

Minnesota Water Plan 2000 Report

Lower Mississippi/Cedar River Basin Team

Feb. 25, 2000

I: Introduction

The Basin Team for the Lower Mississippi/Cedar River Basin has used the Public Review Draft of Minnesota Water Plan 2000 as a framework within which to develop objectives and indicators suitable to this region. This has been done with involvement of local and tribal governments and residents of southeastern Minnesota. An ad hoc basin planning group that was formed last summer, shortly before the Water Unification effort started to form basin teams, has helped to develop land-use indicators, in particular. This locally led effort is working closely with the MPCA's basin planning process, and will soon turn its attention to the development of strategies for land use objectives.

The Basin Team has developed two similar planning documents. One, referred to as Water Plan 2000/State Format, retains the format of the Water Plan 2000 Public Review Draft, while modifying content to suit the basin. This is our main reporting document to the state Water Management Unification team. The other document, referred to as Water Plan 2000 Objectives: Lower Mississippi/Cedar River Basins, uses an alternative format that is simpler and easier to communicate to the public. It lists objectives under three main headings: 1) Water Quality and Quantity Objectives; 2) Ecosystem Objectives; and 3) Land Use Objectives that support the first two objectives. This format has been used in most outreach activities, and will continue to be used in regional basin planning activities. The content of the two documents is very similar.

"Water Plan 2000/State Format" incorporates Goals, Objectives, Indicators and Targets. The same goals are used as in the Public Review Draft. Three objectives were added:

1. Objective C: Manage Land to Support Water Quality [and Ecosystem] Objectives;
2. Objective H: Reduce sedimentation and slow aging of navigation pools, maximizing biodiversity in backwaters while meeting reasonable transportation needs.
3. Objective J: Engage Local Organizations and Citizens in Water Resource Restoration Activities).

The rationale for these additions, and for changes in the indicators used, is discussed in Part III.

Indicators are written as specifically as possible, with quantitative targets specified where possible. State water quality standards were cited as targets where appropriate under Objectives A and D, and well-known benchmarks such as the tolerable (T) level of soil loss and 30 percent surface residue for conservation tillage were used. In addition, the recently issued National

Resources Inventory from USDA was used to establish a target under at least one land-use category. When a specific standard or baseline is not available, targets take the form of “maintain/increase” from a current (undefined) baseline, or “reverse” a trend. There was not enough time to determine how each single indicator/target could be measured, and by whom. This will be a subject of continuing discussion by the Basin Team and ad hoc basin planning group.

Indicators/targets are intended to be accomplished within the duration of Water Plan 2000, that is, by 2010.

Lead agencies for monitoring and tracking of indicators are listed in parentheses with each indicator, where this is known.

II: Water Plan 2000/State Format: Lower Mississippi/Cedar River Basins

Goal: Minnesotans will improve the quality of water resources

Objective A: Protect and improve water quality in streams

Measure levels of pollutants in streams

Indicator 1: Phosphorus

- For Vermillion, Straight, Cannon and Zumbro River. Reduce mean phosphorus concentrations to levels needed to restore downstream reservoirs (approximately 90 parts per billion for lakes Cannon, Byllesby and Zumbro), and that are consistent with a restoration strategy for Lake Pepin (Cannon and Vermillion Rivers). (multi-agency monitoring)

Indicator 2: Nitrogen

- Reverse the trend of increased ambient concentrations of nitrate-nitrogen in streams. (MPCA –Minnesota Milestone sites; USGS, Long-Term Resource Monitoring Program)

Indicator 3: Total suspended solids/transparency

- For warm water streams, maintain at least 10 inches of transparency¹. (MPCA: Citizen Stream Monitoring Program)
- For cold-water streams, attain greater depth of transparency to reduce the number of days during which turbidity exceeds 10 NTUs (the state standard for this class of waters).
- Reduce sediment load to the Mississippi River from tributaries (USGS/Long-Term Resource Monitoring Program, MPCA, Met Council)

Indicator 4: Fecal coliform bacteria

- Meet state water quality standard in streams. ² (MPCA/USGS)

¹ About equivalent to state turbidity standard (25 nephelometric turbidity units) or 90 ppm total suspended solids.

² 200 organisms per 100 milliliters (geometric mean of 5 samples/month) or 2000 organisms per 100 milliliters in no more than 10 percent of samples per calendar month.

Indicator 5: Ammonia

- Maintain stream concentrations below the state water quality standard of 40 parts per billion un-ionized ammonia. (MPCA-Minnesota Milestone sites)

Indicator 6: Biochemical oxygen demand

- Set and enforce point source limits, and manage nonpoint source loads, to keep dissolved oxygen levels above the minimum standard of 5 parts per million. (MPCA-Minnesota Milestone sites)

Objective B: Protect and improve lake water quality

Indicator 7: Secchi transparency in lakes

- Improvement or no decline in Secchi transparency for all lakes (MPCA: Clean Water Partnership/Lake Assessment Program/Citizen Lake Monitoring Program)

Objective C: Manage Land to Support Water Quality (and Ecosystem)

Objectives

Indicator 8: Wellhead Protection Areas:

- Land uses compatible with management strategies identified in local wellhead protection plans are achieved. (MDH)

Indicator 9: Groundwater Recharge Areas:

- Recharge areas of cities needing groundwater protection are identified and delineated;
- Biological filtering of groundwater recharge areas is protected and enhanced through landscape management. (multi-agency)

Indicator 10: Perennial Vegetation:

- Land in hay and pasture; woods and meadow is maintained/increased. Area in pasture and noncultivated crop production is restored to 1982 levels (630,000 acres) from current estimates (448,000 acres) (NRCS: Natural Resources Inventory)
- Stream miles of riparian buffers at least 50 feet wide on protected waters are increased, using native vegetation (DNR; NRCS)

Indicator 11: Floodplain Management:

- Miles of river where the flood plain is connected to the main channel during higher flow periods are maintained/increased. (DNR, NRCS)
- Building, filling and creation of impervious surface areas are minimized to enhance and protect the natural function of flood plains as part of the river system for tributaries to the Mississippi River. (multi-agency)

Indicator 12: Row-Crop Land:

- On highly erodible land, soil loss is brought to or below the tolerable (replacement) level ("T") by 2010. (NRCS: NRI 2002 and 2007 reports)

- The percentage of row-crop land with a rotation average of at least 30 percent crop residue cover, after planting, is increased. (BWSR, NRCS: Crop residue transect survey)
- The percentage of surface tile intakes and drainage ditches that are buffered is increased, to minimize losses of sediment and other contaminants to nearby water bodies.

Indicator 13: Farm/Urban Nutrient Management:

- Increase the efficiency of nutrient and pesticide management (MDA)
 - Commercial phosphate fertilizer is applied at University of Minnesota-recommended rates in a manner that minimizes surface runoff.
 - Phosphate-free fertilizer is used on lawns, golf courses, parks, etc.
 - Commercial nitrogen fertilizer is applied at University of Minnesota-recommended rates, taking account of crop needs and all sources (manure, previous legume crop, etc.)
 - Fall application of nitrogen fertilizer in the karst region is reduced and ultimately eliminated, as called for in state recommendations for nitrogen management.
 - The use of Integrated Pest Management is increased.

Indicator 14: Urban and Residential Land

- Surface runoff (residential, commercial, industrial) is offset/reduced. (MPCA)
- The percentage of the population served with adequate wastewater treatment is increased, including populations served by:
 - Properly functioning septic systems (counties)
 - Phosphorus removal from wastewater treatment facilities upstream of affected waters (include Lakes Zumbro, Byllesby and Pepin) (MPCA)
- Compact development is achieved where feasible and consistent with local and tribal planning, to minimize both loss of farmland and natural areas, and the extent of land areas covered by 10 percent or more impervious surface.

Indicator 15: Animal Feedlots

- Feedlots are permitted or registered to achieve compliance with feedlot rules by 2009 through feedlot runoff controls, manure storage, manure/nutrient management, rotational grazing and other practices. (MPCA, delegated counties)

Indicator 16: Wetland Restoration/Protection:

- Acres of high-quality wetlands are increased. (BWSR)
- Acres of land managed to protect and enhance wetland functions that provide a wide range of ecological benefits are increased. (BWSR)

Indicator 17: Mining (DNR, MPCA, counties)

- Quarries and aggregate sites are inventoried
- Storm water and process water discharge are treated to remove pollutants.
- Measures to protect groundwater are implemented
- Abandoned mines are reclaimed

Objective D: Prevent degradation of groundwater quality and reduce concentrations of contaminants in drinking water

Measure levels of pollutants in ground water and wells:

Indicator 18: Groundwater quality

- All aquifers testing at or below MCL of 10mg/L nitrate-nitrogen (MDH)

Indicator 19: Well water quality

- Fecal coliform bacteria and 85 listed contaminants: reduce concentrations and detections in wells to meet state drinking water standards. (MDH)

Goal: Minnesotans will conserve water supplies and maintain the diverse characteristics of water resources to give future generations a healthy environment and a strong economy

Objective E: Maintain groundwater levels to sustain surface water bodies and provide water supplies for human development.

Indicator 20: Water levels in wells (DNR)

Indicator 21: Domestic, commercial, industrial and agricultural consumption of water

Objective F: Keep stream and spring flows within historic ranges.

Indicator 22: Trends in stream and spring flow (DNR, USGS)

Goal: Minnesotans will restore and maintain healthy ecosystems that support diverse plants and wildlife

Objective G: Ensure that aquatic environments have conditions suitable for the maintenance of healthy, self-sustaining communities of plants and animals

Indicator 24: Maintain/increase diving duck populations (DNR)

Indicator 25: Maintain/increase puddle duck populations (DNR)

Indicator 26: Maintain/increase shore bird populations (DNR)

Indicator 27: Maintain/increase perching bird populations (DNR)

Indicator 28: Maintain/increase number of territories occupied by bald eagles (DNR)

Indicator 29: Maintain mussel species diversity (DNR)

Indicator 30: Establish baseline Index of Biotic Integrity for benthic macroinvertebrates (MPCA)

Indicator 31: Maintain frog and toad populations; reduce the incidence of deformities (DNR, MPCA)

Indicator 32: Fish populations

- Cold-water streams: introduce/maintain brook trout (in streams with historic populations) (DNR)
- Warm-water streams: maintain/increase smallmouth bass populations (DNR)
- Mississippi River: maintain/increase walleye populations (DNR)

Objective H: Mississippi River: Reduce sedimentation and slow the aging of navigation pools, maximizing biodiversity in backwaters while meeting reasonable transportation needs.

Indicator 33: Sediment loads from Mississippi River tributaries are reduced. (USGS, Met Council, MPCA)

Objective I: Limit the introduction and spread of exotic species

Indicator 33: Number of water bodies with Eurasian watermilfoil and/or purple loosestrife. (DNR)

Indicator 34: Miles of waterways and number of lakes and reservoirs with zebra mussels (DNR)

Objective J: Engage local organizations and citizens in water resource restoration activities.

Indicator 35: Number of citizen monitoring projects (DNR, MPCA)

Indicator 36: Number of watershed projects (DNR, MPCA, others)

Indicator 37: Major watershed strategy. In the Vermillion, Cannon, Zumbro and Root River watersheds, conduct major watershed assessments and develop comprehensive strategies for reduction of key pollutants (nutrients, sediment, fecal coliform bacteria) and other stressors (temperature, flow) and creation of habitat conditions that support ecosystem objectives (Objective G). Locally led restoration activities in priority minor watersheds should be underway in each major watershed. (MPCA)

Goal: Minnesotans will have reasonable and diverse opportunities to enjoy the region's water resources

Objective K: Provide appropriate access to water-based recreation sites

Indicator 38: Number of sites for boat launching (DNR)

Indicator 39: Number of public fishing piers (DNR)

Indicator 40: Miles of stream easements (DNR)

Indicator 41: Number of swimming beaches

Objective L: Improve or maintain the quality of water recreation

Indicator 42: Boater satisfaction surveys (DNR)

Indicator 43: Angler satisfaction surveys (DNR)

Indicator 44: Birdwatcher satisfaction surveys (DNR)

Indicator 45: Swimmer satisfaction surveys

Indicator 46: Fecal coliform bacteria monitoring at swimming beaches

Indicator 47: Survey of general public satisfaction

III: Changes to draft goals and objectives, and rationale for changes.

The Basin Team retained the goals of the statewide public review draft, and added three objectives: Objective C: Manage Land to Support Water Quality (and Ecosystem) Objectives; Objective H: Reduce sedimentation and slow aging of navigation pools, maximizing biodiversity in backwaters while meeting reasonable transportation needs; and Objective J: Engage Local Organizations and Citizens in Water Resource Restoration Activities.

Objective C was added for several reasons. First, land management is a major focus of local and tribal government, several state and federal agencies (including BWSR, NRCS), as well as watershed projects. Many of the 10 items (indicators) listed under the land management objective benefit several other objectives, including water quality and quantity, and ecosystem health and diversity. Rather than listing these indicators arbitrarily under a single existing objective, we created a new heading under which all land use related activities could be listed. This helped us to communicate more clearly about land management activities, and to view this important set of inter-related activities as a whole.

Objective H was added to single out the Mississippi River as a major water body with special needs. The lock-and-dam system has converted the Mississippi from a free-flowing, meandering river into a series of navigation pools. A nine-foot channel is maintained for commercial barge traffic. These major structural changes have greatly increased the rate of sediment deposition, including the deposition of fine sediments in backwater areas. Frequent resuspension of these sediments creates a degree of turbidity that limits light penetration and impedes the growth of submersed aquatic vegetation, which greatly limits biodiversity in these potentially rich ecosystems.

Objective J was added to emphasize the importance of local and public involvement in water resource restoration – *the human factor*. Watershed projects are an important (though not the only) way in which local citizens can get involved in water quality restoration activities.

Objective F on wetland acreage in the public review draft was moved. Wetland quantity and quality was used as an indicator (#16) under the Land Use Objective.

IV: Changes to draft environmental indicators, and rationale for changes.

Many of the changes in the indicators were made to add precision. However, there were several deletions and replacements, which included:

Under Objective D: Prevent degradation of groundwater quality and reduce concentrations of contaminants in drinking water, only two of the indicators were retained. First, nitrate nitrogen was retained as the sole indicator of groundwater quality, as it is the major threat to aquifer contamination in the region. Second, under well water quality, fecal coliform bacteria was listed separately as an indicator, but the others were subsumed under the MDH's 85 listed contaminants because it was not felt that nitrate, chloride, voc's, or atrazine needed to be singled out for special attention as well water contaminants.

Under Objective E (maintain groundwater levels) we added Indicator 21: Domestic, commercial, industrial and agricultural consumption of water. This was in response to suggestions made in the citizens' forum (see #6) on the importance of water conservation.

Indicators under Objective G (Ensure that aquatic environments have conditions suitable for the maintenance of healthy, self-sustaining communities of plants and animals) were substantially revised to better reflect species pertinent to this region. Thus, diving ducks, puddle ducks, shore birds and perching birds replace the original indicators 16-19 (bald eagles are retained); Indicator 20 was modified to include reference to deformities; Indicator 21 was made more specific by referring to the Index of Biotic Integrity (IBI); and Indicator 21 was amplified by listing three rather than only one fish species (brook trout for cold-water streams; smallmouth bass for warm water streams; walleye for the Mississippi River).

Indicators under Objective I: Progress toward this objective will be measured by the number of citizen monitoring projects, and the number of watershed projects.

Indicators under Objective J: Indicator 40, number of swimming beaches, was added to reflect opportunities for this form of recreation.

Indicators under Objective K: Indicators 43 - 46 were added to broaden the types of people surveyed for attitudes toward the quality of recreation. These include bird watchers, swimmers (measured by survey and by fecal coliform bacteria monitoring of swimming beaches) and, finally, a survey of general public satisfaction. The latter would include the views of a broader sampling of actual and potential users of water resources.

V: Behavior Indicators with Rationale for Inclusion:

Indicators 8 through 17, under Objective C on land use, all could be described as behavior indicators. These 10 indicators point to the importance of land management in two ways: 1) in highly sensitive areas (wellhead protection and

groundwater recharge areas, flood plains; animal feedlots, and aggregate mines) and 2) for major types of land use that broadly affect water resource quality (perennial vegetation; row-crop land management; urban and farm nutrient management, urban and rural residential land management; wetland acreage).

Indicator 8: Wellhead Protection Areas. Target: Land uses compatible with management strategies identified in local wellhead protection plans are achieved. Since each local plan is unique, achievement of compatible land uses will be evaluated on an individual basis by the communities and the MDH.

Indicator 9: Groundwater Recharge Areas. These areas first need to be identified and delineated, and then evaluated for measures that could help to protect and enhance biological filtering provided by these areas. This is especially pertinent to communities located in the karst area of southeastern Minnesota.

Indicator 10: Perennial vegetation. Maintain or increase land in hay and pasture, woods and meadow, in order to preserve and enhance the important functions provided by perennial vegetation in southeastern Minnesota. A target of 630,000 acres in pasture and noncultivated crop production, as measured by NRCS in the Natural Resources Inventory, has been selected as a specific target.

Indicator 11: Floodplain Management. A river system includes much more than a main channel running at bankfull or lower flows. An important part of a river corridor is the floodplain, a relatively flat area on both sides of a stream that is formed over centuries as the stream moves back and forth in a process of lateral migration. This process, and sediment deposition, continually reshape the floodplain, and often form a rich diversity of ecological niches. During floods, the floodplain serves vital functions ranging from sediment accumulation to providing areas suitable for fish spawning, to dissipating river energy and maintaining channel integrity. At other times of the year, the natural floodplain can be part of a biological corridor that supports a variety of wildlife. For a floodplain to continue to offer these services it must remain connected to the river, and as free as possible of fill, paved surface areas and other severe disturbances.

Indicator 12: Row-Crop Land. About 60 percent of the land area of the Lower Mississippi River Basin is devoted to cultivated crop production. The potential for soil erosion and resulting sedimentation of streams is higher in this basin than almost anywhere else in the state, owing to the steep topography and erosive soils. Thus, soil conservation is a critically important aspect of environmental management in this region. Two over-all targets have been established relative to this indicator: bringing soil loss rates to T or lower; and increasing the use of conservation tillage (at least 30% crop residue as a rotation average.)

Indicator 13: Farm/Urban Nutrient Management. The application of excessive amounts of commercial fertilizers to urban and agricultural land is a significant source of potential pollution. Field test plot evidence indicates that significant

improvements in application rates, methods of application and timing of application could result in significant reductions in this source of pollution. University of Minnesota recommendations are used as benchmarks against which to measure actual behavior.

Indicator 14: Urban and Residential Land: This indicator includes many aspects, ranging from surface runoff to wastewater treatment for individual residences as well as communities. The rapid urban development occurring in southeastern Minnesota demands that we monitor progress in properly managing surface runoff and wastewater treatment to reduce the generation of higher flows and their associated contaminants: sediment, nutrients, fecal coliform bacteria and others.

Indicator 15: Animal Feedlots. This indicator was written to reflect new rules being proposed at both the state and federal levels regarding feedlot management. Compliance with the new rules, when adopted, will be used as an indicator of this class of behavior.

Indicator 16: Wetland Restoration/Protection. This indicator needs to be better defined to take into account type and quality of wetland rather than gross acreage alone. There is strong support for maintaining and increasing acreage of high quality wetlands, and recognition that land upstream of wetlands needs to be properly managed to support this objective.

Indicator 17: Mining. The economic expansion of recent years has brought about a substantial increase in the use of sand, gravel and crushed rock. Old limestone quarries are being re-opened, and new ones proposed, to keep up with the demand. To better manage this land use change we need to identify sites and ensure that the potential for surface and ground water pollution is minimized, and that sites are reclaimed and not simply abandoned.

Indicator 21: Domestic, commercial, industrial and agricultural consumption of water. Reducing the consumption of water is a way of helping to preserve age-pure water supplies for future generation and reducing pressure on community wastewater facilities.

Indicator 35: Number of citizen monitoring projects. There is an increasing trend of citizen involvement in water quality monitoring projects. We would like to maintain and increase this trend to maximize citizen involvement in water quality efforts.

Indicator 36: Number of watershed projects. Measuring the number of watershed projects, and possibly the number of citizens involved in them, is another way of tracking citizen involvement, a critical factor in a locally led approach to water resource management.

Indicator 46: Survey of general public satisfaction with water resource quality and quantity. Surveys of specific user groups are important, but surveys of the general public will help to gauge unmet needs and identify concerns and priorities that might not be revealed through surveys of specific user groups.

IV: Process used to reach local water planning and other interests, and how the Team plans to work with these interests in the future.

One of the first actions of the Basin Team was to expand its membership to include two additional members: Bea Hoffmann, executive director of the nine-county Southeastern Minnesota Water Resources Board; and Allene Moesler, executive director of the Cannon River Watershed Partnership. Through their participation the Team was able to represent all but one county (Freeborn) in the basins.

In addition, an ad hoc basin planning group that was established last summer provided considerable input on land-use objectives. Several members of this group also participated in the Basin Team. The ad hoc group included representatives of state agencies, SWCDs, Counties, University Extension, the Minnesota-Wisconsin Boundary Area Commission and a nonprofit watershed organization. As a result of Water Plan 2000 discussions, the Prairie Island Indian Community has decided to participate in the ad hoc group, as well.

Team members made presentations to a number of regional organizations, soliciting input into the making of Water Plan 2000. These include a 9-county joint powers board, the Southeastern Minnesota Water Resources Board, and its advisory group of county water planners, on a couple of occasions. Also included were presentations to the Whitewater River Watershed Joint Powers Board and Cannon River Watershed Partnership boards, at least two SWCD board of supervisor meetings, and a presentation at the Cannon River Watershed Summit 2000, attended by 120 people. Team members made contact with the Prairie Island Indian Community, which provided comments and suggestions in a letter to the team chair.

In addition to these outreach activities, the MPCA conducted a public forum dedicated to Water Plan 2000 on Feb 7, 2000, in Rochester. Citizens who had participated last May in "The Governor's Forums: Citizens Speak Out on the Environment" in Rochester were invited to attend a similar event to provide input into Water Plan 2000. County commissioners and water planners also were invited, as were members of the public through a widely distributed news release. Thirty-six people participated in the forum, which made use of key-pad technology to provide instant feedback on how the group voted on specific questions. Demographically, the group was evenly split among urban, rural-farm and rural-nonfarm. Forty-six percent were citizens, 34 percent government staff,

and 20 percent elected officials. Using the document *Water Plan 2000 Objectives: Lower Mississippi/Cedar River Basins*, the group evaluated the adequacy of the Water Quality and Ecosystem objectives as a whole, and then evaluated each of the land-use objectives from the standpoint of both *effectiveness* in accomplishing environmental objectives, and the *feasibility* of implementing them. In addition, the group suggested several additional objectives to add to the report, two of which were subsequently added to the report (Indicator 9: Groundwater Recharge Areas; Indicator 11: Floodplain Management). Comments also were used to modify existing objectives and indicators.

Finally, participants were asked whether they would like to be included in future basin planning activities. **100 percent responded 'Yes'**.

V: Additional Information

Included below is a simpler plan format used by the Basin Team in discussions with partner agencies and the public. In our experience, it has made it simpler to communicate to the public in the language of “objectives” under three categories, which we propose to accomplish over the next 10 years, than to use terms such as Goals, Objectives, Indicators and Targets to convey essentially the same information.

Water Plan 2000 Objectives: Lower Mississippi/Cedar River Basins

Water Quality and Quantity Objectives: Clean and Clear Water, Stable Flows

1. Clean and Safe Water:

- **Ground Water: NO₃-Nitrogen < 10 mg/L**
- *Drinking Water:* Fecal coliform bacteria and 85 listed contaminants: reduce concentrations and detections in wells to meet state drinking water standards.

Surface Water:

- **Reverse trend of increasing NO₃-N concentrations in streams**
 - Achieve fecal coliform bacteria standard in lakes and streams.³
2. Clear Water:
- **Rivers: Minimum of 10 inches (25 cm) of transparency⁴**
 - *Mississippi River:* Reduce the sediment load of the Mississippi River.
 - Lakes: Maintain/increase clarity as measured by Secchi disk
 - Reduce P loads to reduce algae blooms and maintain O₂ levels
3. Water Quantity: Keep stream and spring flows and groundwater levels within historic ranges.
4. Conservation: Reduce domestic, commercial, agricultural and industrial water consumption to preserve age-pure waters for future generations.

³ < 200 org./100 ml monthly mean, or 2000 org/100 ml in 10 percent of samples

⁴ About equivalent to turbidity standard (< 25 NTUs) or Total Suspended Solids SS) < 90 mg/L

Ecosystem Objectives: Maintain ecosystems that support diverse and healthy plant communities and wildlife populations.

1. Mussels: Maintain diversity of native species.
2. Aquatic Insects: Establish baseline Index of Biotic Integrity
3. Reptiles/Amphibians: Maintain toad and frog populations; reduce the incidence of deformities.
4. Fish: *Cold water streams:* introduce/maintain brook trout
Warm water streams: maintain/increase smallmouth bass
Mississippi River: maintain/increase walleye population
5. Birds: Maintain/increase perching birds, shore birds, puddle ducks and diving ducks. Maintain/increase territories occupied by bald eagles.
6. Mississippi River: Slow the sedimentation and aging of navigation pools, maximizing biodiversity in backwaters while meeting reasonable transportation needs.

Land Use Objectives: Support water quality/quantity & ecosystem objectives:

1. Wellhead Protection Areas:
 - Achieve land uses compatible with management strategies identified in local and tribal wellhead protection plans.
2. Groundwater Recharge Areas:
 - Identify and delineate recharge areas of cities needing groundwater protection.
 - Manage the landscape to protect and enhance biological filtering of groundwater recharge areas.
3. Perennial Vegetation: Maintain/increase acreage
 - Maintain/increase land in hay & pasture; woods & meadow
 - Area in pasture and noncultivated cropland is restored to 1982 levels (630,000 acres) from current estimates (448,000 acres)
 - Increase stream miles of riparian buffers at least 50 feet wide on protected waters, using native vegetation.
 - Increase the use of hay in contour farming.
4. Floodplain Management:
 - Maintain/increase miles of river where the flood plain is connected to the main channel during higher flow periods.
 - Minimize building, filling and impervious surface areas to maintain, enhance and protect the natural function of floodplains as part of the river system.
5. Row-Crop Land Conservation:
 - Achieve soil loss < T by 2010.
 - Increase percentage of row-crop land with at least 30 percent crop residue cover, after planting, as a rotation average.
 - Increase the percentage of surface tile intakes and drainage ditches that are buffered to reduce losses of sediment and other contaminants to nearby water bodies.
6. Farm/Urban Nutrient Management:
 - Apply commercial nitrogen fertilizer at University of Minnesota-recommended rates, taking account of crop needs and all sources (manure, previous legume crop, etc.)
 - Reduce and eventually eliminate fall application of nitrogen fertilizer in the karst region, as called for in state recommendations for nitrogen management.
 - Apply commercial phosphate fertilizer at University of Minnesota-recommended rates in a manner that minimizes surface runoff.
 - Use phosphate-free fertilizer on lawns, golf courses, parks, etc.
 - Increase the use of Integrated Pest Management

- Increase the use of low-maintenance grass species in urban areas.
7. Urban and Rural Residential Land:
 - Offset/reduce surface runoff (residential, commercial, industrial)
 - Increase percentage of population with “adequate” wastewater treatment (properly functioning septic systems; phosphorus removal from wastewater treatment facilities upstream of affected waters (include Lakes Zumbro, Byllesby and Pepin)
 - Achieve compact development, where feasible and consistent with local and tribal planning, to maximize preservation of farmland and natural areas.
 8. Wetland Restoration/Protection:
 - Increase acres of high-quality wetlands.
 - Increase acres where land is managed to protect and enhance wetland functions that provide a wide range of ecological benefits.
 9. Animal Feedlots:
 - Ensure that feedlots are permitted or registered and achieve compliance with feedlot rules by 2009 through feedlot runoff controls, manure storage, manure/nutrient management, rotational grazing and other practices.
 10. Mining:
 - Inventory quarries and aggregate sites;
 - Treat storm water and process water discharge;
 - Implement measures to protect groundwater;
 - Reclaim abandoned mines.