HAYDEN LAKE
WATERSHED & LAKE MANAGEMENT
PLAN ADDENDUM

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February 2009

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1.0 INTRODUCTION

The Clean Lakes Coordinating Council developed a water quality management plan for Hayden Lake (PHD 1994). The plan identified phosphorous as the primary pollutant of concern to lake water quality. The plan set a total phosphorous goal for the lake at 7.0 micrograms per liter total phosphorous over a ten (10) year average. The plan used the data developed by Soltero et. al. (1986) and estimates of storm water contribution to partition the phosphorous loading to the lake (Table 1). The plan laid out the management actions necessary to protect the lake and the governmental agencies and organizations charged to take those actions. However, the plan did not specify specific projects that should be undertaken to correct phosphorous loading to the lake. Without specified projects, it is difficult for these entities to budget the funds necessary to correct problems or for concerned citizens to advocate with the appropriate governmental agencies to take action and legislatures to appropriate funds.

Table 1: Total phosphorous budget of Hayden Lake (Saltero et. al. 1986; PHD 1994)

Phosphorous Source	**Phosphorous Load (kg/yr)**	**Percentage**
Hayden Creek	1,200	33%
Mokins Creek	240	7%
Other Tributaries	250	7%
Atmospheric Fallout	630	17%
Residential Storm Water	1,179	32%
Shoreline Septic Tanks	120	3%
Total	3,610	99%

Hayden Lake was listed by the State of Idaho in 1998 under Section 303(d) of the Clean Water Act as a water body with threatened water quality. The pollutant identified as threatening water quality is phosphorous. In compliance with the Clean Water Act, the State of Idaho developed a total maximum daily load (TMDL) for phosphorous. The TMDL used the management plan goal of 7.0 micrograms per liter total phosphorous over a ten (10) year average. Based on the loading diagrams developed for the management plan, an allocation of phosphorous to the various phosphorous sources was developed, and the amount of phosphorous reduction from those sources was calculated. A total phosphorous reduction of 709 kilograms phosphorous per year is required to meet the goal of the management plan and total maximum daily load. The phosphorous load allocation and the adjusted load reduction required by the TMDL are provided in Table 2. Phosphorous loading has been adjusted to compensate for atmospheric phosphorous deposition.

The allocations can be grouped based on the activities that will potentially reduce phosphorous sources to the lake. The phosphorous loads of the tributary streams (Hayden, Mokins and other tributaries) will be affected by activities and projects that address forest and highway district roads, forest use and agriculture sources. Phosphorous loads attributed to storm water will be addressed by improvements in roads and driveways that serve residential areas and by treatment of that storm water inevitably generated from the hard surfaces of residential areas. Contributions from shoreline septic systems are a smaller contribution, but those failing systems identified near the lake must be upgraded.

Table 2: Total Phosphorous allocations and reductions required for Hayden Lake (DEQ 2001).

Phosphorous Source	Adjusted percentage after Atmospheric Fallout Removed	Allocated Phosphorous Load (kilograms/year)	Total Phosphorous Load Reduction required (kilograms/year)
Atmospheric Fallout	-	630	0
Hayden Creek	36.4%	826	257
Mokins Creek	10.4%	236	74
Other Tributaries	10.4%	236	74
Residential Storm Water	35.4%	805	251
Shoreline Septic Systems	7.4%	168	53
Total	100%	2,901	709

The 1994 lake management plan and the TMDL do not recognize the potential phosphorous loading by emergent macrophytes. The luxuriant growth of these plants and their subsequent decay has the potential to liberate phosphorous to the water column. The establishment of extensive beds of Eurasian milfoil in Hayden Lake makes it necessary to assess the potential for phosphorous loading from this source.

The TMDL sets the phosphorous loading goal reductions necessary to maintain the high water quality of Hayden Lake. The management plan developed in 1994 charts the general actions to be taken and designates the responsible agencies. However, it does not designate specific projects that can be undertaken to reduce phosphorous loading nor does it address more recent threats. Without specific projects, it is difficult for agencies to budget funds to take corrective action and difficult for the concerned public to apply the necessary pressure to agencies and budget decision makers that results in fund allocation to improvements. This addendum to the Hayden Lake Management Plan designates that set of projects and some additional assessment projects. As work is completed and new challenges to the lake water quality appear, the addendum will require revision to encompass new projects and re-order priorities.

2.0 IDENTIFICATION OF PARTICIPANT AGENCIES AND DISTRICTS

Primary Participants

The U. S. Forest Service manages well in excess of 63% of the watershed as part of the Idaho Panhandle National Forests. The Forest Service has responsibilities to address sediment impacts to the waters and biological resources under the Clean Water Act (CWA). Sediment contains from 400 to 1,000 mg phosphorous per kilogram (Strawn, 2006). Most roads and trails in the watershed are located on Forest Service administered lands. Where these roads and trails create sediment sources, the sources should be abated.

Minor levels of agriculture are practiced in Hayden Lake's watershed. Agriculture consists primarily of cattle grazing in the Lancaster and Nilsen Creek watersheds. Some hay production and grazing occurs in the Bervin Bay Creek watershed north of Lancaster Road. Horse ranchettes are found in a few areas of the watershed, especially north of Lancaster Road in the Bervin Bay Creek watershed, northwest of the lake's northern arm and along lower Hayden Creek. Damage to stream banks from horses kept in confined areas can be substantial. The Soil Conservation Commission of the Idaho Department of Agriculture is responsible for addressing these impacts.

The local Soil Conservation District and the federal Natural Resources Conservation Service provide support to the Commission.

The Lakes Highway District manages most of the paved roads around Hayden Lake and in the Hayden Lake Watershed. The City of Hayden Lake may have responsibility for some roads within the city. The roads are a source of storm water and their drainage systems often function as conduits from paved surfaces and roofs located on private land uphill from the road. The first two and half miles of Lower and Upper East Hayden Lake roads collect and conduit storm water from the densely developed south shore area. In some cases, the road rights of ways at stream or drainage crossings are sediment sources. More often storm water from private property drains to the roads and is focused by drainage ways into flows that can cause erosion and sedimentation that is carried by streams to the lake.

The Hayden Lake Recreational Water and Sewer District (HLRW&SD) is responsible for construction and management of sewer services within its boundaries that surround Hayden Lake. Currently the west portion of the lake has a sewer system. The HLRWSD operations are overseen by the Idaho Department of Environmental Quality (IDEQ) and Panhandle Health District (PHD). The HLRWSD cooperates with the above agencies as well as the U.S. Forest Service, the Idaho Department of lands and Kootenai County to protect and improve the water quality around Hayden Lake.

Regulatory Agencies and Departments:

Some agencies and Departments have a role in the protection of Hayden Lake, but do not have "project" scale work specifically designed to reduce the existing sediment and phosphorous loading to Hayden Lake. These agencies and departments have the authority to regulate activities undertaken by private or public entities in the watershed, but typically do not take on these activities themselves. The lake plan addendum addresses existing phosphorous loading to Hayden Lake. Given the cyclical and sometimes episodic nature of projects development activities proposed and implemented in the watershed, it is difficult to estimate the amount of phosphorous actually loaded to the lake. In any case the regulation by these agencies and departments serves to reduce or eliminate additional loading of phosphorous to the lake, but does not address the current existing loading. It is critical that these agencies and department scrupulously implement their authorities to protect the lake from additional phosphorous loading, while the projects proposed by the addendum reduce the existing load.

Kootenai County's planning and Building Department implements the county site disturbance ordinance. The ordinance essentially requires that all storm water from a land disturbing construction activity be sequestered and treated on site with a number of suggested best management practices. The ordinance further requires a 25 feet setback buffer zone between the high water mark of the lake and any construction. Both measures are designed to protect the lake from additional sediment, which has phosphorous bound to it. The Environmental Protection Agency (EPA) has a storm water management program required on disturbances greater than one acre. A permit is obtained through an Internet site and a storm water quality management plan must be filed to obtain the permit. EPA can follow up on any permit to assure the plan is implemented, but rarely does unless a complaint is received. The Idaho Department of Lands (IDL) permits any activity directly implemented in or on the bed or banks of Hayden Lake. The bed and banks are held in trust by the state whose agent is IDL in their management. IDL is responsible through lake encroachment permits that increased sedimentation does not occur as a result of lake encroachment activities. Best management practices are often prescribed to abate

erosion and sedimentation. Often activities permitted by IDL in the lake bed are built up into the 25 feet buffer zone required by county ordinance. Some of these cases have created situations where sedimentation has occurred. Better coordination between IDL and the county Planning and Building Department is necessary to limit these cases. Panhandle Health District permits on-site wastewater treatment systems in other areas in the watershed, primarily around the lake. The Department of Environmental Quality is responsible for the sufficiency and proper management of the community wastewater system at Mivoden. However, the HLRW&SD is responsible for protection of the lake water quality

The Department of Environmental Quality is ultimately responsible to determine the water quality status of Hayden Lake through water quality standards certification and monitoring. Permitted activities with a potential to affect water quality must be certified by DEQ that water quality standards will not be violated. DEQ must monitor the lake on some schedule to assess whether the water quality of the lake is improving, remaining constant or deteriorating.

3.0 PUBLIC INVOLVEMENT

Hayden Lake currently has a diverse group of interest groups, but few are well organized. Hayden Lake has numerous lakeshore owners. Hayden Lake Watershed landowners beyond the lakeshore are an equal or more numerous interest groups. The lake receives heavy recreational use that includes fishing, power boating, water skiing and swimming. None of these groups has fully coalesced into functioning interest groups, yet concern for the lake's water quality, the invasion of Eurasian water milfoil, debris buildup on lakeshores, and development around the lake and the form its takes, are issues that concern each of these groups. Concern for water quality during the 1980's and 1990's led to the development of the Hayden Lake Water Quality Management Plan. The perceived lack of progress on water quality and development issues has led to the most organized group supporting the protection of the lake. Interests concerned about these issues founded the Hayden Lake Watershed Association in 2005. The group is established as a group of citizens interested in the quality of the lake and dedicated to advocating to governing agencies and districts to address the lake's problems. The development of this addendum to the Hayden Lake Management Plan was undertaken by the Association to complete lake protection work that the state has not made a priority and to develop a list of specific and prioritized projects that the Association can lobby to have implemented to improve water quality.

4.0 PROPOSED MANAGEMENT ACTIONS

The proposed projects address three components of phosphorous loading to the lake. These are projects that will 1) reduce phosphorous loading to the tributary streams of the watershed, 2) projects that will reduce phosphorous loads from storm water, and 3) projects that will address phosphorous loading from septic effluent. A fourth group of projects complete the assessments necessary before action can be taken on defective on-site wastewater systems and address the growing Eurasian milfoil problem.

4.1 Projects Affecting Tributary Loading.

4.1.1 Forest Service Projects

Public land managed by the Forest Service makes up 63 % of the Hayden Lake watershed. Hayden, Mokins, Yellowbanks, Jim, Harrison, Windy Creeks and many smaller streams drain watersheds primarily on Forest Service managed land. These streams transport sediment and the typically attached plant growth nutrient, phosphorous, to the lake. The largest tributaries to the

lake are also the largest sources of phosphorous (Saltero et. al. 1986). Actions taken to abate erosion, the source of sediment, from federally managed lands will help abate sediment and phosphorous loading to Hayden Lake. The projects the Forest Service plans to implement are listed in Table 3. These actions are drawn from watershed inventories developed by the Forest Service.

Table 3: Forest road and floodplain restoration projects, Hayden Lake Watershed.

Project	Forest Road Number	Recommended Action	Total Road Miles	Estimated Cost	Estimated Phosphorous Reduction (kg/yr)	Priority
Culvert Replacement Ohio Match Road	FR 206	Remove and replace 7 log culverts on grade	0.33	$140,000	332.8	*1*
North Fork Hayden Creek Road	FR625	Decommission [1]	6	$180,000	10.3	*3*
Roads in Headwaters of Jim and Yellowbanks Creeks	FR??	Decommission [1]	10	$20,000	5.1	*4*
Stump - Shamrock Meadow Restoration	Not applicable	Stream channel reconstruction, fencing and riparian planting	-	$64,000	6.2	*1*
Lancaster Ck Culvert Restoration	FR 206	Culvert improvement to remove water drop	Negligible	$10,000	3.1	*7*
EF Hayden Creek Rd encroachments	FR 437	Full bench around floodplain encroachments	0.5	$100,000	3.3	*6*
EF Hayden Creek crossings	Not applicable	Armor banks and stream bed	Negligible	$10,000	3.4	*5*
Upgrade FR 437	FR 437	Re-grade, apply gravel base, replace culverts and line inside ditches	2.0	$100,000	37.8	*2*

[1] Activities stabilizing and restoring roads to a more natural state. These activities include removal of stream crossings and full re-contour of the road prism, introduction of woody debris and re-vegetation as needed.

4.1.2 Agriculture Projects

Limited agriculture is practiced in the Hayden Lake Watershed. Primarily agricultural pursuits consist of grazing and some hay crop production. Another agriculture-allied impact is ranchettes. Considerable impact can occur on small parcels when livestock, particularly horses, are pastured especially along streams. Commercial grazing occurs on Lancaster and Nilsen Creeks. Hay crop production and some grazing occur on the un-named stream that eventually enters Bervin Bay. Ranchette impacts occur on lower Hayden Creek and the un-named streams entering Hayden Lake's northern arm from the northwest. These impacts yield sediment and the phosphorous attached to it to Hayden Lake. The projects the Soil Conservation Commission and its partners the Kootenai-Shoshone Soil Conservation District and the Natural Resource Conservation Service plans to implement are listed in Table 4. These actions are drawn from surveys completed by the Soil Conservation Commission and Kootenai-Shoshone Soil Conservation District.

Table 4: Agriculture stabilization projects, Hayden Lake Watershed

Watershed	Recommended Action	Fencing or planting (Feet/acre)	Facility Number	Estimated Cost	Estimated Phosphorous Reduction (kg/yr)	Priority
Lancaster Creek	Riparian exclusion fencing	6,000		$12,000	4.6	*4*
	Watering facility	-	4	$12,000		
	Heavy use protection area	-	3	$7,500		
	Riparian vegetation planting	1,400	-	$7,000		
Nilsen Creek	Riparian exclusion fencing	4,600	-	$9,200	10.8	*1*
	Perimeter exclusion fencing	7,500	-	$15,000		
	Watering facility	-	2	$6,000		
	Heavy use protection area	-	2	$5,000		
	Riparian vegetation planting	1,600	-	$8,000		
Stump Creek	Riparian exclusion fencing	1,600	-	$3,200	0.8	*5*
	Watering facility	-	2	$6,000		
	Heavy use protection area	-	1	$2,500		
	Riparian forest buffer	1	-	$1,250		
Bervin Creek	Riparian exclusion fencing	400	-	$800	1.6*	*6*
	Sediment Basin	-	1	$6,000	7.3	*3*
Hayden Lake North Arm	Nutrient Management	10	-	$2,500	8.3*	*2*

* based on 5% delivery to surface water.

4.1.3 Public Road Projects

The Lakes Highway District manages public roads in the Hayden Lake watershed. The District also manages runoff from private driveways and roads as this runoff may adversely affect the public roads. Public roads and more specifically, the drainage ways that serve these roads carry storm water generated from the surfaces of the public and private roads and other impervious surfaces. Storm water drainage can generate sediment and its associated phosphorous load in two ways. Storm water can cause active soil erosion that creates sediment. Storm water carries its own compliment of phosphorous containing matter washed from impervious surfaces where it has deposited. This section deals with highway district projects designed to abate erosion and sediment production, while the Storm Water Projects Section below will address the phosphorous generated from impervious surfaces.

The Lakes Highway District has undertaken several projects to abate erosion associated with roads. Most public roads in the watershed are paved in recent years to abate the road surface erosion associated with dirt and gravel roads. Nilsen Creek Road is the only remaining unpaved public roads. Many roads have been reconstructed to lessen soil erosion, while grass cover has been established on road cut slopes. New sections of the East Hayden Lake Road from Half Mile Lane to the Yellowbanks Creek Bridge still exhibits slumping of cut slopes and insufficient re-vegetation in some locations. This situation requires active maintenance until these cut slopes fully re-vegetate and slumps cease. The projects listed in Table 5 are designed to further limit erosion from public roads and private roads and drives that yield water to the drainage ways associated with public roads.

Table 5: Lakes Highway District projects designed to abate erosion.

Project	Description	Cost	Phosphorous Reduction (kg/ yr)	Priority
East Hayden Lake Maintenance	Complete annual road maintenance that includes stabilization and seeding of any slumps into ditches and removal of resulting or accumulated sediment from drainage ditches. Target removal and stabilization at flat site of at minimum 40 cubic yards of ditch sediment per year.	$50,000	39.0	*1*
Lancaster Road Curve Improvements	During curve improvements work with adjacent landowners to build two detention basins to hold run off and release at a slower rate to reduce scour.	$16,000	25.3	*2*
Pave Nilsen Road	Pave Nilson Road from its intersection with Hayden Lake Road to the private property boundary.	$105,000	3.9	*3*
Survey drainage of private drainage	Survey drainage from private roadways onto public roads inventorying drainages that cause erosion	$25,000	-	*3*

4.2 Storm Water Projects

Storm water is estimated to load 32% or 1,170 kilograms phosphorous per year to Hayden Lake. Storm water carries sediment to the lake from those surfaces that do not permit the infiltration of

precipitation and snowmelt. Forested areas infiltrate nearly 100% of the precipitation and snowmelt that reaches the forest floor. Yards and grassy areas on moderate slopes infiltrate water to varying extent with sandy soils on moderate slopes superior to tighter silt and clay soils on steeper slopes. Hard surfaces such as pavement and roofs shed storm water that, if not slowed and infiltrated, finds its way into ditches and small streams entering the lake. Storm water must be managed from new construction projects often denuded of vegetation and from existing non-infiltrating surfaces (pavement and roofs) in the watershed. The county site disturbance ordinance requires that sufficient best management practices be installed to capture and treat storm water migration from properties under development. The Hayden Lake Recreational Water & Sewer District has directed its' employees to observe construction sites and notify the county if the required practices are not installed or effective in abating storm water migration from the property. The District has also directed employees to work with the Hayden Lake Watershed Association Lake Manager to coordinate activities of mutual interest. The projects listed here are designed to address storm water capture and treatment from storm water from existing pavement and roofs that finds its way into Hayden Lake.

4.2.1 Public Road Improvement Projects:

Projects to improve public roads to limit erosion and/ or abate storm water runoff have been identified. Most of these projects are located in the upland areas to the north west of the lake. In this area more gentle topography allows the possibility to capture storm water in impoundments and allow sediment settling. Projects that capture storm water and settle sediments are identical to those that will address road impacts and are listed in Table 5.

4.2.2 Storm Water Capture and Treatment:

The capture of storm water and treatment from necessary non-infiltrating surfaces such as roads, driveways and roofs has been successfully practiced on gentle topography. The south shore and other areas around Hayden Lake have very steep topography. Due to its dense development and steep topography, the south shore has been estimated to contribute sixty percent of the phosphorous load attributed to storm water to Hayden Lake. Methods have been suggested to capture and treat at least some of the storm water from steep developed areas. These methods require pilot testing and if successful a broader scale application. Storm water capture and treatment projects are provided in Table 6. These projects would initially be implemented on the south shore that is known to yield the highest volume of storm water to Hayden Lake.

Table 6: Storm Water Capture and Treatment Projects

Watershed	**Recommended Action**	**Stormwater collection area treated (acre)**	**Estimated Cost**	**Projected Sediment Removal (kg/yr)**	**Projected phosphorous removal (kg/yr)**	**Priority**
South Shore	Pilot test two storm water retention and treatment units	2	$60,000	616-1,232	1 – 2.6	*1*
South Shore	If effective install 20 storm water retention and treatment units	20	$600,000	6,616-12,320	10 - 26	*2*

4.3 Wastewater Treatment Projects

Shoreline septic systems were estimated to contribute a minor part (3%) of the phosphorous load to Hayden Lake. The collection and treatment of wastewater at a site remote from the lake by the Hayden Lake Recreational Water & Sewer District (HLRWSD) has addressed wastewater in the highly developed areas bordering the lake. However, septic systems are used to treat wastewater along the shore of the lake where the sewage collection and treatment service is not provided. The HLRWSD has not extended its waste collection further into the watershed or along the shore of the lake. The HLRWSD recognizes that installation of sewage collectors may reduce the minor septic effluent discharge to the lake, but the increased area development can increase storm water discharge and its phosphorous loading. The result would be a net loading of phosphorous to the lake. The HLRWSD should concentrate its efforts of finding and hooking up to the sewer system those properties in its current service area that have failing septic systems. The effectiveness of septic systems on part of the lake that do not have sewers, especially the bay areas, is currently being assessed by the Panhandle Health District working under a contract with the HLRWSD. Should defective septic systems be found, the HLRWSD should find localized on-site solutions to solving these problems. The sewage treatment system located at the Mivoden Camp is being assessed and appears to require upgrade. The HLRWSD should assure that PHD and DEQ adequately address wastewater management issues on that portion of the lake without sewers, especially with the Mivoden System. A list of necessary wastewater treatment projects is provided in Table 7.

Table 7: Wastewater Assessment and Treatment Projects

Location	Recommended Action	Estimated Cost	Estimated phosphorous reduction (kg/yr)	Priority
HLRWSD Service Area	In cooperation with PHD identify and hook up failing on-site wastewater treatment systems	$50,000	6	*3*
Non-serviced shoreline with emphasis on bays	In cooperation with PHD and CVMP identify and create local solutions for failing on-site wastewater treatment systems	$25,000	35.9	*2*
Camp Mivoden	In cooperation with DEQ assure that the Camp Mivoden community wastewater treatment system is upgraded to non-phosphorous contributing land application system	$500,000	137.6	*1*

4.4 Emergent Aquatic Vegetation Management

Emergent aquatic vegetation is a natural component of the lake. It can remobilize phosphorous from the lakebed sediments into the water column. Emergent aquatic vegetation was not addressed in the Hayden Lake Management Plan, primarily because the plants were native to the lake and their productivity was normal. In the intervening years, Eurasian milfoil has been introduced and established as an emergent aquatic species. The growth of Eurasian milfoil has become a concern for the fowling of boat propellers and swimming areas, however, it has the

potential to shift the phosphorous cycling in the lake as a result of its luxuriant growth followed by die back and decay. State supported estimates of potential phosphorous cycling are underway for the southern part of Coeur d'Alene Lake by the Coeur d'Alene Tribe. These data should be applicable to Hayden Lake. Eurasian milfoil may become an important factor in the phosphorous concentration of the lake water and the water quality of the lake. A better understanding of the role of Eurasian milfoil in the phosphorous cycling of the lake and its strict management to retard its growth is required. Table 8 outlines the steps required to address the threat of Eurasian milfoil. Its management will require the efforts of the Kootenai County Noxious Weed Department in cooperation with research efforts by the University Idaho.

Table 8: Emergent Vegetation Assessment and Management Projects

Project	Information/ action Required	Estimated Cost	Estimated phosphorous reduction (kg/yr)	Priority
Assessment of Milfoil phosphorous cycling	Quantify the amount of phosphorous placed in the water column as a result of the milfoil vegetation cycle	$2,000	Not applicable	*1*
Assessment methods to control or eradicate Eurasian milfoil	Develop best available and practical techniques to control and/or eradicate milfoil	$2,000	Not applicable	*1*
Control milfoil growth in critical areas	Implement additional measures to control Eurasian milfoil	$50,000	To be determined based on assessments	*2*

5.0 PHOSPHOROUS LOADING BALANCE

Attainment of the water quality goal of 7.0 microgram phosphorous per liter requires a phosphorous load reduction of 709 kilograms per year (Table 2). The projects outlined above are estimated to reduce the phosphorous loading by 711.6 kilograms per year (Table 9).

Table 9: Phosphorous loading reduction requirement to meet management plan goal and phosphorous load reduction estimated from designated projects.

Phosphorous Source	Phosphorous Source Reduction Projects	Total Phosphorous Load Reduction required (kilograms/year)	Total Phosphorous Load Reduction Estimated for Projects (kilograms/year)
Hayden Creek & Mokins Creek	Forest Service Projects	331	401.9
Nilsen Creek & Other Tributaries	Agriculture Projects	74	33.4
Residential Storm Water	Public Road Projects	251	96.8
Shoreline Septic Systems	Hayden Lake Recreational Water District, DEQ & PHD Projects	53	179.5
Total	**-**	**709**	**711.6**

The balance is achieved by some loading sectors contributing more than others. The Forest Service projects contribute 70.9 kilograms phosphorous per year more than the estimated reduction required of Forest Service lands. Wastewater treatment improvements contribute 126.5 kilograms phosphorous per year more than is required of these projects. These excess contributions occur as a result of two projects. The culvert replacements on the Ohio Match Grade will result in a major phosphorous reduction as will the conversion of the Mivoden wastewater treatment system to a land application system. These two projects compensate for phosphorous reduction shortfalls in agricultural and storm water projects. Agricultural practices are sparse in the watershed. Significant reduction cannot be expected from this source. Storm water treatment systems are currently in the developmental phase. As these develop in sophistication over the next five-year horizon, additional larger reductions might be possible from projects addressing this problem. In the interim the large Ohio Match and Mivoden projects that are necessary fill the shortfall for the current five-year period.

6.0 IMPLEMENTATION SCHEDULE

Implementation of the projects listed in Section 4.0 is critical to the maintenance of Hayden Lake's water quality. The previous management plan was largely not implemented, because specific projects were not assigned to specific agencies and districts. This addendum to the plan seeks to remedy the specificity issue. Additionally the implementation of lake management plans fails due to the lack of political pressure on those budgeting funds in the legislative and executive branches of government. It will be the responsibility of the Hayden Lake Watershed Association (HLWA) and others to develop the political pressure that will assure that funds are dedicated to lake plan implementation.

The plan goal is for each responsible agency or board to implement at least one number 1 priority project for which it is responsible within two years of the adoption of the plan. The remaining projects that have quantified phosphorous reductions should be implemented within five years of the adoption of the plan. The agencies and districts will be encouraged to address as many projects as their budgets will allow. During the same five-year time frame, the assessment necessary and designated in the tables to direct management and indicate additional specific phosphorous load reducing projects should be completed by the designated agencies and districts. At the termination of the five-year implementation schedule, the plan addendum will be revised to designate and set priorities for specific phosphorous load reducing projects.

7.0 HAYDEN LAKE MONITORING

Hayden Lake's water quality should be monitored during the implementation of the management plan in accordance with the current monitoring plan. Monitoring will assess 1) the mid-lake, Bervin Bay and Northern Arm stations, 2) transects of both chlorophyll fluorescence and turbidity during late-summer and spring runoff, respectively, and 3) phosphorous loading from the principle tributary Hayden Creek. Efforts will be made to improve the phosphorous loading data by attempting to measure storm water runoff, especially from the south shore area and possibly from additional tributaries. Monitoring of the effectiveness of storm water treatment systems will be implemented. The HLWA cooperating with other Hayden Lake interest groups will find support for these monitoring efforts.

Accounting will be made of the estimated phosphorous reduction from fully implemented projects. These data will help satisfy the mandated total maximum daily load phosphorous reductions. In addition, these data will be compared to all lake and tributary monitoring data to

better estimate the actual in lake phosphorous reductions achieved. The collected data will be used to revise the management plan addendum five years after its implementation.

8.0 REFERENCES

DEQ, 2001. Total Maximum Daily Loads for the Water Quality Limited Water Bodies Located on or Draining to the Rathdrum Prairie (17010305) Idaho Department of Environmental Quality, 2110 Ironwood Parkway, Coeur d'Alene ID. 6p.

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Soltero, R.A., K.R. Merrill, M.R. Cather and L.M. Appel, 1986. Water quality assessment of Hayden Lake, Idaho. Department of Biology, Eastern Washington University, Cheney, WA 99004. 92p.

Strawn, D. 2006. Personal Communication from Dr. Daniel Strawn, Soil Scientist, University of Idaho that silt-loam soils typical of Hayden Lake's south shore have phosphorous content in the range of 1 g/kg

APPENDICES

Appendix A: Forest Project Sediment Modeling

Project	Road encroach (ft)	Road Crossings	**Potential Fill failure**	**Misc sediment**
Ohio Match Culvert Replace	0	0	8	0
NF Hayden Road Decom.	1,436	7	0	0
Yellowbanks-Jim Road Decom.	0	16	0	0
Stump Meadows Restoration			0	1.8
Shamrock Meadows Restoration			0	1.8
Lancaster Ck Culvert Replace.			0	1.8
EF Hayden Ck Rd Encroach.	592	0	0	0
EF Hayden Ck Xing Armor			0	2
Upgrade Forest Road 437		5	0	38.8

Assumptions

Encroachment sediment	49.9	t/yr	sediment model
Crossing sediment (fine)	0.378	t/yr	sediment model
Tons per potental failure*	2100	t/yr	see below

* Failure 50 feet across by 30 feet deep by 30 feet through = 1,667 cubic yards at 1.26 t/yd^3

Partition of fines and coarse 35%-65%

t/yd^3		P / ton	
1	yd^3	849	mgP/kg
46656	in^3/yd^3	0.001	kg/g
16.39	cc/in^3	0.001	g/mg
1.5	cc/g	2.2	lb/kg
454	g/lb	2000	lb/t
2000	lb/t	3.74	kg P/t
1.26	t/yd^3		

Model Outputs	Encroachment (t/yr)	Crossings (t/yr)	**Failures (t/yr)**	**Total (t/yr)**	**Delivered (t/yr)**	**P Load (kg/yr)**
Ohio Match Culvert Replace	0	0	392.0	392.0	196.0	332.8
NF Hayden Road Decom.	4.7	2.6	0	7.4	6.1	10.3
Yellowbanks-Jim Road Decom.	0	6.0	0	6.0	3.0	5.1
Stump Meadows Restoration	0	0	0	1.8	1.8	3.1
Shamrock Meadows Restoration	0	0	0	1.8	1.8	3.1
Lancaster Ck Culvert Replace.	0	0	0	1.8	1.8	3.1
EF Hayden Ck Rd Encroach.	2.0	0	0	2.0	2.0	3.3
EF Hayden Ck Xing Armor	0	0	0	2.0	2.0	3.4
Upgrade Forest Road 437	0	1.9	0	40.7	22.2	37.7
				455.5	236.7	401.9

Appendix B: Public Roads P Models

East Hayden Lake Rd

40	yd^3		101061 lb	2.2 lb/kg	45937 kg	0.849 g P/kg	39000 gP	1000 g/kg	39.0 kg P
	46656 in^3/yd^3	16.39 cc/in^3	1.5 g/cc	454 g/lb		2526.515 lb/yd^3			

Lancaster Road Settling Ponds

	WS Size acres	Exp. Coeff. t/ac/yr	WS Cont. t/yr	Rd. Cont. t/yr	Total t/yr	P kg/yr		3.74	lb P/t
Bervin 1	56	0.04	2.24	10	8.0	13.5			
Cramps	18	0.04	0.72	10	7.0	11.8			
Bervin 2 (ag)	166	0.04	6.64	0	4.3	7.3			

Nielsen Rd.

name	**county/pri**	**length (mi)**	**width (ft)**	**grade (%)**	**% gravel**	**slope lgth (ft)**	**cut/fill**	**base mat.**	**soil text**
Nilsen Rd.	county	0.54	20	2% 1%-2% (0.40) 3%-4% (0.14)	10	>500	50/50	granetic native	sand

	cut slope	**live water**	**t/ac/yr**	**acres**	**t/y**	**t del/yr**	**kg P/yr**
	covered/stable 60%	<100' except at bottom 10'	7.5 based on Heine &Hull	1.31	9.8	3.4	5.8

Appendix C: Wastewater Models
Mivoden

	Elffluent P							
	47,120	3.79	0.016	0.001	365		1042.9	
	g/d	L/g	g P/L	g/Kg	d/yr		kg P/yr	
	Groundwater							
	0.5	32	43,560	7.48			5213261	
	ft/yr	ac	ft^2/ac	gal/ft^3			gal/yr	
							absorb	Model Load
	17198800		0.767390387		0.01228	0.2	80%	55.0
	gal/d		dilution factor		g P/L	0.3	70%	82.6
					diluted	40%	60%	110.1
					effluent	0.5	50%	137.6
						0.6	40%	165.1
						0.7	30%	192.6

Sewer Boundary Spring Failing Septics

						absorb		
	Elffluent P					50%		
5	108	3.79	0.016	0.001	365	0.5	12.0	6.0
	g/d	L/g	g P/L	g/Kg	d/yr		kg P/yr	kg P/yr

Back bay failing septics

	Effluent P						
15	108	3.79	0.016	0.001	365	35.9	
	g/d	L/g	g P/L	g/Kg	d/yr	kg P/yr	

Appendix D: Letter of Support

HAYDEN LAKE RECREATIONAL WATER AND SEWER DISTRICT

9393 Strahorn Rd
Hayden Lake, ID 83835

February 17, 2009

Mr. Todd Walker, Lake Manager
Hayden Lake Watershed Association
c/o Hayden Lake City Hall
Hayden Lake, ID 83835

Dear Todd: Re: Draft Hayden Lake Watershed Management Plan Addendum, January 2009

The Board of Directors, Hayden Lake Recreational Water and Sewer District appreciates the opportunity to be involved in the development of the Draft Hayden Lake Watershed Management Plan Addendum, January 2009. You have incorporated our comments in the most recent version.

We recommend that the document be forwarded for approval by the reviewing agency.

Sincerely,

/s/ Gerry House

Gerry House, Chairman, Board of Directors
Hayden Lake Recreational Water and Sewer District

United States Department of Agriculture **Forest Service** **Idaho Panhandle National Forests**

Coeur d'Alene River Ranger District

P.O. Box 159
Smelterville, ID 83868

2502 East Sherman Avenue
Coeur d'Alene, ID 83814

File Code: 3500
Date: April 30, 2008

Hayden Lake Watershed Association
Attn: Geoff Harvey/Todd Walker
P.O. Box 3583
Hayden Lake, ID 83835

Dear Sirs,

The Coeur d'Alene River Ranger District has reviewed the "Draft Hayden Lake Watershed & Lake Management Plan Addendum March, 2007". We have also met with members of your Organization.

The projects listed on Page 6 (Table 3) appear reasonable and would contribute toward improved water quality. Obviously our ability to plan and implement them is a function of Forest watershed improvement priorities and appropriated funding or other partnership support. This plan will certainly help elevate the visibility of these opportunities.

In addition, most of the projects will require us to conduct necessary documentation for the National Environmental Policy Act, the Endangered Species Act and all other applicable Laws and Policies.

In summary, we look forward to working with the Hayden Lake Watershed Association in maintaining and/or improving water quality in tributaries managed by the United States Forest Service and ultimately in Hayden Lake.

If you have any questions, please feel free to call Edward Lider at (208) 769-3030.

Sincerely,

Randy Swick

RANDALL G. SWICK
District Ranger

Lakes Highway District
Mailing: P.O. Box 460 • Hayden, Idaho 83835
11341 N. Ramsey Road • Hayden, Idaho 83835
E-mail: info@lakeshwy.com

(208) 772-7527
Fax (208) 772-7417

November 20, 2008

David Cooper
Hayden Lake Watershed Association
PO Box 3583
Hayden, Idaho 83835

RE: HAYDEN LAKE WATERSHED AND MANAGEMENT PLAN

Dear David:

At the regular scheduled Board Meeting of the Lakes Highway District held on November 17, 2008, the District Commissioners reviewed the above referenced proposal. The Board supports the management plan and is willing to participate in the plan. However, the Highway District has no money in the budget to reconstruct and pave Nilson Road as stated in Table 5, Section 4.1.3 Public Roads of the Draft Hayden Lake Watershed & Lake Management Plan Addendum, May 2008. Other possibilities for reconstruction of Nilson Road may include utilizing outside funding sources, working with property owners to acquire the necessary right-of-way for detention ponds to collect roadway and field drainage and roadway sloping. Lakes Highway District and the Hayden Lake Watershed Association may need to work together in coordinating this project.

If you should have any questions, please don't hesitate to give me a call at (208)772-7527.

Sincerely,

Joseph H Wuest

Joseph H. Wuest, Road Supervisor
Lakes Highway District

JHW/bf

W:\Roads\E. Hayden Lake Road\Hayden Lake Watershed and Lake Management\Letter of Comment 11.19.08.doc

Idaho Soil Conservation Commission

PO Box 790
2270 Old Penitentiary Road
Boise, ID 83701-0790

(208) 332-8650
Fax (208) 334-2386

scc.idaho.gov

Governor
C.L. "Butch" Otter

Commission Members
Bill Flory
Dwight Horsch
Richard Rush
J. Morgan Evans
Joe Davidson

Administrator
Jerry Nicolescu

January 22, 2008

Hayden Lake Watershed Association
P.O. Box 3583
Hayden, Idaho 83835

Dear HLWA,

The purpose of this letter is to provide official support for the Discussion Draft of the Hayden Lake Watershed and Lake Management Plan Addendum (March 2007).

Since the Idaho Soil Conservation Commission is the designated agency for agricultural in the TMDL process, I particularly studied the Agricultural Projects section. For the past three years, I have been trying to get a handle on possible agricultural impacts to Hayden Lake, and especially its tributaries. From these inventory findings, the top priority for agricultural BMP implementation would be the riparian areas and adjacent pastures, where livestock are allowed full access. The agricultural projects as listed in this Hayden Lake Watershed and Lake Management Plan would certainly target these critical areas.

If I can be of assistance in the implementation of agricultural BMPs, please feel free to call upon me.

Sincerely,

Mark L. Hogen
Water Quality Resource Conservationist

KOOTENAI COUNTY
NOXIOUS WEED CONTROL

10905 N. Ramsey Road • Hayden, Idaho 83835
Phone (208) 446-1290 • Fax (208) 446-1282

June 9, 2008

Mr. David Cooper
Mr. Geoff Harvey
Hayden Lake Watershed Association
10978 Rock Cliff Ct.
Hayden ID 83835

Dear Mr. Cooper and Mr. Harvey,

Thank you for the opportunity to comment on the Hayden Lake Watershed and Lake Management Plan Addendum, prepared by the Hayden Lake Watershed Association.

You requested that we look at the overall plan, with particular emphasis on the Eurasian watermilfoil statements, as this is our area of control responsibility in Hayden Lake since 1998.

The section of interest for our department is Chapter 4.0, Proposed Management Actions. The last sentence in the first paragraph states in part '...and address the growing Eurasian milfoil problem.'

Comment: The Eurasian watermilfoil problem in Hayden Lake is being addressed and reduced, and will hopefully be under control this season.

In Chap. 4.0, section 4.4 Emergent Aquatic Vegetation Management, further statements are made about potential phosphorous cycling with the growth, die back and decay of Eurasian watermilfoil.

Comment: We would like to see a broader definition of macrophytic growth activity instead of centering on the presence of Eurasian watermilfoil; any aquatic plants can become a factor in the phosphorous concentrations in the lake as they complete their lifecycles. Again, the Eurasian watermilfoil issue is being addressed and we hope that continued monitoring and control measures will make it less of a factor in the future water quality of Hayden Lake.

Other than these comments, we support the proposed management plan as a viable, working document that gives specific, prioritized actions for improving water quality.

Best regards,

Nina Eckberg, Weed Supervisor
neckberg@kcgov.us

Cc: Greg Delavan, Director of Facilities-Kootenai County
Board of County Commissioners-Kootenai County