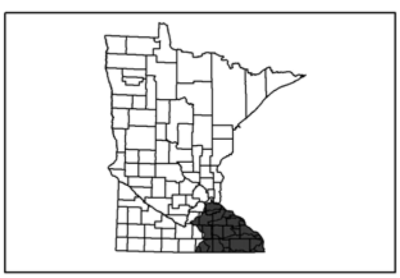
Southeast Minnesota

Conservation Reserve Enhancement Program

February 2003



BALMM

Basin Alliance for the Lower Mississippi in Minnesota

Providing Local Leadership for Water Quality Protection & Improvement in the Lower Mississippi River Basin

Including the Counties of: Blue Earth, Dodge, Dakota, Faribault, Fillmore, Freeborn, Goodhue, Houston, Le Sueur, Mower, Olmsted, Rice, Scott, Steele, Wabasha, Waseca, Winona

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Description of Project Area: The Lower Mississippi River Basin in southeastern Minnesota includes all or part of 17 counties covering 7,266 square miles (4,650,100 acres) of land. It includes 11,500 miles of streams that discharge to the Mississippi, of which 736 miles are designated for trout. About 60 percent of the land is under cultivation, 13 percent forested, 8 percent pasture and 2 percent urban. Fractured limestone bedrock underlies a thin mantle of erosion-prone loess soil in the karst region to the east. Cow-calf and dairy farms add to land-use diversity with pasture, hay and woodland complementing corn and soybeans on hilly terrain. To the west, where major tributaries have their origin, intensive row-crop farming is dominant and most of the terrain is gently sloping.

Existing Conditions and Agricultural Impacts to be Addressed: Water quality monitoring shows widespread exceedances of state and federal water quality standards for turbidity (suspended solids) and fecal coliform bacteria, and increasing concentrations of nitrate nitrogen. Nitrate concentrations exceed drinking water standards in shallow aquifers. Flooding is a major problem. Meeting water quality standards and reducing sediment and nitrogen export to the Mississippi are priority concerns. Increased row-crop production and drainage, and extreme weather, increase stream flows and stream bank erosion. Loss of hay and pasture acreage, excess application of manure and fertilizer, intensive tillage and overgrazing are major sources of these problems.

Project Description: The Basin Alliance for the Lower Mississippi in Minnesota (BALMM) Landscape Buffer Initiative is part of a comprehensive basin plan. The Initiative calls for multi-functional vegetated buffers in four types of strategic locations to reduce runoff, erosion, water pollution and peak stream flows while increasing wildlife habitat. The four strategic locations are: highly erodible land; riparian zones; drained wetlands; and groundwater protection zones.

Size of Project Area and CRP Practices to be Installed: The basin comprises a total of 7,266 square miles (4,650,100 acres) of land, 60 percent of which is cultivated cropland. CRP practices to be installed include: CP-2 (Native Grass); CP-3 (Tree Planting); CP-3A (Hardwood Tree Planting); CP- 4D (Wildlife Habitat); CP-6 (Diversions); CP-12 (Wildlife Food Plots); CP15A (Permanent Vegetative Cover); CP21 (Filter Strips); CP22 (Riparian Buffers); CP 23 (Wetland Restoration); CP25 (Rare and Declining Habitat); CP27/28 (Farmable Wetlands).

Total Number of Acres to be Contracted: 95,730 acres, allocated as follows:

- Highly Erodible Land: 40,230 acres
- Riparian Corridors: 25,000 acres
- Wetland Restoration: 20,000 acres
- Groundwater Protection: 10,500 acres

Estimated Cost of the Project: Approximately $225 million over 15 years, with $190 million from the Federal Government, and $45 million from the State.

Section II: Existing Conditions

State and national significance: The project area is of state and national significance for many reasons. It is a significant source of pollution that negatively impacts water quality and aquatic habitat in the Mississippi River and Northern Gulf of Mexico. The project area also possesses high recreational value, which, however, is being limited by aquatic and terrestrial habitat degradation.

- Water Quality Standard Exceedances: The region's streams generally exceed state and federal water quality standards for fecal coliform bacteria (20 stream reach impairments) and turbidity (19 stream reach impairments). This includes tributaries and the Mississippi River. The Root River, for example, is impaired by high turbidity in its lower reach and is a significant source of turbidity and suspended sediment downstream in the Mississippi River in Navigation Pool 8. Plans to achieve water quality standards must be developed and implemented as required in the Federal Clean Water Act, Section 303, through the Total Maximum Daily Load process. It is an urgent state and national priority to develop and implement such plans. A regional fecal coliform TMDL covering 20 impaired reaches in Southeast Minnesota was approved by the US EPA in November 2002.

- The Upper Mississippi River System (UMRS) includes commercially navigable reaches of the Mississippi River between Cairo, Illinois and St. Paul, Minnesota, including the main channel and its floodplain. The UMRS is a nationally significant ecosystem and a nationally significant commercial navigation system, as declared by the U.S. Congress in 1986. It is critical habitat for 286 state-listed or candidate species and 36 federal-listed or candidate species of rare, threatened or endangered plants and animals endemic to the Upper Mississippi River Basin. The portion of the UMRS that borders southeastern Minnesota, Navigation Pools 3-9, includes some of the highest quality wildlife habitat of the entire UMRS. A 1990 study showed that 75% of all nonresident recreation expenditures in the entire UMRS corridor occurred within the St. Paul District of the US Army Corps of Engineers, which includes Navigation Pools 1-10. The BALMM region of southeastern Minnesota drains to the river and its floodplain, impairing its quality with discharges of sediment and nutrients.

- Hypoxia in the Northern Gulf of Mexico: The problem of low dissolved oxygen (hypoxia) in the Northern Gulf of Mexico is a national concern that has been linked to excessive loads of nitrate nitrogen from the Mississippi River. An estimated 56 percent of the annual average nitrate nitrogen load originates in the Upper Mississippi River Basin, upstream of Cairo, Illinois. Southeastern Minnesota watersheds are identified as yielding high (10,000 – 15,000 kg/km^2) and very high (15,000 – 20,000 kg/km^2) yields of nitrate nitrogen to the Mississippi River.

- Trout Stream Habitat: Southeastern Minnesota is home to 736 miles of trout water in 102 streams, which attract anglers from miles around. In 1998, a DNR creel survey estimated total mean angling pressure to be 617 hours/acre. By contrast, angling pressure on Minnesota lakes rarely exceeds 100 hours/acre. Total estimated annual angling pressure in southeastern Minnesota streams is 500,000 hours. Prior to European settlement, brook trout were distributed throughout the region, but have largely been replaced by introduced brown trout. Brook trout are now restricted to small feeder streams and headwater sections. Trout require cold, clear, oxygen-rich water, and are very sensitive to disturbances from sedimentation, high flows and loss of riparian vegetation. Cold-water streams therefore are protected with more stringent water quality standards than apply to warm-water streams, in accordance with state and national priorities. Management of this fishery is the major DNR Fisheries management program in southeast Minnesota.

- Hunting Habitat – Big-game hunting for white-tailed deer and turkey occurs throughout the area and is most prevalent in the eastern basin where habitat is most extensive. More than 25,000 deer were harvested in 2000. Almost 13,000 individual permits were issued, and about 4,100 turkeys harvested during the spring 2000 wild turkey season. Hunting pressure for deer remains constant, and interest in turkey hunting is increasing as turkey populations expand. Duck hunters spent an estimated 96,692 hunting days afield and harvested 96,804 ducks in 2000. The same year, an estimated 23,112 pheasant hunters spent 161, 782 hunting days afield and harvested 67,785 pheasants. Each hunter spends an estimated $416/season, for a total of $9.6 million, a strong stimulus to the regional economy.

- Trails – Nine trails ranging from three to 48 miles have been established on abandoned railroad grades for hiking, biking, in-line skating, and cross-country skiing. DNR surveys from 1997 and 1998 show that the most popular trails attract upwards of 100,000 user hours per summer, while the remainder attract about 50,000 user hours. Hundreds of additional trail miles are planned in order to create connected corridors traversing southeastern Minnesota. Maintenance of high water quality in streams adjacent to the trails, and landscape diversity on land adjacent to the trails, is integral to the quality of outdoor experience valued by the thousands of people who use the trails.

Human Activities and Land Use in the Basin:
The Lower Mississippi River Basin in southeastern Minnesota includes all or part of 17 counties covering 7,266 square miles (4,650,100 acres) of land. It includes 11,500 miles of stream, 736 of which are designated for trout. About 60 percent of the land is under cultivation, 13 percent forested, 8 percent pasture and 2 percent urban. Fractured limestone bedrock underlies a thin mantle of erosion-prone loess soil in the karst region to the east. Here, cow-calf and dairy farms add to land-use diversity with pasture, hay and woodland complementing corn

and soybeans on the hilly terrain. To the west, where the major tributaries have their origin, intensive row-crop farming is dominant and most of the terrain is gently sloping. The basin population increased by 12 percent to more than 600,000 from 1990 to 1998, putting increased recreation and development demands on the region's land and water resources. Most of the growth has been in Dakota (23.3 percent), Rice (10 percent), Dodge (10 percent) and Olmsted (11.8 percent) counties. Population growth in the first two counties is oriented to employment opportunities in the Twin Cities Metropolitan Area, while population growth in the latter two counties is related to expanding employment opportunities in Rochester, much of it triggered by the rapidly growing Mayo Clinic complex.

Farm Demographics: According to Minnesota Agricultural Statistics 2001, there are 12,844 farms in the basin operating 2,966,165 acres of cropland with an average size of 286 acres. Average farmer age is 51.

Environmental Factors

- Precipitation and runoff: Southeastern Minnesota receives the highest average annual precipitation in the state, 28 to 31 inches, which often occurs as intense storms. The abundant moisture greatly benefits crop production but aggravates problems associated with soil erosion and sediment transport to surface water. Annual runoff ranges from 5.5 to about 8 inches on average, increasing from west to east.

- Soils: Two distinct areas of wind-deposited silt loam (loess) soils dominate the southeastern Minnesota landscape. The karst area to the east has relatively deep to shallow deposits of loess overlying limestone and sandstone bedrock and has exceptional water-and nutrient-holding capacity. The soils also have good internal and surface drainage with a rolling topography and gradual to steep slopes. Soil depth varies from one foot to greater than 20 feet. Gently sloping to flatter fields characterize the other major soil area located on the western edge of the rolling landscape. The loess soil in this area developed as a cap overlying glacial till. The soil has good water- and nutrient-holding capacity as well, but much poorer internal drainage due to the fine-textured subsoil. Loess soils are susceptible to erosion, particularly those on rolling landscapes with steep slopes.

- Important geologic features: Much of southeastern Minnesota exhibits a karst topography where the upper carbonate bedrock, covered only by that thin layer of glacial material or loess, contains numerous and sometimes extensive solution fractures and cavities. The dissolution of the carbonate rocks has lead to structural characteristics like sinkhole formations and provides for a high degree of underground drainage with rapid infiltration to lower aquifers and direct connections between surface waters and ground waters. Karst topography is the term used for the regions over shallow limestone or dolomite bedrock that have had fractures enlarged and caves formed through the dissolution of the rocks. Karst areas are characterized by, among other things, sinkholes, caves, disappearing reaches of streams and rapid underground drainage. Due to the interconnection of surface and groundwater, the risk of aquifer contamination is relatively high.

A second important geologic feature is a linear outcropping of the Decorah shale formation, which runs through five counties in the basin for several hundred miles. The Decorah shale formation acts as a confining layer to upper carbonate aquifers above it, which tend to be very high in nitrate nitrogen concentrations. Water seeps from the upper aquifers over the shale and then percolates through overburden to recharge deeper aquifers that serve as drinking water supplies to cities such as Rochester and Preston. When left intact, with vegetative cover, the band of soil covering the face of the outcropping plus a few yards up- and down-slope provides significant infiltration, absorption and denitrification of polluted water from the upper aquifers. When cropped or covered over with impervious surface, it loses these functions to the detriment of water quality and quantity.

- Vegetation patterns: Western basin: Gently rolling plains in the west and central portions of the region are heavily farmed with very little original vegetation present.

  Eastern Basin: The blufflands area of the east consists of bedrock deposits of limestone and sandstone that are heavily eroded with exposed bluffs and deep stream valleys (500 to 600 feet deep). When the first settlers arrived, they found valleys rich in bottomland forests and clean, spring-fed streams with abundant brook trout populations. Oaks dominated most slopes, although sugar maples and basswood grew on some north- and east-facing slopes. Some of the upland was oak savanna, gently rolling prairie with scattered oaks. Today, upland plains and plateaus are farmed while forests are found along major river corridors and valleys. Remnant stands of white pine and other plants usually found farther north still remain from a time when the climate was colder.

  Western Basin: The Oak Savanna Landscape once hosted a mosaic of plant communities: oak savanna, tallgrass prairie, wetlands, and maple-basswood forest. The occurrence of a particular community depended on topography, geology and disturbances. Approximately 90 percent of the land has been converted to cropland (87%) or developed for towns, housing, industries, roads or rails. Natural communities exist as scattered remnants. Ecological systems are severely degraded and have lost their ability to renew themselves or provide resources on a sustainable basis. The largest prairies remaining occur in road ditches. Remaining examples of oak savannas are rare, small and severely degraded by the invasion of non-native plants and the lack of fire.

- Wildlife: In the course of a year, as many as 42 mammal species and 237 bird species use the ecosystems. In the eastern basin, algific talus (steep, rocky, southern exposure) slopes support plant and animal communities found nowhere else in Minnesota and few other places on Earth. Many upland game species including deer, turkey, pheasant, partridge and ruffed grouse thrive in this area.

- Water Resources: The surface water resources of the Lower Mississippi River Basin in Minnesota consist of 11,566 stream miles (364 miles assessed) and 114,781 lake acres (54,110 acres assessed).

  Lakes: Of 47 monitored lakes, 7 are fully supporting, 4 are partially supporting and 36 are nonsupporting of water quality criteria established for lake assessment in Minnesota. Excess phosphorus resulting in hypereutrophication is usually the cause of partial and non-support.

  Streams: Water quality monitoring over several decades shows widespread exceedances of state and federal water quality standards throughout the basin for turbidity (suspended solids) and fecal coliform bacteria, along with steadily increasing concentrations of nitrate nitrogen. Nitrate concentrations exceeding drinking water standards are found in shallow aquifers. Meeting water quality standards and reducing nitrogen export to the Mississippi River are priority concerns to the state and nation, on top of regional and local concerns caused by water quality degradation. Intensive land use and extensive drainage, coupled with extreme weather, has led to increased flooding and stream bank erosion. Agricultural land use is a significant source of these problems, with livestock manure, commercial fertilizer, and tillage and grazing practices among the major sources of excess nutrients, fecal coliform bacteria and soil erosion, which degrades both soil productivity and stream water quality.

  Ground water: Generally, the upper-most ("shallow") glacial and bedrock aquifers will have ground water movement which is locally toward the nearest topographic drainage point such as a stream or valley and regionally toward the mouth of the watershed. It is often the case that the upper bedrock aquifers have regional flow directions which mimic the surface water flows in the watershed. The general pattern for ground water aquifers is to have recharge in the upland plateaus with subsequent dewatering as baseflow, springs or seeps into the stream valleys. Bedrock aquifers also exhibit a constant downward movement of water with some recharge to deeper aquifers through leaky confining units and some aquifer cross-over of watershed boundaries. The ground water movement of the water table and surficial aquifers tends to bend parallel to river flows with a water table divide at the stream.

Many of the watersheds have areas that are highly susceptible to ground water contamination. These areas typically have only a thin sediment layer over the bedrock. This susceptibility is also magnified by the bedrock dynamics exhibiting rapid water travel times through dissolved limestone and dolomite fractures, caves and extensive underground drainage. While many aquifer waters typically move only a few feet per year, many of the waters in the karst regions can have ground water movement on the extreme order of miles per day. Nitrates, pesticides, and bacteria are common pollutants that can re-enter streams through this underground drainage as well as move vertically to impact deeper aquifers. In addition, many of the ground water aquifers are highly susceptible to pollution because of extensive areas of coarse sediments such as outwash or riverine sand deposits. On the other hand, one of the benefits of this high degree of ground water and surface water interaction is that it provides for a strong (and cool) supply of water to streams through baseflow and springs that has resulted in many of the trout stream reaches in this basin

- Air Quality: Throughout the basin, ambient air quality is in attainment with criteria pollutants listed in state and federal regulations.

- Federally listed endangered and threatened species: Algific talus (steep, rocky, southern exposure) slopes support plant and animal communities found nowhere else in Minnesota and few other places on Earth. Fourteen threatened or endangered species (federal and/or state) occur within very unique and specific habitats. The following five are federally threatened or endangered species: the peregrine falcon, bald eagle, Karner blue butterfly, Leedy's roseroot, and the Higgins Eye pearly mussel.

Section III: Agriculture-Related Environmental Impacts

Agricultural impacts can be most clearly described with reference to specific water quality concerns. These include:

- Fecal coliform bacteria: Data from more than 2300 water samples at 113 monitoring sites from 1997 to 2001 show stream concentrations on average more than twice the water quality standard of 200 organisms per 100 ml. Livestock manure accounts for an estimated 90 percent of the problem during spring and summer wet weather periods, when fecal coliform concentrations tend to be highest, according to the Regional Fecal Coliform TMDL study by the Minnesota Pollution Control Agency. Fecal coliform bacteria also is detected in shallow groundwater. Manure runoff to sinkholes and other focused recharge zones are suspected sources, along with failing septic systems.

- Turbidity: Turbidity values exceed the water quality standard for about 23 percent of samples taken in the Zumbro, 20 to 40 percent of samples in the

Mississippi River downstream of the Root River confluence, and for 47 to 75 percent of samples for Garvin Brook, a trout stream. Watershed assessments identify agricultural runoff as the main source of suspended sediment, which correlates very closely to turbidity. In the Whitewater River Watershed, a 1996 assessment indicated that 68 percent of sediment in the river came from sheet and rill erosion, largely from agricultural fields, while 21 percent came from stream bank erosion. Watershed modeling often shows agricultural best management practices to be the most effective ways to reduce sediment runoff. An assessment of Dobbins Creek, northeast of Austin, showed that most stream sediment originated in the uplands of a largely agricultural watershed. The Agricultural Nonpoint Source model showed that gully removal plus conservation tillage would reduce sediment in the stream by 33 percent after a 5-inch storm, and by 60% in a normal year of moderate rainfall events. A study of the Wells Creek watershed near Frontenac estimated that 100-foot buffers plus conservation tillage would reduce sediment in the stream by 31 percent.

- Nitrate Nitrogen – Concentrations show a steady increase over three decades across the basin. In small headwater streams, the concentration of nitrate nitrogen often exceeds 10 mg/L, the drinking water standard. Typical tributary concentrations range from 3.0 to 9.0 mg/L, with values in the Mississippi from 1-3 mg/L. Besides posing a potential health threat to drinking water, high nitrate nitrogen concentrations lead to excessive algae production in Mississippi River backwaters and contribute to very low oxygen levels, or hypoxia, in the Northern Gulf of Mexico. Soil organic matter and nitrogen fertilizer are by far the leading sources of inorganic nitrogen, providing 42 and 36 percent of the total amount, respectively, statewide. In southeastern Minnesota, livestock manure is another significant source. In the Garvin Brook Watershed study, where more than 36 percent of private wells exceeded the nitrate standard, nitrate-nitrogen concentrations four to eight feet below fertilized land generally were between 20 and 50 mg/L.

- Phosphorus: High concentrations of phosphorus can trigger excessive algae production, or hyper-eutrophication, in lakes, reservoirs or slow-moving rivers or backwaters with hydraulic residence time of one week or more. The decay of algae can use up dissolved oxygen near the bottom of rivers and lakes, threatening aquatic life. This condition of hyper-eutrophication occurs in shallow lakes in the western basin, as well as in Lake Pepin on the Mississippi, Lake Zumbro on the Zumbro River, and Lake Byllesby on the Cannon River. The latter three lakes have recently been added to the Section 303(d) list of impaired waters, for which TMDLs must be developed.

  While hyper-eutrophication does not often occur in Mississippi River navigation pools bordering Minnesota, it is more common further south, in Pools 13 and downriver. Since phosphorus is a conservative pollutant, it can contribute to hyper-eutrophication far from its point of origin, so that phosphorus originating in southeastern Minnesota can contribute to algae production in the Mississippi near Clinton, Iowa, or below. Typically, point sources provide the majority of phosphorus during dry periods, and nonpoint sources dominate during wet weather, when rainfall or snowmelt carries phosphorus attached to sediment, or in solution from manure runoff, to surface water. A 1996 study of Lake Byllesby, for example, estimated that nonpoint sources contributed 65 percent of phosphorus in normal years, and about 45 percent in low-flow years. Manure, commercial fertilizer and phosphorus-rich soil are major agricultural sources of phosphorus.

<u>Past and Projected Future Trends in Agricultural Impacts:</u>

<u>1850 to 1930</u>: The period of European settlement and clearing of the land for agriculture brought profound changes to the landscape. As the new population expanded, highways and towns were built, prairies were plowed for grain production, forested bluffs were cleared for pasture, and the increased runoff and eroded topsoil were shunted off downstream. By the 1920s, resultant problems were becoming intolerable, particularly in steeply sloping areas to the east. For example, farms and small towns were being flooded up to 20 times per year. Low-lying fields and homes were buried under 15 feet of eroded soil in the Whitewater River watershed, where the once-prosperous towns of Beaver and Whitewater Valley were abandoned. Bridges were washed out and had to be repeatedly rebuilt, and ditches and culverts became perpetually clogged with sediment and debris. Clear, cold and productive trout streams became sediment-laden, flood-ravaged warm water streams incapable of supporting native trout.

<u>1930 to 1970</u>: In response to these problems in addition to the Dust Bowl and the Great Depression, the Soil Erosion Service was established in the 1930s, which later became the Soil Conservation Service and today is the Natural Resources Conservation Service. Soil and Water Conservation Districts were established in counties. Federal funding was made available for the design and construction of soil conservation practices. Gradually, as contour farming, terraces, waterways, sedimentation basins and other practices were widely installed, and farmers became more conscious of the need to control erosion, soil erosion and associated problems of flooding, stream channel disturbance and degraded water quality began to subside. From decade to decade, more and more stream reaches became cold, clear and stable enough to once again support trout reproduction.

<u>1970 to present</u>: During the past three decades dramatic changes have taken place in both the technology of agriculture and the structure of farming which have had a mixed influence on soil conservation, water quality and wildlife habitat. New technologies such as high-horsepower mechanization, commercial fertilizer and synthetic pest control agents began to be introduced shortly before and following World War II. At first, farmers adopted these technologies to their existing operations, which were diversified crop and

livestock enterprises with a typical size of 160 acres, and average herd sizes of 20-30 milk cows, 10 – 20 sows, 50 – 100 feeder pigs, etc. Land use remained similarly diverse, with hay, pasture and woodland complementing production of corn, small grains, and soybeans. However, by the 1970s, farming in southeastern Minnesota began following national trends of specialization and expansion which have persisted through the present. A few of the most dominant trends, and their effect on the environment, are as follows:

- Larger farms and fields: Typical commercial farm size has increased from 160 acres to 1,000 to 2,000 acres (average farm-size statistics which include small hobby farms mask this trend). Fence rows, grassed waterways and terraces are commonly eliminated to expand field size to accommodate larger tractors and wider equipment. This increases slope length and erosion potential.

- More row crops, less perennial vegetation: At first in the western basin, and more recently in the east, once-diversified farms have abandoned livestock together with acreage of hay, small grain and pasture. In 9 southeastern Minnesota counties from 1975 to 1999, the percentage of crop acreage comprised of corn and soybeans increased from 64 percent to 80 percent. Data from the National Resources Inventory for the basin shows a 28 percent decline in acreage of pastureland and noncultivated cropland from 1982 to 1997. Driven by farm program incentives and livestock sector economics, hundreds of farmers are planting soybeans on steep slopes once planted to contour strips of corn and alfalfa hay. Not only does this dramatically increase the potential for soil erosion; it also greatly increases the potential for nitrate leaching to shallow groundwater.

- Concentrated livestock production: New dairy operations with several hundred or even 1,000 cows or more have started to become established over the past decade in southeastern Minnesota, replacing herds of 30 to 60 cows. Confinement hog operations with several thousand animal units are not uncommon. This results in highly concentrated manure storage and application, hence the need for more careful design and management of feedlots and manure application to avoid excessive runoff and leaching. Managed, rotational grazing of dairy and beef cattle has proven to be economically viable and environmentally beneficial in the region, but so far is practiced on a relatively small number of farm operations.

- Crop nutrient application rates: Two detailed studies of manure and commercial fertilizer use in southeastern Minnesota suggest that farmers tend to exceed University of Minnesota nitrogen application recommendations by 16 to 53 pounds per acre, when sources from previous legume crops, manure applications and soil mineralization are taken into account. The lower number applies to a project where farmers were engaged in nutrient management education and planning, whereas the second estimate reflects broader farmer practice.

- Increased conservation tillage: Conservation tillage adoption rates on row-crop land ranged from about 23 percent to 77 percent of surveyed sites in a 2000 county transect survey of cropland in the basin. Although this represents significant progress in providing erosion control under normal rainfall conditions, there is considerable scope for increased adoption, and the need remains for control measures to reduce soil erosion and runoff from rare, catastrophic storms.

- Surface and subsurface artificial drainage: Much of the landscape in the western basin was drained for agricultural production starting in the 1940s and '50s with surface ditch construction and subsurface tiling. Drainage tile technological advances in the 1970s have accelerated the rate and intensity of subsurface drainage, particularly in the western basin. While this has improved agricultural productivity and made possible conservation tillage on poorly drained fields, it also has eliminated much wetland habitat and drastically altered the hydrology of the region's stream network. As a result, the region's streams are more "flashy" today than they would otherwise be, with intense storms leading to higher peak flows, and dry periods leading to lower base flows, than prevailed before the advent of artificial drainage. This has the effect of increasing stream bank erosion and otherwise disturbing the habitat requirements of trout and other aquatic life.

Future: Land use trends indicate that environmental problems may worsen in future years, as soybeans continue to replace hay and oat production on thousands of acres on steep hills, field sizes continue to grow, farms continue to specialize in row crops or concentrated livestock production, and artificial drainage continues at a rapid pace. Agricultural scientists and leaders as well as natural resource managers are becoming alarmed at these trends, and question whether the corn-soybean rotation is environmentally sustainable on the steep slopes of southeastern Minnesota. Particularly threatened are cold-water streams that provide trout habitat in the karst region of the eastern basin.

Nature of Health-Related Impacts:

Fecal Coliform Bacteria: Long-term monitoring of fixed sites in the basin demonstrates widespread exceedence of the water quality standard for fecal coliform bacteria. Concentrations often are at levels two to four times the standard used by state sanitarians to close beaches, which is 200 organisms per 100 ml water sample. This is an indication that too much fecal matter is entering the stream. Although it is not direct evidence of pathogens in the water, it does indicate a potential threat to public health.

Antibiotic-Resistant Bacteria: The widespread use of sub-therapeutic levels of antibiotics in livestock feeding operations may be leading to the development of resistant strains of pathogens. Research has been proposed for southeastern Minnesota to determine whether land application of manure is likely to be a significant means for spreading these pathogens into the environment, and whether resistant bacteria move through the soil profile or by overland flow into surface and subsurface flow. At a BALMM public forum in Rochester, Minnesota, in November 2000, citizens asked what is known about the extent of antibiotic-resistant bacteria in the water in southeastern Minnesota. A medical doctor in attendance insisted that this is a potentially widespread problem that deserves attention. Subsequently, the Lower Mississippi River Basin Plan Scoping Document was revised to include mention of this concern and the need to address it through water quality monitoring.

Nitrate Nitrogen: High concentrations of nitrate nitrogen ($N0_3$) in drinking water pose a threat to human health, which is why the federal standard for $N0_3$ in drinking water has been established at 10 mg/L. The greatest threat of nitrate nitrogen is to infants, which may develop a condition known as methemoglobinemia (blue baby syndrome) as a result of ingesting excessive amounts of nitrate nitrogen. Cases of methemoglobinemia in Minnesota and other midwestern states have been associated with high levels of nitrate in well water. In southeastern Minnesota, high nitrate concentrations, often in excess of the drinking water standard, are common in older, shallower wells that draw from upper carbonate aquifers.

Past, Ongoing and Future Efforts (State and Federal) to Address Ag Impacts: As mentioned above, local, state and federal programs to address soil erosion have had a positive impact on soil erosion, runoff, flooding and water quality. A major effort in soil conservation starting in the 1930s resulted in the implementation of conservation practices broadly across the landscape.

Starting in 1977, state cost-share funds delivered through local Soil and Water Conservation Districts enabled landowners to reduce soil erosion through the implementation of additional conservation practices. The Minnesota Board of Water and Soil Resources (BWSR) administers this program, along with state wetland conservation legislation and a land-retirement program called the Reinvest in Minnesota (RIM) Reserve.

The 1985 Farm Bill introduced additional programs, such as the Conservation Reserve Program, and conservation compliance, which required farmers with highly erodible land to operate their farm according to a conservation plan. These plans relied heavily on conservation tillage to achieve compliance, triggering a major increase in adoption of reduced tillage methods across the landscape, particularly in the southeastern-most river counties and the far western basin. State and federal agencies played a significant role in furthering this trend, as did the agricultural input supply industry by developing additional burn-down and post-emergent herbicides, durable, accurate planters, and equipment with tolerance for high levels of surface residue.

Currently, the NRCS, FSA, BWSR, DNR, PCA and SWCDs continue to be very active delivering conservation programs and responding to the needs of local landowners who want to improve their soil conservation performance. In the past several years, increased attention has been paid to installing practices for both soil conservation and water quality benefits. Most recently, in 2001, through BALMM, local, state and federal agencies have developed collaborative interagency strategies addressing soil erosion, wetland conservation, nutrient management and the maintenance of perennial vegetation on the landscape. The BALMM Landscape Buffer Initiative was developed as part of this comprehensive plan.

The following table summarizes current activity levels for the following state and federal conservation programs: Reinvest in Minnesota (RIM) Reserve; Conservation Reserve Program (CRP); Emergency Watershed Protection (EWP); Wetland Reserve Program (WRP); Wildlife Habitat Improvement Program (WHIP); and Environmental Quality Improvement Program (EQIP).

Table 1: State and Federal Conservation Programs in Program Area

Program	Contracts	Acres Enrolled	Dollars Awarded
RIM	302	9,567	5,841,446
CRP		122,523	
EWP	7	490	1,014,283
WRP	86	5,428	6,890,258
WHIP	91	2,023	428,295
EQIP	425		7,622,465
Total	**911**	**140,031**	

Section IV: Project Objectives

The objectives of this project are presented with reference to the following environmental goals: 1) Reduce soil erosion; 2) Reduce sediment in streams; 3) Reduce nitrate nitrogen in surface water and ground water; 4) Reduce peak flows of streams; 5) Improve fish and wildlife habitat. This CREP proposal also is designed to contribute toward the achievement of objectives listed in the BALMM *Lower Mississippi River Basin Plan Scoping Document*, as well as *Watermarks 2000*, the 10-year water plan for the State of Minnesota, as indicated below.

Reduce Soil Erosion: Implementation of the BALMM Landscape Buffer Initiative on highly erodible land through critical area seedings and contour strips is expected to result in a reduction in gross soil erosion of 2,341,250 tons on 214,000 acres of land eroding at twice the tolerable level or greater, according to NRCS estimates. The project objective is to target the implementation of an estimated 40,230 acres of buffers on highly erodible land to reach this target. Critical area seedings will bring erosion rates down to very low levels of approximately 1 ton/a. Contour strips will reduce erosion rates from an average of 27.7 tons/a to 7.35 tons/a on land eroding at 4T and above, and from 12.7 tons/a to 6.0 tons/a on land eroding at 2T-4T per acre.

Reduce Sediment in Streams: A recent study (Boody and Krinke, 2001) found that sediment delivery to the mouth of Wells Creek could be reduced by an estimated 31 percent through implementation of riparian buffers and conservation tillage. An overall project objective is to achieve this goal throughout the basin by implementing buffers in concert with other conservation practices.

A key objective of the BALMM Landscape Buffer Initiative is to target the implementation of buffers to achieve a total reduction of in-stream sediment of 224,051 tons per year. These benefits will be achieved with buffers implemented in three strategic locations, as follows:

> Highly Erodible Land: With a sediment delivery ratio of 7.7 percent (Whitewater River Watershed Project), a reduction in soil erosion of 2.34 million tons leads to a reduction in sediment load to streams of 180,276 tons.
> Riparian Buffers: Based on a MPCA spreadsheet developed for the Minnesota River Basin CREP, 25,000 acres of well-targeted riparian buffers can reduce sediment in streams by 35,775 tons.
>
> Wetland Restoration: Based on a MPCA spreadsheet developed for the Minnesota River Basin CREP, 20,000 acres of restored wetlands is expected to reduce annual in stream sediment load by 8,000 tons.

Reduce Nitrate-Nitrogen in Surface Water and Ground Water: An objective of the BALMM Landscape Buffer Initiative is to achieve nitrate-nitrogen reductions through wetland restoration in the western basin (MLRA 103 and 104). This will be achieved by targeting the restoration of 20,000 acres of wetlands, mainly in the western basin (MLRA 103 and 104), to achieve a 15% reduction in concentration of nitrate nitrogen in surface water. The Integrated Assessment on Hypoxia in the Gulf of Mexico (Mitsch et al; Randall, personal communication) suggests that this can be attained through restoration of properly designed and positioned wetlands on 0.7% of the land surface.

Reduce Peak Flows of Streams and Rivers: Research indicates that peak flows can be reduced by an estimated average of 3.7 percent for each additional percent of the landscape restored to wetlands (Demisse and Khan, 1993). By focusing wetland restoration in priority watershed projects, peak flow reductions above 3.7 percent can be achieved, especially in upper reaches for less extreme flood events.

Increase the Quantity and Quality of Wildlife Habitat: By selection of appropriate native grasses and tree species, wildlife habitat will be increased in proportion to the increase in acreage of perennial vegetation.

Additional Water Quality Objectives:

- Support the BALMM/Watermarks goal of achieving water quality standards for fecal coliform bacteria and turbidity by 2010. This will be accomplished as part of a comprehensive basin plan, and coordinated with the implementation of regional TMDL plans for these pollutants.
- Support the BALMM/Watermarks goal of reversing the trend of increasing nitrate nitrogen concentrations in surface water by 2010.
- Support the BALMM/Watermarks goal of establishing naturally reproducing populations of brook trout in the region's designated trout streams.

Land Use Objectives:

- Support the Regional Fecal Coliform Bacteria TMDL goal of achieving a 65 percent reduction in significant pollutant sources, including livestock.
- Support the BALMM/Watermarks goal of increasing perennial vegetation by 200,000 acres. This project will accomplish 40% of this goal.
- Support the BALMM/Watermarks goal of reducing soil erosion to no greater than the rate of soil formation (T).
- Support the BALMM goal of accelerating the implementation of riparian vegetated buffers as part of a strategy to increase perennial vegetation.
- Support the BALMM goal of achieving targeted wetland restorations that provide benefits to hydrology, water quality and biological diversity.

Section V: Project Description

BALMM is a regional alliance of locally elected officials, local, state and federal units of government, and non-governmental farm and conservation organizations. The purpose of BALMM is to provide local leadership for water quality protection and improvement in southeast Minnesota's Lower Mississippi River Basin.

BALMM has developed a Landscape Buffer Initiative as part of a comprehensive basin plan to protect surface and groundwater resources while reducing peak stream flows. The initiative calls for the placement of multi-functional vegetated buffers in four types of strategic locations on the landscape to reduce runoff, soil erosion and water contamination while providing high quality wildlife habitat and abatement of peak stream flows. The four strategic locations are: highly erodible land; riparian zones; drained wetlands; and groundwater protection zones.

Environmental Criteria and Conservation Practices
All lands to be enrolled in this program must meet the eligibility criteria set forth at 7 C.F.R. Part 1410, and must also meet both the location criteria and the practice criteria described below.

Location Criteria: All lands enrolled must meet one of the following four criteria:

1. Highly Erodible Land: To be eligible for contour buffers, a field must have an Erodibility Index of 8 or greater. To be eligible for other practices, 51 percent or more of the field must have an Erodibility Index of 15 or greater. The contour buffer standard (CP15A) may be expanded to allow 30 to 60 additional feet for correction areas and to square off areas for waterways. Where contour buffers exist, flexibility to extend field borders to 60 feet where needed to allow access to buffer strips for maintenance. Field borders (picture frames) are eligible where contour buffers are established, and where needed for erosion control.

2. Riparian Zones: Riparian buffer and filter strip land along intermittent and permanent water courses in the project area are eligible. These vegetated areas shall be in widths specified in the NRCS Field Office Technical Guide. Limited to cropland only. For occasionally and frequently flooded soils, NRCS Standards 391 and 393 may be used to extend beyond 180 feet.

3. Wetland Restoration Sites: The Federal 1987 Wetland Delineation Manual will be used to define and delineate wetlands. Wetlands and adjacent uplands at a ratio of up to four acres of uplands for each acre of wetlands in Major Land Resource Areas (MLRA) 103 and 104. In MLRA 105, a ratio of up to two acres of uplands for each acre of wetlands will be used. Wetland restoration easements will be perpetual by state law.

4. Groundwater Protection Zones:
   - Sinkholes: A buffer will use CP21 up to 120 feet from the edge of the sinkhole. In areas within the sinkhole watershed that exceed 120 feet, the buffer can be expanded to a maximum average of 200 feet, and enrolled through CP2 or CP25.
   - Wellhead Protection Areas: Areas of the field within the entire Drinking Water Supply Management Area approved by the Minnesota Department of Health.
   - Focused recharge areas: Contour buffer zones designed to intercept and denitrify water flowing over and immediately below outcroppings of the Decorah Shale geologic formation. Buffer width may extend to a maximum of 50 feet upslope and downslope of the edge of exposed shale. For additional erosion control and water

quality benefits, the area identified can be extended on the contour to the ends of the field.

CRP conservation practices to be adopted: The following CRP conservation practices will be used in combination to address the resource needs identified in this application.

- CP-2 Permanent Native Grasses
- CP-3 Tree Planting
- CP-3A Hardwood Tree Planting
- CP-4D Permanent Wildlife Habitat
- CP-6 Diversion
- CP-9 Shallow Water Area
- CP-12 Wildlife Foodplot
- CP-15A Permanent Vegetative Cover (Contour Strips)
- CP-21 Filter Strip
- CP-22 Riparian Buffer (only on existing cropland)
- CP-23 Wetland Restoration
- CP-25 Rare and Declining Habitat
- CP-27/28 Farmable Wetland Program

Additional Provisions:

1. Limited haying and grazing. It is proposed that limited haying and grazing of grass buffers be allowed as cover management practices, according to the provisions of an approved conservation plan.
2. Rotation of contour buffers. It is proposed that rotation of contour buffers be allowed on highly erodible land.
3. Enrollment maximum. A maximum enrollment of 120 acres per project is established. If the project area exceeds 120 acres, approve\al is needed by the local SWCD Board and FSA committee. There will also be an appeal process to the area and state level if denied.

Length of time for project implementation: This project will receive applications from landowners for five years. Therefore, five years of funding will need to be secured. An additional two years of funding will be needed to complete implementation of conservation practices.

Analysis of the likelihood that project objectives will be met: For the following reasons, the likelihood that objectives will be met is thought to be high:

- The Minnesota River Basin CREP project has achieved its signup objective of 100,000 acres well ahead of schedule. This basin is adjacent to the project area. This experience is being applied to the BALMM project.
- Current landowner interest in devoting land to conservation easements is high, based on 113 unfunded applications for WRP and EWP for $12.3 million within the project area. Enthusiasm of local units of government for additional funding for landscape buffers is very high.

- Acreage goals are based on a realistic assessment of environmental need, landowner interest and the ability of local agencies to deliver needed technical assistance within the project period, provided that additional resources are provided for this purpose.
- Well-functioning, inter-agency collaboration through the BALMM Landscape Buffer Committee will continue through the CREP project.
- Geographic Information Systems will be combined with hydrologic and water quality analysis to identify high priority areas that offer maximum environmental benefits.
- Mass communication will be combined with direct mail and person-to-person contacts to achieve sign-up objectives throughout the basin, and to maximize sign-up in targeted areas.

Interagency Coordination The local CREP teams in each county in the basin will receive applications. Eligibility will be determined in cooperation with the USDA Farm Service Agency to ensure that each application meets the requirements as outlined in the CREP agreement. The soil and water conservation districts, Natural Resources Conservation Service and Minnesota Department of Natural Resources-Division of Forestry and Division of Waters, with existing and supplemental staff will do technical assistance and conservation plan development. Contract compliance will be conducted with the same inspection process used under CRP and RIM. Regular inspections will be conducted during the first three years after plan implementation to ensure establishment of practices, and at regular intervals after that to ensure contract compliance.

Acreage Needs Assessment

Four broad types of landscape buffers are needed to address environmental concerns in the Lower Mississippi River Basin. Estimates of acreage needs for each of these types of buffers are provided below:

1. **Highly Erodible Land**:

Resource Assessment: 214,000 acres *Acreage Goal* -- 40,230
Critical Area Seedings and Contour Buffer Strips are needed on steep, erosion-prone land where row crops are raised and hay acreage is not sufficient to provide effective strip cropping. Soil erosion in this area threatens to degrade soil productivity and harm water quality, especially by causing sediment embededness in cold-water streams with the potential to support trout. This acreage is predominantly in the eastern basin in karst topography, although all counties include significant acreage of such land. Land use analysis using the Universal Soil Loss Equation shows the following need to achieve the BALMM goal of T soil loss on highly erodible land in the basin. This is based on a combination of critical area seeding and hardwood forest establishment on 25 percent of farmland that is eroding at 4T or greater, plus the use of contour buffer strips in conjunction with conservation tillage on additional highly erodible land, as shown in the table below:

Table II: Acreage Needs for Highly Erodible Land			
Erosion Rate	**Acres of Highly Erodible Land**	**Needed for Critical Area Seeding and Hardwood Forest**	**Contour Buffer Acreage Needed to Reach T**
Greater than 4T	60,000	15,000	6,750 (15% of field on 45,000 acres HEL)
From 2T to 4T	154,000		18,480 (12% of field)
Total	**214,000**	**15,000**	**25,230**

2. **Riparian Zones**

Resource Assessment: 160,000 acres *Acreage Goal* -- 25,000

The water quality benefits provided by riparian buffer strips range from erosion control and pollutant filtering to streambank stabilization and improved habitat for stream biota and wildlife.

Table III: Land Cover within 100 Feet of Streams			
County	**Percent Row Crop**	**Percent Vegetated**	**Other**
Dodge	**54**	**37**	**9**
Fillmore	**27**	**62**	**11**
Freeborn	**63**	**28**	**9**
Goodhue	**38**	**50**	**12**
Houston	**15**	**73**	**12**
Mower	**60**	**32**	**8**
Olmsted	**36**	**50**	**14**
Rice	**53**	**36**	**11**
Steele	**50**	**40**	**10**
Wabasha	**24**	**63**	**13**
Winona	**16**	**74**	**10**

Percent of land within 100 feet of streams that is in row crops, vegetated, or other land uses. Source: Minnesota Department of Natural Resources

Land cover analysis using GIS and satellite imagery indicates that tributaries in the western basin are the least protected with vegetated buffers.

Most have well under half of riparian acreage in perennial vegetation. Streams in the region are moderately impaired by turbidity (or suspended solids) and fecal coliform bacteria. For counties with primarily karst topography, a relatively high percentage of riparian acreage is vegetated. However, some of the vegetated acreage is pastureland that may be eroding at high rates. In addition, the upper reaches of tributaries in this region sometimes have low percentages of riparian land in permanent vegetation. Thus, riparian buffers in the eastern basin also can provide important benefits. Basinwide, if implemented along with conservation practices in the upland and riparian zones, as called for in the BALMM Basin Plan Scoping Document, riparian buffer strips can go a long way toward meeting water quality standards and providing broad ecological benefits to the region.

To convert all row-crop acreage to buffers within a 100 foot (each side) riparian zone would require an estimated 160,000 acres. To achieve the target of 50% vegetated land use in the 100 foot (each side) riparian zone in the western basin, and meet the need for improved riparian vegetation management in karst topography, will require an estimated 25,000 additional acres of permanent riparian vegetation, basinwide.

3. Wetland Restoration Sites :

Resource Assessment --100,000 acres *Acreage Goal* -- 20,000 acres

The drainage, cultivation and development of land have combined to greatly increase the speed of runoff and the peak flows of streams following significant snow melt and rainfall events, as well as greatly reducing wildlife habitat provided by wetlands. The restoration of wetlands in strategic locations can begin to reverse these adverse effects. Opportunities for wetland restoration are greatest in the headwaters region in the western basin, while more limited opportunities exist in the river valleys and elsewhere in the karst region. In Mower and Steele Counties, the SWCDs estimate that 18,000 acres of wetlands could be restored in each county based on National Wetland Inventory maps and soil information. Applying this to the five headwater counties, and making provision for more limited wetland restoration in the east, the result is a resource need of 100,000 acres. It is proposed that 18,000 acres be targeted for wetland restoration in the headwaters region. The NRCS will be requested to evaluate how wetland restoration can be targeted in this region to maximize reductions in peak stream flows on the Cedar, Root, Zumbro, Cannon and Vermillion Rivers, in addition to Spring Valley Creek and other streams with severe flooding problems. An additional 2,000 acres are needed for wetland restoration elsewhere in the basin.

4. **Groundwater Protection Zones**

Resource Assessment – 37,600 acres *Acreage Goal* -- 10,500

Vegetated buffers can offer significant protection of drinking water supplies, especially in karst areas of the basin with a high potential for groundwater contamination. The following three types of locations have been selected for special focus:

- Sinkhole Protection – An estimated 1,500 acres are needed, based on a total of 5,990 sinkholes on farmland. Individual sinkholes can be protected with a 0.25 acre buffer; multiple sinkholes may require whole-field critical area seedings.
- Focused Recharge Zone at Decorah Shale outcroppings. This zone occurs throughout karst topography. Olmsted County has worked to identify, map and explore biologicial-filtering alternatives for this recharge zone for several years. Estimated acreage of cropland within this zone in Olmsted County alone is 16,000 acres. Our goal basinwide would be to secure half of this amount for permanent easements with perennial vegetation, or 8,000 acres.
- Wellhead Protection Areas. – The Minnesota Department of Health estimates that 20,000 acres of cropland are part of wellhead protection areas

that eventually will be delineated in southeastern Minnesota. In the near future, an estimated 1,000 acres of vegetated buffers could provide protection to drinking water within wellhead protection areas that include agricultural land.

Section VI: Cost Analysis

- Total Estimated Project Cost: $225 million
  - Federal Portion: $180 million
  - State Portion: $45 million
    - Easement payments and cost share: $34 million
    - Technical and Administrative Assistance, Education: $11 million

- Costs Funded from Non-Federal Revenues – State funds will be used to match the federal funds used for this project. State funds will be approved by the state legislature through the Reinvest In Minnesota (RIM) program and will be targeted to basins that are able to leverage federal funds, such as CREP and WRP.

- Incentive Payment Justification and Easement Choices
  CREP payments consist of CRP annual rental payments for a 15-year period, plus a signup incentive and signup bonus, in addition to a RIM payment for easements beyond the initial 15 years. The CREP signup incentive rate will be set at 50 percent of the CRP soil rental rate. The CREP signup bonus is $10 per acre. RIM payments are based on the discounted present value of the estimated market value of enrolled land, as estimated by Steve Taff, University of Minnesota agricultural economist. Also, RIM funds may provide additional funds to implement conservation plans. State funds are also used for technical and administrative costs for implementing the CREP.

  An integral aspect of this CREP proposal is to offer landowners a range of choices regarding duration of easement. This project will use state RIM funds to provide an added incentive to place easements on lands enrolled in the program beyond the 15-year period provided by Conservation Reserve Program payments. Landowners will be presented with the following range of options for easement duration: 20-year; 50-year, 85-year and permanent. Different choices will be available for different types of land, as follows:

Table IV: Easement Options by Type of Buffer

Buffer Placement	Acres Proposed	Easement Description
Highly Erodible Land	40,230	*Contour buffers* = 15-yr CRP *Critical area seedings* = 15 yr CRP + 20-yr RIM
Riparian Zones	25,000	15-yr CRP + 20-, 50- or 85-yr RIM
Wetland Restoration	20,000	Permanent (by state law)
Groundwater Protection	10,500	15-yr CRP + 20- or 85-yr RIM

- Farm Economic Data

  - Three-year average crop yields:

Table V: Average Crop Yields, 1998 - 2000					
	Corn (bu/a)	**Corn Silage (tons/a)**	**Soybeans (bu/a)**	**Oats (bu/a)**	**Hay (tons/a)**
1999	165	20.8	48	63	4.0
2000	153	19.3	44	66	3.9
2001	149	18.5	46	73	4.2
Average	**156**	**19.5**	**46**	**63**	**4.0**

  - Three-year average of production costs: Total direct and overhead expenses, with labor and management (Source: Southeast Minnesota Farm Business Management Association, MNSCU)

Table VI: Average Production Costs, 1998 - 2000				
	2000	**1999**	**1998**	**Average**
Corn ($/bu)	1.99	2.04	2.00	2.01
Soybean ($/bu)	4.67	4.70	4.81	4.73
Oats ($/bu)	2.03	2.53	3.45	2.67
Hogs ($/cwt)*	30.67	27.63	38.50	32.05
Cow-Calf ($/cwt)	76.61	109.28	104.93	96.94
Milk ($/cwt)**	11.23	11.54	12.01	11.60

*Finish Feeder Pigs. Data unavailable for 1998 – 1997 data used instead.
**Average cow. Data taken from 28 dairy operations with average of 100 cows and rolling herd average of 20,000 lbs/year milk production.

  - Opportunity cost – net farm income foregone. The opportunity cost associated with converting land use from agricultural to conserving uses is equal to the discounted present value of the expected stream of future earnings net of production costs. Generally it is expected that market land prices reflect this cost. However, in southeastern Minnesota as in much of the Corn Belt, pure opportunity cost is obscured by large transfer payments from the federal government to farmers in accordance with the Federal Farm Program. According to the Southeastern Minnesota Farm Business Management Association, average net farm income was $77,672 in 2000 for the 58 farms included in the annual report. The total of all government payments averaged $50,496, or 65% of net farm income. This fraction would be higher for crop farms and less for livestock farms.

Without government support payments, many farm operations would be reporting negative net income, and most would report very low incomes.

A second factor relevant to the calculation of opportunity cost is land productivity. In general, much land that is suitable for CREP will tend to be marginally productive for agriculture because of poor drainage or steep slopes, which are difficult to farm.

Therefore, considering the low to negative levels of income from crop and livestock farming, excluding transfer payments, together with the lower agricultural productivity of land targeted for CREP, it can be concluded that the opportunity cost of farmed land is generally low under current market conditions – considerably lower than current land rental rates and market prices.

Section VII: Monitoring Program

Three types of monitoring will be conducted to track progress against goals:

1. Ambient Stream Water Quality Monitoring. The purpose of this type of monitoring is to determine whether land-use changes are accomplishing the ultimate goal of water quality improvement. Such changes take a long time to verify, requiring a comparison of stream conditions before and after land use change implementation. The MPCA will coordinate this effort in cooperation with other state and federal agencies, Winona State University, and local governments involved in stream monitoring projects. Locations to include MPCA's Minnesota Milestone and USGS Long-Term Resource Monitoring Program sites, in addition to project-specific sites.
2. Site-specific edge-of-field monitoring. Sediment boxes will be used above and below representative CREP practice sites such as contour buffers or riparian buffers to help determine the difference in sediment load.
3. Pollutant-Load Reduction Estimates. The purpose of this type of monitoring is to track the enrollment of acres of specific buffer categories, along with an estimate of reductions in erosion and pollutant loads that are being achieved. The Board of Water and Soil Resources for several years has been using and refining an annual reporting system for local government use. It provides estimates of reductions in soil erosion and loads of sediment, phosphorus and nitrogen to surface water.

- Annual reports – SWCDs in the project area will submit annual reports on an electronic reporting system. These reports will be summarized for the basin by the Board of Water and Soil Resources. These reports will detail the acreage enrolled in each buffer category, by conservation practice type, with estimates of reductions in soil erosion and loads of sediment, phosphorous and nitrogen to surface water.

- Provision for Project Modification if objectives are not being met – The annual CREP report will be reviewed and discussed by the BALMM Landscape Buffer Committee each year. Program acreage and pollutant-reduction objectives will be compared against actual progress. Where discrepancies are identified, the BALMM Landscape Buffer Committee will develop and recommend strategies to strengthen, focus, or redirect the communication plan and direct marketing campaign, or other elements of the Landscape Buffer Initiative, in order to achieve desired goals and objectives. These recommendations will be forwarded to SWCD field offices and to staff responsible for CREP implementation.

Section VIII: Public Outreach and Support
A direct indicator of farmer demand for buffer easements in the project area is their demand for far more enrollments from the RIM Reserve Program and Wetlands Reserve Programs than can be supported at current program funding levels. Currently, in the absence of any concerted effort to promote signups, there are requests for 122 RIM easements, 60 WRP easements and 53 EWP easements that cannot be funded. An estimated $18 million of additional funding, plus additional cost-share for site preparation, would be needed to implement these requests. The extensive public outreach effort that will be implemented as part of the BALMM Landscape Buffer Initiative is expected to generate vastly more interest by landowners.

In a sense, public outreach and support have been built into the BALMM Landscape Buffer Initiative from its inception early in 2001, because BALMM has served to involve local farmers, local elected officials, watershed projects, wildlife enthusiasts and government staff in its design. Now that the CREP proposal has taken shape, BALMM participants are involved in giving presentations to local government and civic groups, writing letters of support and offering suggestions on specific aspects of the CREP proposal and how it will be implemented. Through BALMM, such activities will be sustained over the duration of the CREP project, with special emphasis on outreach to farmers, farmland owners, and farm organizations.

Section IX: Development of Procedure
The basin local units of government have been working with state office staff from FSA, NRCS and the Minnesota Board of Water and Soil Resources during the development of this application to address procedural items as much as possible ahead of time. Upon approval of this CREP application, local units of government will continue to work with those staff to fine-tune procedures and to evaluate procedures that have been used in the Minnesota River Basin CREP program in Minnesota. There is a good precedent already established in that basin with regards to procedures.

Section X: Training of Staff
Nearly all NRCS, SWCD and FSA staff in the basin are trained and proficient in processing CRP contracts. Additionally, at least one staff person in each office is trained on processing RIM applications. This will provide a good base for implementing a CREP program in the basin. However, added technical staff will be needed to implement CREP. These will be funded with a combination of public and private funds. We will work with state office staff from FSA, NRCS and the Board of Water and Soil Resources to provide additional training to basin staff to prepare them for taking and processing CREP applications. With the majority of the basin staff already trained in the CRP and RIM programs, a smooth transition will be made into a CREP program.

BALMM will also provide training to staff emphasizing the overall buffer goal for water quality, flow reduction, erosion control, forest improvement and habitat improvement as outlined in the Basin Plan Scoping Document and this CREP application. This will help to ensure that efforts are targeted to achieve the goals outlined in this application.

Section XI: Communication Plan

- Goals and Objectives:

  Goal – Full enrollment of acreage goals in all four priority project areas by the conclusion of the project period.

  Objectives – progressively work toward the following objectives:
  1. Create widespread awareness among the public about the Landscape Buffer Initiative, its goals and key provisions.
  2. Inform potential customers in targeted areas of the full range of options under the CREP program.
  3. Develop landowner understanding of how they can take part in the buffer initiative by enrolling parts of their land.
  4. Assist landowners in making informed decisions that will help them to achieve their own goals while also benefiting the environment.

- Motivators to Enrollment:

  Owners and operators of farmland may be motivated by a number of factors to participate in CREP by enrolling their own land.

  1. Information -- The first consideration is ensuring that eligible landowners are informed about CREP. It needs to be explained in clear and simple terms what the program offers and how they can get involved. Unless landowners are first adequately informed, they cannot become motivated to participate.

2. Legacy – According to interviews conducted in the Minnesota River Basin, leaving a legacy of a better environment and improved wildlife habitat for children and future generations is a primal urge exhibited by landowners in the focus groups.
3. Economic Rewards – In exchange for agreeing to convert farmed land to a conserving use for a specific time period, land owners will receive economic compensation in the form of annual CRP payments, a lump-sum RIM Reserve payment from the State of Minnesota, and cost-share funds to defray costs associated with site preparation and stand establishment. The total economic incentive to retire land must exceed the expected economic rewards of alternative land uses, usually continued cropping of the land.

4. Environmental Protection -- Landowners may be motivated by their concern for protecting the quality of the natural environment by reducing soil erosion, protecting the quality of surface- and ground-water, and providing habitat for wildlife. These attitudes may be influenced by peer groups and prevailing social norms.

5. Recreation Benefits – A third motivator is the opportunity to create additional opportunities for hunting, fishing, bird-watching, hiking or other outdoor activities on or near land that is set aside as a buffer strip or critical area seeding.

- Possible Barriers to Enrollment:

1. Insufficient or unclear information. If land owners are not aware of CREP, or have inadequate information, are confused about the application process or program provisions, or are misinformed, this will act as a barrier to enrollment.

2. Insufficient economic rewards. Combined incentive payments may be insufficient to bid land away from competing uses. Landowners may expect higher payments to be available now or in the future from developers, other farmers, etc.

3. Concerns about the Local Agricultural Economy. Farmers and others may be concerned that removing land from commercial farming will limit the farming potential of local producers, reduce the sum total of agricultural economic activity and utilization of the agricultural infrastructure (local elevators, etc), and reduce the property tax base.

4. Lack of environmental concern. – Landowners may not be convinced that current farming practices are contributing to environmental problems, or that converting land to conserving uses will contribute significantly to environmental improvement.

5. Lack of recreational interest. – Landowners may not be interested in outdoor recreation opportunities.

6. A production ethic. Landowners who have invested in land drainage and clearing over years and decades to build a modern farming enterprise may deem it counterproductive or wasteful to devote their farmland to a conserving use rather than to commercial farm production.

- Communication Tools and Materials: A communication strategy is needed to support the CREP project, consisting of the following elements:

  1. Mass media – Announce the CREP project through daily newspapers, regional television and radio stations via a news conference. Mass media will be used to help create awareness and interest.

  2. Farm media -- Through articles in Agri-News, the use of buffers in each of the four priority areas will be illustrated by case history stories. Case history backgrounders will be sent to reporters with photos, key information, and local contacts. Reprints will be used for displays at meetings. This will help to increase farmer understanding of CREP and options available to them.

  3. Information aids – Mass media can only accomplish so much. Person-to-person communication in small meetings and one-on-one visits are essential to address specific landowner questions and concerns, and eventually "close the deal" with a solution that satisfies and landowner and environmental objectives of the CREP program. A variety of information aids can assist this essential interaction – fact sheets, brochures and videos, in addition to farm-specific information on eligible land, appropriate conservation practices, and estimated payment rates. Experience shows that technical staff armed with this kind of information are very effective in obtaining signups from interested farmers.

- Training: Minnesota has the benefit of a very popular CREP program in the Minnesota River Basin, which is adjacent to the Lower Mississippi River Basin. Technicians who have spent several years on CREP in the Minnesota River Basin will now share their experience with technical staff in this basin. Some will be asked to continue their CREP work here. The Minnesota Board of Water and Soil Resources, Natural Resources Conservation Service, Department of Natural Resources, and Minnesota Pollution Control Agency will collaborate in designing and delivering training to field staff. This will ensure that efforts in the field are effective in securing land enrollment in all four priority areas to achieve environmental objectives in water quality protection and restoration, hydrologic modification and habitat provision.

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