PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Enhance Fish, Riparian, And Wildlife Habitat Within The Red River Watershed

BPA project number: 9303501
Contract renewal date (mm/yyyy): 2/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Idaho County Soil and Water Conservation District

Business acronym (if appropriate) ISWCD

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
4.1 (Salmon and Steelhead Runs), 7.6 (Habitat Goal, Policies, and Objectives), 7.7 (Cooperation with Private Land Owners), 7.8E (Conservation Easements), 10.2 (Watershed Integration of Resident Fish), 11.1(Wildlife Mitigation)

FWS/NMFS Biological Opinion Number(s) which this project addresses
Not directly related to Biol. Op. Nos., but Red River drainage includes critical habitat for steelhead trout and bull trout, recently listed under the ESA

Other planning document references
This watershed project is consistent with the goals of the 1) Wy-Kan-Ush-Me Wa-KushWit; 2) Nez Perce National Forest Plan (1987); 3) South Fork Clearwater River Landscape Assessment (1998); 4) Nez Perce Tribal Hatchery Plan (1992); 5) Idaho Department of Fish and Game's Anadromous Fish Management Plan, Resident Fish Management Plan, Elk Management Species Plan, and Nongame Species Plan; 6) ISWCD Five Year Plan; 7) Clearwater Focus Watershed; 8) Columbia Basin Fish and Wildlife Authority's (CBFWA) Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin (1991); 9) Clearwater River Subbasin: Salmon and Steelhead Production Plan (Nez Perce Tribe and Idaho Fish and Game, 1990); and 10) Interior Columbia Basin Ecosystem Management Project (1994).

Short description
Restore physical and biological processes to create a self-sustaining river/meadow ecosystem using a holistic approach and adaptive management principles to enhance fish, riparian, and wildlife habitat and water quality within the Red River watershed.

Target species

spring chinook salmon, steelhead trout, bull trout

Section 2. Sorting and evaluation

Subbasin
Clearwater

Evaluation Process Sort

CBFWA caucus	**Special evaluation process**	**ISRP project type**
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☒ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☐ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	**Project title/description**
	n/a

Other dependent or critically-related projects

Project #	**Project title/description**	**Nature of relationship**
	n/a - no other projects depend on this one for funding	

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	**Accomplishment**	**Met biological objectives?**
1993	Collaborative purchase of one land parcel in the lower Red River meadow; property deeded over to IDFG in an interagency MOA between IDFG and BPA to manage property as a Wildlife Management Area for habitat restoration and fish and wildlife benefits.	n/a
1994	Surveys of existing conditions; research of historical conditions; planning and project vision discussions with interagency and tribal technical	n/a

	advisory committee; consensus on habitat restoration design philosophy; and budget development.	
1995	NEPA assessment; analysis of restoration options; design criteria established and conceptual restoration designs completed for Phases I and II.	n/a
1996	Final engineering drawing package completed for Phase I and permits obtained; implementation of Phase I of restoration design; began conceptual designs and planning for Phase II	Constructed reaches completed in August 1996; post-construction performance monitoring was initiated in field season 1997 to gather data to measure biological objectives.
1997	Final engineering drawing package completed for Phase II and permits obtained; Phase II of restoration design implemented; revegetation completed in Phase I; implementation and post-construction monitoring completed; initial planning for Phase III.	Too early to report if biological objectives were being met; post-construction and implementation monitoring data analyses were ongoing during remainder of 1997 with report expected in 1998.
1998	Surveying, data collection, computer-modeling and preliminary conceptual designs completed for Phases III and IV; revegetation completed for Phase II; turbidity test completed; post-construction monitoring performed; 1997 monitoring report completed.	Yes. Pool/riffle sequence spacing and number, residual pool depth, and channel form met evaluation criteria; several constructed reaches met spawning and rearing habitat criteria; native riparian plant community evolving; (details in Sect. 8d)

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Restore natural river channel shape, meander pattern, and substrate conditions to enhance the quality and quantity of spawning and rearing habitat for chinook salmon, steelhead trout, bull trout, and other anadromous and resident fish species.	a	Collect current watershed data and re-evaluate watershed conditions and engineering design criteria and methods based on monitoring data analyses and adaptive management principles.
		b	Secure conservation easements, long-term land management agreements, and/or riparian fencing, with willing private landowners in the lower Red River meadow and other sites within the Red River watershed.
		c	Perform topographic survey of future sites within watershed.
		d	Input current and historic watershed, hydrologic, and geomorphic data into computer design model.
		e	Develop preliminary conceptual restoration design alternatives for review with willing landowner, Technical Advisory Committee (TAC), and ISWCD.
		f	Upon landowner, TAC, and ISWCD agreement, complete final conceptual restoration design and detailed engineering

			drawings and specifications.
		g	Develop and submit stream alteration permit application package.
		h	Upon successful easement negotiations, install restoration features to complete the transition between the Red River Wildlife Management Area (RRWMA) and the adjacent downstream property.
2	Restore meadow and riparian plant communities to enhance fish and wildlife habitat, stabilize streambanks, and reduce water temperature.	a	Re-evaluate revegetation design criteria based on monitoring data analyses and adaptive management principles.
		b	Develop preliminary conceptual revegetation design alternatives and review with willing landowner, TAC, and ISWCD.
		c	Upon landowner, TAC, and ISWCD agreement, complete final revegetation design, detailed drawings and specifications.
		d	Collect native seed on-site for future plantings.
		e	Collect and store dormant willow poles.
		f	Provide and install container seedlings and willow poles.
		g	Irrigate container seedlings and willow poles.
		h	Build exclosures and plant with woody seedlings and willow poles.
3	Measure and document progress in satisfying short- and long-term project goals, objectives, and outcomes	a	Modify or refine monitoring evaluation criteria, parameters, or methodology based on monitoring data analyses and adaptive management principles.
		b	Monitor baseline and construction-related turbidity and suspended sediment loads.
		c	Measure plant survival rates.
		d	Complete Technical Advisory Committee field reviews.
		e	Measure stream channel response
		f	Measure and map changes in quantity and quality of fish microhabitats.
		g	Evaluate fish populations through snorkel and redd counts.
		h	Measure change in water temperature regime.
		i	Measure changes in ground- and surface water elevations.
		j	Measure change in greenline and riparian vegetation composition.
		k	Document photopoints for changes in channel stability and riparian vegetation.
		l	Complete Habitat Evaluation Procedure (HEP).

		m	Complete an annual monitoring report.
4	Promote public and agency awareness and scientific knowledge of watershed restoration principles and techniques	a	Re-evaluate and update public information plan with Technical Advisory Committee and project sponsor.
		b	Add to image library and continue public presentations of educational video and slide shows.
		c	Maintain underwater and surveillance cameras.
		d	Maintain and update web site at regular intervals.
		e	Publish articles in local newspapers, natural resource-related magazines, and scientific journals.
		f	Update informational brochure and FACT sheet and continue field season newsletters.
		g	Maintain and update GIS database.
		h	Conduct on-site field tours.
		i	Implement volunteer monitoring and stewardship activities.
		j	Continue to provide outdoor classroom opportunities for students of all ages.
		k	Provide annual report and on-site computer resources for educational and technology transfer of watershed/river restoration techniques.
5	Manage and communicate project activities to efficiently accomplish project goals.	a	Assist project sponsor with personnel contract preparation.
		b	Direct restoration activities and develop project, equipment, and personnel time schedules.
		c	Assist project sponsor with permit application submittal.
		d	Update and distribute communication plans.
		e	Coordinate and facilitate Technical Advisory Committee meetings.
		f	Coordinate project activities with project sponsor, landowners, Tribes, agencies, and consultants.
		g	Share information with adjacent landowners and other public and private interests.
		h	Provide on-site construction supervision, communications, and administrative support.
		i	Prepare quarterly and annual reports.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	3/2000	2/2001	a) Low-flow water surface levels are maintained < 30 inches from top of bank, providing soil moisture conditions able to sustain native riparian plant communities.	a) Negotiate and secure easement with willing landowners of future restoration site in preparation for Phase V restoration work.	54.75%
			b) Pool/riffle sequence spacing equals 5 – 7 channel widths consistent with conditions in stable channels of this stream type (Leopold et al., 1995).	b) Based on easement negotiations, construct transition reach to adjacent property, completing restoration work in Phases I-IV, (the first of four properties in the lower meadow).	
			c) The number of pool/riffle sequences will increase by 50 – 150% from baseline.		
			d) Area available for fish habitat will increased by 50 – 75% from baseline.		
			e) Residual pool depths will increase by 50 – 75% from baseline.		
			f) Spawning and rearing micro-habitat characteristics will meet optimum condition ranges for salmonids (NMFS, 1996; Bjornn and Reiser, 1991 – see Sect. 8f for specific criteria).		
			g) Long-term trend of increasing numbers of chinook salmon spawning in Red River, a change in species composition to a larger percentage of chinook, steelhead, and bull trout juveniles, and increased survival rates of fry and juveniles.		
2	3/2000	2/2001	a) Maintain first year plant survival rates > 50%.	Complete revegetation in Phases III and IV.	14.00%
			b) Long-term trend in		

			decreasing summer water temperatures toward < 64.9 degrees F, optimal for juvenile chinook salmon rearing (ISG, 1996).		
			c) Long-term trend of increasing coverage and density of riparian and greenline vegetation toward "dominant" status, indicating an evolution toward potential natural communities.		
			Long-term trend in establishment of overhanging vegetation and undercut banks on > 75% of channel length.		
			a) Long-term trend of bank stability to > 80%.		
3	3/2000	2/2001	Parameters measured specified under Obj. 1 and 2 above.	Complete 4th year of post-construction monitoring data collection, analysis, and adaptive management evaluation.	11.00%
4	3/2000	2/2001	N/A – education/public outreach obj.	Implement local volunteer monitoring and stewardship program.	9.00%
5	3/2000	2/2001	N/A – management and communication obj.	Complete all pertinent reports and manage and communicate project activities to achieve annual goals/objectives in a timely and cost-effective manner.	11.25%
			*Note: The majority of our monitoring parameters are physical measurements directly related to the development of high quality salmonid spawning and rearing habitat.		
				Total	100.00%

Schedule constraints

Extreme weather causing saturated soils or high flow conditions, extended easement negotiations, delay in approval of the preliminary design, extreme natural event damaging previously constructed channel features, injury/death of consultant(s)

Completion date
2005

Section 5. Budget

FY99 project budget (BPA obligated): $500,000

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%23	126,380
Fringe benefits		%8	44,233
Supplies, materials, non-expendable property		%6	32,192
Operations & maintenance		%1	5,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	Easements to protect investment and restore critical fish and wildlife habitat	%38	211,424
NEPA costs		%0	0
Construction-related support		%19	104,889
PIT tags	# of tags:	%0	0
Travel		%4	22,470
Indirect costs		%1	3,412
Subcontractor		%0	0
Other		%0	0
		TOTAL BPA FY2000 BUDGET REQUEST	$550,000

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
	In-Kind contributions provided by UI and other organizations (see Sections 8c. & 10).	%0	
	Several cost share programs planned once easements have been established on privately owned land parcels.	%0	
		%0	
		%0	
		Total project cost (including BPA portion)	$550,000

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$570,000	$560,000	$550,000	$550,00

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PART II - NARRATIVE

Section 7. Abstract

The Red River has been channelized and the riparian habitat corridor eliminated in several reaches within the watershed. The river responded by incision resulting in over-steepened banks, increased sedimentation, degraded fish habitat, elevated water temperatures, depressed groundwater levels, and reduced hydroperiods. The Lower Red River Meadow Restoration Project is an ecosystem enhancement effort that restores natural physical and biological processes and functions to establish high quality habitats for fish and wildlife, targeting chinook salmon *(Oncorhynchus tshawytscha),* steelhead trout *(Oncorhynchus mykiss),* and bull trout *(Salvelinus confluentus).* February 2000 will conclude year seven of our restoration/enhancement plan and construction of Phases I through IV. State-of-the-science hydrologic and geomorphic models are used to design stable channel cross-sections and meander patterns, provide decision support for adaptive management, and develop interpretive displays. We stabilize the channel by reshaping channel cross-sections, excavating new bends, reconnecting old meander bends, and reestablishing floodplain function. In restored reaches, fish habitat area increased by approximately 50 percent. Both the number of pool/riffle sequences and residual pool depths increased by approximately 60 percent. Over time, native riparian plantings will provide overhanging vegetation, develop undercut banks, increase cover and shade for fish, stabilize streambanks and reduce water temperatures. Our monitoring program collects physical and biological data to evaluate restoration performance. Linkages and benefits between the local restoration site and watershed are quantified. A website, interpretive signs, slide presentations, student monitoring and research activities, annual reports, and scientific publications transfer experiences and technology to a variety of audiences.

Section 8. Project description

a. Technical and/or scientific background

The headwaters of the Red River form in North Central Idaho about four miles northwest of Green Mountain in the Nez Perce National Forest. The river drains approximately 100,000 acres and flows northwest about 28 miles where it joins the American River to become the South Fork of the Clearwater River and part of the larger Columbia River Basin.

On a watershed scale, logging, road building, and gold mining activities altered the hydrology, sediment delivery, and water quality characteristics of Red River (USDA, 1998). Reservoirs and hydroelectric dams constructed in the higher-order river systems downstream (Snake and Columbia) have inhibited the migration of anadromous fish species (Northwest Power Planning Council (NPPC, 1994). On a local scale, attempts to maximize grazing and haying area and dredge mining for gold have straightened the river channel and eliminated the native riparian vegetation in several meadow reaches. This channelization has negatively impacted the ecology of Red River in several ways. First, instream habitat (pools, riffles, overhanging banks, woody debris) is reduced. Second, the channel bed downcut by approximately two feet, accompanied by a depressed groundwater table and a reduced floodplain hydroperiod. In response, the Red River meadow soils provide inadequate moisture conditions to sustain the native riparian and wetland plant communities once thriving there (Brunsfeld et al., 1996). Third, channelization reduced the length of river channel, increasing the water velocity through the meadow and accelerating streambank erosion. Over-steepened banks succumb easily to erosional and gravitational forces, contributing an oversupply of sediment. Channel incision is likely to continue until checked by bedrock or some other geomorphic control. The removal of riparian vegetation has contributed to streambank instability, accelerated erosion, reduced shade and cover habitat for fish, and elevated water temperatures. The decline of both resident and anadromous fish populations in the Red River has been linked to degraded habitat and water quality conditions [Bonneville Power Administration (BPA), 1996].

The Red River has the potential to be a major spring chinook (*Oncorhynchus tshawytscha*), and steelhead (*Oncorhynchus mykiss*) production stream [Nez Perce Tribe (NPT) and Idaho Department of Fish and Game (IDFG), 1990], with several reaches capable of sustaining high quality spawning and rearing habitat (Dave Mays, Fisheries Biologist, Nez Perce National Forest, personal communication, 1997; USDA, 1998). Red River's lower meadow is one of these potentially prime habitat reaches and is currently the focus of our restoration efforts within the watershed. The Lower Red River Meadow Restoration Project encompasses four separate land parcels (1,300 acres) and 4.4 miles of stream channel. Our primary goal is to restore the diverse physical and biological features of the river/wet meadow ecosystem, thereby stabilizing the stream channel and providing high quality spawning and rearing habitat for anadromous and resident fish species [Idaho County Soil and Water Conservation District (ISWCD), 1995].

b. Rationale and significance to Regional Programs

The Red River watershed is part of the Clearwater River subbasin within the Columbia River Basin and is recognized as a potential, major spring chinook and steelhead production stream (NPT and IDFG, 1990). The Red River's upper and lower meadows have been identified in several plans as a high priority for aquatic habitat restoration, primarily for spring chinook salmon, steelhead trout, bull trout *(Salvelinus confluentus),* and westslope cutthroat trout *(Oncorhynchus clarki lewisi)* (NPPC, 1987; USDA, 1987; USDA 1998). In addition, the Red River drainage includes critical habitat for two new listings under the Endangered Species Act, steelhead trout and bull trout, placing even greater emphasis on timely and successful habitat restoration work.

All previous and proposed restoration work on the Lower Red River Meadow Restoration Project meets the need for off-site mitigation, helping to accomplish several goals and objectives of the NPPC's 1994 Fish and Wildlife Program (FWP). Our habitat enhancement objectives are consistent with those in Section 7.6D of the FWP. The project's design criteria for fish habitat enhancement rely on restoration of the physical and biological processes and functions of the natural river system, resulting in sustainable channel characteristics and native riparian plant communities. Stabilizing the channel and restoring native riparian vegetation enhances both the quantity and quality of fish habitat. Our restoration work increases the quantity of spawning and rearing habitat; reduces the amount of fines in spawning gravels; adjusts water depths, velocities, and temperatures to within the optimum ranges for chinook salmon spawning and rearing; establishes overhanging vegetation and undercuts banks; and provides a source of instream nutrients and woody debris. By improving spawning and rearing habitat conditions, we expect to see more redds in the restored reaches and increased survival of fry and juveniles. Increased offspring survival means more fish able to begin migration downstream, thus furthering the FWP's salmon and steelhead goal (Section 4.1, NPPC, 1994). In accomplishing the goal related to chinook salmon and steelhead, our holistic approach targets restoration of the riparian/wet meadow ecosystem and associated uplands and links the local watershed and downstream habitats. For this reason, additional benefits accrue to other anadromous and resident fish (Section 10.2B, NPPC, 1995); waterfowl; upland wildlife; and other aquatic, wetland, and riparian-dependent species (Section 11.1, NPPC, 1995). The end of 1999 will complete our last milestone (construction of Phase IV) on the Red River Wildlife Management Area (RRWMA). Additional phases are planned for restoration work with willing private landowners within the lower meadow and other potential habitat improvement sites, continuing a coordinated and cooperative effort to protect and improve habitat conditions within the watershed (Section 7.7, NPPC, 1994). Easement acquisitions that protect valuable riparian habitat and fully compensate private landowners (Section 7.8E, NPPC, 1994) will be explored and negotiated. And, we will seek cost-sharing opportunities with relevant state and federal entities for conservation easements, riparian fencing, and/or off-channel water development (Section 7.6, NPPC, 1994). Finally, our educational and public outreach activities in 1999 will promote and develop a local student and community volunteer monitoring/stewardship program in the Red River watershed. With an adequate level of involvement, we plan to initiate the program in year 2000. We are currently cooperating with the IDFG and the Elk City and Kooskia communities (recently awarded an Annenberg Rural Challenge Grant) to provide outdoor classroom opportunities at the RRWMA. Here, local school children can experience the field of ecological/watershed restoration in a hands-on learning environment (Section 7.6, NPPC, 1994). University of Idaho (UI) graduate and undergraduate students have participated in fieldwork, data collection, and surveying exercises since 1997 and have contributed a significant amount of information into our project's database.

The restoration philosophy and design used in the Lower Red River Meadow employs "cutting-edge" technology. The design approach integrates geomorphic design criteria and detailed hydrodynamic modeling. Various design scenarios can be tested and analyzed. The geomorphic criteria predicts the channel shape and the computer model routes flood flows and sediment through the project area. The comprehensive, hydrodynamic and mass transport computer model (MIKE-11) is being set up to accurately simulate the channel-floodplain interactions and is run through ArcView in a new software package called MIKE-View. All physical and biological data are stored in ArcView. This is likely the first application of this level of detailed modeling (over 10,000 topographic data points over Phases I-III alone) to predict channel response. This detail allows us to determine the level of survey information and modeling complexity required to obtain meaningful results.

The Lower Red River Meadow Restoration Project is the only one of its kind in Idaho and is being used as a local and regional model/demonstration for other stream and watershed restoration efforts. The project continues to be a complex, interdisciplinary, well-planned effort advised by a committed interagency and tribal Technical Advisory Committee (TAC).

c. Relationships to other projects

Related Projects:

a) The coordinated restoration program of the Clearwater Subbasin Focus Watershed [sponsored by the Idaho State Soil Conservation Commission (SCC) and NPT, BPA Project #9608600] encompasses the Red River drainage.

b) The McComas Meadow Project on Meadow Creek, a related and complementary restoration project in the South Fork Clearwater drainage, is funded by BPA and is a cooperative project of the Nez Perce National Forest and NPT (USFS, BPA Project #9607700). Representatives from the McComas project share restoration insights and knowledge during tours of the Red River project and TAC meetings. Ms. Heidi Stubbers, representative for the NPT on the Red River TAC, will assure collaboration between projects and compare restoration approaches through graduate studies at UI. Her thesis will focus on McComas Meadows. Co-major professors, Ecohydraulics Research Group (ERG) leader Dr. Peter Goodwin (Department of Civil Engineering) and Dr. Mike Falter (Department of Fisheries) will supervise her research.

c) The Lower Red River Prescription Watershed, identified in the Nez Perce National Forest Plan (1987), described the need for the Lower Red River Meadow Restoration Project. Since 1984, BPA and Nez Perce Forest focused restoration activities on critical habitats in these prescription watersheds using bank stabilization, fencing, and vegetative planting (Baer et al., 1990; Siddall, 1992). A USFS stream restoration project (Mullins property) in Red River's upper meadow provided examples of restoration technique effectiveness. A USFS wildlife fencing exclosure at the downstream end of the lower meadow provides information on the potential natural riparian vegetation.

d) The Red River Hatchery, a spring chinook rearing facility, located upstream of the project receives funding from the "Lower Snake River Compensation". This hatchery assists the restoration of anadromous fish runs via supplementation of smolts for the Crooked River, Red River, and the South Fork of the Clearwater drainages.

Agency Cooperation and Support:

a) The Technical Advisory Committee (TAC) for the Lower Red River Meadow Restoration Project meets regularly throughout the year to review designs and advise the ISWCD in decision-making. Interdisciplinary members of the TAC provide a wide range of expertise and include members from: Nez Perce Tribe (NPT), Idaho Department Fish and Game (IDFG), Idaho Division of Environmental Quality (DEQ), Nez Perce National Forest, Clearwater Focus Watershed, Idaho State Soil Conservation Commission (SCC), Bonneville Power Administration (BPA), Idaho County Soil and Water Conservation District (ISWCD), and Natural Resources Conservation Service (NRCS).

b) The USDA ARS Northwest Watershed Research Center loaned weirs and other monitoring equipment for a turbidity field test undertaken during the summer of 1998. Watershed data collected by the USFS as part of the State Water Adjudication process is proving to be very useful in understanding the linkages between the restoration actions at the RRWMA and watershed processes. A landscape-scale analysis of the South Fork of the Clearwater River (USDA, 1998) provided existing conditions and historical land uses in the Red River drainage. Findings from this study recommended Ecosystem Analysis at the Watershed Scale (EAWS) (USDA et al., 1995a,b) for the Red River drainage to be undertaken in 1999-2000. Project data collected by the consultant team and UI will be an important contribution to this EAWS. Information resulting from the EAWS will be shared with the project team.

Collaboration with Other Organizations and Scientists:

a) The Ecohydraulics Research Group (ERG) from UI actively seeks additional, non-BPA funding for research and supplemental educational components of this project. A 1997-98 University of Idaho Seed Grant for $6,000 was funded to initiate a database to support research proposals related to ecohydraulics and to assist agencies in documenting lessons learned from this type of restoration.

b) The Danish Hydraulic Institute has selected the UI Ecohydraulic Research Group as one of the international partners in a $3 million TALENT grant funded by the Danish Academy of Sciences. The Lower Red River Meadow Restoration Project is one site being considered for testing several recent mathematical models, such as Genetic Algorithms, for stream response.

UI In-Kind Donations

a) For the past two years, classes from the Department of Civil Engineering and Biological Systems and Agricultural Engineering have assisted with the on-site collection of survey and monitoring data. This popular student event has generated valuable data for the project. Students learn about restoration and monitoring, display their results through GIS, and compare data with earlier years. This program will continue after the BPA funded restoration work is completed. Plans include extending outdoor classroom experiences to limnology students in future years. [During the academic year, one-month support of ERG faculty (Drs. Goodwin and Jankowski) provides an in-kind contribution of $15,700, with computer software and facilities estimated at a value to the project in excess of $25,000.]

b) The computer center at the College of Engineering, Boise Center maintains the project web-site at no charge to the project (http://boise.uidaho.edu/redriver). [Average time: 4 hours per month for the Boise Center Computer Systems Manager]. Plans are to expand the web site to include real-time imaging and more interactive features (details in Section 10). Initial funds ($2,000) for this endeavor were contributed from the UI College of Engineering and a grant for $22,000 is pending with Foundations.

c) During 1998, Rick Marbury, a professional surveyor and graduate student with the ERG, supervised the wetland delineation survey, at no cost to the project (estimated in-kind contribution of $5000).

Additional undergraduate projects and volunteers:

a) Eight structural engineering students are team designing, fabricating, and installing a small bridge to provide pedestrian and ATV access across Red River on the RRWMA. Another team of mechanical engineering students has initiated design for a remote observation system for the (details in Section 10).

b) In planting season 1998, Americorps volunteers recruited through the IDFG, assisted planting 2000 willow poles. IDFG contributes other funds and volunteer help for supplemental monitoring, education, and fieldwork.

Permits:

All in-channel work (below the high water mark) proposed by the project requires two permits: 1) Nationwide Permit 4 (per Section 404 of the U.S. Clean Water Act) issued by the U.S. Army Corps of

Engineers (USACE); 2) Stream Alteration Permit (per Section 42-3805) of the Idaho State Code) issued by the Idaho Department of Water Resources (IDWR). DEQ water quality standards must be upheld during the construction phase of the project using Best Management Practices (BMP), detailed mitigation plans, and permit stipulations. Throughout the construction phase we constantly monitor turbidity and maintain a feedback loop with DEQ to ensure compliance with water quality standards.

d. **Project history** (for ongoing projects)

Past Costs and Years Underway:
The Lower Red River Meadow Restoration Project completes its sixth year at the end of February 1999 and will have cost $1,665,409. This money funded three years of planning and three years of implementation, resulting in an average project cost of $277,568.00 per year. The construction contract for each field season has averaged $135,000 for seven weeks.

Summary of Major Results:

◆**1993:** BPA, IDFG, Trout Unlimited, Rocky Mountain Elk Foundation, and National Fish and Wildlife Foundation collectively purchased one of the four properties in the lower Red River meadow. This property was deeded to IDFG in an Interagency MOA (BPA and IDFG, 1994) to manage for habitat restoration and fish and wildlife benefits as the Red River Wildlife Management Area.

◆**1994:** A stream habitat reconnaissance survey [Pocket Water Inc. (PWI), 1994a] was completed to document existing conditions and to use as baseline data in our monitoring program. The consultants utilized this stream habitat survey, a channel morphology survey, and an analysis of historical conditions (using stream gauging/sediment delivery data and 1936 aerial photos) to develop a natural stream restoration approach. This overall design philosophy was discussed with and accepted by the interagency and tribal Technical Advisory Committee (TAC). The associated budget for the stream restoration was completed.

◆**1995:** An environmental assessment (BPA, 1996), a cultural resources survey (Luttrell, 1995), and an analysis of options at Red River (Brunsfeld et al., 1996) were completed. Project planning was initiated, design criteria (River Masters Engineering, 1995) established, and conceptual restoration designs developed as a cooperative effort between the ISWCD, project consultants, and TAC. The group decided to implement the project in sequential phases with the intent of completing one phase per year. Restoration of the 1.5 miles of stream on the RRWMA would begin on the upstream end of the property (Phase I) and finish on the downstream end (Phase IV). Phases V - VIII would move restoration work to willing landowners upstream and downstream of the RRWMA.

◆**1996/97:** Phase I (1996) and Phase II (1997) project implementation restored approximately 7,000 feet of stream channel. Stable cross-section geometry was established by reshaping inside point bars, increasing width/depth ratios, and modifying the radius of curvature on outside bends. Meander pattern, floodplain function, and soil moisture conditions were restored by excavating new meander bends, reconnecting historic channels, and installing rock grade control structures. Tributary mouths, backwater channels, and off-channel rearing habitat were reconnected to the main channel. Several log habitat structures were keyed into the outside streambanks. Area available for fish habitat increased by approximately 50 percent. Both the number of pool/riffle sequences and residual pool depths increased by approximately 60 percent. A native grass mix and coir fiber matting was used to stabilize erosion-prone construction areas. We planted a 20-foot riparian buffer with over 46,000 native woody and herbaceous cuttings and seedlings that will eventually provide overhanging vegetation, develop undercut banks, increase cover and shade for fish, stabilize streambanks, and reduce summer water temperatures. Eight wildlife exclosures were built in the Phase I construction area and planted with native riparian plants to monitor browsing impacts on growth and survival rates of new plantings. Post- construction monitoring (details in Section 8f) was initiated in 1997 to evaluate the performance of our restoration design.

◆**1998:** The second year of post-construction monitoring was performed in the constructed reaches (Phases I and II). Monitoring and surveying stations were expanded on the RRWMA and the adjacent upstream property. Watershed and baseline monitoring data were collected in Phases III and IV in preparation for construction in 1999. An ArcView/GIS database was developed and is being used to evaluate monitoring data and prepare restoration designs. Hydraulic, geomorphic, and watershed data was downloaded into the computer design model and conceptual designs are being prepared for Phase III and IV restoration work. Phases III and IV implementation will be complete by September 1999. Data collected from turbidity control tests are being used to develop contingency plans for mitigating elevated suspended sediment levels during construction. Monitoring data collected in the 1997 field season was analyzed and reported in the draft monitoring report (PWI, 1998). Restoration performance evaluation results, as well as adaptive management implications, are being summarized and will be included in the 1996-97 Biennial Report (working draft). Three wildlife exclosures were built and all revegetation activities were completed in Phase II. Our website was established and maintained: http://boise.uidaho.edu/redriver.

Adaptive Management Implications: Learning from our first year of implementation (Phase I in 1996), we modified methods used for channel diversion, channel dewatering, and construction sequencing. We refined our turbidity monitoring protocol. Log habitat structures proved ineffective as fish habitat and were excluded from Phase II design. Our monitoring program allowed us to evaluate our restoration design and implementation procedures and to refine monitoring protocols, methods, and evaluation criteria. For example: 1) we learned that proper construction sequencing and adequate timing for the slow release of construction-induced turbid water are key to mitigating suspended sediment impacts. When unanticipated delays preclude this slow release method, contingency plans must be available; 2) data suggests that slightly narrower channel cross-sections develop higher quality fish habitat and will evolve toward dynamic equilibrium sooner than cross-sections previously designed; 3) selected “model” reaches that meet evaluation criteria for spawning and rearing habitat are being used as guides for Phase III and IV design; 4) deer and elk browsing damage to newly planted vegetation is greater than anticipated and some control will be necessary in future phases; 5) data collection for percent surface fines in spawning gravels was changed from the Wolman Pebble Count to the Grid Method for improved accuracy; 6) three monitoring transects were relocated to better target pool-tailouts; 7) coir fiber erosion control placement methods were improved to reduce the possibility of smolt entrapment; and 8) bank stability, overhanging vegetation, and undercut bank measurements are being considered as additional monitoring parameters. We are carefully documenting our findings for use in similar local and regional restoration projects.

Reports/Technical Papers:

Fisheries Habitat Reconnaissance (PWI, 1994a), Water Temperature Analysis (PWI, 1994b), Design Criteria (River Masters Engineering, 1995), 1995 Budget Proposal (ISWCD, 1995), Monitoring Plan (PWI, 1997), Analysis of Restoration Options (Brunsfeld et al., 1996), Environmental Assessment (BPA, 1996), FY97 Work Statement (PWI et al., 1997), 1st-4th Quarter Reports 1996, 1st-4th Quarter Reports 1997, 1st-3rd Quarter Reports 1998, 1997 Monitoring Report (PWI, 1998), 1998 Field Season Newsletters, FY1998 Work Statement (LRK et al., 1998a), 1996-1997 Biennial Report (working draft, LRK et al., 1998b), Society for Ecological Restoration Conference Abstract (LRK et al., 1998c).

e. Proposal objectives

Objective 1. Restore natural river channel shape, meander pattern, and substrate conditions to enhance the quality and quantity of spawning and rearing habitat for chinook salmon, steelhead trout, bull trout, and other anadromous and resident fish species. The restoration work stabilizes the channel and moves the river wet/meadow ecosystem toward a dynamic equilibrium condition requiring minimal future maintenance. The quality and quantity of pool/riffle sequences are enhanced, meeting spawning and rearing microhabitat preferences of salmonids. Number of fish spawning in the restored reaches increases as well as the survival rates of juveniles. Easement acquisitions with willing landowners expand the amount of high quality fish and wildlife habitat within the watershed.

Objective 2. Restore meadow and riparian plant communities to enhance fish and wildlife habitat, stabilize streambanks, and reduce water temperatures. Overhanging vegetation provides cover and reduces water temperatures. Under-cut bank habitat and streambank stability increases with root establishment of hydrophilic plant communities. Fish and wildlife habitat improves as the coverage, density, and height of native woody shrubs and herbaceous plants increases.

Objective 3. Measure and document progress in satisfying short- and long-term project goals, objectives, and outcomes. We analyze monitoring results and apply adaptive management principles to measure the performance of restoration features. A project database is maintained and annual monitoring reports are produced. Monitoring results and adaptive management implications are summarized in the overall project annual reports. The UI expects to monitor the physical and ecological parameters beyond the project time frame for education and research purposes.

Objective 4. Promote public and agency awareness and scientific knowledge of watershed restoration principles and techniques. We provide site tours, informational brochures, slide shows, journal and newspaper articles, and a website. An educational video is planned for 1999. The RRWMA is used as an outdoor laboratory and classroom. A volunteer monitoring/stewardship program will be initiated in 1999. Annual reports and newsletters, describing all aspects of the project will be made available to all interested parties via our project's website (http://boise.uidaho.edu/redriver).

Objective 5. Manage and communicate project activities to efficiently accomplish project goals: Effective management and communication assure proper and efficient implementation and accountability of project performance. Documents relating to the project including TAC meeting minutes, newsletters, field review and adaptive management reports are available to all interested parties.

f. Methods

Scope: The Lower Red River Meadow Restoration Project uses a holistic approach targeting restoration of the riparian/wet meadow ecosystem and the adjacent uplands and linking the local watershed and downstream habitats. Benefits accrue to salmon, steelhead, and bull trout as well as other anadromous and resident fish; waterfowl; upland wildlife; and other aquatic, wetland, and riparian-dependent species. The project is used as a local and regional demonstration project for other stream restoration and watershed projects. Phases I through IV will be completed at the end of 1999 on the Red River Wildlife Management Area, one of the four land parcels in the lower Red River meadow. Year 2000 will move restoration efforts to willing private landowners within the lower meadow, continuing a coordinated and cooperative effort to protect and improve habitat conditions within the watershed. In 2000, we will collect watershed data and monitor the performance of the previously constructed phases of the project. The data will be used to adjust the design criteria and methodology using adaptive management principles and guidance from the TAC. Easement acquisitions will be explored with willing private landowner(s). Upon favorable easement negotiations, we will design and construct the transition reach between the RRWMA and the adjacent land parcel. A detailed channel survey will be performed and used to prepare Phase V conceptual design alternatives for a willing private landowner. Public outreach/education activities will continue.

Approach: The most important element in restoration planning is to restore the natural physical processes and functions of the site [Barinaga, 1996; Independent Scientific Group (ISG), 1996; National Research Council (NRC), 1996; Rosgen, 1996]. Physical processes enable a river to evolve toward a sustainable dynamic equilibrium to which the habitat and ecology are adjusted. Channel instability and inadequate hydrologic conditions on the RRWMA prevent the use of passive restoration of the native riparian plant communities based on re-planting alone (Brunsfeld et al., 1996). Therefore, the project team chose an active restoration approach using a "soft engineering" philosophy to create a new channel alignment designed to reach a dynamic equilibrium condition with minimal use of artificial bank stabilization measures. A channel in dynamic equilibrium adjusts its form in response to natural fluctuations in discharge and sediment supply but maintains a constant cross-sectional shape over time (Leopold et al., 1995). Specifically, the design restores the river meandering pattern, stable cross-sectional shape, floodplain hydroperiod, sediment transport regime, and native riparian communities. Acquiring conservation easements to work with willing private landowners on adjacent reaches of the river will allow us to compare the costs and benefits of passive versus active restoration. In order to understand the physical processes and the implications of various management and restoration actions, we will evaluate the local site and its linkage to the watershed using detailed geomorphic and hydrodynamic modeling. The project team works closely with the USFS (Nez Perce National Forest) to collect and exchange current and historical land use, discharge, and sediment delivery data pertinent to the computer modeling and design of this project and other projects within the Red River watershed and the Clearwater subbasin. Our monitoring program evaluates the performance of design features against established evaluation criteria. Monitoring results and restoration outcomes will be shared with interested parties through an extensive public outreach/education program.

Critical Assumptions:

1. The consecutive-phase implementation structure of the restoration design is by necessity a multi-year endeavor. Degradation processes in the non-restored reaches are likely to continue until checked by natural geologic or geomorphic controls. The potential, therefore, exists for the development of a physical or associated habitat discontinuity at the downstream end of the restored channel area. Continuing the project with the downstream landowner will ensure channel continuity and the long-term protection of improvements completed to date.

2. The establishment and survival of the native, wet meadow/riparian plant communities is dependent on the restoration of the hydrologic conditions necessary to sustain them.

3. Restoring natural river function and processes will result in a long-term trend toward habitat recovery with minimal need for further human intervention.

4. Restoring historic river channel morphology, geometry, and riparian vegetation will result in high quality and diverse instream habitat for spring chinook salmon, steelhead trout, bull trout, and other anadromous and resident fish species.

Detailed Methodology:

Objective 1. (lower case letters correspond to tasks listed in Section 4):

(a) Re-evaluating historical and collecting current watershed, stream, and fish population data is an annual part of our restoration design process. Success of our restoration efforts is dependent upon understanding the human activities contributing to habitat degradation, the resulting changes in sediment supply and discharge, and the utilization periods and habitat requirements of target species. Watershed and on-site data collection is a cooperative effort between USFS, IDFG, and our project. A landscape-scale characterization of the ecological and social conditions of the South Fork Clearwater subbasin (USDA, 1998) has been completed that provides background information for future planning and the context for a detailed Ecosystem Analysis (EAWS) at the Watershed Scale (USDA et al., 1995a,b). The USFS will perform this EAWS of the Red River watershed in 1999-2000. IDFG continues to collect annual data on fish populations and redds in the Red River drainage. Two USFS gauging stations, located upstream from the lower meadow, will provide 16 years of stage, discharge, and peak flow data. Aerial photographs are used to document changes on a local and watershed level. Our long-term monitoring program documents changes in channel geometry, sediment size and quantity, water quality, and fish habitat conditions. Analyses of these various pieces of information contribute to our adaptive management process to report successes and failures and to modify future restoration designs or monitoring methods.

(**b**) With the completion of Phases I - IV on the RRWMA, Phases V - VIII will move the restoration work to willing landowners up- and downstream of the RRWMA thereby increasing the quantity and quality of fish habitat within this watershed. Continuation of the project throughout the lower meadow of the Red River drainage is of particular importance since this low-gradient stream/wet meadow ecosystem inherently possesses the potential for high quality chinook salmon, steelhead, and bull trout habitat. Easement agreements with private landowners are necessary to protect previously constructed reaches and to ensure that certain land uses will not undermine future habitat improvements. Easement options will be explored with landowners including cost-sharing opportunities with NRCS, US Fish and Wildlife Service, and IDFG, and we will coordination with real-estate easement specialists, land appraisers, attorneys, landowners, and easement holders.

c) Future restoration sites within the watershed will be surveyed using GPS, ground, and aerial survey techniques. These surveys will provide topographic details; stream cross-sectional shape, profile, and meander pattern; and habitat features necessary to evaluate existing conditions and to produce conceptual design alternatives.

(d) Recent research has shown the importance of selecting an appropriate model for restoration/management activities (Willetts and Hardwick, 1993; Ackers, 1993; Interagency Floodplain Management Review Committee, 1994; Havno and Goodwin, 1995). The UI applies a meander migration model (based on formulations by Parker, 1984; Larsen, 1995) and a hydrodynamic model (Falconer et al., 1989; Danish Hydraulic Institute, 1996) to simulate water quality, sediment transport and hydroperiod throughout the meadow reaches of the Red River. In addition, analytical tools for the geomorphic characteristics of the channel (for example, Leopold et al., 1995) and surface water-groundwater interactions are used. The year 2000 design will expand the current design criteria through information gathered in monitoring the previously constructed phases and the experiences of other watershed restoration projects, for example the Napa River (Napa River Community Coalition, 1996). Both active and passive restoration scenarios will be simulated with the model.

e) Based on modeling scenarios, discussions with a willing landowner, and TAC and ISWCD input, several preliminary conceptual restoration design alternatives will be reviewed with the landowner. Ultimately, a restoration alternative will be selected reflecting the landowner's goals and the goals of the project and the FWP.

f) The chosen detailed conceptual design will provide a stable, natural channel alignment including features to raise the water levels in the incised channel; increase channel length and sinuosity ratio; increase the frequency, diversity, and quality of fish habitat; and biostabilize highly erodable streambank areas. From the final conceptual design, detailed engineering and construction drawings and specifications are prepared. Due to the narrow construction window in any given year, these documents are prepared well ahead of time. On-site difficulties are minimized and construction is most cost-effective when the construction contractor reviews the design and construction documents prior to permit submittal. After this review, any necessary changes are made under the direction of the engineer with input from the TAC, ISWCD, and project consultants.

(g) All in-channel work (below the high water mark) proposed by the project requires two permits: 1) Nationwide Permit 4 (per Section 404 of the U.S. Clean Water Act) issued by the U.S. Army Corps of Engineers (USACE); 2) Stream Alteration Permit (per Section 42-3805) of the Idaho State Code) issued by the Idaho Department of Water Resources (IDWR). The permit application package is prepared and submitted 4 months prior to construction start date to allow sufficient time for review and revision. Permit applications include all design plans and specifications, access roads and material storage locations, wetland delineation and mitigation plans, and suspended sediment mitigation plans.

(h) Restoration of the RRWMA in 1999 will finish several hundred feet short of the downstream property boundary to avoid potential negative impacts to the adjacent property. Easement agreements must precede any work in this transition area between the two properties. Details of work in the transition reach will reflect easement specifications determined in negotiations with the landowner and landowner's desires for habitat enhancement. Upon successful negotiations, we will install restoration features to complete the Phase IV transition between the RRWMA and the adjacent downstream property. Channel features will be installed in accordance with engineering construction documents and permit conditions.

Objective 2. (lower case letters correspond to tasks listed in Section 4):

a) A 1936 aerial photograph of the project site is a key ingredient for establishing a "footprint" for native riparian plant community restoration. Studying additional historic photos and records, along with identifying local existing plant communities and soil conditions (Brunsfeld et al., 1996) aided the development of the revegetation design criteria. Using adaptive management principles, recent published data, and revegetation monitoring data, we evaluate critical revegetation assumptions and design criteria and modify as necessary.

b) Based on engineering conceptual design alternatives, discussions with a willing landowner, and TAC and ISWCD input, several preliminary conceptual revegetation design alternatives will be produced and reviewed with the landowner. Ultimately, a revegetation alternative will be selected conducive to the landowner's goals for his/her property, the engineering design, and the goals of the project and the FWP.

c) A detailed written and illustrated revegetation design will be then completed including plant and material specifications to be incorporated into the final engineering and construction package.

d) We will collect seed, on-site, from various native woody and herbaceous plants on-site during the 2000 field season in preparation for in Phase V in 2001. The seed will be cleaned and stored at the WHI facility. WHI will stratify and sow the seed in trays for greenhouse production of container seedlings early in 2001.

e) During early spring of 2000, WHI personnel will collect and trim willow poles. We will store the poles, in dormant condition, sealed in shrink-wrap, in a dark nursery cooler until planting time in early summer.

f) Dormant willow poles and container seedlings are delivered to a temporary storage cooler located near the project site in early June. Planting begins June 15 to ensure sufficient root growth, plant development, and high survival. Plants are installed at locations and densities predetermined by the detailed revegetation specifications, soil erosion potential of various stream reaches, and hydrologic requirements of individual plant species. Planting in 2000 will complete revegetation work in Phases III and IV.

g) Streambank soils, exposed by recent construction, rely on the rapid growth response of planted vegetation to remain stable against high flows and erosive forces during the next peak flood season. Irrigation, immediately following summer plantings, improves survival of planted seedlings and willow poles and ensures vigorous, healthy root systems able to stabilize these newly constructed streambanks against spring flood flows.

h) To establish a reliable seed and cutting source and monitor the effects of large ungulate browsing on planted seedlings and willow poles, we build 16'x16' fenced wildlife exclosures within the project area. The exclosures are planted with seedlings and willow poles identical to that planted elsewhere throughout the riparian zone. Eight additional exclosures, similar to those planted in Phases I and II, will be constructed in Phases III and IV during 2000.

Objective 3. (lower case letters correspond to tasks listed in Section 4):

a) Restoration work must often be implemented without complete scientific knowledge of outcomes. Therefore, our monitoring program measures, evaluates, and documents the outcomes of our restoration efforts against established quantitative and qualitative evaluation criteria. Using adaptive management principles we modify restoration design and implementation procedures for future project phases and refine monitoring parameters, evaluation criteria, and methodology. Consequently, we are identifying the most effective restoration techniques to optimize ecologic, geomorphic, and hydrologic conditions in the long-term and are transferring that information to other natural resource managers and stewards. All monitoring data is integrated into a project database and an ArcView GIS maintained and updated by UI.

[Actual monitoring tasks are summarized below and described in detail, with references, in the *Lower Red River Meadow Restoration Project: 1997 Monitoring Plan* (PWI, 1997) and the *1997 Monitoring Report* (PWI, 1998). Tasks b through d are the short-term, implementation monitoring tasks; tasks e through l are long-term, effectiveness monitoring tasks.] ***Note:** Fish migration to spawning tributaries is highly variable due to the influences of downstream conditions such as dam passage, ocean survival, fishing pressure, and climate fluctuations. Therefore, the majority of our monitoring parameters are measurements of **physical** characteristics directly related to the development of high quality spawning and rearing habitat.*

(b) Turbidity is measured before, during, and after construction to assess short-term impacts to water quality related to our restoration efforts. During construction, the project uses best management practices to comply with the Idaho Water Quality Standards (DEQ, 1996). *Methodology:* Three automatic, continuous turbidity sensors are located above and below construction activities that record turbidity (ntu) every 10 minutes. Manual sediment samples are collected to estimate suspended sediment concentration (mg/L) and sediment load (tons) attributed to project activities. *Evaluation Criteria:* Project turbidity is not to exceed background turbidity by more than 50 ntu instantaneously or more than 25 ntu for more than ten consecutive days; project sediment load is not to exceed 150 tons (projected in the NEPA environmental analysis).

(c) Planting success monitoring is used to determine plant survival over the first year. This information guides species selection, planting location, and out-planting methods in future phases of the project. *Methodology:* After the fall planting, a metric square is laid along representative 50-meter transects. Plants are identified and mapped and percent coverage estimated. The plots are resurveyed in the following summer to calculate percent survival of individual species. *Performance Criteria:* Replanting will normally occur when plant mortality is greater than 50%. In certain cases, replanting will occur when plant mortality is less than 50% depending on the value, function, and potential for natural recruitment of an individual species.

(d) TAC field reviews provide feedback during construction, post construction at low flows, and the following spring after peak seasonal flows. *Methodology:* These reviews are based on visual, qualitative assessments by an interdisciplinary team of experts, using standardized field forms. *Evaluation Criteria:* The committee assesses the integrity and value of design features and any initial evidence that the reconstructed channel is evolving toward the ecosystem characteristics described in project goals, objectives, and design philosophy. The TAC advises consultants and construction crews on changes in design or construction techniques whenever unexpected site conditions make the original design inappropriate. The group also identifies problem areas and recommends repair or maintenance. All reviews are documented in formal Field Review Reports.

(e) Stream channel response to construction is measured to evaluate engineering design and performance of constructed features, channel evolution toward dynamic equilibrium, and development of high quality and diverse fish habitat features. *Methodology:* Total Station or GPS survey equipment is used to survey channel meander pattern, gradient, cross-sections, thalweg profile, and surface water profile before construction, after construction, and over time. Project site data is assembled into a hydraulic geometry database and used to document changes in stream gradient, length, sinuosity ratios, width/depth ratios, low-flow water surface levels, number and spacing of pool/riffle habitats, and residual pool depths. Evaluation results are incorporated into the design and implementation procedures for the remaining components of the project. *Evaluation Criteria:* 1) Lateral bank erosion (measured in inches or feet) will decrease compared to pre-construction conditions as the channel evolves toward dynamic equilibrium where sediment erosion rates are balanced by sediment deposition rates. 2) Stream gradient, sinuosity ratio, and meander pattern are constructed as specified in design documents. Following construction, the stream evolves into a self-regulating state which responds to natural fluctuations in discharge and sediment supply by adjusting local gradients, rearranging bed materials, transporting more or less sediment, and changing channel patterns while maintaining its cross-sectional shape. 3) Low-flow water elevations will increase in most locations to within 30 inches of top of bank to provide adequate soil moisture levels for riparian vegetation and to reconnect tributary, backwater, and off-channel rearing habitat. 4) Cross sectional shapes and channel bottom profiles are designed to adjust to and withstand natural stream discharges and to develop diverse fish habitat features. Width/depth ratio will range between 12 and 20 (Rosgen, 1996), increasing the depth of pool habitats. Number of pool/riffle sequences will increase by 50 to 150%. Pool/riffle sequences will be spaced 5 – 7 channel widths apart, consistent with expected conditions in stable channels (Leopold et al., 1995).

(f) Quantity and quality of salmonid spawning and rearing microhabitats are measured and mapped to document changes attributed to the restoration design. *Methodology:* Depth, velocity, substrate size, and percent fines are measured at representative transects (outside bends and pool tail-outs) using Total Station or GPS survey equipment, a flow meter, Wolman pebble counts (Wolman, 1954), particle size analyses of disturbed samples, and the Grid Method for surface fines (Overton et al., 1997). GIS technology is applied to produce detailed maps of specific geomorphic features (e.g., pool/riffle sequences, run, and glide habitats) created or enhanced by project design implementation. *Evaluation Criteria:* Microhabitat characteristics are compared to chinook salmon spawning and rearing habitat preferences. Rearing habitat: depth of pool = 0.5 – 2.0 feet, velocity = 0.26 – 2.0 ft/s. Spawning habitat: depth = ≥ 1.0 feet, velocity = 1.04 – 3.58 ft/s, substrate size = 0.51 – 4.0 in. (Bjornn and Reiser, 1991). Percent fines = ≤ 20% (NMFS, 1996). We expect to document an increase in the quantity, quality, and utilization of fish habitat in the restored reaches.

g) Fish populations and densities are evaluated annually by the IDFG. *Methodology:* Snorkel transects consisting of pool/riffle/glide sequences; ground and aerial redd counts. *Performance Criteria:* We expect to see a long-term trend of increasing numbers of chinook and steelhead spawning in Red River, a change in species composition to a larger percentage of chinook and steelhead juveniles, and increased survival rates of fry and juveniles.

h) Decreases in width/depth ratios, increases in the number of deep pools, and establishment of overhanging vegetation will help to lower summer water temperatures over the long term. *Methodology:* Summer water temperature data is collected continuously from mid-June to mid-September using waterproof data loggers at four locations in the meadow. *Performance Criteria:* Water temperatures are compared to recommendations for juvenile chinook salmon rearing (< 64.9^{o}F max.) (ISG, 1996).

i) Restoration features are designed to increase groundwater and low-flow surface elevations to create soil moisture conditions that sustain native riparian and wet meadow vegetation. *Methodology:* Groundwater monitoring stations (standpipes) are installed in 14 locations of the floodplain and riparian zone of the project area to measure groundwater table recovery. Total Station or GPS survey equipment is used to survey surface water profiles before construction, after construction, and over time. *Performance Criteria:* Water surface profile is expected to increase by 1-2 feet throughout the project area with an associated increase in groundwater elevation. We expect the elevated groundwater levels to be maintained for longer periods during the growing season. The design criteria specify a low-flow surface water elevation to within 30 inches of the top of bank.

(j) Greenline and riparian vegetation composition are measured over several years following planting to document the reestablishment of the native riparian community. *Methodology:* The extent and quality of the restored riparian plant community is compared to the hypothesized natural community, using greenline and riparian community composition transect methodology (USDA, 1992; Cagney, 1993). *Performance Criteria:* Long-term improvement is expected in the dominance of native riparian vegetation, indicating an evolution toward the potential (hypothesized) natural communities. We expect the native riparian communities to be dominant in 50% of the riparian zone in 15 years.

(k) Permanent photopoints are established to document visual changes in channel stability and riparian vegetation. *Methodology:* A standard profile board is included in photo plots to provide a consistent frame of reference. The procedure has been standardized and documented to ensure accurate replication of photos over time. Photos are taken in construction reaches before, during, and after restoration activities. *Performance Criteria:* Photos compared over time will qualitatively illustrate the development of riparian vegetation and subsequent changes in stream bank conditions.

(l) The restoration design will enhance wildlife and waterfowl habitat as well as fish habitat. *Methodology:* Via a cooperative arrangement with IDFG, a Habitat Evaluation Procedure (HEP) is completed annually to measure changes in riparian habitat quality for specific wildlife species. *Performance Criteria:* Increase in amount and quality of canopy coverage and associated resting and nesting areas for various species of wildlife. Habitat suitability models for indicator species are used to measure and document habitat quantity and quality.

(m) Data analyses proceed during the fall and an annual monitoring report is prepared in early winter.

Objective 4. (lower case letters correspond to tasks listed in Section 4):

(a) Review and update the public information plan, evaluating and modifying the strategy to reach a broad range of age groups and various public and private sectors through a variety of approaches.
(b) Add current aerial and ground photographs and slides to the project's CD-ROM image library. We have developed several versions of our project's slide presentation to target a variety of audiences. We will update these slides as current information and photographs become available. Plans in 1999 include providing an opportunity for a college student to develop a professionally produced documentary. We will use the educational video and the project slide show for on-site tours, landowner communications, and other public outreach opportunities.
(c) Underwater and surveillance cameras with a remote control system and linkages to our website will be installed in 1999 in cooperation with UI engineering students and non-BPA funds. These cameras will require maintenance in 2000 and out-years.
(d) Our website is used as a public information and educational resource for a worldwide audience. In addition to text and still photography describing current project activities and accomplishments, real-time images from the underwater and surveillance cameras will be posted. The project coordinates with UI to regularly update and maintain our website.
(e) Disseminate watershed restoration experiences and successes via non-technical magazines, local newspapers, community organization newsletters, scientific journal articles, and/or conference proceedings.
(f) Update project brochure and FACT sheet using current photography, monitoring, and restoration accomplishments and continue field season newsletters. Distribute these materials to the local community, public agencies, conferences, workshops, and other interested parties.
(g) Update and maintain the GIS database (initiated in 1998 by UI). Maps and graphs produced from this database demonstrate long-term changes in the meadow ecosystem and fish habitat features due to restoration activities. Selected images are posted onto the project website and used in monitoring, adaptive management, field season, and annual reports.
(h) Give on-site tours during the field season to invited groups as well as "drop-in" visitors.
(i) A local student/community based volunteer monitoring and stewardship program will be developed in 1999 in cooperation with local community organizations and school districts. We expect to implement this program in 2000. In addition, selected students from local schools will be given the opportunity to assist in fieldwork and/or long-term science projects. These educational opportunities provide hands-on experiences in ecological restoration techniques and principles.
(j) The local communities of Kooskia and Elk City have been awarded an Annenberg Rural Challenge Grant to expand natural resource and art education to local school children. The project will continue work with the grant-facilitating organization, *Communities Creating Connections, Inc*., and the IDFG to foster student outdoor learning experiences related to fish and wildlife, watershed management, and restoration principles and techniques. Collaboration will continue with UI undergraduate and graduate students to jointly monitor project outcomes. Graduate level research is ongoing.
(k) Our project is a demonstration site and model for other projects interested in similar restoration techniques. An on-site computer will be available for on-site tours. Tour participants and visiting students can access an interpretative exhibit, featuring animation in an easily understandable graphic presentation, of modeling results and restoration scenarios. An annual report will document and transfer river restoration information related to design approach, adaptive management, monitoring, ecological benefits, experiences, and accomplishments.
<u>Objective 5.</u> (lower case letters correspond to tasks listed in Section 4):
(a-d) Communications and management personnel will assist the ISWCD with personnel contract preparation, project and time schedules, permit application submittal, and communication plans.
(e) An efficient decision-making process is crucial for effective management, design, and implementation. Communication and management personnel will organize and facilitate TAC meetings and prepare and distribute minutes. TAC decisions on project plans become recommendations to the ISWCD.
(f-g) TAC recommendations on project design and implementation are efficiently and accurately conveyed to the project sponsor to facilitate informed and timely decisions. Project activities are communicated and coordinated with other interested parties in addition to the TAC and ISWCD including local landowners, community members, and regulatory agencies.
(h) Effective coordination of field season activities will ensure all work is completed within the narrow window (July 1st - August 15th) imposed by regulations protecting fish and wildlife habitat and water quality. Communication and management personnel remain on-site during the implementation phase to provide construction supervision, transfer information, and administrative support. Field season activities

are planned carefully to minimize impacts to other land uses within the watershed. DEQ is kept informed at all times of water quality status during project implementation. TAC members receive weekly updates of field season activities.
(i) Project activity reports are prepared each quarter and a formal annual report is published. All reports are submitted to the BPA and ISWCD and copies are made available to all interested parties.

g. Facilities and equipment

Office space and communication equipment: During planning meetings with the TAC, the sponsor, or participating consultants, meeting space is usually provided at no cost by one of the participants. A 500 square foot field office/work center will be remodeled in 1998-99 from an existing shop/tack room existing on-site. During the field season, telephone service is connected and office equipment (computer, printer, fax, telephone, answering machine) and furniture are leased. Portable radios facilitate communications between personnel at work in the meadow and those in the field office.

Field and construction equipment: Restoring stream meander and channel geometry within the limited construction window will require one track excavator with 1.5-2 yard buckets, a D8-sized bulldozer, a smaller D4-sized finish bulldozer with rippers, and support equipment such as pumps, fuel and or tool truck. This equipment will be specified and supplied via a construction subcontract. A mini track excavator supplied with an auger attachment has proved cost efficient for pre-drilling holes for willow pole planting. A Boise firm leases this mini-excavator and supplies delivery.

Four- and six-wheel ATV's have proved efficient and effective means to deliver personnel volunteer labor groups, equipment, and supplies such as pumps, willow poles, and seedling boxes, to the project site. Lease arrangements have been made for a six-wheel ATV. Tillage, planting, and fertilizing equipment used with the ATV will be supplied by the revegetation contractor.

Technical and monitoring equipment: Survey equipment such as total stations, transits, levels, rods, global positioning systems, computer aided design, and other computer hardware and software will be provided by the engineer consultant/contractor as a portion of their contract for services unless detailed separately by contract. PWI and UI have supplied turbidity sensors, data loggers, flow meters, cameras, computers, and other equipment related to water quality and monitoring tasks.

h. Budget

FY1999 project budget (BPA obligated): $500,000 Amount requested: $589,960
FY2000 Amount requested: $550,000

<u>FY2000 Budget by line item description:</u>
Personnel and Fringe benefits: These headings comprise $170,613, or 31% of our FY 2000 line item budget, and reflect the labor and service provided by the four consultants who comprise the interdisciplinary consultant team. These labor and services represent engineering, revegetation, monitoring, education, management and communication tasks.

Supplies and materials: The majority of these funds reflects the approximately 25,000 willow poles planned for planting in the constructed areas of Phases III and IV. Other supplies and materials include hard goods such as erosion control matting and seed.

Operations and maintenance: This budget has been set in place for potential repair, cleanup, and replanting.

Capital acquisitions or improvement: These funds have been delegated for potential easements with willing private landowners up- and down-stream of Phases I-IV. Preliminary, broad based geographical surveys and hydrogeomorphic data have been collected from one neighboring land parcel and contact with landowners has been initiated. This process will serve to protect substantial investments in on-the-ground restoration work and to support continued restoration of critical fish and wildlife habitat within the Lower Red River Meadow.

NEPA costs: A NEPA-required environmental assessment (BPA, 1996) has been accomplished for the project and no additional NEPA documents are expected during FY2000.

Construction related support: This entry includes preliminary design activities conducted by the UI Ecohydraulics Research Group; specifically, surveys, modeling, mapping, and creating draft conceptual plans. A construction engineer will complete details of preliminary designs and assist with the permit application and construction contract. The construction engineer will then stake the site and assist with construction management. A construction contract will be issued and the construction contractor will implement restoration work.

Travel: The remote location of the Red River project site dictates the need for a significant travel budget. Team members work to reduce costs by car-pooling and combining work activities. Projects are scheduled to pool labor resources when possible and personnel camp at the site to reduce travel costs.

Indirect costs: These costs have been standardized at 2% of Personnel and Fringe Benefits. These funds support administrative activities provided by ISWCD.

PIT tags, Other, and Subcontractor: None required.

<u>Cost Sharing</u>

To date, most work has taken place on property owned by the IDFG. Several cost share programs, such as those available for riparian fencing and grazing planning, will be explored when the project extends to willing private landowners during FY2000. Typically these programs are applied for during, or one year prior, to the year of implementation.

A host of In-Kind support has aided the project, specifically those programs initiated by the UI Ecohydraulics Research Group, detailed in Sections 8c. and 10. In-Kind support has also come from the IDFG and other agencies. We continually search for additional funding and cost-sharing sources.

<u>Outyear Costs</u>

Outyear costs reflect average yearly budgets since Phase I on-the-ground-construction was implemented in 1996. These budgets will support ongoing restoration efforts of critical habitat in the Lower Red River Meadow.

Section 9. Key personnel

Denny Dawes, President
Wildlife Habitat Institute

Project Responsibilities: Management (0.25 FTE)
Revegetation (0.25 FTE)

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Education:

1997	B.S. degree candidate, Wildlife Resources, University of Idaho, Moscow pending completion of 100-level class. Emphasis: Communication and Habitat Management

Relevant Work Experience:

1992 – present	**President**, Wildlife Habitat Institute, Princeton, ID. *Involved in all aspects of the business. Specialists in wildlife habitat improvement, native plant propagation, wetland and riparian restoration.*
1991-1993	**Greenhouse Assistant**, University of Idaho Forestry Research Nursery, Moscow, ID. *Assisted with many phases of nursery management including greenhouse construction, seed storage and stratification, media preparation, fertilization, irrigation, and cold storage.*
1982-1991	**General Manager**, Hash Tree Company, Princeton, ID. *Managed/worked all departments including administration, landscaping, production, and sales.*
1974-1977	**Heavy Equipment Operator/Foreman,** Anchorage, AK. *Worked for several construction projects for various contractors, including Alaska pipeline work for Morrison-Knudson-Rivers.*

Relevant Background:
Mr. Dawes has taught numerous seminars and classes on bird and mammal identification; wildlife, forest, and wetland habitat management; cost share programs; and habitat landscaping. Mr. Dawes has provided revegetation expertise to the Lower Red River Meadow Restoration project since 1995, including the planning and implementation of all phases of the revegetation objectives and tasks. As project manager, Mr. Dawes is responsible for managing and coordinating all project activities including personnel contracts and schedules, permit application procedures, design development, communications, engineering, construction, and monitoring. Mr. Dawes is currently president of the Idaho Nursery Association.

Relevant Publications:
LRK Communications, Pocket Water, Inc., University of Idaho, and Wildlife Habitat Institute. 1998. Lower Red River Meadow Restoration Project FY 1998 Work Statement. Prepared for Bonneville Power Administration and Idaho County Soil and Water Conservation District.
Brunsfeld, S.J., D.G. Dawes, S. McGeehan, and D.G. Ogle. 1996. An analysis of riparian soils, vegetation, and revegetation options at Red River. D.G. Dawes (ed.) Report to Pocket Water, Inc., Idaho Department of Fish and Game, Bonneville Power Administration, and Idaho County Soil and Water Conservation District.
Finity, M., D.G. Dawes, C.B. Hardy, K. Lillengreen J.A. McCurdy, K.W. St. Amand, and J. Steelel. 1996. An environmental assessment of properties for the Coeur d'Alene Tribe.
Konopacky Environmental, River Masters Engineering, Selkirk Environmental, and Wildlife Habitat Institute. 1994. Emerald Creek Garnet Co. 404 Permit Application.

Linda R. Klein, President
LRK Communications

<u>Project Responsibilities</u>: Communications (0.25 FTE)
Education/Public Outreach (0.25 FTE)

Office:
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Education:

1995	M.S. Soil Science, Washington State University, Pullman
1980	B.S. Radiography, Idaho State University, Pocatello

Relevant Work Experience:

1997-present	**President/Technical Communications Specialist**, LRK Communications, Pullman, WA. *Involved in all aspects of the business; provide technical writing/editing, communications coordination, meeting facilitation, and contract management services.*
1997-present	**Communications Coordinator**, Lower Red River Meadow Restoration Project. Client: Idaho County Soil and Water Conservation District. *Responsible for all communications and public outreach/education activities and assisting project manager with management activities.*
1996-1997	**Stream Restoration Consultant/Communications Coordinator**, River Masters Engineering, Pullman, WA. *Responsible for computer aided drawing, wetland delineation coordination, construction supervision, topographic survey, streambank revegetation, monitoring, and communications coordination.*
1995-1997	**Research Associate/Instructor,** Washington State University, Pullman, WA. *Performed research for college-level, introductory soil science textbook and revised two chapters for a natural resource management textbook; taught a variety of soils classes..*

Relevant Background:

Ms. Klein has been involved in the Lower Red River Meadow Restoration Project since May 1996. Since May 1997, she has been primarily responsible for the communications and public outreach/education tasks for the project. These tasks include disseminating project related information to all interested parties, relaying technical information between the TAC and the ISWCD, facilitating and documenting TAC meetings and field evaluations, coordinating communications between project consultants, writing/editing project reports, implementing public outreach activities, and producing educational materials.

Relevant Publications:

LRK Communications, Pocket Water, Inc., University of Idaho, and Wildlife Habitat Institute. 1998. Lower Red River Meadow Restoration Project FY 1998 Work Statement. Prepared for Bonneville Power Administration and Idaho County Soil and Water Conservation District.

LRK Communications, Pocket Water, Inc., University of Idaho, and Wildlife Habitat Institute. 1998. Lower Red River Meadow Restoration Project 1996-97 Biennial Report *(working draft)*. Prepared for Bonneville Power Administration and Idaho County Soil and Water Conservation District.

LRK Communications, Pocket Water, Inc., University of Idaho, and Wildlife Habitat Institute. 1998. Lower Red River Meadow Restoration Project: 1st- 3rd Quarter Reports. Prepared for Bonneville Power Administration and Idaho County Soil and Water Conservation District.

LRK Communications. 1998. Field Season Newsletters: Lower Red River Meadow Restoration. June, July, August, September/October 1998.

Peter Goodwin, P.E.
University of Idaho

<u>Project Responsibilities</u>: Design/Engineering (0.25 FTE)
Monitoring Coordination (0.25 FTE)

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Education:

1986	Ph.D. Hydraulic Engineering, University of California, Berkeley
1982	M.S. Hydraulic Engineering, University of California, Berkeley
1978	B.Sc. Civil Engineering, University of Southampton, U.K.

Relevant Experience: Dr. Goodwin has been the PI, lead hydrologist, or project manager of several large scale river or watershed management studies including: 'Living River Strategy' for the Napa River Watershed (1991-present), Sediment Management Plan for the North Fork Feather River (1993-96), Russian River Enhancement Plan (1992-95), Floodplain Restoration of the Willamette River (1995-96), Tijuana River and Wetland Enhancement Plan (1995-present), Review of the Sedimentation issues of the Three Gorges Dam (1995), and San Lorenzo Flood Management Plan (1985-1996). These projects utilized adaptive management strategies. He is scientific advisor to several related projects including the San Dieguito Wetland Enhancement Project. Recent related research grants include projects funded by NATO, IBM, and NOAA.

Related Activities: Dr. Goodwin is Associate Editor of the ASCE Journal of Hydraulic Engineering with responsibility for computational hydraulics and restoration of rivers and wetlands. He is involved in several national and international activities closely related to this proposal, including the International Association of Hydraulic Research (IAHR) Ecohydraulics Committee and is chair of the American Society of Civil Engineers committee on wetland restoration. Dr. Goodwin is also the organizer or instructor on several short courses on environmental river and wetland management including the ASCE Continuing Education Course on Wetland Restoration (August 1997), the University of Idaho course on Environmental River Management (May 1997), Geomorphology in River Restoration at the University of California, Berkeley, and "Approaches and Processes in Watershed and River Restoration" (University of Idaho, October 1998).

Relevant Work Experience:

1996-present: Associate Professor, Department of Civil Engineering, University of Idaho
1989-1996: Technical Director, Philip Williams & Associates, Ltd., San Francisco.

Relevant Publications:

Goodwin, P., C.W. Slaughter, and R. Marbury. 1998. Dominant discharge as a design criteria in river restoration. ASCE Wetlands, Engineering, and River Restoration Conference. Denver. March. In Press.

Slaughter, C.W. and P. Goodwin. 1998. Hydrologic Modeling Approaches for Integrated Management of Stream Systems. First Federal Interagency Hydrologic Modeling Conference. April. In Press.

Havno, K. and P.Goodwin.1995. Hydraulic modeling of ecological criteria: Towards an integrated approach for hydrologic, geomorphic and ecologic understanding of river corridors. Seminar 2. XXVI IAHR Congress, London.

Jordan, J.J., J. Florsheim and P. Goodwin.1995. Using water resource and riparian parameters to develop a river management program in *Water Resources at Risk.* W.R. Hotchkiss, J.S. Downey, E.D. Gutentag and J.E. Moore. American Institute of Hydrology.

Falconer, R.A. and P. Goodwin. 1994. Wetland management. Thomas Telford, London.

Stephen B. Bauer, President **Project Responsibilities:** Water Quality Monitoring (0.25 FTE)
Pocket Water, Inc.

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Education:

1975	M.S. Zoology, University of Idaho, Moscow (Emphasis: Aquatic Ecology)
1972	B.S. Biology, University of Missouri, Kansas City

Recent Work Experience:
1992 - present: Water Quality/Aquatic Ecology. Mr. Bauer currently provides technical support to several fisheries habitat/water quality projects including the following:

> **EPA -** evaluation of habitat indicators under the Clean Water Act, via a grant to the Idaho Water Resources Research Institute at the University of Idaho.
>
> **Oregon Governor's Watershed Enhancement Board -** As managing member of the consulting group, Watershed Professionals Network, LLC; the technical team is developing a Watershed Assessment Manual to be used by Watershed Councils to identify restoration projects.
>
> **Kootenai Tribe -** Water quality analysis of the Kootenai River. Selected past projects: EPA - Development of a water quality/habitat monitoring guide for evaluation of grazing impacts; Boise Cascade – Gold Fork River watershed assessment; Payette National Forest – EFSF Salmon River watershed assessment; Oregon Water Resources Research Institute – water quality section of a Watershed Primer; Kootenai-Shoshone SWCD - Three year study of agricultural pollutant loading to Coeur d'Alene Lake.

1978 - 1992: Environmental Scientist, Idaho Department of Health and Welfare, Division of Environmental Quality. Evaluated the impact of timber harvests, irrigation return flows, dryland runoff, and livestock grazing, led development of the Idaho Nonpoint Source Pollution Program to comply with the federal Clean Water Act, revised the Silvicultural and Agricultural Water Quality Pollution Abatement Programs, and worked with Idaho legislature and interest groups on water quality issues.

Relevant Background:
Mr. Bauer performed, or assisted with, many of the preliminary site analyses in the lower Red River meadow and helped the ISWCD initiate the Red River project in 1994 as a project coordinator. He has assisted the ISWCD in completing the initial restoration design, in organizing a Technical Advisory Committee, and in completing the stream alteration permits and NEPA documents. In 1996 and 1997, he developed and implemented a project monitoring and evaluation program for the project.

Relevant Publications:
Bauer, S.B. and S.R. Ralph. 1998. Draft – Development of aquatic habitat indicators under the Clean Water Act, EPA, Seattle, WA.

Nonpoint Source Solutions. 1997. Draft - Oregon watershed assessment manual. Prepared for the Oregon Governor's Watershed Enhancement Board. Portland, OR.

Karen Kuzis Consulting. 1997. Watershed analysis of the East Fork South Fork of the Salmon River: Water Quality Section. Prepared for Krassel Ranger Station, Payette National Forest, McCall, ID.

Bauer, S.B. 1996. Gold Fork watershed assessment report: Water quality section. Prepared for Boise Cascade Corp. Boise, ID.

Bauer, S.B. 1993. Monitoring protocols to evaluate water quality effects of grazing management on western rangeland streams, EPA 910/R-93-017, U.S. EPA, Seattle, WA.

Section 10. Information/technology transfer

Elementary and Secondary School Students:

a) Ms. Linda Klein has a particular interest in school outreach. In 1998, Linda presented slide shows to three classes of 6^{th} graders at Grangeville Elementary School and gave a slide show and on-site tour for the Kamiah High School sophomore biology class. Slides shows will be presented to other local school children in 1999 and outyears.

b) *Communities Creating Connections, Inc.* is a local community organization formed to facilitate the Annenberg Rural Challenge Grant, recently awarded to Kooskia and Elk City. In 1999, Linda plans to work with the Natural Resource Coordinator of this organization and the IDFG to initiate outdoor classroom activities related to fish and wildlife habitat enhancement on the Red River Wildlife Management Area. Peter Goodwin and the University of Idaho Ecohydraulics Research Group (ERG) has collaborated with *Communities Creating Connections, Inc.* on a NSF grant application (Ecohydraulics: Simulation of Physical Processes in River ecosystem Management, NSF Solicitation Number 98-103). Submitted in the summer of 1998, the grant proposal included a unique educational endeavor at the Red River project site. This proposal integrates research and monitoring programs on river restoration to the education of K-12 and University students, particularly students from remote rural and inner city environments. The 12-month program gives these students an opportunity, otherwise unavailable to them, to experience restoration and management activities of natural resources in a range of diverse environments, from industrial, urban inner cities to remote wilderness areas. The program is designed as a high school and university-mentoring program, giving students a chance to help and teach each other once they acquire personal experiences and knowledge. We hope to enhance our project's connection to the community through other collaborative efforts such as these in 1999 and beyond.

c) We have plans to work with Mr. Richard Jordan (Boise High School teacher) and Mr. Peter Lane (ISWCD Board Member and Grangeville Elementary Schoolteacher) to structure project information into meaningful exercises for students from grade school to high school. These exercises will include site visits and projects that can be undertaken through data posted on the project web site. In particular, animated model simulations, remote sensing of data and video clips of the site will bring the restoration issues into the classroom. We are exploring the feasibility of high school student summer internship program where selected students would help with fieldwork and monitoring activities to gain hands-on experience in the science of watershed/river restoration.

Local Communities and Public Information:

a) Project brochures and newsletters have been distributed to members and organizations of the local communities. A slide show was presented to the Grangeville Lion's Club and the Idaho Association of Soil Conservation Districts in 1998. This slide show was developed to target the general public and will be presented to other community groups in 1999 and beyond. We have plans to give a university student the opportunity to work with a professional to produce an educational video about our project. A local community-based volunteer monitoring/stewardship program will be explored and developed in 1999. We plan to initiate the program in 2000.

b) Informational signs are displayed at two entrances to the RRWMA. These signs are updated at appropriate intervals so that the local community and Nez Perce National Forest visitors can follow the progress of the project. An Interpretive Center/Watchable Wildlife viewing platform was constructed by the IDFG from funds donated by private foundations. Interpretive signs will be displayed inside the viewing platform, illustrating the cycles of life within a wet meadow ecosystem, meadow ecosystem linkages to processes within the watershed, and principles of watershed management and river restoration.

c) During the field season, the field office displays artistic renditions of various phases and conceptual designs of the restoration project and is open to answer questions or provide tours to visitors and the local community. Organized tours are also given to invited guests from various agencies and public and private groups.

d) The RRWMA will be used as an outdoor laboratory, where people can observe (in a controlled and minimum intrusive manner) the life of anadromous fish in the headwaters of the Columbia Basin, the importance of wise management of watersheds, and the science of restoration. The IDFG is interested in developing the project site for educational purposes.

Over the past few years, IDFG obtained non-BPA funds to produce the RRWMA Education Management Plan (1995, unpublished report), purchase interpretive signs, and build a Watchable Wildlife viewing platform.

e) A computer (purchased by non-BPA funds) at the RRWMA will display monitoring data collected by remote sensing and a simulation program will allow "what-if" scenarios to be explored by people with limited scientific understanding of the issues.

University Students:

a) Graduate/Undergraduate Students. In 1998, our project provided an opportunity for two graduate students to study ecosystem restoration principles. These students are responsible for monitoring, surveying, engineering design, ArvView/GIS mapping and database management, and general fieldwork under the supervision of a professor or project consultant. In return, the students use the monitoring data and analyses as part of their thesis/dissertation work. An undergraduate student assisted with field and monitoring work, performed a literature search, and was responsible for a large portion of the planning, preparation, and reporting of the turbidity test in the summer of 1998. These students will continue working with our project in 1999 and beyond.

b) UI Survey Class. In 1997 and 1998, the Department of Civil Engineering at the UI brought survey classes to the Lower Red River Meadow Restoration site. These outdoor experiences introduce engineers to the perspective of ecologists and natural resource managers very early in their careers. Restoration and enhancement projects are likely to form an increasing part of the activities of engineers in the coming decade and it is important for the students to see the value of an interdisciplinary approach. During a portion of this weekend field trip students viewed different aspects of the project and observed fish counting and PIT tagging techniques. They spent two days spent surveying and monitoring in the meadow. In the evenings, project personnel gave slide presentations regarding various aspects of river restoration.

c) UI Undergraduate Senior Design Projects. In 1998, two undergraduate senior design projects were initiated. The Department of Civil Engineering's team of eight structural engineering students [Professor R.Nielsen, Instructor] is designing a small bridge to provide pedestrian and ATV access for maintenance activities and interpretative trails. The students will also fabricate and install the structure. The design criteria imposed by IDFG are strict. For example, removal and installation must be possible with only four people and the structure should be easily removed each fall and reinstalled in different locations if deemed necessary by IDFG. The bridge should be visually unintrusive and aesthetically suitable. This structural design may be useful in other remote locations. The students are responsible for obtaining sponsorship from industry to pay for the construction materials. The students have already made a presentation to IDFG with preliminary conceptual designs and will present a preliminary design for approval in January 1999.

The Department of Mechanical Engineering's senior students [Professor S. Beyerlein, Instructor] are designing and constructing a remote observation system for the RRWMA. The system includes a surveillance camera, an underwater camera, and data transmission equipment.

The four-member team is designing the mounting and automated control components for the two cameras as well as the connections for the wireless transmission of data from the river to the Interpretive Center and the Internet. The cameras have zoom and panning capability and can be controlled from the interpretative center.

Web Site:

The project web site (http://boise.uidaho.edu/redriver) is maintained in cooperation with UI. The site is updated with project information as it becomes available including newsletters, FACT sheet, field season photographs, and selected reports. The existing web site will be expanded during the next 2 years to include an interface with water temperature and turbidity monitors, the underwater camera, and the surveillance camera of the entire Red River site. The underwater camera would allow students to view the aquatic ecosystem, including how anadromous and resident fish utilize the habitat. The surveillance camera would show an overview of the meadow environment, and there is particular interest in how elk use the meadow. The project was initiated by $2K contribution from the College of Engineering and a grant for a further $22K is pending with Foundations.

Continuing Education:

Dr. Peter Goodwin has organized and lectured on numerous short courses for practicing engineers and scientists, including “Geomorphology in River Restoration”, “Physical Processes in Environmental River Management” and “Wetland Restoration”.

Recently, two short courses have used the Lower Red River Meadow Restoration Project as a case study. The “Environmental River Management” course, organized by Dr. Goodwin and ERG, drew over 120 participants to Boise in May 1997. In October 1998, a short course entitled “Approaches and Processes in Watershed and River Restoration” was offered in connection with the American Watershed Management Council Conference held in Boise and sponsored by the ERG, Northwest Watershed Research Center, and the USFS Rocky Mountain. Research Station. This course also attracted over 120 participants. The ERG continues to offer one short course per year on different aspects of river restoration.

Research:

a) The Ecohydraulics Research Group (ERG) at UI intends to develop the Red River as a long-term field laboratory. Earlier restoration efforts in other areas of the watershed used different design and management philosophies. The Red River, therefore, provides a unique opportunity for a direct long-term comparison of the objectives of the different approaches, and the effectiveness of attaining these objectives. The site also provides a small-scale and easily monitored test area for models simulating geomorphic evolution, floodplain-river interactions, and linkages between ecology and physical processes being developed and used by ERG. These studies will provide useful information to scientists and agencies responsible for restoration in the region.

b) UI has offered to act as a repository for the monitoring data and has committed to the continuation of the monitoring program for research and educational purposes well after the restoration is completed. UI plans to use the data to develop a computer-generated restoration model and to accompany project annual reports to assist future restoration projects of this type. Portions of the long-term monitoring as well as the operations and maintenance cost will be funded by IDFG.

In the long-term, monitoring and adaptive management evaluation of constructed channel features will add to the scientific understanding of the physical and biological processes that lead to the evolution of a dynamic, self-sustaining wet meadow ecosystem. Ultimately, this information will help characterize naturally functioning, ecosystems capable of supporting high quality, diverse anadromous and resident fish and wildlife habitat.

Scientific Publications/Dissemination:

a) The project consulting team and ERG will submit conference papers and prepare peer reviewed journal articles. An abstract, “Lower Red River Meadow Restoration: A Case Study” was accepted and presented at the Society for Ecological Restoration, NW Chapter, Annual Conference in 1998. The project team is targeting the international “EcoHydraulics” conference in Salt Lake City in 1999.

b) UI will maintain a database of design criteria and monitoring data. This 'living' database will be available to other scientists and engineers for research purposes or improving designs for future restoration projects. Annual reports will provide details of the design criteria, hydraulic geometry database, photopoint images, and design guidelines for similar projects.

Congratulations!