Clark Fork River

Voluntary **N**utrient **R**eduction **P**rogram

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Submitted by
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Nutrient Target Subcommittee
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1.0 Summary of the Clark Fork River Voluntary Nutrient Reduction Program

In February 1994 a Nutrient Target Subcommittee was established by the Tri-State Implementation Council (Council) to achieve consensus on in-stream nutrient targets for the Clark Fork River and to develop a basin wide nutrient source reduction program to meet those targets. Subcommittee representation included the cities of Butte, Deer Lodge and Missoula; Stone Container Corporation; the University of Montana; the Clark Fork-Pend Oreille Coalition; the Missoula City-County Health Department; and the Montana Department of Environmental Quality. The U. S. Environmental Protection Agency Region 8 also contributed to the development of this document.

Driven by 303(d) requirements of the federal Clean Water Act and the immediate need to develop a specific plan of action for reducing nutrient loading, the subcommittee wrestled with the controversial questions and complex issues associated with the reduction of nutrient loading. Over the months members built a foundation for open dialogue and trust as they worked to resolve the issues and concerns. Guided by the Council's April 1995 decision to take a voluntary approach rather than mandatory, permitted approach to the reduction strategy, the subcommittee completed its task of developing a specific plan of action, the Clark Fork River Voluntary Nutrient Reduction Program (VNRP.)

The ten-year VNRP calls for site-specific measures to be taken by each of the four key point source dischargers and significant reductions in key nonpoint sources to meet specific in-stream algal density and nutrient targets. Based on river study results, literature review, third party reviews, and citizen concerns about nuisance algae, the subcommittee believes in its best professional judgment that these targets and the accompanying reduction measures to achieve them are reasonable. At three-year intervals during implementation of this plan, the VNRP targets, discharger measures and river water quality will be evaluated and revisions made as needed and agreed upon by subcommittee members.

Having formed a partnership, members of the subcommittee have agreed to the following:

1.) The goal of the VNRP is to restore beneficial uses and eliminate nuisance algae growth in the Clark Fork River from Warm Springs Creek to the Flathead River confluence.

2.) To reach this goal, the VNRP sets the following targets for the Clark Fork River mainstem:

- a.) 100 mg/square meter (summer mean) and 150 mg/square meter (peak) chlorophyll a, at any site, for the entire Clark Fork River area of the VNRP;
- b.) 20 ug/l total phosphorus upstream of the Reserve Street bridge at Missoula, where Cladophora is a problem and the 15:1 N:P ratio should be maintained;
- c.) 39 ug/l total phosphorus downstream of the Reserve Street bridge at Missoula; and
- d.) 300 ug/l total nitrogen.

3.) A margin of safety is provided by the use of nutrient targets that are more conservative than those recommended by third party review, and the use of a 30Q10 low flow as the basis for monitoring the attainment of in-stream targets.

4.) While the focus will be on algal densities, it will be critical to monitor for any changes to both total and soluble nutrient concentrations in the river.

5.) The river can be unpredictable, so the group is using its best judgment to address uncertainties through a phased approach.

6.) The VNRP is a voluntary program that provides four key dischargers with an opportunity to develop and implement their own plan to reduce nutrient discharges and improve in-stream water quality, as opposed to a DEQ-administered mandatory program of permit-based effluent reductions.

7.) Each of the four signatory point sources is committed to: attaining the in-stream targets for summertime (defined as June 21 - September 21) discharges by implementing specific measures at each site as described in Section 3.4; participating in the on-going monitoring evaluation process; and developing new alternatives as necessary, reasonable and agreed to by the parties to the VNRP, should VNRP measures not meet in-stream targets at the 30Q10.

8.) The City of Missoula, Missoula City-County Health Department Board of Health, and Missoula County Commissioners are committed to carrying out a strategy to control septic system and other nutrient source impacts in the Missoula area.

9.) To minimize the potential for losing any ground that may be gained through improvements at the four key point source sites, an approach will be employed that simultaneously addresses other point sources, key nonpoint sources and growth-related issues that impact water quality.

10.) Commitment and involvement in the VNRP by other point and nonpoint sources will be attained through the efforts of a VNRP Coordinator employed by the Council.

11.) The VNRP is a dynamic and flexible approach; changes and adjustments can be made as needed and agreed upon by the members, which can include the consideration of other innovative solutions.

12.) The VNRP sets ten years from the date of signature by the parties to this VNRP to achieve in-stream nutrient and algal targets with an interim evaluation at least every three years.

13.) All members are committed to carrying out their respective site-specific actions in the VNRP; the VNRP can only be successful if all parties fulfill their commitments.

14.) In keeping with a watershed approach, Idaho should be equally committed to nutrient control measures in the Pend Oreille basin, to ensure downstream water quality benefits from the Montana VNRP.

15.) The members are committed to continued coordination and administration of the VNRP through the Council.

The following list summarizes the actions that each party is committed to taking to meet the targets in this VNRP:

Montana Department of Environmental Quality:

- implementation of procedures to address new and other existing discharge permits;
- implementation of appropriate subdivision review procedures to reduce water quality impacts;
- working with the City of Missoula, Missoula County and the City-County Health Department to address septic effluent and groundwater-to-surface water issues in Missoula and surrounding areas;
- working with the Council on a prioritization and implementation strategy to reduce impacts from nonpoint sources in the upper Clark Fork;
- serving as the repository for the Clark Fork model and working with the subcommittee to continue to refine the model; and
- continued coordination with the Council's nutrient target subcommittee.

Butte-Silver Bow:

- meeting in-stream nutrient and algae targets just below Warm Springs ponds through:
  - -installation of an effluent pump at the Metro sewer plant;
  - -flow augmentation of Warm Springs Creek from Silver Lake water;
  - -a combination of other possible options outlined in the Bureau of Reclamation study;
  - -continued implementation of voluntary phosphate detergent ban; and
- continued participation on nutrient target subcommittee to monitor and evaluate program effectiveness.

City of Deer Lodge:

- meeting in-stream nutrient and algae targets by reducing loading by 100% through construction of a land application system; and
- continued implementation of phosphate detergent ban.

City of Missoula:

- reducing loading to meet in-stream nutrient and algae targets in the Clark Fork River through:
  -continued biological nutrient removal experimentation at present wastewater treatment facility;
  -biological nutrient removal upgrade to wastewater treatment plant;
  -capacity upgrade at wastewater treatment plant;
- working with Missoula County, the City-County Health Department and DEQ to address septic effluent/groundwater-to-surface water issues in the Missoula valley both inside and outside of sewer service areas; through actions that include:

-reviewing state and local regulations with the goal of removing disincentives and /or offering incentives for connecting new and existing septic systems to public sewage collection and treatment facilities that will remove nutrients;
-maintaining existing local regulations and modifying state subdivision regulations as appropriate to encourage clustering and smaller lots in new subdivisions and provide for the economically feasible, orderly and timely connection of new subdivisions in the area onto public sewer;
-encouraging development of alternatives to municipal wastewater disposal to reduce nutrients from new development (such as land application, wetlands, and nutrient removal septic systems;)
-connecting 50 percent of the existing 6,780 septic systems in the Missoula urban area, resulting in an estimated reduction of approximately 130 kg/day nitrogen discharged to the Bitterroot and Clark Fork Rivers;
-continuing to connect existing septic systems in the Missoula area to public sewage treatment and collection facilities at a rate approximately equivalent to the number of new septic system permits issued with the Missoula Valley Water Quality District; and
-limiting nutrient loading from septic systems outside the Missoula WWTP service area.

- working with Missoula County, the City-County Health Department and DEQ to control other nutrient source impacts in the Missoula area;
- continued implementation of phosphate detergent ban; and
- continued participation on nutrient target subcommittee to monitor and evaluate program effectiveness.

Stone Container Corporation:

- reducing loading to meet in-stream nutrient and algae targets in the Clark Fork River through:
  -early start-up of the color removal plant at flow at or below 4000 cfs;
  -no direct discharge to the river during July and August at flow below 4000 cfs;
  -summer use of storage ponds farthest from river to reduce seepage;
  -researching additional nutrient reduction techniques; and
- continued participation on nutrient target subcommittee to monitor and evaluate program effectiveness.

Clark Fork-Pend Oreille Coalition:

- continued participation on nutrient target subcommittee to monitor and evaluate program effectiveness

Missoula City/County Health Department:

- working with the City of Missoula, Missoula County, and DEQ to address septic effluent/groundwater-to-surface water issues in the Missoula valley both inside and outside of sewer service areas through actions that include:
  -reviewing state and local regulations with the goal of removing disincentives and /or offering incentives for connecting new and existing septic systems to public sewage collection and treatment facilities that will remove nutrients;

-maintaining existing local regulations and modifying state subdivision regulations as appropriate to encourage clustering and smaller lots in new subdivisions and provide for the economically feasible, orderly and timely connection of new subdivisions in the area onto public sewer;
-encouraging development of alternatives to municipal wastewater disposal to reduce nutrients from new development (such as land application, wetlands, and nutrient removal septic systems;)
-connecting 50 percent of the existing 6,780 septic systems in the Missoula urban area, resulting in an estimated reduction of approximately 130 kg/day nitrogen discharged to the Bitterroot and Clark Fork Rivers;
-continuing to connect existing septic systems in the Missoula area to public sewage treatment and collection facilities at a rate approximately equivalent to the number of new septic system permits issued with the Missoula Valley Water Quality District;
-limiting nutrient loading from septic systems outside the Missoula WWTP service area.

- working with the City of Missoula, Missoula County, and DEQ to control other nutrient source impacts in the Missoula area;

Missoula County:

- working with the City of Missoula, the City-County Health Department and DEQ to address septic effluent/groundwater-to-surface water issues in the Missoula valley both inside and outside of sewer service areas; through actions that include:
-reviewing state and local regulations with the goal of removing disincentives and /or offering incentives for connecting new and existing septic systems to public sewage collection and treatment facilities that will remove nutrients;
-maintaining existing local regulations and modifying state subdivision regulations as appropriate to encourage clustering and smaller lots in new subdivisions and provide for the economically feasible, orderly and timely connection of new subdivisions in the area onto public sewer;
-encouraging development of alternatives to municipal wastewater disposal to reduce nutrients from new development (such as land application, wetlands, and nutrient removal septic systems;)
-connecting 50 percent of the existing 6,780 septic systems in the Missoula urban area, resulting in an estimated reduction of approximately 130 kg/day nitrogen discharged to the Bitterroot and Clark Fork Rivers;
-continuing to connect existing septic systems in the Missoula area to public sewage treatment and collection facilities at a rate approximately equivalent to the number of new septic system permits issued with the Missoula Valley Water Quality District;
-limiting nutrient loading from septic systems outside the Missoula WWTP service area.
- working with the City of Missoula, the City-County Health Department and DEQ to control other nutrient source impacts in the Missoula area;

Tri-State Implementation Council:

- providing coordination and administration of the VNRP to ensure program effectiveness;

- overseeing the nutrient target subcommittee's responsibilities to implement, monitor, evaluate and address progress of the VNRP measures;
- reviewing interim program evaluations and developing any changes to the VNRP as necessary to meet the targets;
- coordinating the monitoring subcommittee's in-stream data with the nutrient target subcommittee's efforts;
- working with other parties in the watershed, in addition to those signatory to this VNRP, to expand nonpoint and other point source awareness and participation in nutrient reduction measures;
- hiring a VNRP coordinator to assist the nutrient target subcommittee in carrying out the VNRP; and
- reporting to EPA and the public on VNRP progress.

2.0 Background

2.1 Clark Fork-Pend Oreille Project History

In April 1984, Montana Governor Ted Schwinden initiated a long-range comprehensive study of the Clark Fork River basin to draw together fragmented information about the river and to develop a management plan for the future. The culmination of that effort was the release in 1988 of the Clark Fork Basin Project Status Report and Action Plan (Johnson and Schmidt, 1988). The document included a review of the resources and special issues affecting the basin, a summary of efforts underway to solve problems, and recommendations for future action.

Along with controlling heavy metals pollution in the upper Clark Fork Basin, the problem of nutrients and algae growth was considered the highest priority issue. It was also ranked as the major water quality issue jointly affecting Montana and Idaho and the one for which the least amount of predictive information was available. The Action Plan gave specific recommendations for addressing the nutrient problem, and introduced a coordinated program to investigate the sources and fates of nutrients in the Clark Fork-Pend Oreille basin of Montana, Idaho and Washington. That program was authorized by Congress in Section 525 of the 1987 federal Clean Water Act amendments.

The Section 525 Project was a response to increasing public attention on water quality degradation in the basin and recognition of the need for a basin wide approach to water quality management. The Clean Water Act language directed EPA to conduct an assessment of the extent and sources of cultural pollution in the three-state drainage area and to develop recommendations for pollution control.

State agencies were assigned responsibility by EPA to conduct investigations within their state boundaries and the project was coordinated by an interstate/interagency steering committee. The project was initiated in 1988, with the Montana Department of Health and Environmental Sciences (now Montana Department of Environmental Quality (DEQ)) designated as the lead state agency for Montana. Project studies were conducted from 1988-1992 and following a series of basin wide public hearings, a three-state water quality management plan was finalized in 1993. The plan focuses on control of nutrients and eutrophication in the three-state basin.

The watershed management plan is being implemented by the Council, a broad based 28-member group established by EPA Regions 8 and 10 and the states of Montana, Idaho and Washington in October 1993. In addition to setting policy and direction for water quality management actions, the Council oversees the efforts of eleven subcommittees working in local communities throughout the watershed to carry out specific priorities from the plan. One of the highest priorities is the development of a nutrient target and nutrient reduction strategy for the Clark Fork River. A subcommittee consisting of dischargers, agencies, citizen groups and other interested parties formed in 1994 to hammer out an agreeable and workable plan for in-stream nutrient reductions to address concerns about algae growth in the river.

Recognizing the value of partnerships that were developing on the subcommittee, the State of Montana gave the Council the chance—and the time—to develop a nutrient reduction plan of action to meet 303(d) requirements. In April 1995, the Council voted in favor of pursuing a voluntary approach to the nutrient target priority whereby the main point source dischargers would be given an opportunity to develop actions for reducing nutrient loading to the river. Following this decision, the Council asked the subcommittee to work with the State of Montana to develop an appropriate voluntary nutrient reduction program.

2.2 Description of the Water Quality Problem

Nutrients are natural components of every aquatic ecosystem. The inherent fertility of a stream, measured as the concentration of nitrogen, phosphorus and other nutrients, is an important factor in fish production and often controls the amounts of algae a river or lake produces. When a waterbody becomes overloaded with nutrients, from natural or cultural sources, nuisance growths of algae may result. In extreme cases, large concentrations of attached algae can deplete the dissolved oxygen needed by fish and other aquatic organisms, favor the propagation of rough fish over game fish, and otherwise impact various uses of the waterbody. In the past, there have been occasions when nighttime oxygen uptake in the Clark Fork River during low flow periods caused violations of the in-stream dissolved oxygen standard in effect at that time.[1]

The upper and middle reaches of the Clark Fork River are some of the most productive stream waters in Montana west of the Continental Divide from the standpoint of nutrient concentrations and the potential to grow algae (Bahls et al, 1979a, 1979b.) Concentrations of nitrogen and phosphorus in the Clark Fork have resulted in dense mats of filamentous algae in the river above Missoula and heavy growths of diatom algae below Missoula.

[1] State of Montana Water Quality Bureau standards for dissolved oxygen were modified in July, 1994.

Seasonally, as attached algae in the Clark Fork die and decay, oxygen, water clarity and visual appeal of the river are reduced. Decaying algae has also been implicated in the production of river foam.

The highest densities of attached algae (measured as chlorophyll a, in mg/square meter) in the upper Clark Fork River are found in the upper reaches below Deer Lodge to the Blackfoot River confluence, and in the middle reaches between Missoula and Huson (Watson,1989,1996.) There is concern that the existing nutrient levels (nitrogen and phosphorus) and algal densities impair beneficial uses in segments of the Clark Fork River.

In the lower Clark Fork, where attached algae are not a significant issue, concerns have focused on nutrient discharges into Idaho's Pend Oreille Lake. The Clark Fork is the source of more than 90 percent of the lake's water and about 75 percent of its total nutrient loading. Although local sources are the primary cause of the lake's increasing nearshore aquatic weed and algae problems, nutrient loading from the Montana portion of the watershed promises to remain an issue of great interest to Idahoans.

2.3 Clark Fork Basin Nutrient Sources

From 1988 to 1991, an intensive monitoring program was conducted to identify and rank the major point and nonpoint sources of phosphorus and nitrogen in the 340 miles of the Clark Fork River from its headwaters to the Idaho border. This study determined that, on a year round basis, approximately half of the soluble phosphorus came from wastewater discharges, while the remainder came from tributary inflows. About three-fourths of the soluble nitrogen loading during the study came from tributaries, with the remaining one quarter coming from wastewater.

Of the wastewater discharges (or point sources,) the majority of nutrients came from just four sources: the Missoula, Butte and Deer Lodge municipal wastewater treatment plants, and the Stone Container Corporation kraft paper mill near Missoula. These sources also provided the largest share of nutrients to the reaches where, and during the times of year when, algae and related problems are most prevalent. Up to half of the soluble nitrogen in the lower Bitterroot River during summer came from contaminated groundwater seepage from the Missoula area. Recent findings from research generated during the City of Missoula's facility planning has quantified this significant link between groundwater and surface water in the Missoula area; pollution from the widespread use of septic systems is a major nutrient source contributing to surface water degradation. Silver Bow Creek and about a third of the other tributaries to the Clark Fork were found to have high nutrient concentrations but smaller nutrient discharges, or loads. Some of those tributaries may have been locally important by nourishing algae colonies in the Clark Fork below their confluences.

A series of basin wide nonpoint source stream reach assessments conducted during the Section 525 study helped identify the sources and causes of elevated nutrients in impaired Clark Fork basin tributaries. They also provided overall assessments of stream condition and use support, as affected by a wide variety of pollution problems. In general, summertime nutrient loading from nonpoint sources, although significant, was relatively less than contributions from point sources. As improvements are made to point sources, however, nonpoint sources will become relatively more significant. Geographically, the largest share of nonpoint source problems was found in the upper Clark Fork and Blackfoot River basins, where more than 300 miles of river and tributaries to the Clark Fork are listed as impaired for nutrients. Studies currently being conducted in the Bitterroot River basin will identify and assess sources from this key tributary as they relate to downstream impacts on the Clark Fork.

Based on results of the Section 525 study and stream reach assessments, management efforts on the Clark Fork to reduce nutrient-related use impairment will focus on key point and nonpoint sources, which include: the Missoula, Deer Lodge and Butte municipal wastewater discharges, direct discharges and groundwater seepage from the Stone Container mill, other point sources, septic systems, agriculture, forestry, mining, urban/suburban land use and sediment sources.

2.4 Clark Fork River Nutrient Criteria: Development of In-stream Goals

Of the many nutrients required by algae and other aquatic plants, nitrogen and phosphorus are the two elements usually in shortest supply in natural water relative to the needs of the plants. As a result, the growth of algae is sometimes controlled by the availability of nitrogen or phosphorus, or both, in the water column. The soluble inorganic forms of these two nutrients--nitrate, nitrite and ammonia nitrogen and orthophosphate--are most available for plant uptake.

A number of factors besides nutrient levels influence algal densities in waterbodies. These include, but are not limited to, the type of algae, stream flow patterns and scouring, water temperature and velocity, light intensity, and grazing by aquatic insects. From a management perspective, factors other than nutrients are difficult to control. During the Section 525 studies, a significant effort was put into the development of site-specific nutrient criteria for the Clark Fork River. The studies focused on determining what nutrient concentrations limited algal development in the Clark Fork, when and where nutrients were limiting algal development, and which nutrient (nitrogen or phosphorus) was most often limiting algal development. An ultimate goal was the establishment of in-stream nutrient threshold levels where all intended beneficial uses of the Clark Fork would be supported. These nutrient "target levels" would serve as just that—targets—for reducing in-stream nutrient concentrations so that nutrient-impaired water uses could be restored.

2.5 Section 525 Study Results and Recommendations

Experimental results indicated that attached diatom algae in the middle Clark Fork continued to increase in response to nutrient additions up to 30 ug/l for soluble phosphorus and 250 ug/l for soluble nitrogen. These values were established as "saturation" concentrations below which diatom algae standing crops could be reduced. Much of the Clark Fork was often found to be below these levels, hence any reduction in nutrients would be expected to reduce algal densities.

Further, it was determined that management of both phosphorus and nitrogen is important to reducing algae, because both were found to limit diatom algae for significant periods of the year in almost all areas.

Algae that dominates the upper Clark Fork is a filamentous green species called Cladophora. It may respond to nutrients somewhat differently than the diatom-dominated communities. Heavy growths of Cladophora are seen in the upper Clark Fork even where nutrient levels are consistently well below 30 ug/l soluble phosphorus and 250 ug/l soluble nitrogen. Even if Cladophora densities are reduced by controlling nutrients, because of their ability to persist in relatively low-nitrogen environments, occasional algae blooms may still occur.

The reduction in nutrients necessary to achieve control of the algae problem is less easy to quantify. A Rationale and Alternatives For Controlling Nutrients and Eutrophication Problems in the Clark Fork River Basin (Ingman, 1992) concluded that decreases in algal biomass, especially for diatom algae, can be expected with reductions in soluble phosphorus and nitrogen concentrations below 30 ug/l and 250 ug/l, respectively. To achieve target concentrations where all water uses would be protected, the report suggested an approach which would set summer nutrient targets at the nutrient concentrations found in reaches of the Clark Fork where algae are not as frequent a problem. Based on this approach, the report proposed summer targets at 6 ug/l or less for soluble phosphorus and 30 ug/l or less for soluble nitrogen. These concentrations are typical of the Clark Fork from Turah to Missoula and from Alberton to the Idaho border during July through September. These sections of the river do not normally exhibit appreciable attached algae growth.

2.6 Subcommittee Conclusions on Target Numbers

The nutrient target subcommittee was unable to reach a consensus on the use of 6 ug/l soluble phosphorus and 30 ug/l soluble nitrogen as the basis for the nutrient reduction strategy. Some members were concerned that these figures may prove to be too restrictive, and in general the group questioned whether nutrient management and monitoring should focus on total or soluble forms of nutrients. The group began by reviewing available literature.

Research by Watson (1988,1990) on the response of algae to nutrients in natural and artificial streams concluded that both nitrogen and phosphorus were limiting algae densities at some time in some parts of the river, hence both should be controlled. Concerning which forms of nutrients to manage, soluble forms stimulate algal growth most directly and most controlled studies of nutrient limitation have focused on these forms. Artificial stream studies show that attached diatom algal densities are saturated at around 30 ug/l for phosphorus (Bothwell 1989) and 250 ug/l for nitrogen (Watson 1988,1990) but that there would be little observable improvement in in-stream algae until nutrient levels were well below 30/250. In the field, soluble nutrients may not be well correlated with algal densities because nutrients may be rapidly depleted to very low levels by algal uptake where algal biomass is high.

The subcommittee decided to have an independent third party review to evaluate possible approaches to predicting algal densities from nutrient levels and to recommend appropriate nutrient targets. Drs. Walter Dodds (Kansas State University) and Val Smith (University of Kansas) were retained to accomplish this task. The subcommittee also received additional input from Dr. John Priscu (Montana State University) and Dr. Eugene Welch (University of Washington.)

Using a data base consisting of 200 rivers to relate algal densities to nutrient concentrations, Dodds and Smith concluded that total nutrients were a better predictor than soluble nutrients and that total nitrogen was a better predictor than phosphorus (Dodds and Smith, 1995.) The subcommittee considered this approach but recognized that control of nitrogen without control of phosphorus might reduce nitrogen:phosphorus (N:P) ratios and favor nuisance densities of Cladophora (which reaches its highest level in the river where N:P ratios are low.) Hence the subcommittee concluded that both nitrogen and phosphorus should be controlled.

Using three approaches (regression, probabilistic and reference reaches) to predict in-stream concentrations for improved water quality, Dodds and Smith evaluated a range of targets for total nitrogen and phosphorus. Their final recommendation was a total nitrogen target of 350 ug/l and a total phosphorus target of 45.5 ug/l. Based on the range of targets considered for total nitrogen (200-350 ug/l) the subcommittee decided to use a conservative target of 300 ug/l. The subcommittee then agreed on a total phosphorus target of 39 ug/l which approximates the Redfield ratio of 7.23:1 N:P by weight (Redfield 1958) for optimum ambient nutrient balance. To further inhibit Cladophora in river segments where it is the dominant problem (above Missoula,) a high N:P ratio of 15:1 was agreed upon, which set the in-stream total phosphorus concentration target in these areas at 20 ug/l. The Reserve Street bridge in Missoula was selected as the point of change of the phosphorus target from 20 ug/l (upstream) to 39 ug/l (downstream), as this area exhibits both a change in algae types and a change in river substrate.

To select a target for chlorophyll a, the subcommittee considered data from Dodds and Smith, and previous work by Welch and Nordin as referenced by Dr.Vicki Watson (Watson 1996.) Based on previous studies of chlorophyll a levels from 50 to 150 mg/sq.meter, known levels in the Clark Fork, and the VNRP targets for total nitrogen and total phosphorus, the subcommittee decided on a chlorophyll a target of 100 mg/sq.meter as a summer mean (June 21-September 21,) and 150 mg/square meter as a peak value, at any site.

The subcommittee agreed that in the absence of more definitive in-stream nutrient criteria for the Clark Fork, the proposed target values are reasonable. The subcommittee agreed that managing and monitoring only total loads might allow soluble loads (which most stimulate algal growth) to rise. Based on recommendations in Ingman's A Rationale and Alternatives For Controlling Nutrients and Eutrophication Problems in the Clark Fork River Basin, Watson's Clark Fork artificial stream studies and literature reviews, the subcommittee agreed to monitor for total and soluble nitrogen and phosphorus. The group agreed that although the in-stream targets will focus on total nutrients, it will be important to monitor soluble nutrients and algal densities in order to evaluate potential changes in the ratio of total-to-soluble nutrients and algal response.

Table 1. Summertime Algal and Nutrient Targets

	Chlorophyll a	Total Phosphorus	Total Nitrogen
Upper Clark Fork: Above Reserve St. bridge	100 mg/sq.meter summer mean 150 mg/sq.meter peak	20 ug/l	300 ug/l
Middle Clark Fork: Below Reserve St. bridge	100 mg/sq.meter summer mean 150 mg/sq.meter peak	39 ug/l	300 ug/l

2.7 Target Summary

The nutrient target subcommittee made use of study results, literature review, third party review and citizen complaints to develop in-stream targets to control algae and associated nutrient-related problems on the river. These targets, as summarized in Table 1 above, are:

- 100 mg/sq. meter (summer mean) and 150 mg/sq.meter (peak) chlorophyll a, was agreed upon as the management focus;
- 20 ug/l total phosphorus upstream of Missoula, where Cladophora is a problem and the 15:1 N:P ratio should be maintained;
- 39 ug/l total phosphorus downstream of Missoula; and
- 300 ug/l total nitrogen

In addition to pursuing the summertime algal and nutrient targets, the group agreed to the following:

- Both nitrogen and phosphorus should be managed since both appear limiting at various times and places on the river.
- Algal densities will be the management focus, but both total and soluble forms of nutrients will also be monitored to ensure that there are no upward trends in dissolved nutrient levels and to give the best picture of bioavailability and of loads from point and nonpoint sources.
- The goal is to reduce algal densities by reducing point and nonpoint source nutrient loading.
- Each discharger will be responsible for implementing site-specific actions to achieve in-stream algal and nutrient targets.
- Algal densities in the river will be evaluated annually during VNRP implementation to determine if levels are unchanged, increasing or decreasing.

3.0 Nutrient Control Strategy Implementation

3.1 Rationale

The subcommittee based its implementation plan on the following:

1.) Algae problems in the Clark Fork River are generally limited to the late June through September period.

2.) Nutrient loading from point sources and groundwater seepage is most critical during these low flow periods.-

3.) Four point source dischargers—the Butte, Deer Lodge, and Missoula municipal wastewater treatment facilities and the Stone Container Missoula paper mill—are presently the dominant summer sources of nutrient loading.

4.) The voluntary nutrient reduction measures agreed upon have been developed on a site-specific basis, but downstream dischargers will benefit from, and are relying on, upstream source reductions resulting from this plan.

5.) The voluntary nutrient reduction measures are intended to accomplish a reduction in algae biomass (measured as chlorophyll a) through achievement of the in-stream nutrient concentration targets of 300 ug/l total nitrogen, 20 ug/l total phosphorus upstream of Missoula and 39 ug/l downstream of Missoula.

6.) The in-stream concentration targets for Butte apply in the Clark Fork River just below the Warm Springs ponds.

7.) Projected reductions are based on achieving in-stream targets during 30Q10 summertime stream flows. In-stream targets apply to all flow regimes during the June 21 - September 21 period.

8.) It is anticipated that in-stream concentrations will be lower than the target values during high flows and higher than the targets when flows are less than 30Q10.

9.) The nutrient target subcommittee recognizes that control of other point sources and widespread nonpoint sources throughout the basin will be important to the long term protection of Clark Fork water quality.

10.) As nutrient load reductions are achieved by the major point source dischargers, and as population in the basin continues to rise, nonpoint sources of nutrient pollution, new industry and other growth-related issues will assume a very high priority. Without a long-term water quality protection plan, improvements or gains made in water quality through implementation of the VNRP measures could be gradually lost.

3.2 Projected Reductions

Montana DEQ contracted in early 1994 with Science Applications International Corporation (SAIC) to develop a nutrient allocation model for the Clark Fork River (Samuels and Hallock, 1994). The purpose of the SAIC project was to estimate acceptable rates of summer nutrient loading from critical targeted sources. The SAIC calculations were based on suggested targets of the 525 study project (6 ug/l soluble phosphorus and 30 ug/l soluble nitrogen) and focused on the major contributors of soluble phosphorus and nitrogen during summer months as identified in the 525 study: the Butte, Deer Lodge and Missoula municipal wastewater treatment facilities, the Stone Container Corporation industrial facility, and the Bitterroot River. In April 1994 the SAIC report was issued and became the starting point for subcommittee deliberations.

Subsequent to the SAIC report, the subcommittee agreed on targets for total phosphorus and total nitrogen. Based on the work done by the SAIC consultants, Montana DEQ and EPA Region 8 developed a Clark Fork River nutrient response model (Appendix B, "Agencies' Clark Fork Model") to illustrate the present nutrient concentrations in the river and to estimate the reductions in effluent nutrient loading needed to meet the agreed-upon in-stream target concentrations below each of the critical sources during the summer period.

The parties to this voluntary reduction agreement differ on the degree to which the agencies' model accurately predicts the individual target conditions that each of the principal dischargers would need to achieve to meet the targeted nutrient concentrations in the Clark Fork River. Given concerns about the model, the subcommittee used best professional judgement to develop specific point and nonpoint source load reductions (Table 2) to meet the in-stream nutrient and algal targets in Table 1. The actions to achieve these reductions are described in Section 3.4. The model predicts that these reductions will meet the targets for total nitrogen and total phosphorus in most instances (see Model Run C, Appendix B;) however, the model also predicts some nitrogen excursions. These excursions will be addressed through the feedback loop process described below.

Because of the uncertainties involved in dealing with an ever-changing biological system, the subcommittee is reluctant to rely solely on the model as the basis for its reduction program. To address concerns about the model's predictive capabilities, the subcommittee has elected to emphasize a feedback loop approach to the reduction program that consists of:

- implementing specific point and nonpoint reduction actions;
- monitoring algae growth and total and soluble nutrient levels in the river through the Council's water quality monitoring program;
- assessing if actions are meeting the goal of eliminating nuisance algae; and
- modifying the reduction program as necessary, reasonable and agreed to by the parties to the VNRP.

Montana DEQ is committed to revising the Clark Fork model as more in-stream data becomes available for calibration, flow, nutrient cycling and the gain/loss factor. Subcommittee members are committed to assisting the State with this endeavor.

Table 2. Point and Nonpoint Source Ten Year Projected Nutrient Reductions

Source	Stakeholder	Calibration Conditions					Predicted Summertime Conditions (9) (10)				
		Discharge	T P		T N		Discharge	T P		T N	
		cfs	kg/d	ug/l	kg/d	ug/l	cfs	kg/d	ug/l	kg/d	ug/l
Butte WWTP (1) (2)	City of Butte	8.8	51.6	2400	204.2	9487	1.8	4.4	1000	44	10000
Deer Lodge (1)	Deer Lodge	2.8	8.5	1249	35.4	5177	0	0	1249	0	5177
Philipsburg WWTP (3) Drummond WWTP (3)	City of Philipsburg City of Drummond										
Clark Fork Nonpoint (4)	MT DEQ			11		180			9		144
Other Nonpoint (5)	MT DEQ										
Missoula Area Groundwater/Septic System Load (6) (7)	MT DEQ Msla Health Dept City Msla Msla County East Msla	40.5	6	60	49	500	40.5	5.4	54	30	300
Missoula WWTP (1)	City Msla	12.8	78.6	2513	382.4	12216	16.5	40	1000	404	10000
Bitterroot Groundwater/Septic System Load in Missoula area (6)	MT DEQ Msla Health Dept Msla County City Msla	92.6	13.6	60	270	1200	92.6	12.2	54	162	720
Bitterroot Nonpoint Sources (5)	Ravalli County										
Bitterroot Point Sources (3) Hamilton WWTP Stevensville WWTP Lolo WWTP	 City Hamilton City Stevensville Msla County										
Stone Container (1) (8)	Stone Cont.Corp. Direct (8) Seepage	 0 12.3	 0 23.1	 905 768	 0 30	 1101 997	 0 12.3	 0 23.1	 905 768	 0 30	 1101 997

(1) Calibrated loadings for Butte, Deer Lodge, Missoula and Stone Container point sources are based on monitored data from summer months, 1991.

(2) Butte's predicted condition is based on measurements at the Clark Fork below Warm Springs Creek.

(3) Point source loadings not included in VNRP wasteload allocation, but addressed on pages 23-24.

(4) Clark Fork nonpoint reduction based on concentrations--not load--at Clark Fork above Missoula site, Model Run C.

(5) Nonpoint loads are incorporated into background, but are not quantified; addressed on pages 25-28.

(6) Calibration loadings for groundwater/septic systems in the Missoula area are based on Land & Water Consulting estimates, 1996.

(7) Loading encompasses area east of the Clark Fork/Bitterroot confluence; area to west of confluence still requires inventory.

(8) Direct discharge from Stone typically does not occur during July and August.

(9) In-stream targets = 39 ug/l TP upstream of Missoula, 20 ug/l TP downstream of Missoula, and 300 ug/l TN.

(10) Achievement of target loading conditions assumed to be accomplished over 10 year implementation period, for summertime conditions (June 21 - September 21.)

3.3 Margin of Safety

To provide a margin of safety, the subcommittee chose to use more protective targets than those recommended by Dodds' and Smith's third party review. Dodds and Smith recommended a total nitrogen target of 350 ug/l and a total phosphorus target of 45.5 ug/l. The subcommittee elected to set a more conservative 300 ug/l total nitrogen target which represents a 15 % margin of safety. This was consistent with later recommendations by Dodds, Smith and Zander (1996.) The selected total phosphorus targets of 20 ug/l above Missoula and 39 ug/l below Missoula represent a 56% and 15% margin of safety respectively.

In addition, the monitoring of the attainment of the in-stream targets will be based on a 30Q10 low flow. The 30Q10 low flow used is the lowest 30-day average typically observed in one summer out of ten over the period of record for each site. Hence, if site-specific actions meet the targets at 30Q10, in-stream nutrient concentrations will be less than the target nutrient levels at all times except for about one month out of ten years.

As described in Section 3.2, the monitoring of the attainment of in-stream targets plays a key role in the feedback loop approach, which establishes an on-going process to ensure program effectiveness. Utilizing this approach, point and nonpoint reduction actions will be implemented and algae and nutrient levels will be measured and assessed—based on 30Q10—to ascertain if these actions are meeting the goal of eliminating nuisance algae. The reduction program will be further modified to meet the targets if necessary and as considered reasonable and agreed to by the parties to the VNRP.

3.4 Reduction Actions

The four predominant summertime point sources of nutrients on the river will be an important early focus of the VNRP. Because they are more easily measured and in many cases historically quantified, it is relatively easy to document successes in point source reductions. These reductions will require substantial capital investments which, in the case of publicly owned facilities, will be financed by the affected citizens. Simultaneous to key point source reductions, other sources of nutrients, including smaller point sources, septic systems, nonpoint sources and new and growth-related sources, will also be addressed in the VNRP.

The following section describes actions that are: 1) completed and/or ongoing efforts to reduce nutrient loading; and 2) proposed additional nutrient control measures to meet in-stream targets of the VNRP.

3.4.1 Butte Wastewater Treatment Plant

1.) Butte's voluntary phosphate detergent ban will continue to be in force. The city has contacted all major water users (hospital, nursing homes, restaurants, etc.) and received their agreement to eliminate the use of phosphorus-containing detergents. Butte will continue to meet with any new potential users to continue this program. A shelf survey of grocery stores showed little or no detergents containing phosphorus.

2.) Butte is well into a plan with ARCO to coordinate nutrient reduction efforts with Superfund clean-up and a proposed land use "Greenway" project. This involves an extensive stormwater plan utilizing sediment basin catchment ponds and a stormwater /groundwater treatment plant. Design of the ponds began in August 1995 and construction is scheduled to be completed in the second quarter of 1998. A final decision on the scope and function of a potential treatment plant will be made by the year 2000. Butte believes the sediment/stormwater project will have a significant effect on nutrient loading to Silver Bow Creek and is currently working with ARCO to develop estimates of water quality benefits.

3.) Butte-Silver Bow continues to investigate the feasibility of using wetlands as a means of summer time nutrient removal. Work is being coordinated with ARCO and the possibility of developing an integrated system for simultaneous nutrient removal from Butte municipal wastewater effluent and metal and sulfate removal from Colorado tailings water is being discussed. No definite time frame has been developed.

4.) Butte entered into an agreement for technical assistance with the Bureau of Reclamation under Title XVI of Public Law 102-575 to develop an appraisal investigation of alternatives to Butte's direct discharge of treated wastewater to the headwaters of the Clark Fork River. Realizing that wetlands may not be the total answer to the problem at Butte, the city and BOR investigated:

- a.) the feasibility of seasonal land application;
- b.) possible cooperative efforts between Butte-Silver Bow and Montana Resources, Inc., a local mining company;
- c.) the impact of water rights issues;
- d.) the potential to interface with existing Superfund programs; and
- a.) the potential for any innovative solutions to assist the city in its efforts to meet the nutrient reduction program.

The BOR work plan and scope of services were submitted in September 1995. Work began in January 1996 and was completed in January 1997. The plan is being used as resource and background material for the overall Butte operation.

5.) In an effort to allow for greater flexibility and enhance the potential for beneficial uses, Butte-Silver Bow will install an effluent pump station at the Metro Sewer plant. This station will be capable of moving up to 5 million gallons per day (MGD) of sewage effluent allowing the treatment plant to pump to Montana Resources or to a variety of future industrial users or potential land application sites. Bid letting is scheduled for Spring 1998.

6.) Butte-Silver Bow has recently acquired ownership of the Silver Lake water system. Present plans call for the annual distribution of approximately 56 MGD in the following manner:

- 4 MGD: Butte-Silver Bow (to be used by ASIMI, an industrial user)
- 2 MGD: Montana Resources Inc.
- 12 MGD: New industry
- 8 MGD: ARCO
- 30 MGD: Irrigators

Of ARCO's total annual allocation (8 MGD x 365 days), 24 MGD will be placed into Warm Springs Creek during the months of June, July, August and September. This corresponds with the timeframe identified as the most critical for affecting algae growth. Initial calculations indicate a significant reduction in both phosphorus and nitrogen concentrations due to flow augmentation.

3.4.2 Deer Lodge Municipal Wastewater Treatment Plant

1.) The city will continue to enforce its phosphate detergent ban ordinance, passed in 1993.

2.) During the summer1995, the City lined the irrigation ditch adjacent to its sewage lagoon to stop leakage into cell 4 of the lagoon. The results thus far indicate that the amount of water processed through the system has been reduced by 413,860 gallons per day. This reduction is important because it paves the way for pumping the city's entire effluent discharge onto the Grant Kohrs Ranch hay fields and adjacent private lands. Prior to lining the ditch, elevated effluent volumes caused land area requirements that jeopardized the feasibility of land application of the city's wastewater.

3.) The City is constructing a land application system that will eliminate discharge into the Clark Fork River during critical summer months. A feasibility plan was prepared by Professional Consultants, Inc. for development of a system to land apply the city's treated wastewater on hayfields at the National Park Service's Grant Kohrs Ranch and on adjacent private lands. A public hearing was held on the feasibility study in March 1995 and the final report was issued December 1995. In October 1995 the city petitioned for a declaratory ruling from the state's Department of Natural Resources and Conservation (DNRC) regarding water rights issues associated with land application of the city's wastewater. In June 1996 a favorable ruling was received from the state. (This ruling may have impact on other potential land application projects in the basin as well.)

After receipt of the declaratory ruling, an Environmental Assessment was prepared cooperatively by the National Park Service and DEQ to determine any significant impacts as a result of the proposed project. Clean Water Act regulations, public health concerns, hazardous materials issues and impacts to the resources of the ranch were considered in the assessment. A Finding on No Significant Impact was issued on the EA in January 1997.

The National Park Service has granted a waiver from policy for the land application project. The city has acquired the necessary funding and easements and is currently working on contracting agreements in order to begin construction in 1998.

3.4.3 Missoula Municipal Wastewater Treatment Plant

1.) Missoula and the surrounding area became the first metropolitan area along the Clark Fork mainstem to ban the sale of phosphorus detergents in November 1988. This resulted in a 40% reduction in phosphorus discharges from the Missoula wastewater treatment plant and started a trend which has virtually eliminated phosphorus detergents from store shelves throughout the basin. Due to the ban, the city's discharge was reduced from an annual average of 342 pounds per day in 1988 to an average of 228 pounds per day in 1989.

2.) In anticipation of future restrictions on nutrient discharges, the city hired Thomas, Dean and Hoskins, a Great Falls, Montana consulting firm to complete a Land Application of Wastewater Assessment (March 1991.) The study included in-depth evaluations of irrigation reuse, rapid infiltration, and a cursory look at wetlands treatment for nutrient management.

3.) In anticipation of future restrictions on nutrient discharges, the city hired Montgomery Watson, a national consulting firm, to conduct a Missoula WWTP Phosphorus Removal Evaluation (July, 1993.) This study looked at chemical precipitation technologies and biological removal technologies that could be used at the plant. Some of the recommendations of this report have been implemented on an experimental basis, as discussed below in #5, resulting in substantial reductions in phosphorus discharges.

4.) In mid-1995 the city hired Brown and Caldwell, a national wastewater consulting firm, to perform a comprehensive update of its 1984 Facility Plan (also known as a 201 Plan.) The updated plan, which the city plans to complete in the summer of 1998, will make recommendations about the collection and treatment of wastewater in the Missoula area. Nutrient management actions will be an important part of the planning process; the plan will also have a substantial public participation component. In-stream nutrient targets, which have been agreed upon, are the basis for future treatment facility designs. Land application, effluent reuse, wetland treatment, and in-plant nutrient removal options are all being evaluated as part of this comprehensive planning effort.

Although the Facility Plan has not been adopted at the time of this writing, the following elements will be included in the final document:

a.) Chosen Alternative. The chosen Wastewater Management Plan Alternative is central treatment, which is identified as alternative B in the Facility Plan. In this alternative, the major wastewater management facility continues to be the existing Missoula wastewater treatment plant. The facility would be upgraded to provide for the biological removal of the nutrients, nitrogen and phosphorus. The central treatment facility will also be expanded to accommodate increased loadings due to the predicted growth of the Missoula area.

b.) Biological Nutrient Removal (BNR). Both nitrogen and phosphorus will be removed utilizing BNR. Typically, an “aeration” basin for this process includes zones with no oxygen (anaerobic) and low oxygen (anoxic), as well as conventional aerated zones. These modified aeration basins are called bio-reactors. In the bio-reactors, nitrogen is removed by oxidizing the ammonia compounds, forming nitrates in the aerobic zones, then reducing the nitrates to nitrogen gas in the anoxic zones. Nitrogen gas, a natural component of the air we breathe, is released into the atmosphere.

The anaerobic zones in the bio-reactors encourage the growth of specific bacteria that consume large quantities of phosphorus in a process called “luxury uptake.” In the BNR facility, phosphorus is removed from the liquid stream in the form of phosphorus-rich sludge, which is made into compost at a nearby facility.

Nominal effluent quality parameters for BNR at the Missoula facility are:

Biochemical Oxygen Demand (BOD)	10 mg/l
Total Suspended Solids (TSS)	10 mg/l
Total Nitrogen	10 mg/l
Ammonia Nitrogen	1 to 2 mg/l
Total Phosphorus	1 mg/l

While the facility is expected to meet effluent levels of 1mg/l total phosphorus and 10 mg/l total nitrogen under the optimum-treatment BNR regime, in actual operation the plant may attain lower levels than these. If the plant can be operated at lower than expected levels, the extra reduction in nutrients would likely provide an even greater potential for algal reductions in the river downstream of the facility.

5.) Based on recommendations from the Montgomery Watson Phosphorus Removal Evaluation study, attendance by facility staff at several BNR seminars, and observations of BNR technology at Kalispell, Montana and Heidelberg, Germany, the Missoula plant operations staff have been experimenting with BNR since September 1994. This is being done, at no cost, using the existing aeration basin capacity. The air has been shut completely off in two of the eight aeration cells, creating the anaerobic and anoxic zones which are necessary for BNR. This experimental operational mode has not only resulted in substantial phosphorus removal, but has significantly improved the overall stability and performance of the treatment facility. In spite of the substantial growth of the Missoula area, the City has continued to improve the quality of its wastewater discharge to the Clark Fork River through these improvements in plant efficiency. Currently the City is providing a much higher level of treatment than is required in its discharge permit, despite thousands of new hook-ups to the system.

6.) During the interim period between now and the time the recommendations of the new Facility Plan are implemented, City wastewater staff will continue to operate the treatment facility in the experimental nutrient removal mode. Staff may have to temporarily suspend this operational mode during periods of high influent flows, usually in the spring. Higher flows require additional aeration capacity, which is lost in the experimental nutrient removal mode. Without the additional capacity, treatment of the conventional pollutants, BOD and TSS, might be compromised.

7.) In the Missoula urban area, various groundwater pollution sources contribute an estimated 319 kg/day of nitrogen and 19.6 kg/day of phosphorus into the lower Bitterroot River and the Clark Fork near its confluence with the Bitterroot. (Land & Water Report, 1996.) The source of nutrients in groundwater is likely a combination of development and land use activities including septic systems, agriculture, and urban/suburban sources such as stormwater, land fertilizers, and road de-icers. Nitrate loading from 6,780 septic systems in the Missoula urban area to the Clark Fork and Bitterroot rivers is estimated to be 257 kg/day (MCCHD 1996.) Septic systems in the outlying portions of the Missoula area contribute additional loads. Phosphorus loading to surface water from urban area septic systems has not been reliably estimated. This compares to a discharge of 712 kg/day nitrogen and 40.5 kg/day phosphorus from the Missoula WWTP in 1995. It is apparent that to ignore the impact of septic systems on surface water while implementing nutrient removal measures at the WWTP will: a.) not solve nutrient problems in the river for the long term; b.) place the economic burden of temporarily solving the problem on those people connected to the WWTP; c.) provide a disincentive to connect to public sewer thus perpetuating groundwater impacts of septic systems; and d.) further encourage large parcel suburban and rural sprawl resulting in septic discharges that cannot be feasibly sewered and adequately treated.

To resolve these issues, the City of Missoula, the City-County Health Department Board of Health, the Missoula County Commissioners, and Montana DEQ commit to developing strategies in Missoula and surrounding areas that will:

- a) recognize the connection between septic effluent/ground water/surface water in the Upper Clark Fork watershed and in the Missoula Valley;
- b.) review state and local regulations with the goal of removing disincentives and /or offering incentives for connecting new and existing septic systems to public sewage collection and treatment facilities that will remove nutrients;
- c.) provide for the extension of sewer mains into high density unsewered areas as quickly as is feasible;
- d.) maintain existing local regulations and modify state subdivision regulations as appropriate to encourage clustering and smaller lots in new subdivisions and provide for the economically feasible, orderly and timely connection of new subdivisions in the area onto public sewer;
- e.) give credit to the Missoula WWTP for meeting part of its nutrient reduction as additional connections of existing septic systems are made;
- f.) encourage development of alternatives to municipal wastewater disposal to reduce nutrients from new development (such as land application, wetlands, and nutrient removal septic systems.)
- g.) connect 50 percent of the existing 6,780 septic systems in the Missoula urban area, resulting in an estimated reduction of approximately 130 kg/day nitrogen discharged to the Bitterroot and Clark Fork Rivers;

h.) continue connecting existing septic systems in the Missoula area to public sewage treatment and collection facilities at a rate approximately equivalent to the number of new septic system permits issued with the Missoula Valley Water Quality District;

i.) reduce groundwater phosphorus loads to the Bitterroot and Clark Fork Rivers by 10%, or approximately 2 kg/day, and reduce surface water loads by 10% through such measures as best management practices for urban/suburban development and agriculture; control of stormwater pollution sources; enforcement of existing local regulations such as the Aquifer Protection Ordinance, Riparian Regulations and Lakeshore Regulations; and through connection of septic systems located in shallow groundwater areas near streams to public sewer; and

j.) limit nutrient loading from septic systems outside the Missoula WWTP service area.

In addition to this local commitment, efforts will be made to work with and involve Ravalli County to assess groundwater/surface water contamination from increasing septics in the Bitterroot River valley and develop a strategy to reduce these impacts.

3.4.4 Stone Container Corporation Missoula Mill

Since 1986, a number of improvements and/or operational changes have reduced the levels of nitrogen and phosphorus contained in the treated effluents that are discharged to the Clark Fork River from the Missoula mill. These changes, as well as current and future proposed efforts are outlined as follows:

1.) The mill's discharge permit issued in 1986 stipulated that the mill pursue a course of action designed to return the nutrient concentrations of nitrogen and phosphorus to pre-1983 levels. It was not possible to determine accurately those pre-1983 levels. Nevertheless, the mill embarked on a reduction program to gradually reduce the level of supplemental nutrients added to the wastewater secondary treatment system with the goal of ultimately achieving levels in the treated effluent at or below 1983 levels. At the same time, the mill had to ensure that the biological health of the secondary system be maintained. Over the course of the next ten years, the mill gradually reduced the amount of supplemental nutrients added to the treatment system.

2.) In 1990 the mill added an additional 650 horsepower of aeration capability and introduced a third aeration basin to the secondary treatment system to improve the biological oxygen demand (BOD) reduction efficiency and reduce BOD and total suspended solids (TSS) in the treated effluent. A secondary benefit of the project was the ability to reduce further the supplemental nutrients required to maintain the biological health of the secondary treatment system. It is uncertain at this time if the operational stability of the secondary treatment system can be maintained indefinitely under this operating scenario. The mill adds small quantities of supplemental phosphorus-containing compounds (25 pounds per day as phosphorus,) and adds small quantities of nitrogen on a regular basis (25 pounds per day as nitrogen.)

3.) In 1995 the Missoula mill voluntarily adopted the following operational changes which will be continued in order to reduce the levels of nitrogen and phosphorus entering the Clark Fork River:

a.) The mill will start up the Color Removal Plant on or before June 15th of each year in an effort to reduce the levels of total nitrogen and phosphorus in treated effluent, provided that river flow is at or below 4000 cfs. The CRP will run through the critical low flow period (through September 21.) Future in-plant process changes may make operation of the CRP unnecessary to achieve nutrient reductions. In addition to a demonstrated nutrient reduction potential, the early operation of the plant allows the mill to utilize long-term storage ponds that are a greater distance from the river, which in turn reduces the seepage component to the river during the summer months. In the event that equipment malfunctions or regular scheduled maintenance prevents CRP operation, the plant will start up as soon as repairs are completed.

b.) The mill will utilize other long-term storage ponds (for non-color treated effluent) that are farthest away from the river to reduce seepage contribution to the river.

c.) The mill will not direct discharge to the river during the months of July and August of any future year if the river flow is less than 4000 cfs. The mill is currently allowed by permit to discharge up to and including July 15th of any year providing that the river flow is greater than 1900 cfs.

4). Additional future reduction efforts: While the mill continues to follow the operational practices that were initiated in 1995, research into additional nutrient reduction processes and techniques will be evaluated. This will consist of working with biological experts and consultants to evaluate the existing treatment system and determine what additional steps may be required to further reduce the levels of nitrogen and phosphorus in the mill's treated effluents. A list of alternatives will be developed and ranked according to specific criteria (i.e. efficiency, cost, simplicity of operation, etc.)

3.4.5 Other Point Sources

In addition to the implementation of strategies for the key point source discharges targeted above, the nutrient target subcommittee:

1.) Will assist with the development and implementation of equitable treatment technologies for smaller point sources such as Drummond, Philipsburg, Hamilton and Lolo.

2.) Will be active in review of the state’s permitting process to ensure that in-stream targets are being met from other existing and new MPDES permits.

3.) Requests that DEQ develop a policy to address new and other existing discharge permits to achieve in-stream targets identified in this VNRP and to address current 303(d) listed segments. The subcommittee believes that in order to successfully meet the in-stream targets, new and existing discharges should be required to either a.) implement sufficient levels of treatment that will ensure targets will be met in-stream or b.) implement pollutant trading.

3.4.6 Septic Systems

To meet in-stream targets, the following actions will be implemented to reduce impacts from septic systems:

1. Missoula City-County Health Department

a.) A strategy for treatment of septic systems as point sources will be explored. In order to control the contribution of nutrients from septic systems entering surface water via ground water, changes will be needed in the way septic systems are permitted and, perhaps, constructed. This issue is especially relevant in the Missoula area where the large community investment in reducing nutrient discharge from the wastewater treatment plant will likely be offset in the long term by the continued proliferation of septic disposal systems. Addressing septics as a nutrient point source will require the cooperation of the City, County, Board of Health and Montana DEQ to determine the appropriate allocation of allowable discharge and necessary mitigation strategies. Since owners of land on which septic systems may be placed in the future are not signatories to the VNRP, it will be necessary to develop some requirements to mitigate these sources through state and local point source regulation. Septic systems meet the definition of "Point Source" in 75-5-104 which "means a discernible, confined and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, or vessel or other floating craft, from which pollutants are or may be discharged."

The subcommittee does not intend that the treatment of septic systems as point sources will mean that state-authorized MPDES or groundwater permits would be required. The goal is to establish a sound basis for mandatory county and/or health department septic regulations (through Title 50 and Title 76 authorities) to deal with septic contributions to surface water.

b.) The strategy will also consider ways to control septic densities outside of areas serviced by wastewater treatment facilities. This will require working closely with DEQ's Subdivision Section to implement lot size requirements and appropriate subdivision review policies that address the impacts of groundwater on surface water quality and are protective of the nutrient targets. In Missoula County, outside the designated service area for the Missoula WWTP, the City, County, Board of Health and DEQ commit to development and implementation of a strategy that will:

1.) estimate the discharge of septic nutrient effluent and track the number of new septic permits and new public sewer connections each year in the Missoula Valley;
2.) develop a maximum permissible allocation of septic nutrient discharge to surface waters in the Missoula Valley;
3.) institute adequate requirements and policies to implement the allocation;

4.) explore options for addressing discrepancies in surface water and groundwater standards in areas where the two are strongly interconnected; and
5.) develop a program to address potential groundwater contribution to surface water from existing small community land application and rapid infiltration systems.

2. Additional Septic Source Controls

Although the impetus for the development of the above strategy to treat septic systems as point sources and develop protective subdivision regulations is directly related to concerns over septic contributions to surface water in the Missoula area, the subcommittee recognizes that other developed and developing areas covered by the VNRP may also have similar problems. The subcommittee firmly believes that to ignore the impact of septic systems on surface water while implementing nutrient removal measures at publicly owned treatment works (POTW's) will not solve nutrient problems in the river for the long term. Where necessary and feasible, the subcommittee will implement strategies in VNRP communities that:

a.) recognize the connection between septic effluent, ground water, and surface water;
b.) review state and local regulations with the goal of seeking opportunities to remove disincentives and /or offer incentives for hook-up to POTW's;
c.) provide for the extension of sewer mains into high density unsewered areas as quickly as is feasible;
d.) provide for the orderly and timely connection of new subdivisions onto public sewer;
e.) give credit to wastewater treatment facilities for meeting nutrient reductions as additional hook-ups are made; and
f.) encourage planning for alternatives to municipal wastewater disposal to reduce nutrients from new development (such as land application, wetlands, and nutrient removal septic systems.)

3.4.7 Nonpoint Sources

1. Existing Nonpoint Sources

The findings of the Section 525 studies and the nonpoint source stream reach assessments provide a good foundation for the development of a nonpoint source nutrient control strategy for the Clark Fork basin.

Of 99 suspected impaired streams surveyed in the nutrient source assessment, 65 percent were given an overall rating of "impaired" (partial or non-support of the streams' designated uses.) Fifty-seven percent of the 272 individual reaches examined within those 99 streams were rated as impaired. The largest share of nonpoint source problems was found in the upper Clark Fork and Blackfoot River basins, where more than two-thirds of the assessed streams were rated as impaired. Conditions were marginally better in the Clark Fork drainage below Missoula and in the Bitterroot valley, where 45 and 33 percent of the assessed streams, respectively, were rated as impaired.

Based on the information from these assessments, DEQ’s Watershed Management Section staff will be developing and implementing nonpoint source plans and TMDL processes to target nutrients as part of the state’s combined nonpoint and TMDL strategy. Working with state staff on areas specific to the Clark Fork basin, the nutrient target subcommittee will develop a nonpoint strategy that includes the following:

a.) Setting of priority drainages. This includes the state's priorities from the Section 525 and Section 305b reports, the state's nonpoint source stream reach assessments, and priorities identified at the community level by local groups and conservation districts based on available information. The Natural Resources Conservation Service (NRCS) suggests that the nonpoint priorities for the Clark Fork basin should focus on areas where groups are already working on these issues, such as in the upper Clark Fork mainstem (Upper Clark Fork River Basin Steering Committee), the Blackfoot River (Blackfoot Challenge), and the Bitterroot River (Bitterroot Water Forum.) Because the Section 525 study identified the Bitterroot River as a critical source of nitrogen to the Clark Fork during summer months, it will be a high priority to focus on groundwater nitrogen loading to the Bitterroot River.

b.) Identification of sources of pollution in priority drainages through water quality investigations and monitoring.

c.) Completion of an assessment of water quality data to prioritize for corrective measures. Issues to be considered will likely include, but will not be limited to, impacts from agriculture, forestry, mining, and urban/suburban land uses (stormwater and erosion/sedimentation control.) Nonpoint source nitrogen and phosphorus loading from the five principle drainage basins contributing to the Clark Fork have been estimated by Brown and Caldwell (1997) based upon land use, area (acres) and loading factors (kg/acre.) The EPA BASINS program was used to identify land use and area in the following categories: Forest, Urban, Rangeland, Agriculture, and Barren. Loading factors for nitrogen and phosphorus were selected from literature values. For example, continuous flow nonpoint source loads in the upper Clark Fork River basin were identified and estimated for irrigation return flows (500 kg/d total nitrogen and 190 kg/d total phosphorus) and livestock (100 kg/d total nitrogen and 30 kg/d total phosphorus.) The preliminary analysis identified the magnitude of nonpoint source loading by drainage basin and by land use. These estimates will be used to prioritize nonpoint efforts throughout the basin.

d.) Engaging local groups in problem-solving in collaboration with the state and the local conservation districts.

e.) Implementation of voluntary best management practices to address identified impacts.

f.) Tracking overall progress towards meeting nutrient targets; this includes keeping track of how local groups' efforts relate to the big picture and monitoring for water quality improvements in the Clark Fork River.

2. Local Program Implementation

To meet VNRP targets, the subcommittee has set a goal for a 20 percent reduction in nitrogen and phosphorus loading from existing nonpoint sources. To meet this goal, the subcommittee will work in an advisory capacity with basin groups to encourage nonpoint source planning and TMDL implementation. Initial efforts will focus on the upper Clark Fork and Bitterroot drainages where established groups and projects are underway. Recognizing the need for reductions in other areas, the subcommittee will direct its VNRP coordinator to work with DEQ on a prioritization and implementation strategy as described above. Looking at the "big picture," the Council views its role as a potential advisor or assistant to local groups, recognizing that nonpoint plans and TMDL's in tributaries to the Clark Fork will in turn help meet the algal and nutrient targets of this VNRP.

DEQ will be working with local conservation districts and watershed planning groups to reduce nonpoint source nutrient loads in the Upper Clark Fork basin (upriver of Missoula) over the next ten years. Strategies for dealing with nonpoint reductions in the upper basin will be determined by local watershed planning groups such as the Upper Clark Fork River Basin Steering Committee, the Blackfoot Challenge and local conservation districts. The following projects are currently underway and have anticipated water quality benefits:

a.) Upper Clark Fork River Basin Steering Committee: In cooperation with other partners, the committee is beginning a water quality planning approach to smaller watersheds in the upper Clark Fork. The group will be conducting a systematic evaluation of causes of impairment to Section 303(d) listed waters, and developing pilot watershed projects to reduce pollutant levels.

b.) Blackfoot Challenge: The Challenge is a local citizen-based group that is conducting nonpoint source pollution reduction projects in the Blackfoot River basin. Over thirty projects have already been implemented to improve fish habitat, restore natural stream channels and improve riparian vegetation.

c.) Bitterroot Watershed: The Bitterroot Water Forum is a citizen-based group working to increase awareness of water quality issues in the Bitterroot River valley. In 1998 the group is holding several "Know Your Watershed" workshops to foster involvement in water quality planning and restoration efforts. The workshops are expected to generate interest in forming local watershed planning groups to begin developing TMDL's for 303(d) listed waterbodies in the valley, with an emphasis on land use and development issues. DEQ, USGS and Ravalli County have been coordinating on GIS development and ground and surface water monitoring.

d.) Nevada Creek: The North Powell Conservation District is sponsoring a watershed restoration project that proposes to meet water quality standards by improving riparian conditions, stabilizing streambanks, implementing grazing management BMP's, and reducing agricultural wastes from two major confinements and three winter feeding grounds. The project will potentially meet the requirements of a nonpoint source TMDL and proposes to reduce sediment delivery to the Blackfoot River by 50 percent over a ten-year period.

e.) Rock Creek: The Forest Service and Bureau of Land Management are conducting the Rock Creek Sub-basin Analysis to assess the historic and current conditions of fish and wildlife, vegetation, social and economic resources in the Rock Creek watershed. The process is expected to assist federal lands managers with developing a "desired future condition" for Rock Creek which may be used as a TMDL in this watershed. Local landowners, county officials, tribes and state agencies have been invited to participate in the process.

3. New Activities and Growth-related Issues

To address new nonpoint sources and increases to current sources from expanded population growth, the VNRP calls for actions which the nutrient target subcommittee will oversee including:

a.) Developing a priority listing of areas where growth and nutrient increases are likely to take place.
b.) Investigating possible local control options.
c.) Assisting local entities with implementation of appropriate water quality controls in priority areas to buffer impacts from growth.
d.) Working closely with the Growth Management Task Force established for the Missoula valley.
e.) Attaining involvement of Ravalli County to address growth and Bitterroot River-related issues.
f.) Seeking opportunities for nutrient pollution trading and evaluate the need for changes to state laws.

3.5 Timelines

The following milestone tables illustrate timelines and associated projected or actual costs for the point and nonpoint source reduction measures.

Table 3: VNRP Implementation Timeline

			Prior to VNRP								VNRP Ten-Year Program											Costs
			90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	
BUTTE																						
	Voluntary phosphate detergent ban						x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	$4,000
	Stormwater containment pond							x	x	x	x	x	x	x	x	x	x	x	x	x	x	$4,000,000
	Groundwater/stormwater treatment plant + wetland											x	x	x	x	x	x	x	x	x	x	$10,000,000
	BOR investigation of direct discharge alternatives								x	x												$40,000
	Installation of effluent pump station										x											$650,000
	Warm Springs Creek flow augmentation										x	x	x	x	x	x	x	x	x	x	x	$11,500,000
																				Subtotal		$26,194,000
DEER LODGE																						
	Phosphate detergent ban					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0
	Lining of irrigation ditch							x														$30,000
	Rebuild irrigation ditch								x													$5,000
	Land application feasibility study							x	x													$8,500
	Declaratory ruling from DNRC								x													$2,500
	Construct land application system at Grant Kohrs Ranch										x											$207,000
	Land application system operational											x	x	x	x	x	x	x	x	x	x	
																				Subtotal		$253,000
MISSOULA																						
	Phosphate detergent ban	1988	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	$10,000
	Land application assessment			x																		$20,000
	WWTP phosphorus removal evaluation					x																$10,000
	Facility plan update							x	x	x	x											$500,000
	WWTP biological nutrient removal (BNR) experimentation						x	x	x	x	x	x	x									0
	WWTP BNR upgrade												x	x	x	x						$15,000,000
	WWTP capacity upgrade (12 MGD)																			x	x	$20,000,000
																				Subtotal		$35,540,000
STONE CONTAINER																						
	Upgrade of secondary treatment system		x																			$750,000
	Reduction of supplemental phosphorus					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	n/a
	Reduction of supplemental nitrogen		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	n/a
	Summer storage pond selection to reduce seepage							x	x	x	x	x	x	x	x	x	x	x	x	x	x	n/a
	Early start-up of color removal plant (at flow below 4000 cfs)							x	x	x	x	x	x	x	x	x	x	x	x	x	x	$50,000
	No direct discharge July/August (at flow below 4000 cfs								x	x	x	x	x	x	x	x	x	x	x	x	x	n/a
	Contractor evaluation of other nutrient reduction alternatives										x	x	x	x	x							$100,000
																				Subtotal		$900,000
OTHER POINT SOURCES																						
	Committee / DEQ coordinate on other MPDES permits										x	x	x	x	x	x	x	x	x	x	x	n/a
	DEQ permit policy implemented for others to meet targets										x	x	x	x	x	x	x	x	x	x	x	n/a

Table 3: VNRP Implementation Timeline

	Prior to VNRP								VNRP Ten-Year Program												Costs
	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08		
SEPTIC SYSTEMS: Missoula area septic system connection schedule (1)																					
E. Reserve, South: 1,029 units										x	x	x	x	x	x	x	x	x	x		$4,000,000 (2)
E. Reserve, North: 948 units												x	x	x	x	x	x	x	x		$5,000,000 (2)
W. Reserve Interceptor: 516 units														x	x	x	x	x	x		$5,000,000 (2)
East Missoula: 766 Units											x	x	x	x	x	x	x	x	x		$ 820,000 (2)
South Avenue: 1,227 units																			x		$ 660,000 (2)
Target Range Collectors: 660 units																			x		$3,400,000 (2)
Miscellaneous Projects: 113 units																			x		unknown
																		Subtotal			$18,880,000
NONPOINT																					
DEQ TMDL Strategy																			(3)		$2,000,000
Phase I: Existing Clark Fork Basin Nonpoint Projects								x	x	x											
Phase II: Clark Fork Basin TMDL Implementation										x	x	x	x	x	x	x	x	x			
Phase III: Target remaining Clark Fork TMDL needs														x	x	x	x	x			
VNRP Coordinator works w/ DEQ; EPA start-up grant									x	x	x										$50,000
Upper Clark Fork Water Quality Planning projects								x	x	x	x	x	x	x	x	x	x	x			$450,000 (4)
Rock Creek									x	x	x	x	x	x	x	x	x	x			
Blackfoot River 319 projects		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Nevada Creek 319 project						x	x	x	x	x	x										
Little Blackfoot MT Fish, Wildlife & Parks projects								x	x	x	x										
Mainstem Clark Fork Superfund Clean Up																					$20,000,000
Bitterroot River																					$300,000 (5)
Three Mile Creek 319 project		x	x	x	x	x	x														
Bitteroot Water Forum projects, current			x	x	x	x	x	x	x	x	x										
Bitteroot Water Forum projects, projected										x	x	x	x	x	x	x	x	x			
Water Quality Characterization, EPA								x	x	x	x										
Committee/VNRP coordinator develop growth-related issues strategy										x	x										
																		Subtotal			$22,800,000
TOTAL PROJECTED COSTS																					$104,567,000

(1) Numbers indicate potential units for sewer connection
(2) These amounts do not include individual connection fees @ $3,000 per unit
(3) DEQ nonpoint and TMDL schedule currently planned through May, 2007
(4) $450,000 has been spent over the last 8 years; DEQ estimates it will spend about the same amount through 2007.
(5) $300,000 has been spent since 1991; DEQ estimates it will spend about the same amount through 2007.

3.6 Monitoring Plan

A monitoring plan has been developed that incorporates in-stream water quality monitoring and management option evaluation.

1. In-stream Water Quality Monitoring Goals

In 1995, the Council's Monitoring Subcommittee contracted with Land & Water Consulting, Missoula, Montana to design a coordinated, consistent and meaningful monitoring program for the three-state watershed. The work performed by the contractor included: data inventory and compilation; data analysis; definition of monitoring information expectations; assessment of statistical "power of trend"; optimization of the existing monitoring network; and development of operating plans/procedures and reporting procedures. The contractor developed monitoring plan alternatives—based on variables, frequencies, confidence levels and costs—for subcommittee consideration prior to the development of a final monitoring plan. (See Appendix C, related excerpts from the Clark Fork-Pend Oreille watershed monitoring program Sampling and Analysis Plan.) The final plan was completed in 1997 and is being implemented in the 1998 field season.

The monitoring subcommittee has set the following goals for the Montana (Clark Fork River) portion of the watershed:

- Improve water quality, which includes monitoring of seasonally based total phosphorus and total nitrogen concentrations, to detect significant water quality trends;
- Control nuisance algae, which includes measurement of attached algae levels to be compared year to year to detect significant trends in algae growth; and monitoring for changes in algal species to detect trends in species composition as a result of nutrient targets; and
- Achieve in-stream nutrient targets, which includes monitoring of total and soluble phosphorus and nitrogen to evaluate success at achieving targets.

The nutrient target subcommittee believes that a monitoring program based on these goals will fulfill its need for an effective in-stream assessment process. The nutrient target subcommittee worked in conjunction with the monitoring subcommittee to ensure that these goals were included in the final monitoring plan. If the nutrient target subcommittee determines a need for other specific monitoring to assess whether in-stream targets are being met, plans will be developed with the monitoring subcommittee.

2. Evaluation of Management Actions

At least every three years, using the feedback loop approach, the nutrient target subcommittee will complete an evaluation of the VNRP to address the following:

- Based on the time lines, have nutrient reduction measures been implemented?
- Based on in-stream monitoring results and a reasonable expected reduction from each action, are measures as effective in reducing nutrients as anticipated?
- Based on in-stream monitoring results, are algal densities unchanged, increasing or decreasing?
- Based on discharge monitoring reports, in-stream data and model calibration, would in-stream targets be met at 30Q10 flow?

If measures are not meeting expectations, new alternatives will be developed as necessary, reasonable and agreed to by the parties to the VNRP.

3. Responsibilities

To carry out the monitoring/evaluation plan, the following responsibilities have been agreed to:

a.) Point and nonpoint source measures aimed at meeting the in-stream targets will be implemented by the parties to this agreement. The nutrient target subcommittee will oversee this implementation.
b.) The monitoring subcommittee will be responsible for implementing a process to assess in-stream progress, including photo documentation at algal sampling sites.
c.) The nutrient target subcommittee will be responsible for coordinating with the monitoring subcommittee and providing discharger and other monitoring information that it deems appropriate to the monitoring subcommittee's work. (To ensure information coordination and consistency, a nutrient monitoring chart has been prepared by each discharger and forwarded to the monitoring subcommittee and contractor.)
d.) The nutrient target subcommittee will be responsible for evaluating the progress of the VNRP, reporting progress to the Council, and recommending to the Council any revisions to the reduction program that may be deemed necessary if actions are not meeting in-stream targets.

3.7 Public Participation/Education Plan

To gain public support and approval of the VNRP, the Council worked with DEQ and the nutrient target subcommittee to facilitate public meetings. In July 1996, meetings were held in Missoula and Butte. The subcommittee prepared a response document to public comments (Appendix E) and incorporated some of these comments into the final VNRP.

Because keen interest in the Clark Fork VNRP exists in downstream Idaho communities, the Council has sent a copies of the VNRP to its Pend Oreille Lake nutrient target subcommittee for dissemination to the Idaho public.

Once implementation of the VNRP is underway, the nutrient target subcommittee will develop and implement a plan for continued public education in coordination with the Council's Montana public education subcommittee. Through the education subcommittee, a program will be developed to build public support and participation on key issues in priority tributary watersheds, with emphasis on implementation of nonpoint and growth-related issues.

3.8 Administration

Implementation of the VNRP will be coordinated through the Tri-State Implementation Council. Under direction of the Council, the nutrient target subcommittee will be responsible for:

- tracking site-specific management actions for the point sources;
- expanding the present subcommittee to include representation from key nonpoint sources (which may include local governments, water quality districts, conservation districts, subdivision and nonpoint experts from Montana DEQ, NRCS, and other appropriate agencies, and local interest groups;)
- designing and implementing strategies for nonpoint sources and new nutrient sources;
- conducting interim program evaluations with water quality monitoring results;
- developing any changes and adjustments to the VNRP;
- reporting to EPA and the pubic regarding the overall success of the VNRP; and
- providing guidance and oversight to the VNRP Coordinator.

A VNRP Coordinator will be hired by the Council in Fall 1998 to assist the subcommittee with implementation of the VNRP. The key objectives for the Coordinator's position will be to:

- assist the subcommittee with management and oversight of the VNRP;
- gain support for and involvement in the VNRP from a variety of stakeholders representing point and nonpoint sources of nutrient loading;
- assist the subcommittee and stakeholders with implementation of specific nutrient reduction measures;
- establish a basinwide communication network on VNRP progress; and
- establish a foundation for long term project maintenance.

3.9 Funding

In coordination with the Council's funding subcommittee, the nutrient target subcommittee will explore funding possibilities to support implementation measures, especially public education/participation, program administration, and monitoring.

A $50,000 grant has been received from EPA Region 8's Ecosystem Protection Program Regional Geographic Initiative (RGI) FY97 funds to support the VNRP Coordinator's position for a two-year period. An extension request for these grant funds will be submitted by the Council to cover the position for the 1998 to 2000 timeframe.

4.0 Appendices

Appendix A: Clark Fork River Basin Map

Appendix B: Agencies' Clark Fork Model

Appendix C: Excerpts, Clark Fork-Pend Oreille Watershed Water Quality Monitoring Program Sampling and Analysis Plan

Appendix D: Reference List

Appendix E: Response to Public Comments