Bonneville Power Administration
Fish and Wildlife Program FY98 Watershed Proposal Form

Section 1. General administrative information

Title **Evaluate effects of grazing exclosures on vegetation, channel, and habitat conditions**

Bonneville project number, if an ongoing project 8057

Business name of agency, institution or organization requesting funding

Columbia River Inter-Tribal Fish Commission

Business acronym (if appropriate) CRITFC

Proposal contact person or principal investigator:

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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name

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

3.3D.1, 3.3E.1, 7.6C.2, 7.6D,

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

The NMFS ESA Section 7 - Consultation Biological Opinion Land and Resource Management Plans for the: Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests (NMFS, 1995) accepted Riparian Management Objectives (RMOs) for pools, bank stability, width-depth ratio, and bank

angle in designated critical habitat. NMFS (1995b) also called for development of baseline information, monitoring land management effects and progress towards meeting objectives (p. 68), and periodic measurement of important habitat components as part of effectiveness monitoring (p. 86). The project will address all of these recommendations by measuring the attributes set as RMOs within and outside of exclosures in reaches in critical habitat in the Grande Ronde and Salmon Subbasins.

Other planning document references.

Wy-Kan-Ush-Mi Wa-Kish-Wit, Spirit of the Salmon, The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes (CRITFC, 1995) sets standards for bank stability, substrate conditions in spawning and rearing habitat, and recommended monitoring of trends in those habitat attributes and pools rearing and spawning natal habitat to ascertain progress towards habitat recovery (pp. 5B-10, 5B-38). *The Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* (USFS and USBLM, 1994) set Riparian Management Objectives (RMOs) for pools, bank stability, width-depth ratio, and bank angle in anadromous fish habitat. The proposed project will measure these all of these habitat attributes within and outside of exclosures in several subbasins.

Subbasin.

Potential Candidates: John Day, Deschutes, Grande Ronde, Salmon, Okanogan, Yakima

Short description.

Monitor in-stream and riparian vegetation conditions in and outside of fenced stream exclosures. Compare conditions within exclosures to pre-exclosure historic data (if available) and conditions outside of exclosures to quantify effect of exclosures on riparian and stream conditions.

Section 2. Key words

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

Other keywords.

livestock grazing, riparian vegetation, salmonid habitat, stream restoration

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
		No projects are directly dependent on funding this project.

Section 4. Objectives, tasks and schedules

Obj 1,2,3	Objective	Task a,b,c	Task
1	Select exclosures in place for more than 10 years for study	a	Review project history and data on exclosures, including environmental setting (soils, geology, climate, etc.) and available information on adjacent stream reaches
2	Measure key habitat attributes within and outside of exclosures	a	Measure bank stability, bank angle, width, depth, pool frequency and depth, stream shade, substrate conditions, and vegetation attributes within and outside of exclosures on all study sites.
3	Estimate effectiveness of exclosures on key habitat variables and consistency with habitat objectives (e.g., NPPC, 1994; CRITFC, 1995, etc.)	a	Determine differences in measured habitat conditions in and outside of exclosures provide estimate of exclosure effectiveness and trends in conditions.
4	Develop summary database on monitored fencing/exclosure projects	a	Compile data on monitored exclosures including project history, location, stream reach (name and USEPA reach code), affected anadromous fish species, and measured stream and riparian vegetation attributes.
5	Report and disseminate findings	a	Prepare annual and final reports, submit results to StreamNet, present findings to land and fish management entities and watershed councils, and submit article

			describing results to peer-reviewed publication.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	3/1998	6/1998	15%
2	6/1998	10/1998	42%
3	8/1998	10/1998	20%
4	5/1998	12/1998	13%
5	9/1998	1/1999	10%

Schedule constraints.

Completion date.

FY98

Section 5. Budget

Item	Note	FY98
Personnel	Project leader for 6 mo. @ $3,925/mo.; technician for 4.4 mo @ $2,500/mo.	$34,550
Fringe benefits	31.5% of salaries	$10,883
Supplies, materials, non-expendable property	Film, fieldbooks, densiometer	$490
Operations & maintenance	Postage, photocopying, film processing	$780
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		$0.0
PIT tags	# of tags:	
Travel	Per diem, lodging, car rental, and fuel	$6,220
Indirect costs	37.9% of personnel, fringe, supplies, operations and maintenance, and travel.	$20,050
Subcontracts		$0.0
Other		
TOTAL		$72,973

Outyear costs

Outyear costs	FY99	FY00	FY01	FY02
Total budget	0	0	0	0
O&M as % of total	0	0	0	0

Section 6. Abstract

Livestock grazing has caused widespread habitat degradation, contributing to basin-wide declines in anadromous fish populations (e.g., Henjum et al., 1994; Rhodes et al., 1994; NRC, 1996). Scattered stream segments throughout the Columbia River basin have been fenced to exclude grazing and improve degraded habitat. While fencing and exclusion of livestock is widely acknowledged to be an effective restoration approach, previous assessments of exclosure effectiveness have examined only the effects on a few stream and habitat objectives in exclosures in one or two subbasins. To our knowledge, there has been no attempt to evaluate the effectiveness of exclosures in several subbasins on riparian and stream conditions (pool frequency, bank stability, width/depth ratio, etc) specifically set as objectives in plans to restore/protect anadromous fish habitat (NPPC, 1994; CRITFC, 1995; NMFS, 1995).

Stream and riparian vegetation conditions (e.g., bank stability, bank angle, riparian vegetation condition, etc.) will be measured in and outside of fenced livestock exclosures in several reaches in several subbasins to examine the effectiveness of exclosures in meeting habitat objectives set habitat restoration/protection plans. Differences in between measured variables in and outside of exclosure will be quantified and compared to the objectives for habitat attributes in salmon habitat restoration plans (NPPC, 1994; CRITFC, 1995). A database will be developed for monitored projects including project history, location, and conditions measured by this project, that can be foundation to expand efforts to monitor the effects of exclosures on riparian and stream conditions in a variety of environmental settings.

Section 7. Project description

a. Technical and/or scientific background.

Livestock grazing is one of the most widespread land uses in the Columbia River basin. In many areas, grazing has had multiple negative effects on salmonid habitats including stream widening, increased sedimentation, reduced stream shading, altered structure and composition of riparian vegetation, and increased water temperatures (Clary and Webster, 1989; Platts et al., 1991; Magilligan and McDowell, 1997). Grazing is widely acknowledged to be a major cause of degradation of anadromous fish habitat in the Columbia River basin, contributing to basin-wide declines in anadromous fish populations (e.g., Henjum et al., 1994; Rhodes et al., 1994; NRC, 1996; USFS and USBLM, 1997). Resting grazed riparian areas has repeatedly been assessed as the most effective approach to arresting and reversing riparian degradation from grazing (Platts et al., 1991; Beschta et al., 1991; Elmore, 1992; Anderson et al., 1993; Beschta et al., 1993). Scattered stream segments have been fenced to exclude cattle throughout the Columbia River basin as part of efforts to improve and restore riparian vegetation and anadromous fish habitat (Reeves et al., 1991; Beschta et al., 1991; Beschta et al., 1993; Kauffman et al., 1997; Magilligan and McDowell, 1997). Many of these projects are now several years old so that there has been time for measurable changes in riparian and stream conditions to become manifest,

although it appears that there has been no systematic tracking of history of these projects on a basin-wide scale in the Columbia River. These exclosures provide prime opportunities for examining the effectiveness of livestock exclusion on riparian conditions and aquatic habitat (Reeves et al., 1991; Beschta et al., 1991; Beschta et al., 1993; Knapp and Matthews, 1996; Kauffman et al., 1997; Magilligan and McDowell, 1997).

However, it appears that their has been no attempt to quantify differences in a wide suite of conditions in riparian vegetation, streams, and fish habitat attributes in exclosures and adjacent, grazed stream reaches, in multiple subbasins and relate these differences to the effectiveness of meeting the measurable objectives of land management and salmon restoration approaches, such as those for bank conditions, pool frequency, width/depth ratios, set in the NPPC Fish and Wildlife Program (NPPC, 1994), ESA biological opinions (NMFS, 1995), or other approaches to protect/restore anadromous fish habitat (CRITFC, 1995; USFS and USBLM; 1995). Although there has been some analysis of the effectiveness of exclosures on riparian conditions by comparing conditions in and outside of exclosures, these have generally involved differences in conditions in and outside of a few exclosures in a single subbasin. Further, while extremely informative, most previous evaluations of difference in stream and riparian conditions in and outside of exclosures have been qualitative (e.g., Beschta et al., 1991; Kauffmann et al., 1993; Beschta et al., 1993) or have had a relatively narrow focus on differences in specific geomorphic (Clifton, 1989; Magilligan and McDowell (1997)) or vegetative response (Schulz and Leininger, 1990; Green 1991; Kauffman et al. 1997) and not aimed at specifically addressing the conditions of riparian and stream attributes set as objectives in salmon restoration approaches (e.g, (NPPC, 1994), ESA biological opinions (NMFS, 1995), CRITFC, 1995, and USFS and USBLM (1995). Knapp and Matthews (1996) measured a wide variety stream, riparian vegetation, and fish habitat conditions in and outside of exclosures, but the work was in the Sierra Nevada, well outside of the Columbia River basin. To our knowledge, there has been no systematic, multi-subbasin attempt to evaluate the effectiveness of grazing exclosure projects by measuring differences in stream and riparian vegetation conditions in and outside of grazing exclosures and relate these differences to the objectives of regional approaches to the protection of anadromous fish habitat. We propose to fill this gap and provide a multi-basin evaluation of the effectiveness of exclosures by measuring conditions in and outside of exclosures that have been in place for several years in several subbasins.

The proposed project will also catalog project history, location, environmental setting, and results in database. The database will be developed to encourage expansion of cataloging of projects and conditions temporally and areally for subsequent monitoring efforts. The ultimate goal is to catalog all exclosure projects for easy access for future monitoring of effectiveness.

b. Proposal objectives.

Obj. 1: Select exclosures for study based on review project history and data on exclosures, including environmental setting (soils, geology, climate, etc.) and available information on adjacent stream reaches.

Obj. 2: Measure key habitat attributes within and outside of exclosures, set as objectives in approaches to salmon restoration/protection.

Obj. 3: Estimate effectiveness of exclosures on key habitat variables and consistency with habitat objectives (e.g., NPPC, 1994; CRITFC, 1995, etc.) a

Obj. 4: Develop summary database on monitored fencing/exclosure projects including project history, location, stream reach (name and USEPA reach code), affected anadromous fish species, and measured stream and riparian vegetation attributes.

Obj. 5: Report and disseminate findings.

The project will also test the following hypotheses: 1) The condition of stream, vegetation, and habitat attributes are measurably different in and outside of exclosures; 2) Although the magnitude of differences in riparian and stream conditions vary regionally, the direction of the difference is similar among regions; 2) The condition and apparent trend within exclosures (estimated based on comparison of conditions within exclosures are more consistent with the objectives of anadromous fish habitat restoration/protection approaches than outside of exclosures; 3) In and outside of exclosures there is less difference in conditions that are affected by watershed level impacts (e.g. substrate) than conditions that are strongly influenced by reach-scale impacts (e.g., bank stability).

c. Rationale and significance to Regional Programs.

The proposed project will inventory habitat conditions in exclosures and adjacent broadly comparable grazed reaches, providing data on updated conditions and apparent trends within exclosures in substrate, pools, and bank stability. As recommended in NPPC Fish and wildlife measure 7.6C2, the project will supply trend data to determine progress and compliance with NPPC objectives for as set in NPPC Fish and Wildlife Program measure 7.6D.

As recommended in NPPC Fish and Wildlife Program measure 3.3D1, the project will also provide data that will provide an indication of habitat trend and status with respect to substrate, pools, and channel morphology within the context of hierarchical classification; this data will be supplied to Streamnet. The project will also provide updated data on conditions within stream reaches, as recommended in NPPC Fish and Wildlife measure 7.6C. The results of the project will presented to watershed councils and entities interested in improving salmon habitat. The data will also be used to determine consistency of conditions in monitored reaches with habitat objectives of USFS and USBLM (1995), CRITFC (1995), and NMFS (1995). The updated data in monitored reaches complies with the recommendation of CRITFC (1995) and NMFS (1995) for monitoring of important habitat components as part of effectiveness monitoring

d. Project history

- summary of major results achieved - past costs (see attached spreadsheet)

The proposed project is new and has no project history.

e. Methods.

Obj. 2, Task a In areas selected for study, measure conditions set as objective in regional approaches to habitat restoration protection including: bank stability, bank angle, width, depth, pool frequency and depth, stream shade, substrate conditions, and vegetation attributes in reaches within and outside of exclosures.

Obj. 3, Task a: Determine differences in measured habitat conditions in and outside of exclosures to provide estimate of exclosure effectiveness and trends in conditions; determine consistency of conditions inside and outside of exclosures with objectives set in regional approaches to protection/restoration of salmon habitat.

Obj. 4, Task a: Develop summary database on monitored fencing/exclosure projects that includes project history, location, stream reach (name and USEPA reach code), environmental setting and reach type according to hierarchical classification, affected anadromous fish species, and stream and riparian vegetation attributes measured in this study.

Obj. 5, Task a: Report and disseminate findings in annual and final reports, submit results to CIS and StreamNet, present findings to land and fish management entities and watershed councils, and submit article describing results to peer-reviewed publication.

Study sites will be selected based on review of available information in agency files, interviews with agency personnel, project report data, and maps. Criteria for select include: 1) exclosure is older than 10 years, so that there has been time for potential recovery; 2) adjacent reaches are broadly comparable using hierarchical classification (Frissell et al., 1986; Rosgen, 1996), except in terms of grazing pressure; 3) fenced reaches are long enough to allow meaningful inventory of conditions and comparison with adjacent reaches; 4) reaches contain potential habitat for anadromous fish; and, 5) reaches are distributed across subbasins. Additionally, exclosures with historic or trend data on attributes will be prioritized for inventory.

The interim goal is to inventory a total of 30 exclosures over at least four subbasins. This goal is set based on logistics rather than statistical considerations. It is unlikely that the number of reaches for study can be set based on statistical considerations. Exclosures have typically been implemented in an opportunistic fashion rather than based on treatment replication in comparable reaches (Knapp and Matthews, 1996; Magilligan and McDowell, 1997). Although this situation is less than ideal and makes analysis problematic due to pseudoreplication, it nonetheless provides important information on the effects of exclosures over time (Knapp and Matthews, 1996; Magilligan and McDowell, 1997).

Bank stability, bank angle, substrate, channel width/depth ratio, stream shading, pool frequency and depth, and vegetative ground cover will be measured in outside of exclosures because these attributes have been variously set as habitat objectives in regional approaches to habitat protection/restoration and they are affected by grazing (Platts, 1991; Knapp and Matthews, 1996; Magilligan and McDowell, 1997). Data will be collected

using the methods of Platts et al. (1987) and Bauer and Burton (1993). Non-parametric analyses of variance will be used to test for differences inside and outside of exclosures.

A database will be developed for all exclosures examined to encourage future efforts to monitor conditions in and outside of exclosures. The database will include location (including EPA River Reach system), date of implementation, classification of stream type within exclosure and in adjacent reaches (Rosgen, 1996) , environmental attributes of the watershed relevant to stream and hierarchical classification (Frissell et al., 1986; Rosgen, 1996), and results of monitoring of this proposed project. The expandable database will be provided to StreamNet to allow access to the information.

Each proposer should complete the methods section with an objective assessment of factors that may limit success of the project and/or critical linkages of the proposal with other work (e.g., a smolt monitoring program, etc.).

f. Facilities and equipment.

No major special equipment is needed. Vehicles will be rented. The CRITFC has suitable office space and personal computers that support a variety of widely used word-processing, spreadsheet, and statistical analysis applications adequate to store and analyze data and report findings.

g. References.

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Green, D.M., 1991. Soil Conditions Along a Hydrologic Gradient and Successional Dynamics in a Grazed and Ungrazed Montane Riparian Ecosystem. Unpub. PhD Thesis, Oregon State Univ., Corvallis, Or.

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Kauffman, J.B., Beschta, R.L., Otting, N., and Lytjen, D., 1997. An ecological perspective of riparian and stream restoration in the western United States. Fisheries. **22**: 12-24.

Knapp, R.A., and Matthews, K.R., 1996. Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: Impacts and management implications. N. Amer. J. Fish. Management. 16:805-820.

Magilligan, F.J., and McDowell, P.F., 1997. Stream channel adjustments following elimination of cattle grazing. J. Amer. Water Resour. Assoc., 33: 471-478.

Platts, W.S., 1991. Livestock grazing. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, Am. Fish. Soc. Special Publ. **19**: 389-424.

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Section 8. Relationships to other projects

The project will evaluate the effectiveness of a major aspect of previously funded efforts under the FW Program: the fencing of riparian areas to exclude livestock grazing. The project will evaluate the effectiveness of fencing projects implemented throughout the Columbia River basin. It is assumed that at least some of the monitored exclosures will have been funded as part of the NPPC Fish and Wildlife program and funded by Bonneville. However, even where monitored exclosures have not been funded by Bonneville under the Fish and Wildlife Program, the project will supply data documenting the effectiveness of recent, on-going, and future funding of fencing projects under the Fish and Wildlife Program. This will provide an estimate of the effectiveness of the projects in contributing to meeting habitat objectives for habitat attributes, such as pools and bank stability, throughout the region. This should aid in evaluating the funding additional exclosures and provide watershed councils throughout the Columbia River basin with information that can help prioritize habitat restoration/protection efforts.

Section 9. Key personnel

Jon Rhodes, Hydrologist, Columbia River Inter-Tribal Fish Commission (CRITFC), Project FTE: 0.5 with FY 98 project funds. Project Duties: Project coordination and oversight, site selection, classification of stream types, monitoring, training of technicians in monitoring methods, analysis of monitoring data, final report. Education: B.S. Hydrology and Water Resources (Univ. of Arizona, 1981); M.S. Hydrogeology (Univ. of Nev.-Reno, 1985); Ph.d. candidacy degree Forest Hydrology (Univ. of Wash., 1989). Certification status: None. Current Employer: CRITFC (4/89-present). Current Responsibilities: Analysis of direct and cumulative effects of land-use on salmon habitat, channel morphology, water quality, and watershed processes. Provide scientific input as a member of numerous policy and technical forums dealing with aquatic issues, including forest practices and water quality monitoring programs. Recent Previous Employment: Research Assistant, Univ. of Wash. (11/88-4/89, 8/84-6/87); Consulting Hydrologist, Tahoe Regional Planning Assoc. (5-10/88, 7-10/87); Expertise: General watershed hydrology, water quality, direct and cumulative effects of land-use on aquatic resources, monitoring non-point source pollution, water temperature alteration, sedimentation,

analysis of water quality data. Recent/relevant publications/job completions: 1) Co-author with eight others: 1992. The Upper Grande Ronde River Anadromous Fish Habitat Protection, Restoration and Monitoring Plan; 2) Rhodes, J.J., McCullough, D.A., and Espinosa, F.A., 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech. Rept. 94-4, Portland, Or.--developed under contract with NMFS; 3) Espinosa, F.A., Rhodes, J.J., and McCullough, D. A. 1997. The failure of existing plans to protect salmon habitat on the Clearwater National Forest in Idaho. J. Env. Management **49**: 205-230; 4) Rhodes, J.J. and Purser, M.D., *in press*. Overwinter sedimentation of clean gravels in simulated redds in the upper Grande Ronde River and nearby streams in northeastern Oregon, USA: Implications for the survival of threatened spring chinook salmon, Proceedings of Forest-Fish Conference: Land Management Affecting Aquatic Ecosystems, Calgary, Alberta, Canada, May, 1995.

Section 10. Information/technology transfer

Results will be summarized in annual and final reports, presented to watershed councils and fish and land management entities, provided to StreamNet, and submitted in article for publication in a peer-reviewed journal.