Research Lab in the adult ladder at Bonneville Powerhouse II. PTAGIS also provides equipment support for the towed array PIT tag detector research near the Columbia River estuary. The PTAGIS project is also involved in project 9101000 to install the International Standards Organization (ISO) radio frequency identification standard (ISO 11784 / 11785).

Section 9. Key personnel

Carter Stein

Program Manager

2080 Hrs per Year

Duties: Develop PTAGIS annual work plan and budgets;

Manage system development life cycle for PTAGIS software;

Investigate new technical capabilities related to software engineering techniques, new hardware and software and applicability to PTAGIS;

Work with PTSC to develop and update Basin wide standards for PIT tag information processing. Develop production supportable implementations of new PIT tag technologies in cooperation with National Marine Fisheries Service.

Supervise four full time positions, two Field Systems Engineers and two Programmer Analysts.

Degrees Earned:

Master of Business Administration, University of Portland, 1992

Bachelor of Science, Computer Science, Portland State University, 1985

Current Employer:

Pacific States Marine Fisheries Commission since September, 1992

Accomplishments:

- Conversion of PTAGIS prototype database into stable production environment.
- Established PIT tag Operations and Maintenance Field Office in Kennewick, WA.
- Managed installation of PIT interrogation systems at Lower Monumental and McNary Dams.
- Led development of technical specifications for ISO based stationary transceiver system for deployment in Columbia River Basin.
- Led development of technical specification for ISO based portable transceiver system for deployment in Columbia River Basin.

Recent Employer

Tektronix, Inc. 1978-1992

Senior Software Engineer; CAX Data Management

Systems Development Project Leader

Publications:

Stein, Clough, Apr. 1995. Monitoring Endangered Salmon in the Columbia River Basin.

Computer Associates / Ingres World Conference, Presenter, July 1995.

Section 10. Information/technology transfer

The PTAGIS project currently maintains a web page (www.psmfc.org/ptagis) where project documentation (described in references section, above) can be downloaded. The project also collaborates with the Columbia River Basin PIT Tag Steering Committee to conduct workshops as necessary for timely dissemination of information to system users. The project publishes a newsletter with the purpose of providing useful information to expert and casual system users. Project personnel also maintain communication with various organizations including Federal agencies, State Fish and Wildlife agencies, Private electrical companies, direct service industry contacts, universities, private consultants and other entities.