

4 Implementation Strategies

To meet load and wasteload allocations discussed in this TMDL requires implementation of various policies, programs, and projects aimed at improving water quality in the Bear River and its tributaries. These policies, programs, and projects would be in addition to, or replacement of, current efforts (e.g., Bear River Water Quality Task Force work, EPA's construction stormwater permit). Like the TMDL, the goal of the implementation plan is to reduce pollutant loading so as to support beneficial uses. DEQ recognizes that implementation strategies for TMDLs may need to be modified if monitoring shows that the TMDL goals are not being met or significant progress is not being made toward achieving the goals. On the other hand, should monitoring show that beneficial uses are being supported prior to the attainment of TMDL targets, less restrictive load and wasteload allocations will be considered.

4.1 Time Frame

No time frame is proposed for attainment of beneficial uses in Bear River Basin as it would be highly dependent on many factors. Modification of government policies requires changes in current agency operations. These changes often necessitate some type of legislative action and diffusion down to the local level where the programs resulting from such policies are determined and carried out. On-the-ground projects in addition to proper planning require willing landowners and often some type of financial help.

Adding to the problem of predicting when beneficial uses might be obtained are the vagaries of nature. For example, streams which maintain high levels of subsurface sediment are dependent on geofluvial processes to mobilize the smaller sediment and move it out of the system. Flows required for such mobilization are dependent on winter snow levels and resultant spring runoff, neither of which can be predicted with any certainty next year, let alone any years after that.

Despite the above, there is no reason not to see substantial progress within 10 years of the discharge of the implementation plan. Development of a proper monitoring plan should allow a statistical evaluation of that progress.

4.2 Approach

Idaho Water Quality Standards list designated agencies responsible for reviewing and revising nonpoint source BMPs based on water quality monitoring data generated through the state's water quality monitoring program (Idaho Code 39-3602). Department of Lands is responsible for timber harvest activities, oil and gas exploration and development, and mining activities. The grazing and agricultural aspects of the implementation plan will be written and developed by the Soil Conservation Commission. Public road construction activities fall under the auspices of the Transportation Department. Department of Agriculture has responsibility for aquaculture. All other activities are the responsibility of DEQ.

Gathering of new information may indicate federal lands as a source of nonpoint pollutant loading in the Bear River Basin. It is expected that federal agencies will write



their own implementation plans as to how they intend to reduce pollutant loading from land under their jurisdiction.

Point sources will also be asked to write their own implementation plan on how they will meet TMDL wasteload allocations. In addition, it is expected that any allocations set forth in this TMDL will eventually be incorporated into the point sources' NPDES permits.

4.3 Load Reduction Analysis

It has been shown in the previous section that total phosphorus is a major element of concern in that it exceeded the TMDL target load during all seasons at multiple sites throughout the Bear River in Idaho. In this section, several load reduction scenarios are discussed that, if implemented, will reduce phosphorus loading in the river.

4.3.1 Load Reduction Strategies

The mass balance approach used in the TMDL analysis calculated nonpoint source loads for total phosphorus and total suspended solids. The loads from tributaries, which drain mostly agricultural and forested land, can be considered functionally as nonpoint sources. Combined with the main stem nonpoint source loads, this source (nonpoint) accounts for over 97 percent of the total load. The reduction of this load in both the tributaries as well as in the mainstem Bear River will be mandatory if compliance to the phosphorus TMDL is to be attained.

The potential reduction of the excess phosphorus loadings through the implementation of various remediations was evaluated. These nutrient reduction activities were focused on the implementation of various best management practices (BMPs), including agricultural lands and feedlots. Table 4-1 lists a wide range of remediation activities and BMPs, the effectiveness of each of the activities in reducing nutrients and solids input into waterways and, when available, typical costs associated with each activity. The ability to reduce pollutant inputs is largely a function of the amount of effort and money available for the task. Because of this, a range in nutrient reductions were calculated based upon a low, medium and high effort (Table 4-2).



Table 4-1. A literature review of remediations and their effectiveness.

Potential Sources of Pollution	Remediation	Percent Reduction	Cost	Impact
Feedlots (manure management)	Structural			Reduce runoff of nutrients, fecal coliform and total suspended solids from animal waste into adjacent waterways
	Holding Ponds	50-70%	\$25,000	
	Lagoons	75-100%	\$25,000-\$85,000	
	Bunkers	*	\$10,000-\$50,000	
	Tanks	*		
	Composting			
	Operational			
	Total animal waste management			
Agriculture	Hook into MWWTF	*		These practices reduce soil erosion and therefore, decrease the transport of sediments and associated nutrients (soluble and insoluble) into adjacent waterways
	Structural			
	Sprinkler systems			
	Operational (BMPs)			
	Conservation tillage	full strip 40-90% ⁽¹⁾ wide strip 40-60% ⁽¹⁾ narrow strip 50-95% ⁽¹⁾		
	Contour farming	50% max ⁽¹⁾		
	Strip cropping	75% max ⁽¹⁾		
	Cover crops	40-60% ⁽¹⁾		
	Terrace	95-98% ⁽¹⁾		
	Grade stabilization	75-90% ⁽¹⁾		
	Water sediment control	40-60% ⁽¹⁾ 60-80% ⁽¹⁾		
	Filter strips (10-25 m width)	35-40% (general) ⁽²⁾ 70% (nutrients) ⁽¹⁾ 80-90% (feedlots) ⁽¹⁾	0.18-1.92/m ² ⁽²⁾	
	Nutrient Management			
	Livestock Management			
Stream bank	Exclusion	*		Reduce stream bank erosion, reduce the transport of animal waste and associated pollutants (nutrients, fecal coliform and total suspended solids) into adjacent waterways
	Rest-rotation	*		
	Mgmt + reveg	groundcover >30% ⁽¹⁾		
	Mgmt w/o reveg	groundcover >10% ⁽¹⁾		
	Fencing	*	\$2-\$2.50/ft ⁽¹⁾	
	Constructed wetlands	?	\$5,000 and up	
Stream bank	Non-structural			These practices stabilize stream banks and reduce soil and stream bank erosion.
	Revegetation			
	Trees	15-50%	\$1-\$2/ft for willows ⁽¹⁾	
	Brush	50-60%	0.18-1.92/m ² ⁽²⁾	
	Grass	up to 90% ⁽²⁾	\$55 and up/acre ⁽¹⁾ ; \$1.50-\$3.50/ft ⁽¹⁾	
	Snag removal and clearing	*	\$1/ft ⁽¹⁾	
	Structural			

	Flow regulation		Up to \$5,000 depend. on size, length	
	Drop structures	*		
	Rock Pools	*	up to \$20-placed rock	
	Wire structures		\$500/ea	
	Revetments			
	Conifer	** (1)	\$12/ft (3)	
	Rock	** (1)	\$200-\$400/ft	
	Deflectors			
	Single	75% (1)	\$500/ea	
	Irrigation management (offsite watering, pipelines)	25-75% (1)	\$400/trough + \$?/pump + \$2/ft for pipe (1)	
Open Channel	Meander Reconstruction	** (1)	\$50/ft (2)	Reduce stream bank erosion

		COST PER MGD			
			Construction (4)	Maintenance (4)	
Waste water	Hook into MWWTF				Reduce total phosphorus
	Land treatment option	80-90% (3)	\$980,000-1,200,000	\$44,000-64,000	
	Rapid infiltration (underdrained or not)	80-90% (3)	\$34,000-44,000	\$25,000-47,000	
	Overland flow	30-60% (3)			
	Activated sludge	>90% (3)	\$160,000-820,000	\$10,000-64,000	
	Alum	94% (3)	\$18,000-48,000	\$40,000-55,000	
	Ferric chloride	56-97% (3)	\$16,000-46,000	\$28,000-40,000	
	Lime clarification of raw waste water	75% (3)	\$21,000-47,000	\$20,000	
	Primary treatment				Reduce total suspended solids
	With mineral addition	60-75% (3)			
	Without mineral addition	40-70%			
	Secondary treatment				
	Trickling filter				
	With mineral addition	85-95% (3)			
	Without mineral addition	70-92%			
	Activated sludge				
	With mineral addition	85-95% (3)			
	Without mineral addition	85-95%			

- (1) Utah Little Bear Hydrologic Unit Plan 1992
- (2) Water Quality Investigations – Lower Bear River and Hyrum Reservoir; ERI 1991
- (3) Process Design Manual for Phosphorus Removal; 625/1-76-0019
- (4) Barker et al. 1989

Table 4-2. The potential percent reductions in phosphorus loads based upon an estimated level of effort.

SOURCE	ESTIMATED LEVEL OF EFFORT		
	LOW	MEDIUM	HIGH
Nonpoint	40%	50%	90%
Point	50%	75%	90%
Feedlots	50%	75%	90%

4.3.2 Load Reduction

The data used to calculate the effect of the three levels of effort on the removal of phosphorus mass from the Bear River within the four management reaches is shown in Table 3-19 through Table 3-22. Using the loads by source for each hydrologic time period, and the percent reductions by effort, load reductions expressed as kg TP/day were calculated and compared to the TMDL target load. The results are presented in Table 4-3, Table 4-4, and Table 4-5. Depending upon the management reach, attainment of the TMDL phosphorus mass targets will take a low to medium/high level of effort. The highest level of effort needed to meet the targets was in MR4 during runoff (75% reduction). The lowest levels (no remediation necessary) were in MR1 during base flows. System wide, less effort or remediation would be necessary for winter base flow, followed by summer base flow. Highest system wide effort would be needed to reduce phosphorus load during the runoff periods (56-57%). These data are summarized in Table 4-6. Although one can assume that common sources occur within each hydrologic period, the magnitude of the source may differ over time, and thus the impact of the remediation may influence the ultimate amount of mass removed.

Table 4-3. The estimated reduction in total phosphorus load that would be realized with a low level of effort. Shaded cells indicate where effort has resulted in meeting the TMDL target.

REACH	INPUT	TRIBS	POINT SRC	NPS	OUTPUT	TMDL	
						TARGET	EXCESS
LOWER BASIN RUNOFF							
MR1	169.2	0.6	0	-131.4	38.4	42	-3.6
MR2	51	2.4	0	45.6	99	61	38.0
MR3	52.8	4.8	0	73.8	131.4	95	36.4
MR4	65.4	49.8	1.5	163.2	279.9	117	162.9
UPPER BASIN RUNOFF							
MR1	283.8	52.2	0	-253.8	82.2	86	-3.8
MR2	87.6	22.2	0	156	265.8	124	141.8
MR3	81	25.2	0	45.6	151.8	111	40.8
MR4	64.2	99	1.5	37.2	201.9	138	63.9
SUMMER BASE FLOW							
MR1	31.2	3.6	0	-31.2	3.6	11	-7.4
MR2	176.4	4.8	0	14.4	195.6	107	88.6
MR3	75.6	4.2	0	17.4	97.2	90	7.2
MR4	48.6	21	1.5	48.6	119.7	112	7.7
WINTER BASE FLOW							
MR1	26.4	0	0	-19.2	7.2	20	-12.8
MR2	25.2	0	0	34.2	59.4	71	-11.6
MR3	16.2	0	0	21.6	37.8	56	-18.2
MR4	25.2	5.4	1.5	80.4	112.5	104	8.5

Table 4-4. The estimated reduction in total phosphorus load that would be realized with a medium level of effort. Shaded cells indicate where effort has resulted in meeting the TMDL target.

REACH	INPUT	TRIBS	POINT SRC	NPS	OUTPUT	TMDL	
						TARGET	EXCESS
LOWER BASIN RUNOFF							
MR1	141	0.5	0	-109.5	32	42	-10.0
MR2	42.5	2	0	38	82.5	61	21.5
MR3	44	4	0	61.5	109.5	95	14.5
MR4	54.5	41.5	0.75	136	232.75	117	115.8
UPPER BASIN RUNOFF							
MR1	236.5	43.5	0	-211.5	68.5	86	-17.5
MR2	73	18.5	0	130	221.5	124	97.5
MR3	67.5	21	0	38	126.5	111	15.5
MR4	53.5	82.5	0.75	31	167.75	138	29.8
SUMMER BASE FLOW							
MR1	26	3	0	-26	3	11	-8.0
MR2	147	4	0	12	163	107	56
MR3	63	3.5	0	14.5	81	90	-9.0
MR4	40.5	17.5	0.75	40.5	99.25	112	-12.8
WINTER BASE FLOW							
MR1	22	0	0	-16	6	20	-14.0
MR2	21	0	0	28.5	49.5	71	-21.5
MR3	13.5	0	0	18	31.5	56	-24.5
MR4	21	4.5	0.75	67	93.25	104	-10.8

Table 4-5. The estimated reduction in total phosphorus load that would be realized with a high level of effort. Shaded cells indicate where effort has resulted in meeting the TMDL target.

REACH	INPUT	TRIBS	POINT SRC	NPS	OUTPUT	TMDL	
						TARGET	EXCESS
LOWER BASIN RUNOFF							
MR1	28.2	0.1	0	-21.9	6.4	42	-35.6
MR2	8.5	0.4	0	7.6	16.5	61	-44.5
MR3	8.8	0.8	0	12.3	21.9	95	-73.1
MR4	10.9	8.3	0.3	27.2	46.7	117	-70.3
UPPER BASIN RUNOFF							
MR1	47.3	8.7	0	-42.3	13.7	86	-72.3
MR2	14.6	3.7	0	26	44.3	124	-79.7
MR3	13.5	4.2	0	7.6	25.3	111	-85.7
MR4	10.7	16.5	0.3	6.2	33.7	138	-104.3
SUMMER BASE FLOW							
MR1	5.2	0.6	0	-5.2	0.60	11	-10.4
MR2	29.4	0.8	0	2.4	32.6	107	-74.4
MR3	12.6	0.7	0	2.9	16.2	90	-73.8
MR4	8.1	3.5	0.3	8.1	20	112	-92.0
WINTER BASE FLOW							
MR1	4.4	0	0	-3.2	1.2	20	-18.8
MR2	4.2	0	0	5.7	9.9	71	-61.1
MR3	2.7	0	0	3.6	6.3	56	-49.7
MR4	4.2	0.9	0.3	13.4	18.8	104	-85.2

Table 4-6. A summary of estimated effort needed to attain the TMDL target mass in the management reaches of the Bear River. Values in the table reflect the remaining mass (kg/day) to be removed to attain compliance. Negative values indicate excess mass removal for that level of effort. The percent reduction needed column reflects the exact level of reduction necessary for compliance. Shaded cells indicate where effort has resulted in meeting the TMDL target.

REACH	LEVEL OF EFFORT			LEVEL NEEDED	% REDUCTION NEEDED
	LOW	MEDIUM	HIGH		
LOWER BASIN RUNOFF					
MR1	-3.6	-10	-35.6	L	34
MR2	38.0	21.5	-44.5	M-H	63
MR3	36.4	14.5	-73.1	M-H	57
MR4	162.9	115.8	-70.3	M-H	75
UPPER BASIN RUNOFF					
MR1	-3.8	-17.5	-72.3	L	37
MR2	141.8	97.5	-79.7	M-H	72
MR3	40.8	15.5	-85.7	M-H	56
MR4	63.9	29.8	-104.3	M-H	59
SUMMER BASE FLOW					
MR1	-7.4	-8	-10.4	L	0
MR2	88.6	56	-74.4	M-H	67
MR3	7.2	-9	-73.8	M	44
MR4	7.7	-12.8	-92	M	44
WINTER BASE FLOW					
MR1	-12.8	-14	-18.8	L	0
MR2	-11.6	-21.5	-61.1	L	28
MR3	-18.2	-24.5	-49.7	L	11
MR4	8.5	-10.8	-85.2	M	45

4.4 Responsible Parties

The implementation of a plan to improve water quality in the Bear River Basin will require the cooperation of many folk. These may include, but not be limited to, the following.

Federal Government – Natural Resources Conservation Service, U. S. Forest Service, Bureau of Land Management, U. S. Fish and Wildlife Service

State Government – Departments of Environmental Quality, Lands, Transportation, Fish and Game, and Agriculture, Soil Conservation Commission; Bear Lake, Caribou, Franklin, and Oneida Soil Conservation districts

County Government – Bear Lake, Caribou, Franklin, Oneida counties

Local Government – Cities of Montpelier, Soda Springs, Grace, Preston, Franklin

Quasi-Government – Bear Lake Regional Commission, Bear River Commission, Bear River Resource Conservation and Development, Bear River Tri-State Water Quality Committee

Companies – PacifiCorp

Irrigation Companies – West Cache Irrigation Company, Bear River Canal Company, Cub River Canal Company, Last Chance Canal Company

Fish Hatcheries – Clear Springs Food (Clear Springs Foods), Grace Fish Hatchery (Idaho Department of Fish and Game), Bear River Trout Farm and Black Canyon Trout Farms (George Kimball), Bosen Land and Livestock (Clair Bosen), Smith Creek Hatchery (John Lambregts, Edwin Smith), Ben Forsgren, and Wright’s Rainbows (Sherman Wright).

Grazing Associations – Samaria Grazing Association, Pleasantview Livestock and Grazing Association, Cottonwood Grazing Association, Cub River Stockmen's Association, Fish Haven Stockmen's Association, Gem Valley Stockmen's Association, Main Canyon Stockmen's Association, Paris-Liberty Cattle Association, Bloomington Cattle Association, Cherryville Cattle Association, Maple Canyon Cattle Association, Caribou Cattlemen’s Association, Bear Lake Cattlemen’s Association, Mink Creek Cattlemen’s Association

Numerous private individuals

4.4.1 Reasonable Assurance

EPA requires that TMDLs with a combination of point and nonpoint sources and with wasteload allocations dependent on nonpoint source controls, provide reasonable assurance that the nonpoint source controls will be implemented and effective in achieving the load allocation (EPA 1991). If reasonable assurance that nonpoint source reductions will be achieved is not provided, the entire pollutant load will be assigned to point sources. Nonpoint source reductions listed in the Bear River TMDL will be achieved through state authority within the Idaho Nonpoint Source Management Program.

Section 319 of the Federal Clean Water Act requires each state to submit to EPA a management plan for controlling pollution from nonpoint sources to waters of the state. The plan must: identify programs to achieve implementation of best management practices (BMPs); furnish a schedule containing annual milestones for utilization of



program implementation methods; provide certification by the attorney general of the state that adequate authorities exist to execute the plan for implementation of best management practices; and, include a listing of available funding sources for these programs. The current Idaho Nonpoint Source Management Plan has been approved by EPA (December 1999) as meeting the intent of section 319 of the Clean Water Act.

As described in the Idaho Nonpoint Source Management Plan, Idaho Water Quality Standards require that if monitoring indicates water quality standards are not met due to nonpoint source impacts, even with the use of current best management practices, the practices will be evaluated and modified as necessary by the appropriate agencies in accordance with provisions of the Administrative Procedure Act (IDAPA). If necessary, injunctive or other judicial relief may be initiated against the operator of a nonpoint source activity in accordance with authority of the Director of Environmental Quality provided in Section 39-108, Idaho Code (IDAPA 58.01.02.350). Idaho Water Quality Standards list designated agencies responsible for reviewing and revising nonpoint source BMPs based on water quality monitoring data generated through the state's water quality monitoring program. Designated agencies are: Department of Lands for timber harvest activities, oil and gas exploration and development, and mining activities; Soil Conservation Commission for grazing and agricultural activities; Transportation Department for public road construction; Department of Agriculture for aquaculture; and the Department of Environmental Quality for all other activities (Idaho Code 39-3602). Existing authorities and programs for assuring implementation of BMPs to control nonpoint sources of pollution in Idaho are as follows:

- Nonpoint Source 319 Grant Program
- State Agricultural Water Quality Program
- Wetlands Reserve Program
- Resource Conservation and Development
- Agricultural Pollution Abatement Plan
- Conservation Reserve Program
- Idaho Forest Practices Act
- Environmental Quality Improvement Program
- Stream Channel Protection Act
- Water Quality Certification for Dredge and Fill

The Idaho Water Quality Standards direct appointed advisory groups to recommend specific actions needed to control point and nonpoint sources affecting water quality limited water bodies. Upon approval of this TMDL by EPA Region 10, the existing Bear River Basin Advisory Group, with the assistance of appropriate local, state, tribal, and federal agencies, will begin formulating specific pollution control actions for achieving water quality targets listed in the Bear River Total Maximum Daily Load. The plan is scheduled to be completed within eighteen months of finalization and approval of the TMDL by EPA.

4.5 Monitoring Strategy

DEQ will monitor BMP implementation through annual reports submitted as part of any implementation program. Due to constraints of money, time, and personnel, DEQ does



not expect to directly monitor BMP effectiveness. The hope would be that the funding agency include monitoring as part of the project funding request. Tributary monitoring at the point the stream enters the mainstem would allow some determination of watershed BMP effectiveness.

DEQ is responsible for monitoring both mainstem and tributaries as to compliance with TMDL allocations and as to progress toward supporting beneficial uses. The Beneficial Use Reconnaissance Program monitoring will help determine support of beneficial uses for coldwater aquatic life, salmonid spawning, and contact recreation. Ambient water quality monitoring will be dependent on money, time, and personnel available to DEQ. Point sources will be monitored through their Discharge Monitoring Reports submitted to DEQ monthly.