Paradise Creek
Total Maximum Daily Load Implementation Plan

December 1999
First Revision

Paradise Creek Watershed Advisory Group
c/o Latah Soil & Water Conservation District
220 East Fifth Street, Room 212
Moscow, ID 83843
208.882.4960

PARADISE CREEK WATERSHED ADVISORY GROUP
220 East Fifth Street, Room 212
Moscow, Idaho 83843
208-882-4960 ext. 101

December 9, 1999

Jim Bellatty
Regional Administrator
Division of Environmental Quality
1118 F St
Lewiston, Idaho 83501

Dear Mr. Bellatty:

The Paradise Creek Watershed Advisory Group (PCWAG) is pleased to present the first revision to the Paradise Creek Total Maximum Daily Load Implementation Plan (Plan). This revision was undertaken by the PCWAG to make the Plan more readily understandable by a wide audience. The best management practices originally proposed within the watershed have remained unchanged.

The PCWAG considers the Plan to be a dynamic document that will be revised as needed to account for new information, changing resource conditions and public interest. Please feel free to distribute the Plan to those that may have an interest in the Plan or our work within the Paradise Creek watershed. If there are any questions regarding the Plan, or the work of the PCWAG, please feel free to contact me or any other member of the PCWAG.

With regards,

Lee Hawley
Chairman

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1.0 INTRODUCTION

Section 303(d) of the Federal Clean Water Act (CWA) requires states to develop a total maximum daily load (TMDL) management plan for water bodies that are water quality limited. The Total Maximum Daily Load for a given water body, also called the load capacity, is the maximum amount of a specific pollutant that can enter the water body without violating a state's water quality standards. The load reduction required for a water body to attain state water quality standards is based on the difference between current loads and the allowable loads allocated to known point and nonpoint sources within the watershed. The TMDL document is a record of the load capacity, needed reductions, and allocations for the water body of concern. The TMDL includes a margin of safety whenever there is uncertainty about the exact nature of the pollutant/water body interactions. TMDLs are defined in 40 CFR Part 130 as the sum of the individual waste load allocations (WLA) for point sources and the load allocation (LA) for nonpoint sources, including a margin of safety and natural background conditions.

The CWA requires each state to adopt water quality standards necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the water, whenever attainable. The ultimate goal of the TMDL is to achieve water quality standards and to restore full support of beneficial uses to a water body. Load allocations and reductions are intended to provide an environment conducive to support beneficial uses. Attainment of beneficial uses prior to achieving TMDL load reductions, or full attainment of load reductions without achieving full support of beneficial uses will result in an evaluation of the appropriateness of the Paradise Creek TMDL and this implementation plan.

2.0 PARADISE CREEK TMDL

The Paradise Creek TMDL was approved by the US Environmental Protection Agency (EPA) in February, 1998. The Paradise Creek Watershed spans an area from the top of the Palouse Mountain Range in Moscow, Idaho to its confluence with the South Fork of the Palouse River in Pullman, Washington (Figure 1). Elevations range from 4,356 feet (1,320 meters) at Paradise Point in the Palouse Range, to 2,520 feet (763 meters) at the Idaho-Washington border (Figure 2). The headwaters of Paradise Creek are fully contained within Latah County (Figure 3). Interstate waters such as Paradise Creek are required by the CWA to meet the receiving state's water quality standards at the state line. Washington State water quality standards classify Paradise Creek as a Class A water to be protected for salmonid spawning, primary contact recreation, and domestic uses along with uses such as water supply, wildlife, and aesthetics. Salmonid spawning, primary recreation, and domestic water supply are not presently supported in Paradise Creek (EPA, 1993). The parameters of concern are sediment, temperature, phosphorus, pathogens, ammonia, habitat, and flow.

The permitted point sources of pollution include the Moscow wastewater treatment plant (MWWTP) and the University of Idaho's Aquaculture Facility (UIAF). The primary nonpoint sources (NPS) of pollutants in the Paradise Creek Watershed are non-irrigated croplands, grazing lands, land development (construction activities), urban runoff, roads, and forest land harvest activities. Stormwater discharge systems and several other discrete sources are included with the more traditional nonpoint sources for loading analysis due to a lack to data and methodology for separate evaluation.

The Paradise Creek TMDL assigns load and waste load allocations to sediment, temperature, phosphorus, pathogens and ammonia. To meet the allocated loads, reductions in both point and nonpoint source pollution is required.

2.1 Sediment

The sediment waste load allocations for the MWWTP and UIAF are 91 and 5 tons/yr, respectively. The allocations for both facilities are below the specified target end-of-pipe concentrations of 15 mg/l. No reductions are required from either source.

The current sediment load from nonpoint sources within the watershed is 1040 tons/yr. The sediment load allocation (including margin of safety) for nonpoint sources within the watershed is 260 tons/yr. Meeting this allocation will require an approximate 75% load reduction from nonpoint sources.

2.2 Temperature

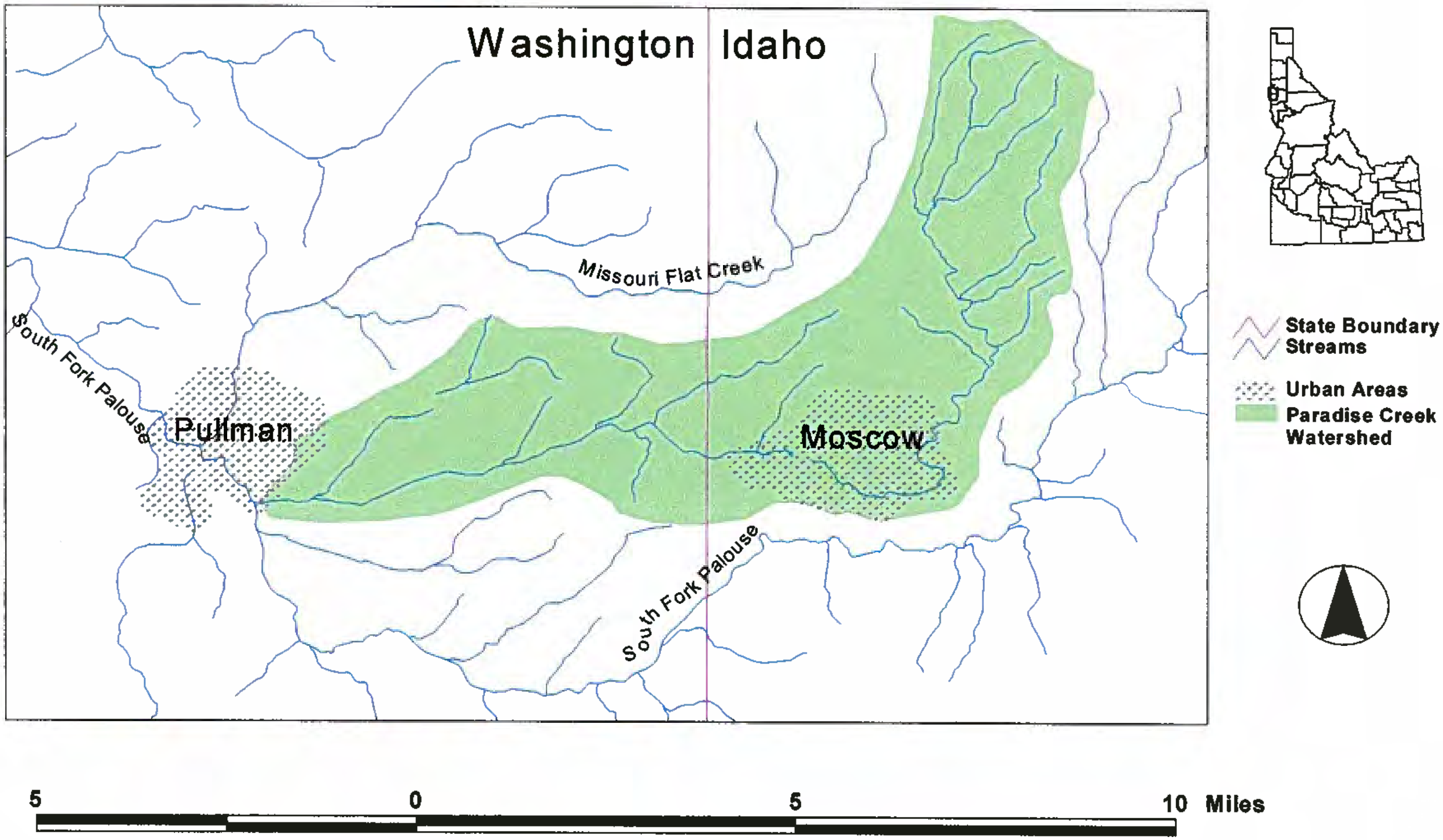
The temperature waste load allocation for end-of-pipe discharge for both the MWWTP and the UIAF is 18°C. No reduction is required from the UIAF. Based on the 1997 Paradise Creek TMDL, there is a sliding-scale reduction in discharge allowed for the MWWTP based on upstream temperature and flow of Paradise Creek and the discharge temperature from the MWWTP.

The nonpoint source load allocation is also 18°C. To meet this allocation, an estimated 71% reduction in energy input to the creek is required from nonpoint sources.

2.3 Phosphorus

The phosphorus waste load allocation for the MWWTP is 4.5 lbs-P/day. Based on the potential daily average load at maximum discharge of 236 lbs-P/day, a load reduction of 98% would be needed from the MWWTP to meet the interim 136 microgram/liter target during the growing season. The waste load allocation for the UIAF is 0.2 lbs-P/day. Since the UIAF 's existing P load is well below this allocation, no reductions are required from the facility.

Figure 1. Paradise Creek Watershed



Paradise Creek Watershed Elevations

Figure 2

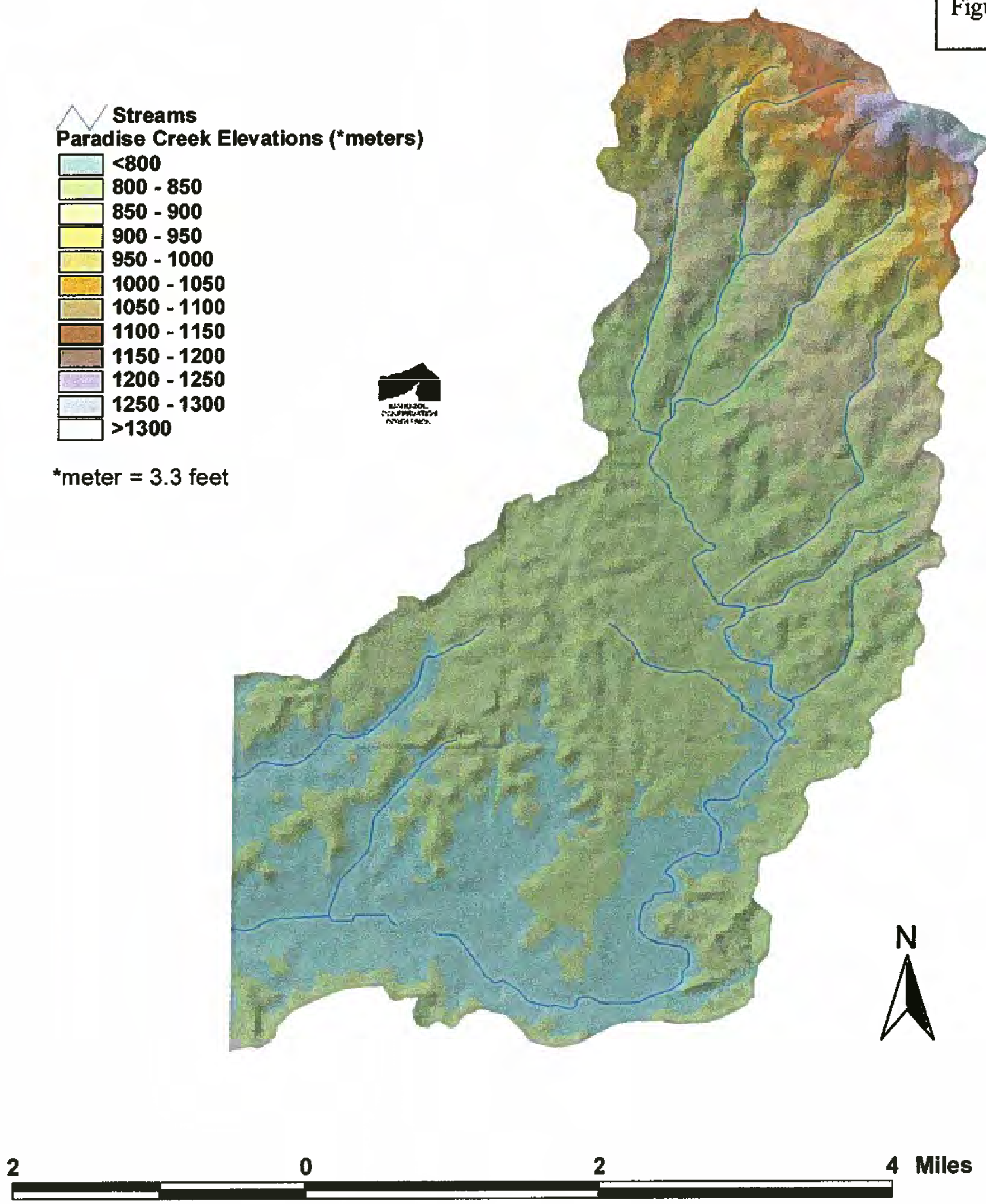
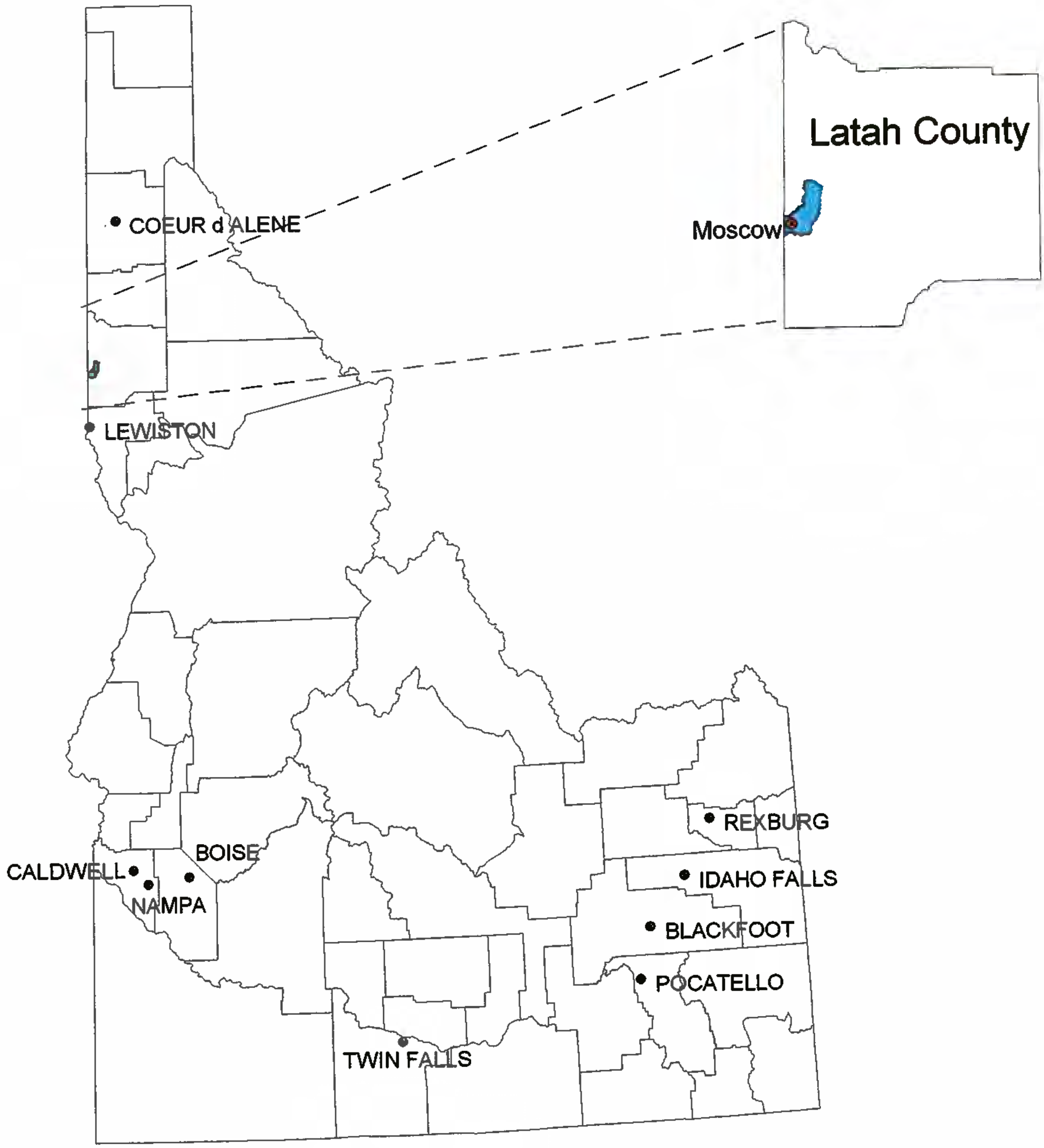


Figure 3.Paradise Creek Watershed Location Map



The phosphorus load allocation for nonpoint sources is 0.9 lbs-P/day. Based on the estimated average daily load, a 59% reduction in loading is required from nonpoint sources.

2.4 Pathogens

The fecal coliform waste load allocation for the MWWTP is 1.51×10^{10} cfu/day. An 18% reduction is required from the facility based on an estimated load of 1.85×10^{10} cfu/day. The waste load allocation for the UIAF is 7.64×10^{8} cfu/day. Self-monitoring by the University of Idaho detected no fecal coliform present in discharge water from the Aquaculture Facility. Therefore, no pathogen load reductions are required from the UIAF.

The nonpoint source load allocation for pathogens in Paradise Creek is 2.02×10^{10} cfu/day. Based on a mean load of 8.1×10^{10} cfu/day, an approximate 75% load reduction is required from nonpoint sources.

2.5 Ammonia

The MWWTP ammonia waste load allocation varies from 47.5 lbs/day during the winter to 28.5lbs/day during the summer. The current estimated load to Paradise Creek ranges seasonally from 205 lbs/day to 141.5 lbs/day. An average daily load reduction of approximately 80% is required to meet Washington State's ammonia limits at the MWWTP outfall. Ammonia levels in the UIAF's discharge were found to be negligible and no reductions are required.

No exceedances of the proposed ammonia targets were found upstream from the MWWTP. Therefore, no load reductions from nonpoint sources are required.

2.6 Habitat and Flow

The Paradise Creek TMDL does not assign a load allocation to habitat modification and flow alteration. The EPA Region 10 does not currently require these parameters to be addressed as TMDL pollutants since they do not lend themselves to meeting the minimum requirements of a pollutant load as defined by EPA guidance on TMDL development. However, habitat and flow will be addressed indirectly through the implementation of conservation practices outlined in this implementation plan.

3.0 PARADISE CREEK TMDL IMPLEMENTATION PLAN

Restoration efforts have been on-going in the Paradise Creek Watershed for the past several years. Many of the activities implemented in the watershed, such as planting trees and vegetated buffer strips, will require several years before they are mature enough to be fully effective. The Paradise Creek implementation plan has been developed with this in mind and is a phased plan, designed to improve water quality in Paradise Creek and lead to full support of designated beneficial uses. The plan will accomplish this by providing a schedule of activities to achieve the estimated load reductions and maintain the load allocations listed in the Paradise Creek TMDL. The plan lists the activities, structures, treatment facilities, and nonpoint source management practices designed to achieve the load reductions desired. The plan contains potential funding sources, estimated completion schedules, anticipated effectiveness of treatment measures and lead responsible management entities where known. Once all the components of this implementation plan are in place or completed, it is expected that water quality in the Paradise Creek Watershed will be significantly improved; the time period necessary to restore water quality to a level sufficient to support beneficial uses is unknown.

Nonpoint source loads are largely driven by climatic conditions and the effects of some best management practices (forest buffer strips, bank stabilization, etc.) may take years to be fully realized. Best management practices (or BMPs) are defined as a component practice or combination of component practices determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. This implementation plan should be viewed as a dynamic document, subject to change as current conditions dictate. Table 1 summarizes the implementation costs, status and schedule of pollution control and watershed restoration efforts in the Paradise Creek Watershed.

The primary focus of this implementation plan is to address nonpoint pollution sources. Point sources are addressed through the individual NPDES permits issued to the MWWTP and the UIAF. The TMDL implementation plan is subdivided into individual sub-plans to account for agricultural and non-forest rural lands, rural roads, forest lands and urban lands.

3.1 Past and Present Pollution Control Efforts

3.1.1 Agricultural and non-forest lands

Over the years, individual landowners within the Paradise Creek watershed have implemented several BMPs with technical and financial assistance from the USDA Natural Resource Conservation Service (NRCS), the USDA Farm Service Administration (FSA) and the Latah Soil and Water Conservation District (LSWCD). These BMPs have included the establishment of grassed waterways, riparian forest buffers, and shallow water systems.

	A	B	C	D	E	F	G	H	I	J	K
1	Draft 12/09/99										
2	**Table 1. Implementation costs, status, and schedule summary.**										
3											
4											
5	**Description of Implementation Task**	**Implementation Category**	**Pollutant(s) Addressed**	**Estimated BMP Effectiveness**	**Compl. Status**	**Sched. Compl.**	**Task Participants**	**Cost**	**Funding Source**	**Funding Status**	
6											
7	**Past and Current Implementation Efforts**										
8	De-chlorination and sludge de watering facilities construction	Point Source Facilities	chlorine, solids		Complete		Moscow	$1,700,000.00	City sewer service - rate payers		
9	New secondary treatment facility	Point Source Facilities	temp., phos.		Proposed	2000-2002	Moscow	12-18,000,000	City sewer service - rate payers		
10	Stormwater pollution prevention plan	Stormwater	sed., nut., path., temp.		Proposed	2000-2001	UI/Moscow				
11	Erosion Control Ordinance		sed., nut., path., temp.		Complete		Moscow		Normal Operations		
12	Phase I (floodplain,						PCEI, Moscow, DEQ,	$115,900.00	319 Grant		
13	streambank restoration,	Urban Riparian	hab., sed., nut., temp.		Complete		EPA	$77,266.00	match		
14	Phase II (wetland treatment						PCEI, UI, DEQ, EPA,	$117,800.00	319 Grant		
15	facility, demonstration)	Urban Riparian	hab., sed., nut., temp.		Complete		Moscow	$78,533.00	match		
16	Phase III (channel re-						PCEI, UI, IWRRI,	$131,988.00	319 Grant		
17	alignment, revetted banks,						DEQ, EPA, Moscow,	$50,360.00	Bur Disaster Svcs		
18	floodplain restoration, pocket	Urban Riparian	hab., sed., nut., temp., path.		Complete		former tenants		UI-remediation work		
19	Phase IV (backyard							$148,250.00	319 Grant		
20	restoration: bank stabilization	Urban Riparian	hab., sed., nut., temp.		Complete		PCEI, City	$98,833.00	match		
21	Phase V (Agricultural Demonstration Project)	Agriculture	hab., sed., nut., temp.		In progress	2000	Private Landowners, PCEI, LSWCD, NRCS, Bonterra, Wildlife Habitat Institute	$304,000.00	319 Grant/match		
22	Phase VI (Animal waste			75-80% sediment[4]							
23	biofiltration system: constructed wetland &	Public Urban Areas,Animal		30-45% phosphorus[4]			PCEI, UI-IWRRI,	$167,700.00	319 Grant/UI-IWRRI		
24	vegetated swale)	Waste Prevention, Riparian	path., nut., solids	30-70% bacteria[4]	In progress	1999-2000	Moscow	$111,800.00	match		
25	Road rocking	Rural Roads	sed., nut.		Complete		NLCHD				
26	Forest road grass seeding & cross ditching	Silvicultural	sed., nut., flow	80% sediment[6]	Complete		Bennett Tree Farms, IDL	$13,000.00	landowners		
27											
28	**Proposed Implementation Efforts**										
29											
30	**Agricultural BMPs**										
31	30-ft grassed filter strips (34						LSWCD, SCC	$2,160.00	FY99-319 Grant	approved	
32	acres)	Agricultural	sed., nut.	85% sediment[1]	Proposed	2000-2001	Private Landowners	$560.00	FY99 - 319 Match		
33	30-ft grassed filter strips (301							$24,080.00	CRP installation-est.	pending	
34	acres)	Agricultural	sed., nut.	85% sediment[1]	Proposed	2000-2001	LSWCD, SCC	$180,600.00	CRP rental-est.	pending	
35	Riparian forest buffers (56			60-80% sediment, BOD[5]			LSWCD, SCC	$25,200.00	FY99-319 Grant	approved	
36	acres)	Agricultural	sed., temp., nut., hab., flow	40-60% nutrients[5]	Proposed	2000-2001	Private Landowners	$8,400.00	FY99 - 319 Match		
37	Riparian forest buffers (678			60-80% sediment, BOD[5]			LSWCD, SCC	$406,800.00	CRP installation-est.	pending	
38	acres)	Agricultural	sed., temp., nut., hab., flow	40-60% nutrients[5]	Proposed	2000-2001		$406,800.00	CRP rental-est.	pending	
39							LSWCD, SCC	$39,375.00	FY99-319 Grant	approved	
40	Sediment basins (21)	Agricultural	sed., nut.	65-90% sediment[2]	Proposed	2000-2001	Private Landowners	$13,125.00	FY99 - 319 Match		
41	Sediment and erosion control						LSWCD, SCC	$78,000.00	FY99-319 Grant	approved	
42	structures (52)	Agricultural	sed., nut.	up to 99% sediment[2]	Proposed	2000-2001	Private Landowners	$26,000.00	FY99 - 319 Match		

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43	Field borders and critical area						LSWCD, SCC	$7,500.00	FY99-319 Grant	approved	
44	treatment	Agricultural	sed., nut.	26-98% sediment[2]	Proposed	2000-2001	Private Landowners	$2,500.00	FY99 - 319 Match		
45	Continuous direct seeding						LSWCD, SCC	$45,000.00	FY99-319 Grant	approved	
46	high residue management	Agricultural	sed., nut.	82-92% sediment[2]	Proposed	2000-2001	Private Landowners	$15,000.00	FY99 - 319 Match		
47	Monitoring assessment, grant funds	Agricultural	sed., nut., temp., path.,	na	In progress		IASCD,SCC	$78,000.00	FY99 - 319 Match	approved	
48	Monitoring	Agricultural		na				$1,700.00	FY99 - 319 Match		
49											
50	**Forestry BMPs**										
51											
52	Forest road rocking	Silvicultural	sed., nut.	80% sediment[6]	Proposed	2000-2001	Bennett Tree Farms, IDL	$7,250.00	FY99-319 Grant	approved	
53							Bennett Tree Farms, IDL	$7,750.00	FY99 - 319 Match		
54	Pond 9 repair and clean-out	Silvicultural	sed., nut., flow	65-90% sediment[2]	Proposed	2000-2001	Bennet Tree Farms, IDL	$2,500.00	FY99-319 Grant	approved	
55	Additional grass seeding and mulching	Silvicultural	sed., nut.	90-95% sediment[3]	Proposed	2000-2001	Bennet Tree Farms, IDL	$1,000.00	FY99-319 Grant	approved	
56	Reforestation of high erosion	Silvicultural	hab., sed., nut.	60-80% nutrients[3]	Proposed	2000-2001	IDL	$3,600.00	FY99-319 Grant	approved	
57	agricultural sites						Private Landowners	$6,400.00	FY99 - 319 Match		
58											
59	**Urban Riparian Restoration**										
60							PCEI	$321,554.50	FY99-319 Grant	approved	
61	Vegetation, streambank stabilization	Urban Riparian	hab., sed., nut.		Proposed	2000-2001	Landowners, privated companites, Moscow, UofI, PCEI	$379,193.00	FY99 - 319 Match		
62											
63	**Animal Waste Prevention**										
64	Rural animal waste	Animal Waste Prevention	path., nut., solids		Proposed	2000-2001	PCEI	$3,999.05	FY99-319 Grant	approved	
65	prevention						PCEI, Volunteers	$2,175.00	FY99 - 319 Match		
66											
67	**Roadside Erosion Control**										
68							NLCHD	$41,349.00	FY99-319 Grant	approved	
69	Stabilization of cut and fill banks, revegetation	Rural Roads	hab., sed., nut.		Proposed	2000-2001	NLCHD, PCEI, private companies, volunteers	$34,500.00	FY99 - 319 Match		
70	Improved water conveyance	Rural Roads	sed., nut., flow		Proposed	2000-2001	NLCHD	$20,000.00	FY99-319 Grant	approved	
71	systems						NLCHD	$15,000.00	FY99 - 319 Match		
72											
73	**Rural Riparian Restoration**										
74	Rural riparian restorations - 2	Rural Riparian	sed., nut.	60-80% sediment[5]	Proposed	2000-2001	PCEI	$301,903.95	FY99-319 Grant	approved	
75	miles (filter strips and bank stabilizations)			40-60% nutrients[5]			PCEI, volunteers, private companies	$230,011.00	FY99 - 319 Match		
76											
77	**Wetlands restorations**										
78	Wetlands restorations/native	Wetlands Restoration	hab., sed., nut.	85% sediment[1]	Proposed	2000-2001	PCEI	$33,225.35	FY99-319 Grant	approved	
79	buffer strips (20ac.)						PCEI, volunteers, private companies	$30,510.00	FY99 - 319 Match		
80											
81	SEE BUDGET SHEETS FOR ADDITIONAL DETAILS										
82											
83	1) Findings of LSWCD, 2) BMP Effectiveness Review, LSWCD, 3) Best Management Practices for Road Activities Vol. II. 4) Catalogue of Storm Water BMPs, 5) T.R. Shueler. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs, 6) Findings of IDL.										

Within the Paradise Creek Watershed, there are several on-going and planned projects which will provide pollution reduction benefits. Many of these projects are being jointly sponsored by individual landowners, Palouse-Clearwater Environmental Institute (PCEI), NRCS and the LSWCD. The Paradise Creek Demonstration Project involves establishment of a 300-foot wide riparian/forest buffer on 150 acres of agricultural land adjacent to Paradise Creek and two of its tributaries. The current approximate cost of the Paradise Creek Demonstration Project is ***$304,000***. Other related projects include: 1) a riparian forest buffer along the main channel of Paradise Creek; 2) a channel realignment on approximately 0.5 miles of Paradise Creek; and 3) construction of several ponds with associated vegetative wildlife habitat plantings.

3.1.2 Rural Roads

On County roads in the Paradise Creek Watershed, the North Latah County Highway District (NLCHD) has historically focused on transportation and maintenance of the road systems. In the proposed implementation plan, the NLCHD will focus on water quality, while continuing to maintain the existing transportation system as well as providing aesthetic benefits and wildlife habitat.

3.1.3 Forest Lands

In the forested part of the Paradise Creek Watershed, all logging operations were inspected during 1998 by the Forest Practices Advisor for the Idaho Department of Lands (IDL) to determine compliance with the Idaho Forest Practices Act (FPA). The majority of operations were found to be in compliance with the FPA. One minor unsatisfactory violation on non-industrial forest land was noted and was repaired. Additional site-specific BMPs were recommended by the IDL, as needed, on FPA inspection reports. The State of Idaho grass-seeded and cross-ditched forest roads on public school lands within the drainage during the summer of 1998. Bennett Tree Farms surface-rocked one mile of forest roads, installed five relief culverts, and installed grass-seeding and cross-ditching during the summer of 1998 at a cost of over $13,000.

3.1.4 Urban Lands

In the past, pollution control and watershed restoration efforts for the Paradise Creek Watershed have been focused on the urban area. The PCEI has directed projects to survey discharge pipes, reconfigure channel segments, restore floodplains, re-vegetate riparian areas, stabilize streambanks, and construct wetland areas in and adjacent to the City of Moscow. In addition, PCEI manages the Adopt-A-Stream Program and has organized trash removal, riparian plantings, and development of a pedestrian/bicycle path along Paradise Creek.

PCEI has been the lead entity in organizing and implementing five phases of the Paradise Creek Watershed Restoration Project. Phase I, in collaboration with the Moscow School District, involved an educational demonstration area of floodplain and streambank restorations. In Phase II, a demonstration wetland treatment facility was constructed near the City of Moscow 's Waste

Water Treatment Plant. Phase III involved restoration of the riparian area near the Sweet Avenue site in coordination with the University of Idaho's restoration efforts. Phase III restorations included re-alignment of the stream channel, bank revetments, floodplain restorations, and the construction of pocket wetlands to treat stormwater runoff. The Sweet Avenue site has been the target of an intensive reclamation effort to clean up contamination left behind by a long history of industrial use, sometimes involving toxic chemicals. Phase IV efforts focused on individual property owners within the City to rehabilitate riparian areas through bank stabilization and vegetation to native species. Phase V is the development of the Paradise Creek Demonstration Project which involves establishment of a 300-foot wide riparian/forest buffer on 150 acres of agricultural land adjacent to Paradise Creek and two of its tributaries.

The City of Moscow has recently implemented an erosion control ordinance and is currently in the process of developing an EPA Phase II stormwater pollution prevention plan which will address nonpoint source pollution associated with urban stormwater runoff. See Attachment C in Appendix C. The City is also currently upgrading the treatment facility at the MWWTP to address water quality problems associated with ammonia and nutrients. In addition, the City of Moscow is acquiring and restoring lands within the Paradise Creek floodplain in an effort to expand the linear park within the City.

The University of Idaho is in the process of developing erosion control and stormwater runoff policies. In addition, the University of Idaho is in the process of establishing biofiltration swales within the watershed to reduce animal waste runoff from an area of the West Farm. Biofiltration swales will be seeded with grasses and the constructed wetland will be vegetated with native herbaceous plant materials. Collection of animal waste runoff in will reduce loading of pathogens, nutrients and oxygen-demanding materials into Paradise Creek.

3.2 Paradise Creek Community Education and Outreach

Community education and outreach has been undertaken throughout the watershed by a variety of organizations, both private and public. PCEI has coordinated most of the efforts within the urban and suburban environment. The rural education and outreach programs have been coordinated by the LSWCD and the NRCS.

Since 1991, PCEI has promoted conscientious water quality stewardship by recruiting community volunteers to accomplish stream restoration projects on Paradise Creek. School groups, boy scouts, girl scouts, environmental clubs from high schools and universities, student interns, and interested members of the Moscow community are groups that frequently contribute their time and efforts toward restoration. Through their participation, these groups learn about environmental stewardship and techniques to improve water quality while benefiting landowners, wildlife, and the entire community.

Every year, PCEI hosts an annual Paradise Creek cleanup day. For this event, approximately 100 community volunteers pick up trash along the creek; in addition to improving the appearance of the stream, this activity promotes a sense of ownership from the community toward the stream. In 1998, PCEI held a stream restoration workshop for the community to inform them about stream restoration techniques and related stream information. Additionally, PCEI frequently serves as the community's source of information regarding issues and information about Paradise Creek and offers free tours of Paradise Creek restoration projects upon request.

The LSWCD, with assistance from NRCS, has coordinated community education and outreach programs that have focused on conservation agricultural practices to minimize soil erosion and improve water quality, farm tours, wetlands protection and restoration, and the implementation of various BMPs.

The Idaho Department of Lands (IDL), in cooperation with the University of Idaho's Cooperative Extension Service, provides forestry education and outreach through forest stewardship programs such as the Logger Education to Advance Professionalism (LEAP) and forest management shortcourses. Also provided are joint publications that address forestry BMPs and other forest management topics. Programs, displays and publications are provided at community events and natural resource management meetings. IDL provides service forester assistance to private forest landowners in Idaho as requested.

3.3 Point Source Pollution Control Activities

Point sources in the Paradise Creek Watershed that have EPA National Pollution Discharge Elimination System (NPDES) permits include the MWWTP and the UIAF.

3.3.1 City of Moscow Waste Water Treatment Plant

The MWWTP is responsible for load reductions of the following pollutants to Paradise Creek: phosphorus, pathogens, ammonia, and temperature.

The City of Moscow is planning to construct a secondary treatment facility beginning in the year 2000. Construction should be completed by 2002 with the plant coming on line shortly thereafter. Several years ago, the City of Moscow increased sewer service fees in anticipation of construction costs for a new facility. Additionally, the City will be receiving a low-interest state wastewater state revolving fund loan to assist in financing construction costs. The new treatment plant is designed to reduce the pathogens to an accepted level.

Changes in past operations include an increase in seasonal re-use of effluent to meet in-stream temperature and phosphorus targets. The biological process utilized in the new treatment facility will remove a minimum 85% of phosphorus in the effluent. The remainder of the potential phosphorus concern, as it relates to nuisance algae growth, will be dealt with in the phased approach indicated in the TMDL approved by the EPA. The phased approach will involve restoration of the riparian areas of Paradise Creek Watershed to promote shading of the water, with consequent reduction of algae growth.

The temperature concerns will be addressed with the phasing and shading discussed above. Monitoring for phosphorus, algae, and temperature parameters will be conducted during the phasing process. Wetland treatment technologies are in place and being evaluated for their efficiency in treating several different sources of pollution, including the MWWTP and the UIAF. The wetlands are designed to reduce the nutrient loading to Paradise Creek as well as significantly reduce the total suspended solids and biological oxygen demand.

3.3.2 University of Idaho Aquaculture Facility

The UIAF met the targets set out in the Paradise Creek TMDL for all pollutants. No load reductions are required from the facility.

3.4 Nonpoint Source Pollution Control Activities

Nonpoint source treatment focuses on limiting pollutant loading to the waterway through a combination of erosion reduction and filtering and screening pollutants from reaching the waterway by restoring natural riparian vegetation, streambank channels and floodplains.

This section outlines the TMDL implementation efforts for agricultural and non-forest lands, rural roads, forest lands and urban lands. Each "sub-plan" has been authored by the individual jurisdictions responsible for their implementation. Several of the plans are incorporated as attachments.

3.4.1 Agricultural and Rural Non-Forested Lands TMDL Implementation Sub-Plan

Agricultural resource management planning to address water quality typically involves the application of BMPs to address particular resource concerns. For the Paradise Creek Watershed, there are three groups of practices that are applicable: agronomic, structural, and riparian. It is difficult to accurately predict the effectiveness of any BMP; ultimately, the impact any conservation activity has on a resource concern is a function of a wide variety of variables. The goal of any implementation project is to provide the most practical, cost-effective solution to correct the resource concern.

For the Paradise Creek Watershed, the most practical and cost-effective implementation strategy involves a phased or incremental approach. Practices with the best cost/benefit ratio will be implemented initially. If monitoring shows that additional practices are needed, the next cost/benefit tier of practices will be used; this process will continue until the resource concerns are addressed.

For eligible landowners, the USDA Conservation Reserve Program (CRP) is viewed as the program most attractive for installation of filter strips and riparian forest buffers. By enrolling in CRP, landowners and operators will receive assistance with installation costs for approved practices, and will additionally receive annual rental payments. Requested 319 monies will be used to address those agricultural lands within the watershed that are not eligible under CRP and those BMPs that CRP is unlikely to fund.

BMPs that will be implemented in the Paradise Creek watershed include: riparian buffer strips, structural practices, and select agronomic practices.

3.4.1.1 Riparian Buffer Strips

Riparian buffer strips, also known as filter strips, have been shown to be effective in reducing suspended sediments from overland flows by reducing the velocity of runoff. Analysis of vegetative filter strips (VFS) has shown that a 30-foot wide grassed buffer will trap from 70 to 98% of the sediment in water filtering through the strip (Gilmore, 1995). The Paradise Creek Preliminary Investigation estimated that 94% of the field erosion in the watershed was caused by sheet and rill processes (USDA, 1995). This is the type of erosion most likely to be countered by a VFS. If 85% of the sheet and rill erosion were prevented from entering the watershed by VFS, the overall erosion from agricultural lands would be reduced by 61%. However, VFS do not address erosion associated with concentrated flow. With respect to temperature, VFS in the agricultural land may slightly improve base flow conditions in Paradise Creek. However, given the predicted size of the strips, this effect is likely to be negligible.

Additionally, coarse streambank erosion estimates were compiled in the Preliminary Investigation. Average streambank erosion rates were estimated at 0.04 tons/year per linear foot of stream channel. Permanent vegetative buffers could eventually reduce streambank erosion substantially once stream channel stability and hydraulic equilibrium are restored. This would result in an additional 4344 tons per year reduction in sediment delivered to the watershed. Overall, sediment reductions could be as high as 83%.

It is difficult to determine what constitutes "the stream" when trying to identify what areas to protect. Analysis of USGS 24K topographic maps shows 168,248 linear feet of stream (intermittent and perennial), of which 107,107 linear feet flow through agricultural land (64%). A 30-foot buffer strip on each side of the creek in the agricultural land would encompass a total of 148 acres. Figure 4 outlines the potential extent of vegetative buffer strips within the Paradise Creek watershed. However, there are certainly watercourses susceptible to erosion that are not significant enough to be identified on the 24K topographic maps; nonetheless, these areas also warrant protection. In another analysis, the presence of watercourses was predicted using ARC/INFO GRID. Areas that received flow from more than 22 acres were considered to be watercourses. This analysis shows 243,604 linear feet of stream flowing through the agricultural land. Under this method, a 30-foot buffer strip would encompass 335 acres.

In addition to the 30-foot grassed buffers proposed above, 150-foot riparian woody vegetative buffer strips are proposed for the floodplains of Paradise Creek and its main tributaries where these reaches flow through agricultural land. Besides filtering sediment and helping stabilize streambanks through additional rootmass, such a buffer strip would help maintain base flow to the creek by decreasing upland runoff to the creek, encouraging infiltration, and increasing interception and depression storage of precipitation. Rather than runoff from the land surface to the creek, more water would be stored beneath the floodplains and slowly released to the stream channel. As the woody vegetation matured, canopy cover to the stream would increase, likely resulting in some water temperature decrease as well as blocking the sunlight necessary for algal growth. Fish habitat would be improved over time with recruitment of large woody debris and development of undercut banks; wildlife habitat would be enhanced for both game and non-game species. A woody vegetative buffer applied to 107,710 linear feet of stream channel within the agricultural lands of the Paradise Creek Watershed would envelop 734 acres.

Wide vegetated buffers would allow streams, particularly channelized portions, to meander and establish equilibrium over time without the need to perform channel re-alignment using heavy equipment. Increased stream length will result in decreased flood intensity through increased channel storage capacity and decreased flow velocity. This will result in a reduction in sediment load and bank erosion.

The 319 funding request included only those potential buffer and filter areas within the agricultural portion of the watershed (about 10%) that do not qualify for the USDA Conservation Reserve Program. The 319 program monies will be used as incentives to encourage participation by landowners and operators who will not participate with USDA due to preference or because of the ineligibility of certain BMPs for CRP funding.

3.4.1.2 Structural Practices

Erosion associated with concentrated flow is best addressed with structural practices. "When rainfall exceeds the infiltration rate of the soil, surplus water will run off over the land" (Gilmore, 1995). Structural practices that address concentrated flow erosion work in two ways; structures trap sediment that has been eroded by concentrated water flow, or impede the eroding action of the water (either by armoring the soil or by slowing the water down to reduce the eroding energy). When properly designed, installed, and maintained, the right combination of structural practices can virtually eliminate erosion associated with concentrated flow. The practices most applicable to the Paradise Creek Watershed are grassed waterways, sediment basins, and water and sediment control structures (gully plugs).

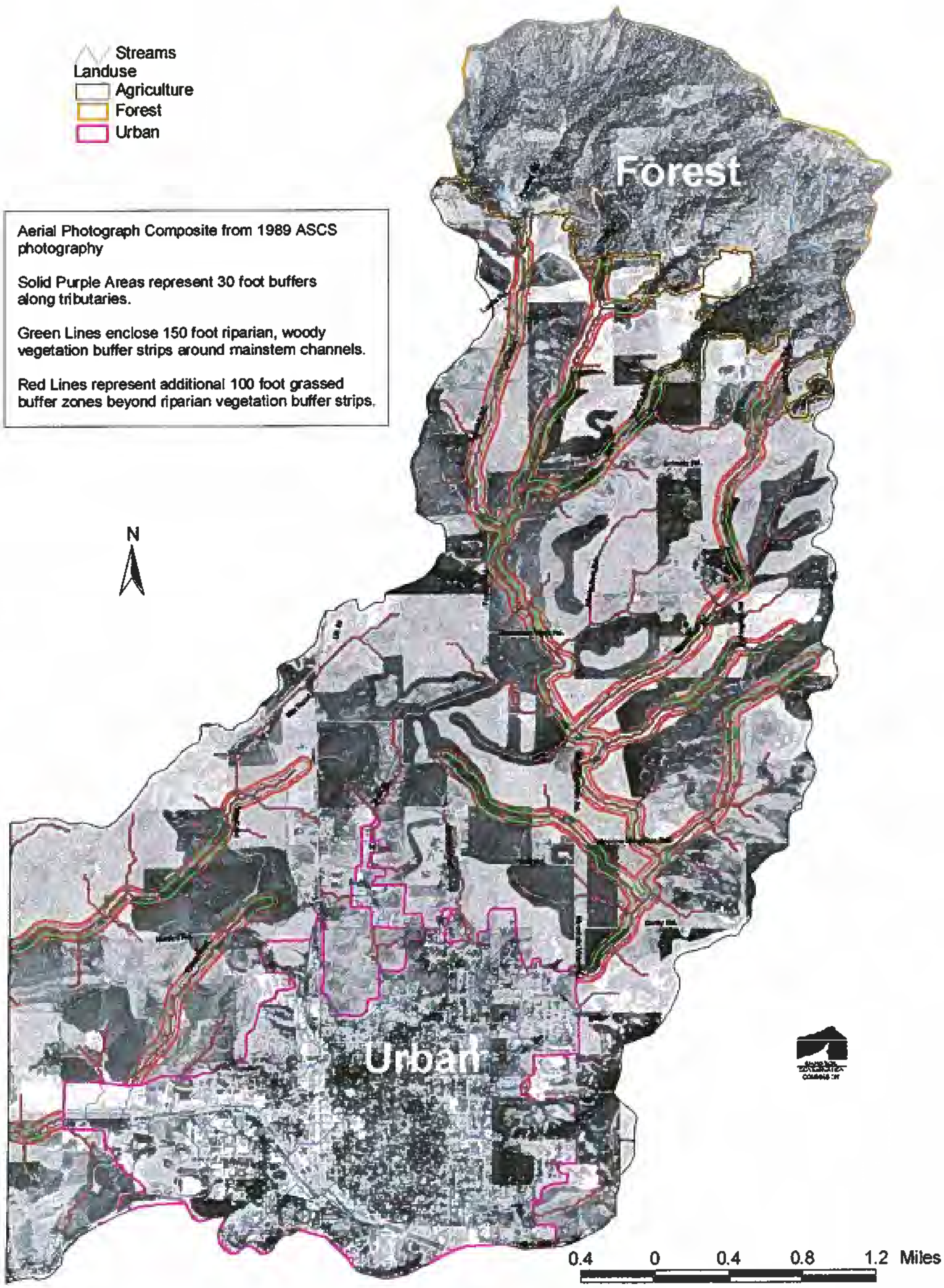
3.4.1.3 Agronomic Practices

Keeping the land under some form of surface cover is the single most important factor in preventing soil erosion. Surface cover absorbs the explosive power of rain, which can detach soil particles from the soil mass, setting up transport by runoff water. Cover also slows the flow of water across the soil surface, further reducing the threat of erosion.

Paradise Creek

Figure 4

Potential Extent of Vegetative Buffer Strips



3.4.1.3.1 Conservation Cropping Sequence / Conservation Tillage / Residue Management

Conservation tillage in all its various forms (such as shank and seed, minimum tillage and no-till direct seeding), leave residue on the soil surface, generally from the previously harvested crop. If adequate residue remains on the surface upon entering the critical erosion period, the BMP is effective at reducing soil erosion. Locally, extended research efforts at the Palouse Conservation Field Station from 1978 through 1985 showed that with a 50% surface residue cover, a 92% reduction in soil loss was achieved (McCool, *et al.*, 1993) when comparing conservation tillage to conventional tillage (Gilmore, 1995). Conservation tillage is proposed for use on the cropland acres in the Paradise Creek Watershed.

3.4.1.3.2 Continuous Direct Seeding High Residue Management Systems

To encourage the most effective methods to control erosion and prevent sediment and nutrients from entering waterways, it is necessary to encourage the use of new technology and establish its economic viability on the Palouse. Continuous direct seeding high residue management systems will be carried out by innovative farmers within the Paradise Creek Watershed to show that soil loss reductions and economic viability can occur simultaneously.

In other regions of the US and Canada continuous direct seeding systems have been successful. In these situations, current crop seeding is accomplished by seeding directly into the previous crop's residue in one pass, with minimal soil disturbance. USDA recently reported that farmers expanded use of direct seeding nationally from 5.1% to 14.8% of cropland between 1989 and 1996. In contrast, use of direct seeding in the Pacific Region, which includes the Pacific Northwest, remained around 1 % and showed comparatively little growth during this period (Young, 1999). Some Pacific Northwest growers have tried no-till as part of a rotation on limited acres or for a few years; examples are fall wheat seeded into pea or lentil residue or oats and lentils direct seeded into chemically-killed grass or hay. The overwhelming majority of cropland in the Pacific Northwest is currently tilled prior to seeding.

Development of crop sequences and equipment requirements for continuous direct seeding have not been fully realized in this region. A total package of crop rotation and direct seeding equipment conducive to continuous direct seeding needs to be demonstrated and applied on a whole-field basis to move agronomic systems for controlling erosion to the next level. Landowners have seen attempts to use direct seeding fail as part of a crop rotation and have doubts that continuous direct seeding will work. Recent research has shown that continuous direct seeding can be profitable, but to succeed it requires careful management of all components of the production and marketing system. Profitable continuous direct seeding requires more than high crop yields, it requires careful control of costs at each stage of the production process.

Finally, as in other areas of farming, the economic performance of direct seeding varies considerably from grower to grower. These differences appear to be associated with site factors, management, and luck (Young, 1999). Research has shown that there is a transition of 3 to 6 years for the soil/weeds/microorganisms to reach equilibrium and for operators to make sound management decisions based on good and bad experiences , research, and technical assistance. Some problems which need to be worked out during this transition period are: 1) dealing with excess residue without burning stubble; 2) dealing with increased weed problems during the first 2 to 3 years; 3) instituting longer crop rotations to reduce the potential for soil-borne diseases; 4) handling problems with continuous direct seeding specifically prevalent in high rainfall areas such as the Palouse; and 5) bearing new equipment costs.

The TMDL process in Idaho and other Northwest states adds to the urgency of helping growers develop continuous direct seeding systems that provide the most effective cropland erosion protection, other than establishing grass and trees. Continuous direct seeding reduces soil disturbance, increases organic matter content, improves soil structure, buffers soil temperature and allows soil to catch and hold more melt water (Clapperton, 1999). After a transition period, the practice of continuous direct seed high residue management improves soil biological health; equilibrium is reached and benefits are fully achieved from the system. Continuous direct seeding would retain residue on the surface and minimize spring soil compaction, thus reducing the potential for runoff and soil erosion and improving water infiltration (Veseth, 1999). According to the Revised Universal Soil Loss Equation (RUSLE), erosion rates on continuous direct seeded fields would reduce erosion from 14 tons/ac to 3 tons/ac, compared to conventional seeding. However without financial incentive to try continuous direct seeding landowners/operators cannot and will not risk the chance of failure in today's financial climate and will continue to use conventional tillage.

3.4.1.3.3 Contour Farming / Strip-cropping

Performing farming operations across slopes and following the shape of the land has proven to be an effective practice for reducing erosion compared to farming up and downhill, particularly on gentle slopes. On steeper slopes it is less effective, unless combined with strip-cropping or buffer strips. The use of strip-cropping and contour buffer strips on the steeper slopes characteristic of much of the Paradise Creek Watershed will be encouraged.

The costs shown above include estimated costs for non-319 funded BMPs, primarily riparian/forest buffers and grassed filter strips expected to be eligible for continuous CRP sign up within the Paradise Creek Watershed. Other than the Paradise Creek Demonstration Project, the costs do not include agricultural lands currently under CRP contracts or those scheduled to go into CRP this year.

Table 2 - Summary of Proposed Agricultural BMPs, Costs and Schedule

Implementation			Cost	Schedule
30-ft grassed filter strips		**(335 acres)**	**$207,400**	**2000-2001**
	319	(34 acres)	$2,720	2000-2001
	CRP	(301 acres)		
		Installation	$24,080	2000-2001
		Rental payments (est.)	$180,600	2000-2011
Riparian forest buffers		**(734 acres)**	**$847,200**	**2000-2001**
	319	(56 acres)	$33,600	2000-2001
	CRP	(678 acres)		
		Installation	$406,800	2000-2001
		Rental payments (est.)	$406,800	2000-2011
Ag Demonstration Project		**(150 acres)**	**$403, 824**	**1999-2001**
	CRP	Installation	$63,537	1999-2001
		Rental payments (est.)	$135,000	1999-2014
	319	Creek re-meander	$139,250	1999-2000
	Other		$66,037	1999-2000
Sediment Basins (21)			**$52,500**	**2000-2001**
Sediment and Erosion Control Structures (52)			**$104,000**	**2000-2001**
Field Borders and Critical Area Treatment			**$10,000**	**2000-2001**
Continuous Direct Seeding High Residue Management			**$60,000**	**2000-2001**
Estimated Cost of Agricultural Plan Implementation			**$1,684,924**	

3.4.2 Rural Roads TMDL Implementation Sub-Plan

See Appendix A.

3.4.3 Forest Lands TMDL Implementation Sub-Plan

See Appendix B.

3.4.4 Urban Lands TMDL Implementation Sub-Plan

See Appendix C.

4.0 PARADISE CREEK TMDL IMPLEMENTATION MONITORING PLAN

Water quality monitoring is an important component of the implementation plan and will be used to measure the success of both individual activities and the overall effort. Due to the phased structure of the Paradise Creek TMDL, an on-going, long-term monitoring effort is required to determine beneficial use status. The results of this monitoring effort will be used to evaluate the changing condition of the watershed and may lead to adjustments in pollutant targets throughout the implementation phase of the TMDL. The monitoring plan will utilize several approaches to obtain water quality data from Paradise Creek. Table 2 summarizes the monitoring plan for the Paradise Creek Watershed.

Substrate monitoring for benthic algae, chlorophyll *a*, dissolved oxygen, and temperature will be conducted by the City of Moscow over the course of four seasons from 1998-1999. Sediment and nutrient monitoring to gauge BMP effectiveness and determine source and transport pathways will be a combined effort by the Idaho Soil Conservation Commission, the Idaho Department of Lands and the Idaho Association of Soil Conservation Districts (IASCD).

4.1 Individual Nonpoint Monitoring Components

Responsible entities will be encouraged to include a monitoring component for all current and proposed projects in the implementation plan. The data generated from these projects will be included in the overall monitoring program. Individual monitoring plans are outlined below for both point source and nonpoint source pollution sources

4.1.1 Agriculture and Non-Forest Lands Monitoring Plan

This monitoring program is intended to verify previous findings of agricultural input to Paradise Creek in its upland areas before the stream enters Moscow at Mountain View City Park.

Determining where loads are entering the stream will allow prioritization for the implementation of Best Management Practices (BMPs) on a subwatershed scale. Monitoring is also designed to certify that reductions in phosphorus, temperature, pathogens, and dissolved oxygen are being made on Paradise Creek. Monitoring of Paradise Creek in accordance with this plan will be conducted on agricultural and forested lands before the stream enters Moscow city limits at Mountain View City Park. Parameters being monitored will provide information related to implementation to determine priority areas of the watershed with regards to sources of sedimentation, nutrient loading, temperature loading, dissolved oxygen, and pathogens.

Monitoring will be done by IASCD employees with additional support coming from staff of SCC, Natural Resources Conservation Service (NRCS), and ISDA employees. IASCD will supply the technical support, equipment, and funds for analytical testing. If additional help is needed to conduct physical monitoring, SCC or ISDA personnel, or other temporary employees, will provide technical and field expertise and time.

The sampling schedule for this program will consist of bi-weekly (once every two weeks) sampling starting March 8, 1999 and continuing for one (1) year. By January 15, 2000 the monitoring project will be evaluated to determine future monitoring needs within Paradise Creek.

4.1.2 Forest Lands Monitoring Plan

Forest practices in the Paradise Creek watershed may be inspected yearly for compliance with FPA. If any unsatisfactory conditions are identified, they will be corrected using IDL's standard enforcement procedures. The IDL district office in Deary will be the office of record for all FPA inspection reports in this drainage. If needed, the Idaho Cumulative Watershed Effects process will be used to monitor the Paradise Creek forested watershed.

In addition to the regular FPA inspection program conducted by IDL, the Forest Practices Water Quality Management Plan calls for a statewide audit of the application and effectiveness of Idaho Forest Practices Rules. This interagency independent audit is conducted every four years. The 1996 Forest Practice audit found that FPA rules were implemented 97% of the time. The audit also determined that when the FPA rules were properly implemented and maintained, the rules were effective 99% of the time. The audit process is one key component of the feedback loop mechanism used by the Forest Practices Act Advisory Committee and the Idaho State Board of Land Commissioners to evaluate the effectiveness of Idaho forestry BMPs. With the next round of audits scheduled for the year 2000, it is recommended that at least one forest practice be audited in the Paradise Creek watershed at that time.

4.1.3 Urban Lands Monitoring Plan

In an effort to monitor the effectiveness of urban BMPs, the urban lands monitoring plan will be a combination of existing monitoring taking place at the MWWTP and the monitoring currently in place within agricultural lands on Paradise Creek outside city limits. The agricultural monitoring plan identifies a sampling site at the city limit in the upper portion of the watershed. The sampling data from this site will be compared to the sampling data at the MWWTP, upstream of the discharge point, which is in the lower section of the watershed. Differences between parameters gathered at each site can be attributed to land use practices within the City of Moscow and on the University of Idaho campus.

4.1.4 Rural Roads Monitoring Plan

The monitoring of rural roads will be undertaken within the agricultural and non-forest rural lands monitoring program.

4.2 Beneficial Use Reconnaissance Project

Beneficial use status will be re-assessed on a biennial basis using the Idaho Division of Environmental Quality's (DEQ) Beneficial Use Reconnaissance Project (BURP). The goals of the BURP are to: 1) document the existing beneficial uses of a water body to the extent possible at a reconnaissance-level intensity and 2) to determine the beneficial use support status of a water body (IDHW-DEQ, 1997).

The BURP survey includes the collection of data on the numbers and species of fish and macro invertebrates, as well as habitat parameters, to determine a water body's beneficial uses and support status of those uses based on the Idaho State Water Quality Standards (IDHW-DEQ, 1996). BURP data is analyzed using the Water Body Assessment Guidance (WBAG) document (IDHW-DEQ, 1996). When BURP data show a major exceedance of Idaho State Water Quality Standards, the corresponding beneficial use is considered to not be fully supported. The ultimate measure of success for the Paradise Creek TMDL Implementation Plan is full support of designated beneficial uses. For this reason, BURP data will play a significant role in determining when the goals of the implementation plan have been met and in adjusting TMDL targets throughout the implementation process.

4.3 Trend Analysis

Statistical trend analyses will be used to assess the overall, long-term effectiveness of the Paradise Creek TMDL Implementation Plan. Long-term water quality data from the MWWTP will be used in the trend analyses. These analyses will be conducted on a 5-year interval, using the Mann-Kendall trend test or another acceptable trend analysis method. Results will show the degree to which water quality parameters are increasing or decreasing in Paradise Creek at the lower end of the watershed in response to the TMDL Implementation Plan.

Table 3. Monitoring Summary for the Paradise Creek Watershed

Parameter	Monitoring Objective	Responsibility	Reporting Sequence
Sediment	BMP Effectiveness	**IASCD/IDA/IDL**	**3-5 years**
	Source & Transport	**IASCD/IDA/IDL**	**3-5 years**
	Trend Analysis	**MWWTP/IDEQ/IDA**	**3-5 years**
Temperature	Trend Analysis	**MWWTP/IDEQ/IDA**	**annual**
Phosphorus	BMP Effectiveness	**IASCD/IDA/IDL**	**3-5 years**
	Source & Transport	**IASCD/IDA/IDL**	**3-5 years**
	Trend Analysis	**IDEQ**	**3-5 years**
Pathogens	NPDES Compliance	**MWWTP**	**per NPDES permit**
Ammonia	NPDES Compliance	**MWWTP**	**per NPDES permit**
Beneficial Use Support Status	BURP	**IDEQ**	**3-5 years**

5.0 Reporting and Evaluation

In an effort to provide useful information to watershed residents, community organizations, local governments and related funding agencies, the Paradise Creek Watershed Advisory Group will report, on an annual basis, the progress made towards meeting the TMDL for Paradise Creek and identifying the challenges that remain for the improvement of water quality within the watershed. The Paradise Creek Watershed Advisory Group and Latah Soil and Water Conservation District will seek to develop a reporting format that can simultaneously educate and inform watershed residents while satisfying the reporting needs for the related funding agencies. If needed, additional reporting will be made to local, state and federal agencies to meet established reporting requirements.

6.0 References

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7.0 Acronyms

BMP -	Best Management Practice
BURP -	Beneficial Use Reconnaissance Project
CFR -	Code of Federal Regulations
CFU-	Colony Forming Units
CRP -	Conservation Reserve Program
CWA -	Federal Clean Water Act
CWE -	Cumulative Watershed Effects
EPA -	U.S. Environmental Protection Agency
FPA -	Idaho State Forest Practices Act
FSA -	USDA Farm Service Agency
IASCD-	Idaho Association of Soil Conservation Districts
IDA-	Idaho Department of Agriculture
IDEQ -	Idaho State Division of Environmental Quality
IDHW-	Idaho Department of Health and Welfare
IDL -	Idaho State Department of Lands
IWRRI -	Idaho Water Resources Research Institute
LA -	Load Allocation
LSWCD -	Latah Soil and Water Conservation District
MWWTP -	Moscow Waste Water Treatment Plant
NLCHD-	North Latah County Highway District
NPDES -	National Pollution Discharge Elimination System
NPS -	Nonpoint Source Pollution
NRCS -	USDA Natural Resource Conservation Service
PCEI-	Palouse-Clearwater Environmental Institute
RUSLE -	Revised Universal Soil Loss Equation
SCC -	Idaho State Soil Conservation Commission
SRF -	State Revolving Fund
TMDL -	Total Maximum Daily Load
UIAF -	University of Idaho Aquaculture Facility
USDA -	United States Department of Agriculture
USGS -	United States Geologic Service
VFS -	Vegetative Filter Strip
WBAG -	Watershed Basin Advisory Group
WLA -	Waste Load Allocation

Appendix A

Rural Roads TMDL Implementation Sub-Plan

Paradise Creek TMDL Rural Roads Implementation Plan

Purpose

Water Quality Concerns Related to Roads

In 1994, Paradise Creek was identified as water quality limited from its headwaters to the Washington State line for the following pollutants: ammonia, nutrients, sediment, habitat modification, pathogens, flow alteration, and temperature. A Total Maximum Daily Load (TMDL) management plan for Paradise Creek was developed under Section 303(d) of the Federal Clean Water Act, and approved on December 24, 1997. The primary nonpoint sources of pollutants in Paradise Creek have been identified as non-irrigated croplands, grazing lands, land development, urban runoff, roads, and forest lands (Paradise Creek TMDL:1). As outlined in the Paradise Creek TMDL, the county roads need to reduce 8% of sediment loads above background loading.

The public county roads in the Paradise Creek watershed are maintained by the North Latah Highway District. The Highway District is a local government agency administered by a board of locally-elected commissioners.

Project Benefits

By stabilizing road cuts and fills and addressing water conveyance problems, the Highway District anticipates reducing the sediment load from county roads to meet TMDL standards. Additionally, decreased sediment delivery will reduce the input of associated nutrients to the stream. The Highway District will focus on the problem areas with the highest erosion problems.

Environmental Stewardship

The activities planned by the Highway District will be part of the on-the-ground application of the approved Paradise Creek TMDL. The Highway District's project will be accomplished through cooperation with landowners and other agencies throughout the watershed. It is anticipated that watershed project tours and news releases will be used to increase public awareness of the problems and the solutions. Assistance can be requested from the Latah Soil and Water Conservation District, Natural Resources Conservation Services, Palouse-Clearwater Environmental Institute, Idaho Soil Conservation Commission, Division of Environmental Quality, and the Local Highway Technical Assistance Council of the Idaho Department of Transportation.

Community/Agency Commitment

A letter from the North Latah Highway District is attached, showing the District's commitment to implement erosion control via cut and fill bank stabilization projects and improved water conveyance.

Plan for Monitoring Results

The local Water Quality Specialist for the Idaho Association of Soil Conservation Districts will provide the monitoring water quality for the agriculture portion of the TMDL implementation plan. This will be done in the same area and will detect changes in sedimentation from road BMPs.

Characteristics

Priority

Paradise Creek is a high-priority water quality limited stream, as addressed in the Paradise Creek TMDL (December 1997).

Proposed Implementation

The North Latah Highway District will implement road BMPs focusing on high-priority problem areas, such as eroding road cut and fill banks and water conveyance problems contributing to nonpoint source pollution.

Unstable, eroding road cut and fill banks will be shaped and stabilized by planting woody and herbaceous vegetation. Additional methods to stabilize the slope and reduce erosion which may also be used include erosion control blankets, armoring, and mulching. These treatments will greatly reduce the input of sediment and pollutants to the water course, and in addition the significant increase in available habitat will benefit wildlife. These treatments will also provide aesthetic benefits to county residents.

Predicted Efficiency and Extent of Best Management Practices

Currently, the county roads are already rock surfaced, which contributed to a past large reduction of sediment. To achieve the necessary 8% reduction identified in the Paradise Creek TMDL Plan, implementation of additional road BMPs is necessary. The Highway District proposes to use grant funds for stabilization of eroding cut and fill banks and improvement of water conveyance. These additional road BMPs will greatly reduce sediment and associated pollutants while providing for efficient transportation systems.

The treatments described will be applied to 15 to 25% of the county road system in the Paradise Creek watershed. These will be the sections identified as high priority segments, those currently contributing the highest sediment loads or problems.

Structural Practices

Structural practices may involve installation of culverts, improvements of road ditches, erection of bank buttresses, armoring and matting.

Agronomic Practices

Agronomic practices will include planting of vegetation to stabilize newly re-shaped slopes of the cut and fill banks. This would include seeding with an appropriate mix of grass and forb species. Woody vegetation could be planted to stabilize the soil and could include a combination of low-growing shrubs such as rose and snowberry on the lower two-thirds of the slope. On the upper third of the slope, additional stability could be provided by the planting of deep taprooted species such as hawthorn and serviceberry. All the species listed are native and would be low maintenance. All plantings will be designed with transportation safety issues in mind.

Programs Available for Implementation Assistance

The Natural Resources Conservation Service, Latah Soil and Water Conservation District, Idaho Soil Conservation Commission , Idaho Transportation Department, Palouse-Clearwater Environmental Institute, and the Division of Environmental Quality will provide technical assistance and arrange for volunteer labor for planting the vegetation.

Past and Present Pollution Control Efforts on County Roads within the Watershed

Historically, the Highway District has focused on transportation and maintenance of the road systems. This grant proposal will give the District the opportunity to focus on water quality, while continuing to maintain the existing transportation system. This project will also provide aesthetic benefits and wildlife habitat.

Project Benefits

Please refer to the "Project Benefits" section on page 2.

Cooperation with Other Programs/Other Funding Sources

The Latah Soil and Water Conservation District (LSWCD) will administrate and coordinate the Paradise Creek TMDL Implementation Plan among the various special interest groups and cooperators within the watershed. The LSWCD will function as a liaison between landowners, public interest groups, and various governmental agencies. The LSWCD will also work to achieve public participation and awareness through development of information and education materials and news releases.

Conclusions

Provision of funds to implement road BMPs on county roads within the Paradise Creek watershed should significantly reduce the inputs of sediment and associated nutrients from county roads into the water course.

Tasks

Task 1: Stabilization of cut and fill banks

Task 2: Improving water conveyance to reduce sedimentation

Budget: Estimated Road BMP Needs and Costs

Best Management Practice	Total Cost	Match	Funds Requested
stabilization of cut and fill banks, revegetation	$75,849.00	$34,500.00	$41,349.00
improved water conveyance systems	$35,000.00	$15,000.00	$20,000.00

Funding Request

Total Match Available $49,500.00

Match provided by the North Latah County Highway District: costs associated with paid labor and equipment for excavation and shaping work; plus volunteer labor for planting and installation of erosion control materials.

Total Funding Request $61,349.00

Total Project Cost $110,849.00

Roadsides

Maintenance activities along roadsides are aimed primarily towards erosion problems, vegetation establishment, and vegetation control. Cut and fill slopes created by road construction can be steep, lacking in vegetation, and subject to altered drainage patterns.

Erosion control vegetation

Slide scars and other areas of exposed soils along roadsides are very susceptible to gullying and other erosion problems. Vegetative cover can help stabilize these areas by shielding the soil from raindrop impact and holding it in place with a well-anchored root system.

If natural vegetation does not quickly invade and cover areas of exposed soil, it may be necessary to make erosion control seedings or plantings. Renewed efforts to establish erosion control vegetation are sometimes needed where initial efforts after road construction or other disturbance have failed or have had only partial success.

Grasses and other low-lying vegetation usually are most desirable for roadside erosion control. A mix of species can be used to help ensure establishment and possibly provide forage for wildlife or livestock. A planting of grasses and forbs can be interplanted with a combination of low shrubs (such as snowberry and native rose) on the lower two-thirds of the slope, and deep-rooting shrubs (such as black hawthorn and serviceberry) at the upper third of the slope. This combination of erosion control plantings will provide for bank stability and water quality improvements, as well as offering aesthetic and wildlife values.

Design

Design cut slopes to match the soil type's ability to hold the slope's steepness (see figure 1). Steep hillside slopes of hardpan soils, high in clay, can hold a 3/4:1 cut slope, while gentle slopes with loose, noncohesive soils need a 1:1 cut slope. Rock can be cut vertically.

An extra amount of soil is exposed to erosive forces when the cut slope is not steep enough to be held by the soil. In fact, on some steep slopes, a 1:1 cut slope may not be as steep as the adjacent ground slope (the slopes may not match). On the other hand, the cut slope will fail if it is too steep for the soil to hold (see figure 2).

Fill slopes also depend on terrain steepness and soil types, but to a lesser degree than cut slopes. Fills are usually designed to have a 1-1/2:1 slope because this is the steepness uncompacted or loose earth will hold. The stability of fills on sloped terrain depends on the ground's steepness; fills on slopes that are more than 65 percent will not catch (attach to original ground) nor provide support; material will ravel (slide away) down the hillside.

Paradise Creek Watershed

Treatments of unstable cut and fill slopes along roads in the Paradise Creek Watershed will include a combination of several methods. The North Latah County Highway District will: shape slopes to reduce steepness by laying banks back; plant erosion control vegetation; use erosion control materials and mats, and other structural treatments as needed.

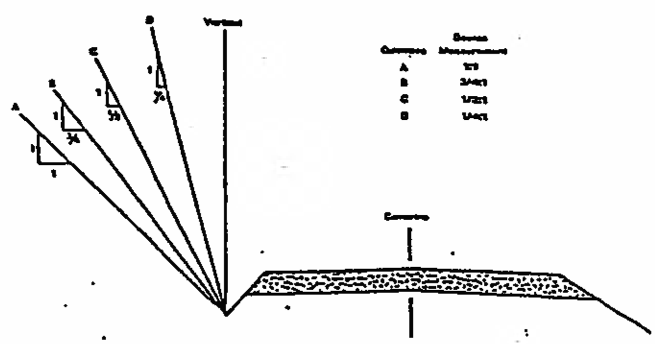

Figure 1. Cut slopes at common steepnesses.

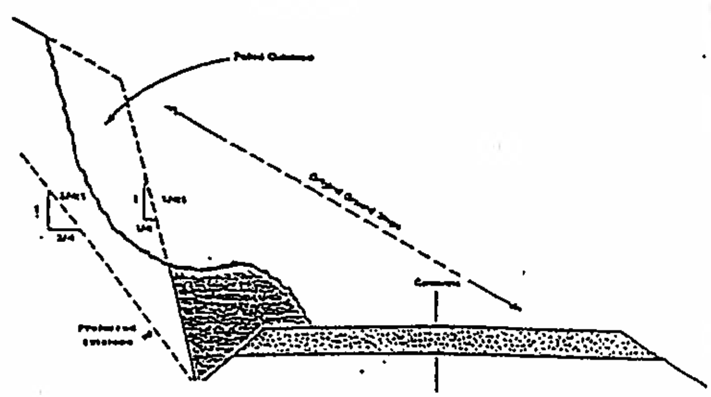

Figure 2. *Oversteepened cut slopes may fail.*

Appendix B

Forest Lands TMDL Implementation Sub-Plan

Paradise Creek TMDL Forestry Implementation Plan

Introduction

Forestland comprises approximately 14.2% (1,978 acres) of the total 13,888 acres in the Paradise Creek watershed. The Paradise Creek water body assessment and total maximum daily load (TMDL) document prepared by the Idaho Division of Environmental Quality (DEQ) in 1977 lists non-irrigated crop lands, grazing lands, land development and construction activities, the city of Moscow's storm water system, and road and skid trail construction associated with forest land harvest activities as the primary non-point source of pollutants (p. 25 of the TMDL). This portion of the TMDL implementation plan addresses non-point source pollution from road and skid trail construction associated with timber harvest activities. While forest roads are a minor source of sediment within the watershed as proportioned in the TMDL (p. A-11 of TMDL), efforts should still be made to reduce sediment pollution from forestlands. Forest roads have long been recognized as a main source of sediment from forest harvesting activities. Forest road sedimentation problems are most acute during major storm events and on new road construction, especially when roads are located close to streams. As with other soil disturbances, sedimentation generally declines with vegetation establishment on roadsides and implementation of erosion control measures.

Forestry Pollution Control Strategies

Under the 1972 Clean Water Act (CWA), congress authorized states to control non-point sources of pollution through the implementation of Best Management Practices (BMPs). A BMP is defined as a measure determined to be the most effective practical means of preventing or reducing pollution inputs from point or non-point sources in order to achieve water quality goals. Idaho's forestry BMPs are included in the Idaho Forest Practices Act (FPA), Title 38, Chapter 13, Idaho Code passed by the legislature in 1974. The Act and associated administrative rules have been updated on several occasions since that time. The FPA is designed to assure the continuous growing and harvesting of forest tree species and to protect and maintain the forest soil, air, water resources, wildlife, and aquatic habitat. FPA rules address timber harvesting practices, forest road construction and maintenance, forest tree residual stocking and reforestation, use of chemicals/management and prescribed fire. The Idaho water quality standards and wastewater treatment requirements, Title 39, Chapter 1, Idaho Code reference the FPA rules as the approved BMPs for silvicultural activities. The Idaho Department of Lands (IDL) is the designated state agency responsible for administering and enforcing the FPA on all forestlands in the state.

Prior to the harvest of timber, a logging operator must notify the Department of Lands of planned timber harvest by filing a Certificate of Compliance B Notification of Forest Practices. This Compliance B Notification form lists the contractor responsible for slash management, operator responsible for FPA compliance, landowner, and log purchasers. Fire hazard and basic forest environmental information on streams, soils, and slopes are included in the form. IDL has the authority to enter logging operations to inspect for compliance with the fire hazard reduction laws and the FPA. Any time department personnel inspect a logging operation a report of inspection may be completed that lists satisfactory practices and unsatisfactory rule violations.

When the department determines that an operator has violated any provision of the FPA, it shall be considered a violation. If the violation is minor, the operator may only receive an unsatisfactory inspection report. If the unsatisfactory items are corrected in a timely manner, no Notice of Violation will be issued. A Notice of Violation (NOV) will be issued for all major infractions where serious resource damage has occurred or will occur, when an operator has multiple minor infractions which are collectively significant, or when an operator fails to correct previously noted unsatisfactory conditions. The Notice of Violation will specify the reason for the violation, any damage or unsatisfactory condition, and required repair of mitigation. If the operator corrects the violation, no further action is taken. If an operator fails to correct the Notice of Violation, the department can complete the repair and take civil action to recover repair and legal costs. Provisions also exist to deny an operator the ability to obtain new Notifications if an operation is in current violation, or the operator can be required to post a bond if it is determined by the board that the operator is a repeat or habitual offender of the FPA.

As the department does not have the resources to inspect all logging operations in the state, department personnel work cooperatively with the University of Idaho, industry, environmental groups, and other agencies to assist and train private forest landowners and logging operators help on appropriate forest management and water quality protection practices.

Provisions are also included within the FPA to address water quality impacts across drainages. In 1991, the FPA was amended to include provisions for minimizing watershed impacts resulting from cumulative effects of multiple forest practices. The Idaho Cumulative Watershed Effects process (CWE) includes assessing erosion hazards, canopy closure, stream temperature, hydrology, sediment delivery, channel stability, beneficial uses, and nutrients. The CWE process provides a broad scale watershed assessment that determines if water quality problems exist and what should be done to mitigate those problems. This is done on a cooperative approach with affected landowners through development of site-specific forest BMPs.

Forestry Pollution Control Schedule

The following forestry work has been completed for the Paradise Creek watershed:

- All logging operations within the watershed were inspected by the IDL Forest Practices Advisor during 1998 for compliance with the FPA. The majority of operations were found to be in compliance with the FPA. One minor unsatisfactory violation on non-industrial forestland was noted and repaired. Additional site-specific BMPs were recommended by the department as needed on FPA inspection reports.

- The State of Idaho grass seeded and cross-ditched forest roads on public school lands within the drainage during the summer of 1998.

- Bennett Tree Farms has surface rocked one (1) mile of forest roads, installed five (5) relief culverts, and performed grass seeding with cross-ditching work at a cost of over $13,000 during the summer of 1998.

The following site-specific forestry BMPs are planned for implementation within five years. However, site-specific BMPs that are recommended or required beyond standard FPA rules may require incentive funding for implementation.

- Installation of additional road cross-ditches, rolling dips and other drainage structure to reduce road erosion.
- Clean out Pond 9 sediment and undertake minor repair to dam.
- Surface rocking of approximately 1.5 miles of existing forest roads.
- Additional grass seeding for erosion control.
- Tree planting for permanent forest cover.

By implementing the Idaho Forest Practices Act and completing additional site-specific BMPs erosion work, the sediment load from forestland within Paradise Creek watershed should be reduced to meet TMDL forest pollution targets.

Monitoring

Forest practices in the Paradise Creek watershed may be inspected yearly for compliance with FPA. If any unsatisfactory conditions are identified, they will be corrected using IDL's standard enforcement procedures. The IDL district office in Deary will be the office of record for all FPA inspection reports in this drainage. If needed, the Idaho Cumulative Watershed Effects process will be used to monitor the Paradise Creek forested watershed.

In addition to the regular FPA inspection program conducted by IDL, the Forest Practices Water Quality Management Plan calls for a statewide audit of the application and effectiveness of Idaho Forest Practices Rules. This interagency independent audit is conducted every four years. The 1996 Forest Practice audit found that FPA rules were implemented 97% of the time. The audit also determined that when the FPA rules were properly implemented and maintained, the rules were effective 99% of the time. The audit process is one key component of the feedback loop mechanism used by the Forest Practices Act Advisory Committee and the Idaho State Board of Land Commissioners to evaluate the effectiveness of Idaho forestry BMPs. With the next round of audits scheduled for the year 2000, it is recommended that at least one forest practice be audited in the Paradise Creek watershed at that time.

Forestry Implementation Plan Funding

Under the FPA, logging operators are responsible for meeting the rules. Therefore, the cost of complying with the FPA is born solely by the operator or forest landowner depending on any contractual agreements that may be in existence. At present, private forest landowners are assessed $.05 per acre for all forestlands and $.08 per thousand board feet harvested to help fund the IDL administration of the FPA. Since this funding is not totally adequate to support the FPA administrative program, funds for the initiation of additional protection measures beyond the requirements of the FPA are not available. IDL also has authority to expend funds out of the FPA rehabilitation account but is limited to only those costs associated with the repair of unsatisfactory practices identified in the Notice of Violation process. The natural resource conservation income tax credit, forest landowner stewardship program and grants are other possible sources of limited funding for additional volunteer site-specific forest BMPs.

Appendix C

Urban TMDL Implementation Sub-Plan

Urban/Suburban Paradise Creek
TMDL Implementation Plan

I. Introduction

In late 1997, the Idaho Division of Environmental Quality completed the Paradise Creek TMDL: Water Body Assessment and Total Maximum Daily Load. This report classified Paradise Creek as "water quality-limited," and named ammonia, nutrients, sediment, habitat alteration, pathogens, flow and temperature as parameters of concern (DEQ, p.3). The stream uses affected by these parameters are secondary recreation, agricultural water supply, and cold water biota (DEQ, p.3). In the case of Paradise Creek, the parameters of concern originate largely from non-point sources, which include agriculture, forestry and urban land use areas. TMDL requirements are designed to limit the quantities of the parameters of concern that enter Paradise Creek.

The EPA has also introduced regulations dealing with non-point source pollution. These regulations are known as the Phase II water quality standards and are corollaries of the Clean Water Act (40 CFR Parts 122 and 123). Phase II regulations do not involve numeric standards like TMDL requirements, but call for general water quality improvement. Phase II requirements are designed to "result in significant monetized financial, recreational and health benefits, as well as benefits that the EPA has been unable to monetize, including reduced scouring and erosion of streambeds, improved aesthetic quality of waters, reduced eutrophication of aquatic systems, benefit to wildlife and endangered and threatened species, tourism benefits and reduced siting costs of reservoirs (EPA, p.1536)."

A. Goals

This portion of Paradise Creek's overall implementation plan is concerned with addressing the non-point source pollutants defined by the Paradise Creek TMDL, originating from urban land use areas. The purpose of this plan is to identify and recommend appropriate design guidelines and their pollutant removal effectiveness for both water quality and quantity; identify, inventory and recommend a list of retrofit opportunities within the scope of the implementation plan; and explore the feasibility and recommend a range of viable local regulatory strategies for managing erosion and storm water runoff. The desired outcome of this plan is compliance with both TMDL and Phase II requirements.

B. Coverage

This portion of the overall implementation plan will encompass urban land use areas affecting Paradise Creek within the Moscow City limits (Mountain View Park to the Idaho/Washington border). Parties responsible for administering this section of Paradise Creek are the City of Moscow and the University of Idaho.

C. Control of Pollutants

1. Sediment and Total Suspended Solids (TSS). High concentrations of sediment and TSS typically occur during periods of high runoff. These parameters reduce water clarity and impair fisheries when deposited. Sediment is also known to degrade fish habitat (DEQ, p.21). TMDL requirements call for an overall 75% reduction in sediment and TSS within the Paradise Creek watershed (DEQ, p.52).

2. Total Phosphorous (TP). Excessive TP can lead to algal growth and reduced levels of dissolved oxygen (DO). This has adverse effects on the beneficial uses of the creek, as well as cold water biota. TP is of concern during the low flow months of summer when temperatures are warm (DEQ, p.21). TMDL requirements call for an overall 59% reduction in TP within the Paradise Creek watershed (DEQ, p.52).

3. Bacteria/Fecal Coliform. Bacteria in the form of fecal coliform is also a problem during periods of low flow and can exceed Idaho Water Quality Standards for secondary contact recreation (DEQ, p.21). TMDL requirements call for an overall 75% reduction in fecal coliform within the Paradise Creek watershed (DEQ, p.52).

4. Temperature. Temperature combined with high levels of nutrients, especially TP, leads to increased eutrophication and low levels of DO. Elevated temperature is a problem during low flow periods of the summer months (DEQ, p.21). TMDL requirements call for an overall 42% reduction in the temperature of Paradise Creek (DEQ, p.52).

D. Flood/Flow Control

It is commonly known in geomorphology that a stream will naturally strive to reach equilibrium between erosion and deposition. The streambed of Paradise Creek has been modified by channelization in the past. This was an accepted flood/flow control measure designed to lessen the severity of flooding in Moscow; however, this practice disrupted the stream's equilibrium and increased streambed and streambank erosion. Channelization is not a common practice at present, and now, engineering the stream channel to imitate the natural flood plain and natural meander pattern is a practice currently employed in the Paradise Creek drainage near the city of Moscow. Modifying the stream channel in this manner provides the following benefits: decreased velocity of flood waters; increased storage and detention of flood waters, thereby lessening the impact on developed areas; increased capability of sediment and nutrients to settle out of the stream flow, thereby improving water quality; and the ability of sediment to be eroded and deposited in a natural fashion. Another flood/flow control measure used by the City of Moscow is cleaning the bottom of the stream channel. This practice is designed to reduce the roughness factor of the streambed and thereby reduce scouring and erosion.

E. Conveyances

In the urban land use area, the primary conveyances of pollution into Paradise Creek are through storm water drains and direct runoff.

II. Approaches

A. Inventory

In order to designate and prioritize problem areas that contribute excess sediment and other pollutants to Paradise Creek, thereby degrading the overall water quality, an inventory of the Moscow and University of Idaho storm sewer systems will be conducted. This study will assess the potential impact that various parts of the storm sewer system have on Paradise Creek by estimating the output of pollutants from a storm water outlet based on: the area serviced by the outlet, the degree of imperviousness of the area, the degree of accumulation of pollutants (dust, bacteria, etc.), the rate of wash-off, areas of high slopes, construction activities, etc. Monitoring may also be done on storm sewer outlets if funds allow. This study will then prioritize problem areas, if any, recommend practices to reduce pollution originating from these areas, and estimate the cost of implementing these practices.

Anticipated Completion Date: October, 2002

B. Construction Activities

Runoff from construction activities can contribute as much as 70% of the sediment that originates from urban/suburban land use areas. Therefore, reducing the quantity of sediment originating from construction areas is an obvious place to begin reducing sediment pollution to Paradise Creek. In the interest of improving the water quality of Paradise Creek and meeting TMDL and Phase II requirements, this implementation plan will develop city ordinances and university policies that require applicable and reasonable temporary/construction best management practices (BMPs) be implemented during construction activities. These BMPs will be selected based on applicability, feasibility, cost effectiveness, and pollutant removal effectiveness.

Anticipated Completion Date: October, 2001

C. EPA Phase II Storm Water Control Measures

To meet TMDL goals and to anticipate compliance with the proposed EPA Phase II regulations, this plan will implement the six control measures described in the proposed rules (EPA, pp.1574-9). These control measures are:

1. Public Education and Outreach on Storm Water Impacts. This will require the City and University to "implement a public education program to distribute educational materials to the community (or conduct equivalent outreach activities) about the impacts of storm water discharges on water bodies and the steps to reduce storm water pollution." Topics could include, but are not limited to: septic system maintenance; proper fertilizer use; and proper disposal of hazardous substances like household cleaners, motor oil, etc. Activities could include, but are not limited to: stream restoration activities, litter pick-up, storm drain stenciling, etc. Some of these educational/outreach activities should be targeted to commercial, industrial, and institutional entities.

2. Public Involvement/Participation. The EPA suggests that the public be involved and take an active role in the development of a municipality's storm water management program. Public involvement "can shorten implementation schedules and broaden public support for a program."

3. Illicit Discharge Detection and Elimination. The City and University must be able to demonstrate, through maps, etc., knowledge of the system. The City and University must prohibit, through ordinance, etc., illicit discharges (illegal dumping, improper disposal, improper sewer connections, etc.) into the system and enforce these ordinances. The City and University must implement a plan to address and detect illicit discharges. Last, the City and University must inform businesses, the public, etc., the hazards and consequences associated with illicit discharges.

4. Construction Site Storm Water Runoff Control. This will require the City and University to "develop, implement and enforce a pollutant control program to reduce pollutants in storm water runoff from construction activities that result in a land disturbance of 1 or more acres to their municipal separate storm sewer systems as a part of their storm water management program." The City and University will need to "use an ordinance or other regulatory mechanism that controls erosion and sediment to the maximum extent practicable and allowable under State, Tribal, or local law. This program would also need to control other waste at construction sites that could adversely affect water quality."

5. Post-Construction Storm Water Management in New Development and Redevelopment. This will require The City and University to "develop, implement,

and enforce a program that includes a plan to address storm water runoff from new development and redevelopment projects to their municipal separate storm sewer systems using site appropriate and cost effective structural and non-structural BMPs, as appropriate."

6. Pollution Prevention/Good Housekeeping for Municipal Operations. This proposes that any NPDES permit issued to The City or University "must, at a minimum, require the owner or operator to develop and implement a cost-effective operation and maintenance/training program with the ultimate goal of preventing or reducing pollutant runoff from municipal operations."

Anticipated Completion Date: July, 2003

(Note: The above control measures and/or completion date may change or be revised depending on the outcome of the final EPA Phase II rules.)

III. Previous and On-Going Activities

The following table lists past and on-going activities that have or will address water quality and flood/flow control.

Item	Location	Water Quality/Flow Improvement Project	Responsible Parties	Status	Targeted Parameters				
					Flood/Flow	Sediment	Phosphorous	Temperature	Bacteria
1	Mountain View Park	Potential revegetaion and stream bank stabilization	PCEI	Summer '99/ Spring '00	X	X	X	X	
2	Mountain View Road	Creek Crossing Replacements (3)	City of Moscow	Completed	X				
3	Mountain View Road at Joseph St.	Grass swale and storm drainage	City of Moscow	Completed	X	X	X		
4	Joseph St.	Bridge replacement	City of Moscow	federal aid project; pending	X				
5	North of Darby Road	Potential floodplain enhancement, wetland restoration, streambank stabilization and revegetation	PCEI	Pending	X	X		X	

Item	Location	Water Quality/Flow Improvement Project	Responsible Parties	Status	Targeted Parameters				
					Flood/Flow	Sediment	Phosphorous	Temperature	Bacteria
6	White St.	Reslope streambanks and revegetation	PCEI	Pending	X	X		X	
7	Dahmen St.	Log crib-wall revetment (Bank stabilization)	PCEI	Completed	X	X			
8	South of 6th St.	Carol Ryrie Brink Nature Park; Remeander stream channel and revegetate and restore stream bank	PCEI	Completed	X	X	X	X	
9	Sweet Ave.	Development of biofilters and restoration of riparian vegetation	PCEI/UI	In progress	X	X	X	X	
10		Permit to clean 300' of Paradise Cr.	City of Moscow	Completed	X	X			
11		Permit to clean 3500' of Paradise Cr.	City of Moscow	Completed	X	X			
12	Mountain View Road, Joseph St. and Lemhi St.	Installed 295' of storm line	City of Moscow	Completed	X				
13	Wick's Field	Replaced 2 sanitary sewer receptors	City of Moscow	Completed					X
14	South of Harrison St.	Replaced buried sanitary sewer (10 in.) crossing in creek bed	City of Moscow	Completed					X
15	D' St.	Built pad to accommodate a backhoe for ice break-up	City of Moscow	Completed	X				
16	Moscow Waste Water Tmt. Plant	Wetlands project to treat MWWTP effluent	PCEI/UI	Completed	X	X			
17	Near MWWTP	Proposed project to stabilize 1300' of stream bank	PCEI/UI	Summer '99	X	X	X	X	
18	UI Campus	Proposed project to construct wetlands in order to treat animal waste runoff	PCEI/UI	Fall '99		X	X		
19	Moscow Public Lands	Proposed project to increase riparian vegetation and stabilize 3 miles of stream bank	PCEI	Summer '99/ Spring '00	X	X	X	X	
20	Hordemann's Pond	Potential revegetation project	PCEI	Summer '99/ Spring '00		X	X	X	

Item	Location	Water Quality/Flow Improvement Project	Responsible Parties	Status	Targeted Parameters				
					Flood/Flow	Sediment	Phosphorous	Temperature	Bacteria
21	D' St. to Bridge St.	Potential revegetation project	PCEI	Summer '99/ Spring '00		X	X	X	
22	Latah County Fairgrounds	Potential revegetation project	PCEI	Summer '99/ Spring '00		X	X	X	
23	Troy Hwy. to Hwy. 95	Potential revegetation project	PCEI	Summer '99/ Spring '00		X	X	X	
24	Ghormley Park	Potential revegetation project	PCEI	Summer '99/ Spring '00		X	X	X	
25		Sedimentation/Erosion control ordinance	City of Moscow	Completed		X	X		
26		Storm water management ordinance	City of Moscow	Completed	X				
27		Budgeted (FY00) $10,000 for a consultant to assess the Paradise Cr. drainage	City of Moscow	Pending	X				
28		TMDL/Discharge permit	City of Moscow	Pending/EPA		X	X	X	X
29		TMDL - Sediment/Erosion control above city limits	City of Moscow	Pending	X	X	X		
30		TMDL - City storm water	City of Moscow	Pending/DEQ		X	X		
31		Contacted Fish and Game; beaver dams and beaver trapping; no beavers found	City of Moscow	Completed	X				
32		Sandbagging plan	City of Moscow	Completed	X				
33		EPA Grant; Latah Water/Soil Conservation Dist.			X	X	X		

IV. Best Management Practices (BMPs)

In 1998, the City of Moscow adopted an erosion control ordinance and associated erosion and sediment control standards. The University of Idaho is currently reviewing erosion and sediment control measures.

In addition to the existing City of Moscow erosion control ordinance and adopted erosion and sediment control standards, private and public entities may use existing BMP guidelines as a reference for adopting erosion and sediment control policies. The State of Idaho has produced a workbook titled Catalog of Storm Water Best Management Practices for Idaho Cities and Counties. This workbook is a resource citing BMPs that are available for use when conducting activities. This workbook is available from the Idaho Division of Environmental Quality (DEQ) and contains 52 BMPs of two general types: construction/temporary BMPs and permanent BMPs. Temporary BMPs are designed to be used when new situations arise that require construction. These temporary BMPs consist, largely, of practices that will mitigate construction site runoff pollution to water bodies. It is possible to design certain types of temporary BMPs (i.e., swales, dikes, etc.) so they can function temporarily during construction and permanently after construction is completed. Permanent BMPs are also designed to mitigate storm water pollution to water bodies; however, they are designed for use as "retrofit" options at existing locations.

The BMP's listed in the following parts II and III of this document are, in a large part, from the Catalog of Storm Water Best Management Practices for Idaho Cities and Counties. For a complete description of a particular BMP; including applications, limitations, design parameters, construction guidelines, and maintenance information; please refer to the corresponding BMP number in sections 4 and 5 of this catalog.

There are several different sub-types of BMPs contained in the Catalog of Storm Water Best Management Practices for Idaho Cities and Counties.

A. Temporary/Construction BMPs

1. General Construction Site Guidelines (BMPs 1 through 5b) and Housekeeping BMPs (6 through 10) are designed to act as preventative measures to limit storm water pollution from construction sites both before and after construction begins.

2. Slope protection BMPs (11 through 18) are designed to reduce erosion and sediment discharge by minimizing and protecting exposed soil surfaces.

3. Storm Drain and Channel Protection BMPs (19 through 23) are designed to mitigate pollution to storm drains, natural channels, and ditches from construction runoff. These BMPs prevent or reduce sediment and debris input into the drainage system.

4. Sediment Collection and Runoff Diversion BMPs (24 through 33) are practices that can be used to collect sediment on a site, keep run-on from entering the site,

keep runoff from leaving the site, and to divert runoff away from sensitive areas.

B. Permanent BMPs

1. Slope Protection and Stabilization BMPs (34 through 37) are designed for use as a vegetative means of protecting and stabilizing slopes. These BMPs can be used during construction and then kept in place afterward.

2. Storm Water Filters (BMPs 38 through 42) are BMPs designed to filter pollutants out of runoff through the processes of settling and straining. There are several types of media used, all of which are effective in removing coarse to fine sediment as well as the pollutants adhered to them.

3. Infiltration Facilities (BMPs 43 and 44) are a means to interrupt and hold runoff long enough for it to enter the underlying soil. In order for these BMPs to be used, the infiltration rate must be no less than .4 inches/hour.

4. Detention Facilities (BMPs 45 through 51) are designed to capture runoff and temporarily detain it so pollutants can be removed through settling and/or biological uptake. Detention Facilities can also help prevent erosion and flooding by detaining runoff and then releasing it at rates close to those that occur naturally.

For a table listing selection criteria for choosing storm water BMPs, please see Table 3-1 in the catalog. A copy of this table can be viewed in Attachment A at the end of this document. The flow chart in Attachment B (Figure 3-1, in the catalog) provides a general overview items to consider when choosing BMPs for a particular site. Chapter 3 in the catalog describes each of these items in greater detail. Attachment C includes the City of Moscow's erosion and sediment control ordinance (#98-1).

V. References

Idaho Division of Environmental Quality (DEQ). Catalog of Storm Water Best Management Practices for Idaho Cities and Counties. 1997.

Idaho Division of Environmental Quality (DEQ). Paradise Creek TMDL: Water Body Assessment and Total Maximum Daily Load. Lewiston, Idaho. 1997.

Environmental Protection Agency (EPA). Federal Register, January 9, 1998. pp. 1574-9. 1998.