Dane County Waterbody Classification Project

Phase II: Shoreland and Riparian Management Final Report

2009

Dane County Department of Planning & Development
Dane County Office of Lakes and Watersheds

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B. *Executive Summary*

1. Problem

Shorelands, or the areas closest to navigable waters, provide critical functions related to the water quality, ecology, biodiversity and environmental health of Dane County's waters. Properly managed shoreland buffers can provide significant water quality, fish and wildlife habitat, erosion and aesthetic benefits. On the other hand, poorly designed urban and suburban development in shoreland areas can have disproportionate environmental impacts, resulting from increased impervious surfaces, erosion and removal of natural vegetation. Although many of these impacts can be effectively mitigated with relatively inexpensive design, landscaping and engineering practices, such practices are not common in current single-lot residential development, even in shoreland areas.

Recent science suggests that individual waters respond to development impacts in different ways, depending on their natural characteristics (such as lake depth or size) and existing human changes in the surrounding landscape (such as current level of urban development). Dane County's current shoreland management program, however, is based on an antiquated statewide model ordinance that applies the same rigid zoning standards to all unincorporated shorelands in the county, making no distinction between environmentally sensitive and more resilient waters. Current county regulations also do not allow for innovative practices that may better meet the goals of protecting water quality, fish and wildlife habitat and natural scenic beauty.

In incorporated cities and villages, shoreland management practices vary widely from community to community. Some communities rely entirely on general development guidelines, and apply no standards specific to shoreland areas. Many such general standards, particularly with respect to construction site erosion control, are less rigorous than similar county standards that apply in unincorporated areas. This results in uneven and inconsistent shoreland management, along the same body of water.

2. Response

The Shoreland and Riparian Management Report attempts to create a flexible, yet rigorous, set of policy options to better protect Dane County's surface waters from near-shore impacts. The policy options are based on the principle that any management strategy must take into account the diverse characteristics, constraints and opportunities of the equally diverse waters in Dane County. One size does not fit all. The Shoreland and Riparian Management Report builds on the sound science and research of the Phase I Waterbody Classification Report, which classifies Dane County Waters into Urban, Developing and Rural categories, based on their physical characteristics and planned level of development. The Shoreland and Riparian Management Report is not a panacea. Instead it is designed to complement other ongoing county and regional programs operating on the site and watershed scales, such as agricultural nutrient, erosion control, urban stormwater and wastewater management programs. The Shoreland and Riparian Management Report fills in a critical gap by specifically addressing impacts to critical areas immediately adjacent to county surface waters. The Shoreland and Riparian Management Report is intended to bring Dane County's shoreland management program up to the same standard as current county urban erosion control, stormwater and agricultural soil and water conservation programs.

3. Purposes

- Protect, enhance and restore water quality, habitat, and natural scenic beauty.
- Treat different types of waterbodies differently.
- Treat similar types of waterbodies similarly.
- Provide consistency across government boundaries.
- Allow flexibility for landowner & municipalities.
- Complement other water-related efforts.
- Focus limited resources where they will do the most good.

4. Approach

The Shoreland and Riparian Management Report takes a multi-pronged approach to addressing impacts to Dane County's waters resulting from shoreland development. The report applies to shoreland areas within unincorporated and incorporated communities of Dane County. Under state law, "shorelands" are defined as areas within 1,000 feet of the ordinary highwater mark of navigable lakes or ponds and within 300 feet of navigable streams and rivers. Non-navigable waters, such as artificial dry stormwater basins with no natural waterway history, or active agricultural drainages exempted by state law, would not be affected.

5. Policies

The report suggests using a variety of strategies and implementation tools to achieve goals and objectives for each class of navigable water. Specific policy options include:

a. ***Shoreland Zoning Regulations:*** For each class of Urban, Developing and Rural lakes, ponds, rivers and streams, the report suggests two sets of regulatory policies: traditional zoning standards, based on setbacks and designated buffer areas, and performance-based standards, based on designs that meet objective, measurable engineering criteria. The two sets of standards are designed to be functionally equivalent in terms of their ability to protect water quality, habitat and natural scenic beauty.

b. ***Public Lands:*** The Dane County Waterbody Classification System should be considered during future updates to the *Parks and Open Space Plan, the Land and Water Conservation Plan*, and other priority-setting documents for county land acquisition. Dane County should also set a very high standard for environmental stewardship and management of all publicly-owned shoreland properties.

c. ***Public Infrastructure:*** County, municipal, regional and state facilities should be managed to minimize their negative impact on the condition of Dane County surface water resources. Priorities, opportunities and types of public investment vary between Urban, Developing and Rural Waters, with differing policy options for each class.

d. ***Incentives and Technical Assistance:*** Existing cost-share and other incentive programs should use the Dane County Waterbody Classification System to better target funding to those waters that can most benefit from particular programs. Dane County should also develop new incentive and cost-share programs for riparian landowners who volunteer to restore shoreland habitat on their property.

e. ***Education and Outreach:*** Dane County and its partners conduct a variety of outreach and educational programs focused on protecting, restoring or enhancing Dane County's surface waters, and to assist local governments, landowners and others with natural resource protection, invasive species control, habitat protection and native landscaping. Educational programs should be targeted to the specific needs of each waterbody class.

C. *Introduction*

1. Impacts of Human Development on Shoreland Areas

a) Water Quality

Water quality impacts associated with converting natural, permeable vegetative cover to hard pavement and unprotected soil are well documented. A Wisconsin DNR model showed that a typical developed shoreland lot produced a 900% increase in sediment, a 700% increase in phosphorus loading, and a 500% increase in total runoff volume, compared with the same parcel in an undeveloped state (*WI DNR, 1994*). The Environmental Protection Agency estimates that replacing natural ground cover with 10% to 20% impervious surfaces effectively doubles the surface runoff, while reducing infiltration *(US EPA, 1993)*. Active construction sites, where bare soil is exposed to the elements, can contribute 4 to 150 times the total suspended solids (TSS), compared with predevelopment conditions *(Owens, Jopke et al, 2002)*. A study of Lake Mendota found that although active construction sites comprised only 1% of the land area of the watershed, they accounted for 23% of the total sediment delivered to the lake *(WI DNR, WI DATCP, et al, 1997)*.

b) Habitat

Shorelands and littoral zones are also unusually productive and sensitive habitat for a wide variety of aquatic and terrestrial species. The Wisconsin Department of Natural Resources estimates that 94% of all lake life is born, raised and fed within 30 feet of the waterline. Dane County maintains active sport fisheries in most of its waters, including both warmwater resources like Lake Mendota, and nationally renowned coldwater fisheries like Black Earth Creek. Seventy-two endangered or threatened species depend on Dane County waters, wetlands and shore areas for some or all of their life cycle. These include 45 animal species (fish, insects, mussels, birds and one mammal) and 27 plant species. In addition, remnants of endangered, water-dependent ecological communities such as bogs, calcareous fens and floodplain forest persist throughout Dane County *(Wisconsin Natural Heritage Inventory, 2009)*.

By removing natural vegetation, disturbing hydrologic regimes and increasing sediment loads, residential or commercial development tends to degrade and fragment habitat, ultimately negatively impacting fish and wildlife populations. In a series of independent studies, researchers found that muskellunge populations declined rapidly with lake development *(Rust, Diana, et al, 2002)*, bluegill populations were 2.5 times lower on developed vs. undeveloped lakes (*Schindler, Geib & Williams, 2000*), while trout populations disappeared entirely once impervious surfaces covered as little as 11% of a watershed (*Wang, Lyons et al., 2000*). The Wisconsin Department of Natural Resources found that woody cover, aquatic plants and shore cover, all essential elements for fish habitat, declined from 30% to 600% on shores with riprap or seawalls (*Jennings, Johnson & Staggs, 1996*). Shoreland development impacts nongame resources as well. One study found that green frogs declined with density of residential homes per mile of shoreline, and disappeared by 30 homes per mile (*Woodford & Meyer, 2003*). As development increases, rare and declining songbird species, such as warblers and vireos, tend to be replaced with more common, tolerant species, such as catbirds and grackles *(Lindsay, Gillum & Meyer, 2002*).

2. Legal Authority

a) State Authority

Waterbody Classification

In 1997, the Wisconsin Legislature established the Lake Classification Grant Program to assist counties in adopting classification systems to protect or improve water quality or natural ecosystems. Under Section 281.69, Wisconsin Statutes, classification programs can be used to help county governments make informed decisions about any of the following activities:

- Purchase of land or conservation easements;
- Wetland restoration or enhancement
- Shoreline and littoral habitat restoration
- Development of local regulations or ordinances
- Implementation of DNR-approved water quality or ecosystem plans

At last count, twenty-seven counties in Wisconsin have adopted or are in the process of adopting water body classification systems. Almost all of them have chosen shoreline development as their primary management concern, and improvement of shoreland regulations as their primary management strategy.

Shoreland Zoning

Under sections 59.692, and 281.31,Wisconsin Statutes, all counties in the state must adopt shoreland zoning ordinances to protect the navigable waters of the state. County ordinances must serve the following purposes:

- further the maintenance of safe and healthful conditions;
- prevent and control water pollution;
- protect spawning grounds, fish and aquatic life;
- control building sites, placement of structure and land uses, and;
- reserve shore cover and natural beauty.

"To aid in the fulfillment of the state's role as trustee of its navigable waters and to promote public health, safety, convenience and general welfare, it is declared to be in the public interest to make studies, establish policies, make plans and authorize municipal shoreland zoning regulations for the efficient use, conservation, development and protection of this state's water resources. The regulations shall relate to lands under, abutting or lying close to navigable waters. The purposes of the regulations shall be to further the maintenance of safe and healthful conditions; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structure and land uses and reserve shore cover and natural beauty." Section 281.31(1), Wisconsin Statutes.

"…the department shall prepare and provide to municipalities general recommended standards and criteria for navigable water protection studies and planning and for navigable water protection regulations and their administration. Such standards and criteria shall give particular attention to safe and healthful conditions for the enjoyment of aquatic recreation; the demands of water traffic, boating and water sports; the capability of the water resource; requirements necessary to assure proper operation of septic tank disposal fields near navigable waters; building setbacks from the water; preservation of shore growth and cover; conservancy uses for low lying lands; shoreland

layout for residential and commercial development; suggested regulations and suggestions for the effective administration and enforcement of such regulations." Section 281.31(6), Wisconsin Statutes

Chapter NR 115, Wisconsin Administrative Code, establishes minimum standards, including building setbacks, wetland protection, lot sizes and filling and grading permitting, for county shoreland zoning ordinances. County ordinances may be more restrictive than NR 115 standards, but not less so.

Wisconsin's shoreland zoning standards were originally developed in the late 1960s based on the best professional judgment at that time. Since then, there have been significant advances in our understanding of aquatic natural systems, and the public's knowledge, perceptions and the political landscape have also changed as well. Current and future development trends, such as redevelopment of small lakefront lots, conversion of seasonal cottages into year-round homes, and expansion of urban growth into the watersheds of previously rural streams, pose major challenges to the significant environmental, recreational and economic resources in Dane County. Options for improving the shoreland zoning program have been recommended at the state level tied to regional water body classifications systems specifically tailored to local circumstances and priorities. The realization has been that a "one-size-fits-all" approach may not be necessary or even appropriate in many cases, and that different strategies can be used for different situations. In this manner a water body classification system can be used to guide program resources, promote cost-sharing opportunities and partnerships among various agencies and groups, and direct their efforts where they will do the most good and have the greatest beneficial impact.

b) County Authority

Shoreland Zoning

Shoreland regulations are found within Chapter 11 of the Dane County Code of Ordinances. Dane County Chapter 11.02 states:

> *"The county Board does find that the uncontrolled use of the shorelands and pollution of the navigable waters of Dane County adversely affect the public health, safety, convenience, and general welfare and impairs the tax base. The legislature of Wisconsin has delegated responsibility to the counties to further the maintenance of safe and healthful conditions; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; and preserve shore cover and natural beauty, and this responsibility is hereby recognized by Dane County."*

The 1988 Wisconsin DNR model county shoreland zoning ordinance served as the basis for Dane County's shoreland ordinance. Over time, the county board has approved a few amendments that have modified regulatory standards, including:

- protection for inland wetlands (not associated with navigable waters) [s. 11.06, Dane County Code];
- establishment of a 75-foot building setback from shoreland and inland wetlands [s. 11.06(5)];
- shoreland erosion control permitting requirements [s. 11.05];
- allowances and safeguards for replacement of marina fuel pumps [s.11.03(4)], and;
- allowances and mitigation for minor structures to comply with changes to state statute [s. 11.03(5)].

Other than the changes listed above, the Dane County shoreland zoning ordinance remains essentially identical to the 1988 DNR model.

Dane County Lakes and Watershed Commission

The state legislature has granted the Dane County Lakes and Watershed Commission and the county board of supervisors unique authority (Chapter 33, Subchapter V, Wis. Stats.) to enact regulations that apply within towns, villages and cities to protect surface and ground water resources. To date, the Lakes and Watershed Commission and the County Board have exercised that authority to establish countywide standards for wetland protection, boating, erosion control, stormwater management, and reduction of other pollutants including phosphorus and polycyclic aromatic hydrocarbons. The Lakes and Watershed Commission also has broad authorities in other management activities recommended in this plan.

Dane County Comprehensive Plan

Under the authority of the state Comprehensive Planning Law (s. 66.1001, Wis. Stats), the Dane County Board of Supervisors adopted the *Dane County Comprehensive Plan* in January of 2008 to serve as the primary guide for all land use decisions in the county. The Agricultural, Natural and Cultural Resources chapter of the *Dane County Comprehensive Plan* includes the following policy guidance regarding waterbody classification:

> *"Complete and implement the Dane County Waterbody Classification system (currently underway) to design programs that take into account the environmental sensitivity and existing development conditions for each water body. Program policies should treat all riparian landowners (including public, private, in incorporated or in unincorporated areas)within a particular waterbody class in a uniform way. Specific programs could include:*
> *(1) Waterbody-sensitive shoreland zoning regulations, including standards for vegetative buffer protection and restoration, mitigation of nonconforming uses, slope protection and conservancy overlay districts;*
> *(2) Cost-share funding, including wetland ,lakeshore and streambank restoration, and in-water habitat;*
> *(3) Acquisition;*
> *(4) Education, and;*
> *(5) Other county programs."*
> (*Dane County Comprehensive Plan*, Chapter 5, Water Resources Policy 2C, p. 46)

II. Phase I: Water Body Classification Report

When the Lakes and Watershed Commission conducted public meetings on various amendments to the shoreland zoning ordinance in 2003, a number of groups and individuals expressed concern that the current approach to planning and regulation, especially the approach of applying one set of shoreland zoning standards to all waters and only in the unincorporated areas, was inadequate for enhancing Dane County's water resources. In 2004, Dane County was awarded a DNR Lake Classification grant to develop a water body classification system that would include all navigable waters in the county. The Phase I study was intended to provide the technical basis and support for a subsequent Phase II management report developed in cooperation with local units of government, private citizen groups and landowners as well as incorporated in the County's Comprehensive Plan. The Waterbody Classification Report was viewed as the first step toward developing a consistent set of countywide standards, policies, and strategies to help protect and restore Dane County's waters.

In April 2005 the final report was completed and distributed to local units of government, public resource management agencies, and private conservation and environmental groups. The report can be viewed at www.danecorpc.org and www.danewaters.com/management/water_body_classification.aspx. The water body classification study classifies lakes, ponds, rivers, and streams according to their current level of development and sensitivity to that development. The result provides a range of protection, enhancement, and restoration strategies as well as various management actions that can be taken, depending on the circumstances surrounding a particular site. In this manner, the classification system allows water resource plans, policies, and programs to be tailored to the needs of the resources as well as the priorities of the community.

A. *Science and Other Rationale Used to Develop Resource Management Strategies*

1. Why Classify Waters?

A classification system is based on the notion that water resources plans, policies and programs can be modified to suit local needs and circumstances. In other words, one strategy or set of standards may not be appropriate in all cases, and that these can be tailored to reflect local conditions. The purpose is to provide enhanced protection of lake and river shorelines, and local water quality. The water body classification system and accompanying management policy options are designed to provide varying degrees of protection and restoration based on a water body's surrounding levels of development and sensitivity to that development. For example, classification systems have been used to control the pattern and density of development along shorelines, limit land disturbing activities, limit runoff from yards and impervious surfaces, provide greater and therefore more effective shoreland buffer widths, protect sensitive resource areas, restore lost shoreland functions, etc.

2. Impervious Cover

Impervious cover is an excellent indicator of environmental impacts and can provide the basis for a resource management plan. As more areas are paved there is a subsequent increase in overland runoff with attached sediment, nutrients, oils and other toxic substances, as well as a subsequent decline in groundwater recharge and baseflow to area waters. There are also significant impacts to shoreline habitats. These are highly productive areas where the land and water meet. Many juvenile species depend on these areas. The logs and brush along the shoreline provide important habitat, structure and diverse ecology comprised of insects, amphibians, reptiles, fish, birds, and predatory mammals at the top of the food web, including humans. Shoreline buffers also provide important water quality benefits, including filtering and removing pollutants, that are literally stripped away when these areas are developed. Some, but not all, of these effects can be

mitigated with development and construction practices such as erosion control, ground water infiltration, the use of pervious materials, and adapted landscaping techniques. This report recognizes that riparians, as well as non-riparians, have a responsibility to enhance infiltration of stormwater back into the ground and protect and restore native vegetation where possible.

3. Classification Methodology

For the Phase I classification work, the county's known navigable lakes and streams were grouped into three categories based on their current levels of development and sensitivity to that development. For the current levels of development, shoreline and watershed measures were used because of the cumulative nature of the impacts on aquatic habitat and water quality. Using a Geographic Information System (GIS), a 300-foot buffer was drawn around each lake and the subwatershed was delineated around each stream. Lakes and streams are naturally different and were thus treated differently. This has much to do with their different surface areas and volumes as well as their ecologies adapted to free-flowing versus stillwater conditions. Also, whereas lakes are more affected by shoreland development and habitat loss along their shorelines, streams are more affected by the water flowing through them.

The identified areas were then intersected with the 2000 County Land Use Map. Each land use within the intersected area had a corresponding impervious cover percentage assigned to it, based on literature values. A composite impervious cover percentage was then calculated based on the weighted average of all the individual land uses within the intersected area for each stream, lake, and pond.[*] Three development categories were then established representing Rural, Developing, and Urban water bodies possessing increasing impervious cover percentages. For lakes, these categories generally correspond with rural residential shoreline development (2 acre lots or greater), single family residential shoreline development (1 to 1-1/2 acre lots), and multi-family shoreline development (half acre lots or less), respectively.

a) Rivers and Streams

For stream classification, research has shown very strong correlations between increasing watershed impervious cover and decreasing stream quality. More specifically, as impervious cover increases, peak flows and volumes of storm water increase, groundwater recharge and stream baseflow decrease, and more pollutants are washed off the land's surface into our surface waters. There is a particularly sharp decline in stream quality from 0 to 10 percent impervious cover. Streams in largely rural areas possess relatively good water quality but are particularly vulnerable to development impacts. Many of our trout streams fall in this category. With between 10 to 25 percent impervious cover, streams in developing areas have already been affected to a moderate degree. These are streams are located on the urban fringe such as the Upper Yahara River, Sugar River, Token and Door Creeks. They possess relatively fair water quality indicated by the presence of fish and aquatic insect species more tolerant of pollution. Beyond 25 percent impervious cover, "streams in urban areas have consistently poor water quality and are generally non-supporting of biological communities, but may still have significant recreational and aesthetic value. Examples include Starkweather and Nine Springs Creeks.

Additional distinctions were also made based on sensitivity to development. Lakes and ponds were adjusted either up or down based on their level of sensitivity. Streams were considered equally sensitive to development since all streams are vulnerable to increased stormwater volumes and peak flows. This results in increased bank erosion, sedimentation, reductions in groundwater discharge, etc. In fact, by the time water quality impacts become evident (in the form of increased pollution), the damage to the ecology of the stream has already largely been suffered.

[*] Dane County has over 1800 farm ponds that are largely private held and controlled by a single landowner. These are treated as a separate group since the county typically works with individual landowners through soil and water conservation plans

b) Lakes and Ponds

For lakes and ponds, the greatest distinction between sensitivity levels is by type. “Drainage” lakes have a river running through them. They are flushed more regularly and therefore are relatively insensitive or resilient to development. “Seepage” lakes are landlocked. Almost everything that is flushed into them settles there. As such, they are very sensitive to development. “Spring” lakes were grouped with seepage lakes, although somewhat less sensitive because they are flushed with spring water.

Lakes may also be distinguished by depth, resulting in three levels of sensitivity owing much to their respective volumes and assimilative capacity. Shallow seepage lakes are the most sensitive. Hook Lake west of Stoughton is a good example. On the other end of the spectrum are deep drainage lakes which are the most resilient. The Yahara Lakes fit in this category. In between are the shallow drainage lakes and the deep seepage lakes, exhibiting medium levels of sensitivity. These include many of the County’s millponds such as Lake Belle View and Marshall Millpond. Additional factors were also taken into account to rank water bodies within the three categories. Although not affecting the classification directly, they are nevertheless important issues for consideration. These factors include:

- Area – small lakes are more sensitive than large lakes
- Shoreline development – irregular lakes have more homes per shoreline mile than circular lakes, thus more development pressure
- Stratification – stratified lakes are more sensitive to inputs because they are cut off from recycling of nutrients from bottom sediments
- Steep slopes – have higher potential for erosion and sedimentation
- Septic suitability – lakes surrounded by high water tables and sandy soils are more sensitive to unsewered development

B. *Management Strategies*

Overall, the Phase I classification study provided the scientific basis and rationale for grouping water bodies based on their current development levels and sensitivity to development. This provides the foundation for the Phase II management report to target management policies, programs, and activities where they will do the most good and have the greatest beneficial impact. Recommended strategies include:

- Protecting rural water bodies (keeping them from becoming degraded)
- Enhancing developing water bodies (improving their condition)
- Restoring and improving urban water bodies (re-establishing previously lost functions and values)

These strategies provided the framework for more specific goals, objectives, and policy options developed as part of Phase II Management Report, and described in the following sections.

1. Definitions of the Overall Strategies:

a) Protection:

This strategy is suitable for a site whose present conditions are desirable as they are but which may be threatened by existing or future impacts. The most common forms of protection have been through federal and state regulations, local zoning, acquisition, and easements (such as upland buffers). Physical protection from urban and agricultural runoff may be needed as well. Examples include development restrictions in terms of lot sizes and setbacks, buffers, and urban and agricultural runoff management practices.

b) Enhancement:

This strategy is intended to improve conditions beyond what currently exists to some pre-existing condition. Enhancement may be undertaken for purposes such as water quality improvement, flood attenuation, or wildlife habitat. Enhancement may include re-establishing fully functioning ecological systems, where possible, or re-habilitating one or more environmental functions, addressing the most serious impacts first. Enhancements may also include expanding trails and other linkages between natural resource or recreational areas.

c) Restoration:

This strategy is intended to reclaim environmental functions or values previously lost to urban development. Examples include restoration of shoreline vegetation and habitat, retrofitting existing storm water facilities with improved technologies, stream clean-ups, and expanding trails and other linkages between natural resource or recreation areas.

III. Phase II: Shoreland and Riparian Management Report

Based on a subsequent policy option by the Lakes and Watershed Commission, Dane County applied for and received another DNR Classification grant to develop a Phase II management report. The Phase I study provided the technical basis for the Phase II report. The purpose of the Phase II project was to better determine Dane County's interests and priorities and how current water body management efforts might be best restructured or focused. In order to accomplish this the project had the following goals:

- Providing public information and educating riparian landowners, local decision makers and the general public about the Dane County Water Body Classification system, impacts of shoreland development and mitigation techniques
- Working with these groups, the Lakes and Watershed Commission and comprehensive planning workgroups, establish goals, objectives, and design implementation strategies appropriate to each individual water body class
- Developing revisions to the county shoreland zoning ordinance as well as other county programs and efforts to reflect water body classification
- Identifying alternative management tools that could be used to protect and improve water bodies, such as purchase of land or development rights, conservation easements, targeting local, state, and federal cost-share dollars, public information and education, continuing education for local government decision makers and staff, individual lake and watershed plans, etc.
- Building on policy options of the Dane County Comprehensive Plan, develop a set of action initiatives such as ordinance amendments, program designs, and resource allocation strategies for adoption by the Dane County Board of Supervisors.

A. *Process Used to Develop the Shoreland and Riparian Management Report*

The Shoreland and Riparian Management Report incorporated broad community and stakeholder input to develop goals, objectives and policies appropriate to each water body class. Community discussions included an evaluation of priorities and available resources, identification of limitations or gaps in existing policies and programs, and how current efforts might be best restructured, focused, or improved.

In late 2005 a small Dane County staff team was assembled to initiate Phase II of the Water Body Classification project consisting of representatives from Dane County Planning and Development Department, Dane County Lakes and Watershed Commission, Dane County Office of Lakes and Watersheds, Dane County Regional Planning and Dane County UW-Extension. During the winter of 2006 a public input process was designed including a series of stakeholder meetings, web-based information and input access, resource material development, focus groups, and venues of interactive discussion throughout the development of the project.

A county web-presence for the project was developed (www.danewaters.com/management/water_body_classification.aspx) along with supportive educational materials. Four Strategy Cafes geographically dispersed in different watersheds in the spring of 2006 gave an overview of the project and allowed citizens an opportunity to discuss what strategies they would like to have occur to manage the surface water resources in their watershed in particular. These were held in restaurants, bowling alleys and community centers in discussion groups of 3-5 individuals per table with the mix of people at the table changing after 40 minutes of dialogue. This led to a cross-pollination and

connection of diverse perspectives, where people were “ambassadors of thought” carrying ideas from one table conversation to another. This strategy café process provided “raw” strategy ideas that were fed into the draft policy document.

In addition, related current county planning and guidance documents were reviewed and relevant policies were added to the strategy café data. The staff team then stepped back, examined the Phase I work and overall scope of the project, and drafted the broad goals, measurable objectives, and recommended policies.

At this point, the draft goals, objectives, and policies document was reviewed by a broader Dane County guidance group that consisted of members from Planning and Development and Land and Water Resources Departments (the latter including Parks, Land Acquisition, and Land Conservation Divisions and the Office of Lakes and Watersheds), and the Dane County Lakes an Watershed Commission. The draft goals, objectives, and policies document was then brought back a second time for review including examining some of the guiding principles of the project and the roles of other groups and agencies outside of county government.

The modified document was then used as the core of focus group discussions, first with other municipal officials and then with other stakeholder groups during the summer of 2007. They examined the document through a discussion of the following questions:

For Municipal Officials

- What current and anticipated growth issues do you see impacting your local water resources?
- How might this approach assist you in implementing your community’s programs and objectives?
- How might your current method of dealing with water-related issues be impacted by this approach?
- What modifications to the document are needed to strengthen it and make it better able to be implemented?

For Stakeholders

- What current and anticipated growth issues do you see impacting the county water resources?
- How might this approach assist in addressing regional water resource issues?
- How might current management strategies be impacted by this approach?
- What modifications to the document are needed to strengthen it and make it better able to be implemented?

The responses to these questions were compiled and used to modify the report, to assist in designing educational pieces, to clarify the report and planning process, and to aid the county staff team in addressing concerns of the current draft report. Feedback on how the focus groups data was used were given to all focus group invitees and individual reviewers.

Through the focus groups it became apparent that a science advisory guidance group was needed to assist in developing performance standards that would give more flexibility in meeting regulations suggested in the report. Such a group was formed and met periodically (about monthly) for approximately six months to develop performance standards based on the most current science. The revised draft report was again sent out to the focus group participants and county staff for review.

Under the guidance of the Dane County Lakes and Watershed Commission, public meetings on the draft report were held in the spring of 2008. As a result of public comment, a number of changes were made (see http://danedocs.countyofdane.com/webdocs/PDF/LWRD/Lakes/Runoff_Policy options.pdf). A new focus group was convened in January of 2009 to discuss potential economic impacts of the proposal. Focus group members included municipal assessors, real estate appraisers, UW researchers in land economics and real estate, real estate agents, public and private land acquisition agencies, and others. Economic focus group participants looked at revised standards and addressed the following questions:

- What factors influence the market value of property in general? What is different about shoreland properties in particular?
- How do land and design regulations in general affect property values? How might land and design regulations affect specifically shoreland properties?
- How might the recommended management strategies economically impact local property values both negatively and positively? Please provide specific examples.
- Besides property values and individual parcels, what other positive of negative economic implications might be associated with this proposal?
- What modifications to the draft report would strengthen it and make it better?

Comments from the Economic Focus Group are posted online at:
http://danedocs.countyofdane.com/webdocs/PDF/LWRD/Lakes/Focus_Group_011309.pdf

As a result of the Economic Focus Group meeting, county staff developed quantitative estimates of relative environmental benefit across the waterbody classifications. Based on this information, further policy changes were made, including exempting Urban Waters from recommended habitat and scenic waters and establishing a minimum impervious surface area trigger for Urban Waters.

The Lakes and Watershed Commission held two formal public hearings on the proposal in November of 2009, including one in the City of Verona and one in the City of Sun Prairie.

IV. Management Goals, Objectives and Strategies:

A. *Rural Waters*

1. Overall Conditions & Management Strategy

The Rural Waters category includes Dane County's lakes, ponds, rivers and streams that:

- have experienced the least direct and indirect impacts from human development to date;
- due to their natural characteristics, are extremely sensitive to land use changes, or;
- a combination of both.

Based on adopted plans, agriculture, forestry, natural resource reserves and outdoor recreation will likely continue as predominate land uses in the shorelands and watersheds of Rural Waters. Current water quality and existing biodiversity are both very high, and generally stable over time. Rural Waters typically either already have, or have the potential for, natural vegetative buffers wide enough to provide maximum benefits for water quality, wildlife habitat and natural scenic character. Natural hydrology is largely intact, thanks to low impervious surface cover and low groundwater withdrawal rates. As a result, management strategies for Rural Waters focus on protection of existing resources.

2. Classification

a) Rural Lakes & Ponds

Rural lakes and ponds have low to medium development levels within their immediate shoreland areas and medium to high natural sensitivity to development impacts (see Figures 1 & 2).

Hook Lake (Rural Waters)

Water Body Classification Matrix			
Natural Sensitivity to Development	**Current Level of Development**		
	Low Level	**Medium Level**	**High Level**
High Sensitivity	Rural Lakes (Protection)	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)
Medium Sensitivity	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)
Low Sensitivity	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)	Urban Lakes (Enhancement and Restoration)

Figure 1: Rural Lake Classification Matrix

Typical characteristics of rural lakes and ponds include:

- Low development levels/impervious cover in shoreland zone
- High environmental sensitivity
- Excellent shoreline structure
- Low flushing rates
- Smaller size--less volume for dilution
- Irregular shape--more shoreline developed per acre
- Nutrients--more sensitive to phosphorus loads
- Steep slopes--more vulnerable to erosion and sedimentation
- Septic suitability--high groundwater or excessive percolation rates

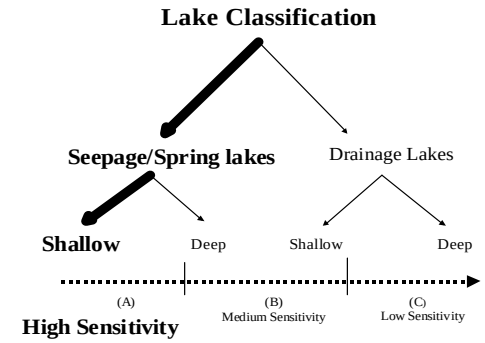

Figure 2: Lake Classification flowchart

b) Rural Rivers & Streams

Rural rivers and streams typically have good biologic quality and are particularly sensitive to development impacts. They have very low (<6% for coldwater systems; <8% for warmwater systems) percentages of impervious surface area throughout their entire watershed (see Figures 3 & 4).

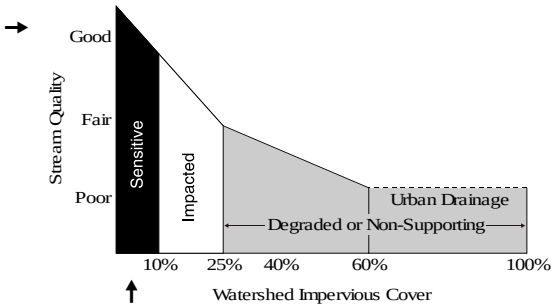

Figure 3: Stream Sensitivity Curve (Rural Waters)

Black Earth Creek (Rural Waters)

Typical characteristics of rural rivers and streams include:

- Low impervious cover (<10%) throughout watershed
- Good stream quality and habitat
- Stable channels
- Diverse fish and aquatic insects
- Maximum groundwater discharge
- Minimum temperature fluctuations
- Natural stormwater peaks and volumes

Natural Characteristics	Stream Classification Matrix		
	Rural Streams (Sensitive)	**Developing Streams (Impacted)**	**Urban Streams (Degraded)**
Warm and cold water streams are equally sensitive.	Protection	Protection & Enhancement	Enhancement & Restoration

Figure 4: Rural Stream Classification Matrix

3. Rural Waters Policy options

a) Goals & Objectives

(1) Protect existing natural resources and their ecological function.

Supporting objectives:

(a) Maintain pre-development diversity and protect endangered and threatened species.
(b) Maintain pre-development hydrology and recharge
(c) Preserve or restore high quality, native vegetative buffers of at least 100 feet in width for each rural water body, or provide for equivalent protection of native riparian habitat.

(2) Maintain Rural Waters conditions over the long term.

Supporting objectives:

(a) Seek to prevent future reclassification of Rural Waters into Developing or Urban categories based on changes in development.

(3) Minimize human impacts to prevent degradation.

Supporting objectives:

(a) Mitigate 100% of the sediment and infiltration impacts of new impervious surfaces within 1000 feet of rural lakes & ponds, and within 300 feet of rural rivers and streams.
(b) Minimize runoff from existing and new developments.
(c) Reduce pollution and runoff associated with development.
(d) Reduce pollution and runoff associated with agricultural uses.

(4) Provide for low-impact, sustainable recreational use and aesthetic enjoyment.

Supporting objectives:

(a) Provide opportunities for recreational use, such as fishing, low impact motorized and non-motorized boating, hunting, hiking and wildlife observation.
(b) Establish design and landscaping guidelines that minimize visual intrusions into natural landscape.

B. *Developing Waters*

1. Overall Conditions & Management Strategy

The Developing Waters category includes Dane County's lakes, ponds, rivers and streams that:

- are experiencing rapidly changing, direct and indirect impacts from human development associated with suburbanization and urbanization;
- due to their natural characteristics, are moderately sensitive to land use changes, or;
- have offsetting natural sensitivity and development conditions.

Current water quality and biodiversity for Developing Waters vary widely, but are typically declining over time – in some cases quite steeply. Because of their location on the urban fringe, lands near Developing Waters are projected to convert from agricultural and low-density residential uses to more intensive urban and suburban uses over time. The potential remains to protect or establish vegetative buffers wide enough to provide good water quality protection, and some degree of natural scenic and wildlife benefit. Natural hydrology is intact in some places, disrupted in others, but is potentially subject to dynamic fluctuations due to changes in impervious surface area and accelerating groundwater withdrawal. Management strategies should focus on a combination of natural resource protection, minimizing impacts from both existing and new development, and ecological enhancements.

2. Classification

a) Developing Lakes & Ponds

For developing lakes and ponds, levels of existing development and natural sensitivity tend to either fall into intermediate categories, or to offset each other (see Figures 5 & 6). For example, lakes such as Marshall Millpond and Lake Belle View, although shallow, are regularly flushed or drained and are more resilient to development impacts. These lakes possess medium sensitivity and development levels and are typically faced with growing development pressures. Combined protection and enhancement strategies are recommended. Some lakes such as Morse, Stricker, and Tiedeman Ponds, while highly sensitive, are already impacted by high levels of development and protection opportunities are more limited. Efforts focusing more on ecological enhancement may be more beneficial or effective in these situations. There are no Low Sensitivity/Low Development lakes in Dane County, as all low-sensitivity lakes have already been developed to some extent.

Marshall Millpond (Developing Waters)

Typical characteristics of Developing lakes and ponds include:

- Large land-locked lakes and shallow millponds
- Increased erosion and sedimentation from construction
- Increased nutrient and pollutant levels
- More frequent algae blooms
- Increased loss of shoreline habitat and structure
- Cumulative impacts results in lower fish abundance and diversity

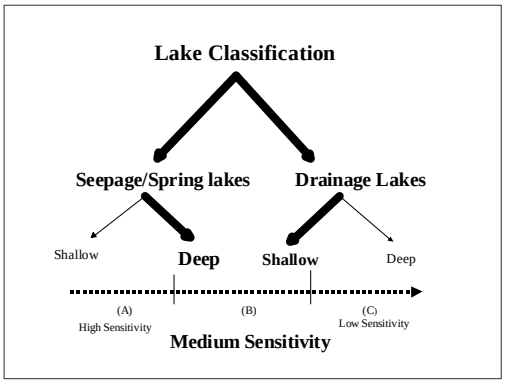

Figure 5: Developing Lakes Classification Flowchart

Water Body Classification Matrix			
Natural Sensitivity to Development	**Current Level of Development**		
	Low Level	**Medium Level**	**High Level**
High Sensitivity	Rural Lakes (Protection)	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)
Medium Sensitivity	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)
Low Sensitivity	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)	Urban Lakes (Enhancement & Restoration)

Figure 6: Developing Lakes Classification Matrix

b) Developing Rivers & Streams

Developing rivers and streams have moderate levels (between 10% and 25%) of impervious surface area throughout their entire watershed (see Figures 7 & 8). They typically have fair biologic quality and have been impacted by existing development.

Sugar River (Developing Waters)

Typical characteristics of Developing rivers and streams include:

- Intermediate and increasing impervious cover (10 to 25%)
- Significant impact at low development levels (sharp decline)
- Fair stream quality and habitat
- Greater fluctuations in water levels
- More sediment and pollutant delivery
- Spawning areas filled with silt, loss of shoreline vegetation
- Increased water temperatures and loss of coldwater species
- Decline in aquatic insect diversity
- Reduced natural reproduction and numbers of species

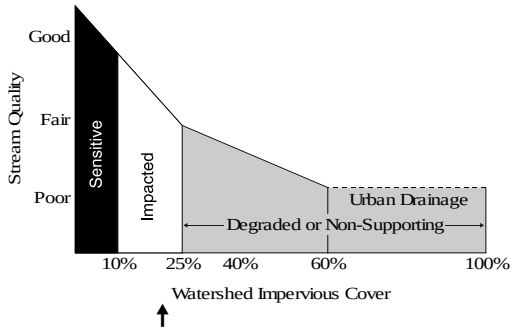

Figure 7: Stream Sensitivity Curve (Developing Waters)

Natural Characteristics	Stream Classification Matrix		
	Rural Streams (Sensitive)	**Developing Streams (Impacted)**	**Urban Streams (Degraded)**
Warm and cold water streams are equally sensitive.	Protection	Protection & Enhancement	Enhancement & Restoration

Figure 8: Developing Stream Classification Matrix

3. Developing Waters Policy options

a) Goals & Objectives for Developing Waters:

(1) Protect and enhance existing natural resources.

Supporting objectives:

(a) Protect highest quality watershed elements of each waterbody.

(b) Restore or re-establish fully functioning ecological systems, where possible.

(c) Protect or re-establish a predominately native buffer of at least 75 feet in width for each Developing Water body, or provide for equivalent protection and restoration of riparian habitat. Vegetative buffers should consist of non-invasive and predominately native species and include only limited breaks in the buffer necessary for viewing and riparian access to the water.

(d) Maintain, restore or enhance infiltration, recharge and hydrology to maintain or improve current conditions.

(2) Maintain or improve Developing Waters conditions over the long term.

Supporting objectives:

(a) Seek to prevent future reclassification of Developing Waters into Urban Waters based on changes in development.

(b) For Developing Waters that have been identified as "potentially restorable," take active steps to work with private and public riparians to re-establish or enhance Rural Waters conditions, where possible.

(3) Reduce or mitigate human impacts to:

- prevent further degradation;
- improve conditions, where possible, and;
- prevent downstream impacts to Rural Waters.

Supporting objectives:

(a) Maintain and retrofit, as necessary, to meet current county stormwater standards for new residential development.

(b) Rehabilitate specific environmental or ecological functions, addressing the most serious impacts first.

(c) Limit new impervious surfaces and find opportunities to remove existing impervious cover.

(d) Manage and reduce specific impacts of rapid development and urbanization, including:
- Increased pollution and sediment loading;
- Changes to and variability of runoff volume;
- Loss of infiltration;
- Reductions in baseflow, and;
- Loss of in-stream, shoreland and watershed habitat.

(e) Reduce pollution and runoff associated with agricultural uses.

(4) Provide for appropriate, sustainable recreational use and aesthetic enjoyment

Supporting objectives:

(a) Increase amenity value and provide opportunities for appropriate recreational use, such as sport fishing, swimming, non-motorized and low-horsepower boating, hiking, picnicking, etc.

(b) Establish design and landscaping guidelines that result in development that harmonizes with natural elements of the landscape and protects significant viewsheds.

C. *Urban Waters*

1. Overall Conditions & Management Strategy

The Urban Waters category includes Dane County's lakes, ponds, rivers and streams that:

- have experienced the greatest direct and indirect impacts from human development to date;
- are naturally resilient in response to impacts from land use changes, or;
- a combination of both.

Urban waters are visible and accessible to a majority of the Dane County population. Consequently, they rank among the county's most highly-valued waters, and receive intensive, year-round recreational use. Water quality for urban waters may range from good to poor, with streams suffering the most from development while lakes are much more resilient. While biodiversity is generally low in streams, significant populations of sport and other fish may exist in large lakes. In streams, impervious cover and groundwater withdrawal have disrupted the natural hydrology. In lakes, shoreline habitat may be degraded by clearing activity and chemical and fertilizer use on adjacent development. Invasive species may also pose a threat. Urbanized, stable land uses predominate, with most changes occurring through redevelopment. Through redevelopment and change of existing management practices, some potential exists to re-establish buffers wide enough to provide at least minimal water quality protection and habitat, some degree of aesthetic enhancement, and basic shoreline erosion protection. Management strategies for urban waters should focus on restoration and enhancement practices.

2. Classification

a) Urban Lakes & Ponds

Urban lakes and ponds have medium to high development levels within their immediate shoreland areas and medium to low natural sensitivity to development impacts (see Figures 9 & 10).

Lakes Monona & Mendota (Urban Waters)

Water Body Classification Matrix			
Natural Sensitivity to Development	**Current Level of Development**		
	Low Level	**Medium Level**	**High Level**
High Sensitivity	Rural Lakes (Protection)	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)
Medium Sensitivity	Rural Lakes (Protection)	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)
Low Sensitivity	Developing Lakes (Protection & Enhancement)	Urban Lakes (Enhancement & Restoration)	Urban Lakes (Enhancement & Restoration)

Figure 9: Urban Lakes Classification Matrix

Typical characteristics of urban lakes and ponds include:

- High development levels/impervious cover (limited opportunities)
- Low sensitivity/higher resiliency
- High flushing rates
- Larger size--more volume for dilution
- More circular shape--less shoreline developed per acre
- Nutrients--relatively less sensitive to phosphorus loads
- Shallow slopes--less vulnerable to erosion and sedimentation
- Septic suitability--developed areas are typically sewered

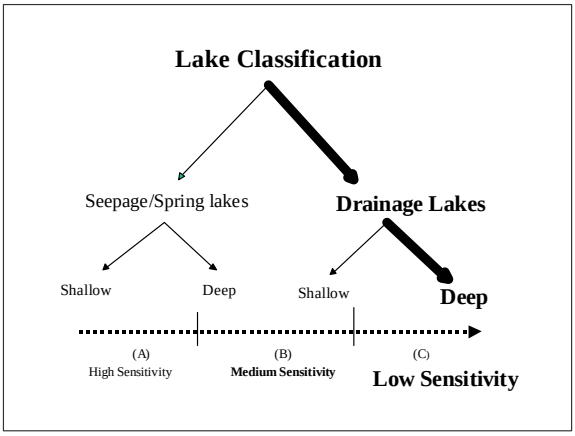

Figure 10: Urban Lakes Classification Flowchart

b) Urban Rivers & Streams

Urban rivers and streams have high (25% or greater) percentages of impervious surface area throughout their entire watershed (see Figures 11 & 12). Urban rivers and streams typically possess poor biologic quality and have been degraded by high levels of existing development.

Starkweather Creek (Urban Waters)

Characteristics of Urban Rivers & Streams may include:

- High impervious cover (>25%)
- Poor stream quality and habitat
- Primarily a stormwater conduit
- Highly unstable stream channel
- Severe widening, downcutting, and erosion
- Diverse fish and aquatic community absent
- Spawning substrate lost
- High bacterial contamination
- High nutrient loads
- Dominated by pollution-tolerant insects and fish
- Stream ecology significantly/permanently altered
- May still possess other values such as open space, scenic beauty, trails, neighborhood identity, and terrestrial and wildlife habitat.

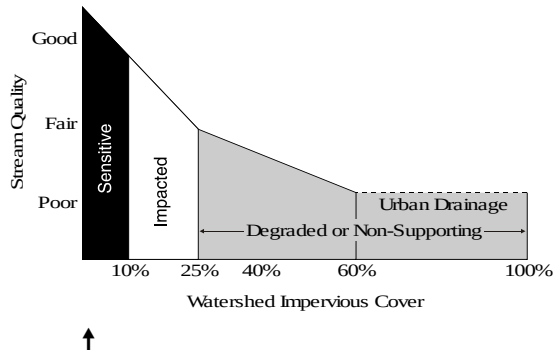

Figure 11: Stream Sensitivity Curve (Urban Waters)

Natural Characteristics	Stream Classification Matrix		
	Rural Streams (Sensitive)	**Developing Streams (Impacted)**	**Urban Streams (Degraded)**
Warm and cold water streams are equally sensitive.	Protection	Protection & Enhancement	Enhancement & Restoration

Figure 12: Urban Stream Classification Matrix

3. Urban Waters Policy options

a) Goals & Objectives

(1) Improve water quality and near-shore habitat.

Supporting objectives:

(a) Enhance ecological function where possible.
(b) Manage to restore or emulate lost environmental functions and values where feasible.
(c) Maintain, restore or enhance infiltration, recharge and hydrology to maintain or improve current conditions.

(2) Reduce or mitigate human impacts to: prevent further degradation, improve conditions (where possible) and prevent downstream impacts to rural or developing waters.

Supporting objectives:

(a) Maintain and retrofit, as necessary, to meet current county and NR 151 stormwater standards.
(b) Prevent flooding, reduce flood damage and reduce water quantity impacts.
(c) Encourage development meeting or exceeding existing stormwater and shoreland zoning standards to reduce water quality impacts.
(d) Rehabilitate specific environmental or ecological functions to the extent possible, addressing the most serious impacts first
(e) Reduce pollution and runoff associated with development
(f) Find opportunities to replace existing impervious cover with pervious substitutes.

(3) Manage waters and public shorelands for multiple, appropriate, sustainable recreational uses.

Supporting objectives:

(a) Minimize conflicts among, and reduce environmental impacts of, multiple recreational uses.
(b) Promote and develop land-based recreational use along waterway corridors, such as bike paths, linear parks, etc.

(4) Improve aesthetics and amenity value.

Supporting objectives:

(a) Preserve shoreland parks and ensure visual and functional integration of urban and recreational development with the natural landscape.
(b) Protect significant viewsheds and minimize visually disruptive or intrusive uses near the shore.
(c) Create and enhance relationships between waters and residents, develop urban waterfronts and water-related recreation in appropriate locations, and establish attractive pedestrian connections from neighborhoods to activities in or near shorelands.
(d) Reduce solid waste and odors, eliminate artificial mosquito habitat, encourage mosquito predators and improve water clarity.

V. Implementation

A. *Regulations*

1. Shoreland Zoning Ordinance (Chapter 11, Dane County Code)

The shoreland zoning ordinance is Dane County's primary tool for managing shoreland and riparian areas. Although current standards, if properly implemented, could provide minimal water quality protection for Urban Waters, the shoreland zoning ordinance:

- does not adequately protect more sensitive waterbodies in the Developing and Rural categories;
- inadequately addresses statutory mandates to protect habitat and natural scenic beauty for all classes of waters;
- includes many loopholes and vague language that compromise the ordinance's effectiveness;
- provides for little flexibility to deal with existing, non-conforming development and lots, and;
- provides no opportunity to mitigate existing or proposed impacts to improve current conditions.

For each class of Urban, Developing and Rural lakes, ponds, rivers and streams, the report suggests two sets of amendments to the county shoreland zoning ordinance:

- traditional zoning standards, based on setbacks and designated buffer areas, and;
- performance-based standards, based on designs that meet objective, measurable engineering criteria.

The two sets of standards are designed to be functionally equivalent in terms of their ability to protect water quality, habitat and natural scenic beauty. Communities may enact a traditional zoning model, a performance based model, or a combination of both. In Dane County's case, the report suggests a hybrid approach, where shoreland developers may choose which set of standards they wish to apply to their particular development. In every case, however, recommended regulatory standards will meet or exceed the statewide minimum requirements required under Chapter NR 115, Wisconsin Administrative Code.

a) Shoreland Erosion Control

In 2005, the Dane County Board of Supervisors adopted amendments to the county shoreland zoning ordinance to require enhanced erosion control measures for active construction sites in the shoreland zone. Active construction sites, with no vegetation in place to retain soil, contribute a disproportionate amount of sediment to Dane County's waters. Erosion control is especially critical in shoreland areas, where proximity to the water and typically small lots leave little or no margin of error. Failure of an under-designed erosion control practice (such as a silt fence) in a shoreland area will likely result in immediate deposition of large amounts of sediment into the water, with little time to correct the problem. For these reasons, the Shoreland and Riparian Management Report suggests bringing cities and villages up to current county shoreland erosion control standards for unincorporated areas.

Standard	Rural Waters	Developing Waters	Urban Waters
Shoreland Erosion Control			
Applies to:	Shoreland lots with active construction sites.	Shoreland lots with active construction sites.	Shoreland lots with active construction sites.
Require erosion control plans meeting standards of s. 11.04, Dane County Code for any disturbance in shoreland area, with simplified checklist for small projects.			

b) Performance Standards

In order to meet stated objectives for each class of waterbody, the Shoreland and Riparian Management Report suggests quantitative, measurable water quality, habitat and natural scenic beauty performance standards, tailored to the needs and conditions of Rural, Developing and Urban waters. Dane County will maintain a list of approved practices to meet each standard, and developers will be able to choose which practices to use on any particular site. As new practices become available, and can be shown to meet recommended performance standards, they will be added to the list. In unincorporated shorelands, flexibility may be limited by state minimum requirements under NR 115, so some base-level prescriptive minimums may still apply. Performance standards also provide opportunities to mitigate redevelopment of existing shoreland lots or structures.

(1) Water Quality Performance Standards

Recommended water quality sediment control standards are derived from existing county stormwater and erosion control standards for residential development established under Chapter 14, Dane County Code. Residential subdivisions, commercial projects and any development that adds more than 20,000 square feet of impervious surface area already have to meet similar sediment control standards. Recommended infiltration standards are based on recommended lot sizes and buffers for Urban, Developing and Rural Waters and the effectiveness of currently available infiltration technology.

Table 1: Water Quality Performance Standards

Standard	Rural Waters	Developing Waters	Urban Waters
Water Quality Performance Standards			
Applies to:	All shoreland lots with new development or redevelopment.	All shoreland lots with new development or redevelopment.	Shoreland lots with proposed impervious surface area > 4,000 sq. ft. or > 65% of lot, or as mitigation for variance.
Alternatives to achieve standards (choose one):			
1. Install stormwater practices to meet sediment retention and infiltration targets.	Achieve 80% reduction in sediment, compared with no controls.	Achieve 80% reduction in sediment, compared with no controls.	Achieve 40% reduction in sediment, compared with no controls.
	Infiltrate 100% of predevelopment infiltration volumes.	Infiltrate 90% of predevelopment infiltration volumes.	Infiltrate 75% of predevelopment infiltration volumes.
2. If residential use, development has an approved Dane County or municipal stormwater permit compliant with current standards of Chapter 14, Dane County Code.	Not applicable	Applicable	Applicable
3. Comply with specified lot design and setback standards for each class.			
Min. Lot Width	300	200	100
Min. Structure Setback	200	100	75
Min. Vegetative Buffer Depth	100	75	37.5
Max.impervious surface area	10%	15%	35%
Min. Lot Area (acres)	4	2	0.46

(2) Habitat Performance Standards

The Shoreland and Riparian Management Report suggests Dane County adopt a point-based system, similar to that used by many municipal landscaping ordinances, to promote protection or restoration of shoreland habitat. Recommended habitat performance measures are based on:

- technical practice standards developed by the Natural Resources Conservation Service and the Wisconsin DNR to evaluate Wisconsin shoreland restoration projects, and;

- Dane County-specific native species lists developed by the Dane County Land Conservation Division and used for mitigation of new minor structures under current Dane County shoreland zoning standards.

Relatively more points are given for shoreland wetland restoration and habitat restoration nearest the shore, while relatively fewer points are given for restoration farther from the shore. Offsite habitat restoration is also available as a practice, at a reduced point total. Points are also adjusted for relative size of lots in each waterbody class, since there may be fewer opportunities for habitat restoration on smaller lots. This approach is also consistent with proposed changes to NR 115, Wisconsin Administrative Code.

Table 2: Habitat Performance Standards

Standard	Rural Waters	Developing Waters	Urban Waters
Habitat Performance Standards			
Applies to:	Lots immediately adjacent to the water with new development or redevelopment.	Lots immediately adjacent to the water with new development or redevelopment.	Removal of existing natural vegetation along shore.
Min. Score	*100 points*	*75 points*	*NA*
Primary Vegetative Buffer Depth from Ordinary Highwater Mark	*100 feet*	*75 feet*	*NA*
Alternatives to achieve standards (choose one or combination to meet min. score):			
1. Passive Buffer (see def'n)			
Onsite:			
Within primary vegetative buffer	4 points per 1000 square feet.	8 points per 1000 square feet.	Limit removal of existing natural vegetation within 37.5 feet of water.
Outside primary vegetative buffer	2 points per 1000 square feet	4 points per 1000 square feet	*NA*
2. Shoreland Restoration (see def'n)			
Onsite:			
Within primary vegetative buffer	8 points per 1000 square feet.	16 points per 1000 square feet.	*NA*
Outside primary vegetative buffer	4 points per 1000 square feet.	8 points per 1000 square feet.	*NA*
Offsite:			
Within primary vegetative buffer	2 points per 1000 square feet.	4 points per 1000 square feet.	*NA*
Outside primary vegetative buffer	1 points per 1000 square feet	2 points per 1000 square feet	*NA*
3. Shoreland Wetland Restoration or Enhancement (see def'n)			
Onsite:	6 points per 1000 square feet	18 points per 1000 square feet	*NA*
Offsite:	3 points per 1000 square feet.	6 points per 1000 square feet.	*NA*
4. Comply with specified lot design and setback standards for each class.	100 points	75 points	*NA*
5. Non-structural agricultural practice that complies with ATCP 50, Wisconsin Administrative Code, and any other state or county water protection standards applicable to agricultural use.	100 points	75 points	*NA*

Shoreland Restoration must meet the following standards:

- Must comply with NRCS Technical Standard 643a & Wisconsin Biological Technical Note 1, and;
- Must be planted in shoreland species native to Dane County from a list approved by the Dane County Land Conservation Division (see http://www.danewaters.com/pdf/20041130_acceptable_native_plants.pdf).

Protection of existing areas that meet above standards qualifies for equivalent points.

Passive Buffer must meet the following standards:

- Meet or exceed standards for a Streambank and Shore Cover (NRCS 580) or Vegetative Buffer Strip (Dane County Stormwater and Erosion Control Manual);
- Be managed in an unmowed state, with at least 30% of species achieving a summer peak height of 14" or more, and;
- Cannot include any invasive, noxious or exotic species from a list approved by the Dane County Land Conservation Division.

Protection of existing areas that meet above standards qualifies for equivalent points.

Wetland Restoration or Enhancement must meet the following standards:

- Restorations must meet or exceed standards under NRCS 657;
- Enhancement must meet or exceed standards under NRCS 659;
- WI Biological Tech Note 1 may also apply to either restoration or enhancement.

(3) Natural Scenic Beauty Performance Standards

As with habitat protection, recommended natural scenic beauty protection standards give preference to restoration of a primary vegetative buffer of native species near the shore. For properties where full restoration is not possible, other options include techniques to limit visual impact based on limiting building height and bulk, using natural colors and landscaping. Such techniques are similar to standards used in the Lower Wisconsin Riverway. Some construction and design techniques, such as controlling building materials, exterior colors or consistency with locally developed aesthetic guidelines, are more appropriate to shorelands with a high degree of existing development than for shorelands with a relatively natural shore. To reflect this, point totals for such techniques are highest in Urban Waters, moderate in Developing Waters and lowest in Rural Waters.

Table 3: Natural Scenic Beauty Performance Standards

Standard	Rural Waters	Developing Waters	Urban Waters
Natural Scenic Beauty Performance Standards			
Applies to:	Lots immediately adjacent to the water with new development or redevelopment.	Lots immediately adjacent to the water with new development or redevelopment.	Removal of existing natural vegetation along shore.
Min. Score	*100 points*	*75 points*	*NA*
Primary Vegetative Buffer Depth from Ordinary Highwater Mark	*100*	*75*	*NA*
Alternatives to achieve standards (choose one or combination to meet min. score)			
1. Shoreland Restoration (see def'n)			
Onsite:			
Within primary vegetative buffer	4 points per 1000 square feet.	8 points per 1000 square feet.	*NA*
Outside primary vegetative buffer	2 points per 1000 square feet.	4 points per 1000 square feet.	*NA*
2. Passive Buffer (see def'n)			
Onsite:			
Within primary vegetative buffer	2 points per 1000 square feet.	4 points per 1000 square feet.	*NA*
Outside primary vegetative buffer	1 points per 1000 square feet	2 points per 1000 square feet	*NA*
3. Demonstrate through topographic analysis, visualization technology or photography that development is not visible from the water.	100 points	75 points	*NA*
4. Use exterior colors and materials that harmonize with the natural surroundings	10 points	15 points	*NA*
5. Minimize use of reflective materials	10 points	15 points	*NA*
6. Height of structure does not exceed screening vegetation	10 points	15 points	*NA*
7. Landscaping plan to render structure visually inconspicuous (no invasive species used).	15 points	20 points	*NA*
8. Consistent with locally-developed aesthetic, landscaping and design guidelines specific to shoreland zones.	10 points	25 points	*NA*
9. Comply with specified lot design and setback standards for each class.	100 points	75 points	*NA*

(4) Miscellaneous Mitigation Options

Existing structures, particularly within primary buffer areas, can simultaneously compromise protection of water quality (due to increased impervious surfaces), habitat (by displacing native riparian vegetation) and natural scenic beauty (due to bulk and visual prominence along the shore). Landowners who choose to remove or relocate unnecessary structures, such as sheds or boathouses, could earn points toward performance targets. Point totals are adjusted by classification, reflecting proportional level of impact given recommended lot sizes.

Table 4: Miscellaneous Mitigation Options

Standard	Rural Waters	Developing Waters	Urban Waters
Misc. mitigation options			
1. Remove existing structure(s)/impervious surface within building setback	**Water Quality:** Credit toward sediment and infiltration goals.	**Water Quality:** Credit toward sediment and infiltration goals.	**Water Quality:** Credit toward sediment and infiltration goals.
	Habitat: 2 points per 1000 square feet if restored to vegetative buffer standards.	**Habitat:** 4 points per 1000 square feet if restored to vegetative buffer standards.	**Habitat:** *NA*
	Natural Scenic: 5 points per 100,000 cubic feet of structure removed.	**Natural Scenic:** 10 points per 100,000 cubic feet of structure removed.	**Natural Scenic:** *NA*
2. Remove existing structure(s)/impervious surface within vegetative buffer area.	**Water Quality:** Credit toward sediment and infiltration goals.	**Water Quality:** Credit toward sediment and infiltration goals.	**Water Quality:** Credit toward sediment and infiltration goals.
	Habitat: 4 points per 1000 square feet if restored to vegetative buffer standards.	**Habitat:** 8 points per 1000 square feet if restored to vegetative buffer standards.	**Habitat:** *NA* .
	Natural Scenic: 10 points per 100,000 cubic feet of structure removed.	**Natural Scenic:** 20 points per 100,000 cubic feet of structure removed.	**Natural Scenic:** *NA*

*Urban waters base points per 100 square feet due to smaller lot size and limited opportunities for restoration.

c) General Shoreland Zoning Ordinance Improvements

In addition to standards that vary with each class of water, the Shoreland and Riparian Management Report suggests several amendments to the shoreland zoning ordinance that would apply universally to all classes of waters. These general amendments are intended to clarify terms, remove loopholes that compromise shoreland buffer quality, and to provide a fair and consistent means to accommodate existing land management practices.

Table 5: Other Shoreland Zoning Changes

Standard	Rural Waters	Developing Waters	Urban Waters
Other Shoreland Zoning Changes			
Allow currently nonconforming structures and uses to become compliant by meeting performance standards.	●	●	●
Expand current county shoreland erosion control requirements to cities and villages.	●	●	●
Prohibit new boathouses.	●	●	●
Clarify statutory definitions of "navigable waters."	●	●	●
Clarify measurement of height, setback and definition of "structure"	●	●	●
Prohibit fertilizer use within the primary buffer area	●	●	●

● Critical need / high potential for improvement / many opportunities
◉ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

2. Other Regulations

Other county land regulations, including land division and general zoning ordinances, significantly influence development in and near shorelands. In Developing Waters, which experience the most dynamic changes in land use and urbanization, county conservation subdivision standards could provide a particularly useful tool to cluster development while protecting sensitive shoreland areas. Other suggested changes would apply to two or more classes of waters.

Table 6: Other Regulatory Changes

Standard	Rural Waters	Developing Waters	Urban Waters
Other Regulatory Changes			
Amend the county land division ordinance (Chapter 75, Dane County Code) to establish standards for conservation subdivisions.	○	●	○
Modify CAPD/CARPC environmental corridor and open space corridor mapping policies to be consistent with Waterbody Classification standards for each water class.	●	●	○
Allow reductions in road setback standards, if needed to meet setbacks from the OHWM.	●	●	●

● Critical need / high potential for improvement / many opportunities
◉ Significant need / moderate potential for improvement / some opportunities
○ Less needed / low potential for improvement / fewer opportunities

B. *Public Lands*

1. Acquisition

The *Dane County Parks and Open Space Plan* which serves as the primary document for guiding county land acquisition projects, includes, among others, the following goal:

> ***"Protect lakes, rivers and streams, including shorelines, wetlands, high infiltration areas and associated vegetative buffers to maintain high water quality, manage water quantity and sustain water-related recreation throughout Dane County."***

The *Parks and Open Space Plan* includes a variety of proposed water trails, recreational and natural resource lands (including many associated with water features) and a Stream Corridor Protection and Management Program. Using the county Conservation Fund, matching grants and other sources of funds, the Land Acquisition Division of the Dane County Land and Water Resources Department purchases fee-title and conservation easements from willing sellers to implement the *Parks and Open Space Plan.* The Shoreland and Riparian Management Report suggests that the Dane County Waterbody Classification System be considered during future updates to the *Parks and Open Space Plan, the Land and Water Conservation Plan,* and other priority-setting documents for county land acquisition.

Table 7: Public Lands Acquisition Policy options

Standard	Rural Waters	Developing Waters	Urban Waters
Public Lands			
Land Acquisition			
Continue to acquire, protect and restore critical near-shore habitat adjacent to Dane County Waters, as identified in county and state priority-setting documents such as the Dane County Parks & Open Space Plan, streambank easement programs, the Land & Water Resources Management Plan, Flood Mitigation Plan, and others.	●	⊙	❍
Purchase canoe, fishing and pedestrian access easements where needed and appropriate.	●	⊙	❍
Establish and promote a system of water-based trails and linkages, as identified in the Parks and Open Space Plan and other trail initiatives.	⊙	●	⊙
Target public and leverage private investments strategically to enhance use of waters as environmental corridors for human and wildlife use, and to address specific environmental problems.	❍	⊙	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

2. Public Land Management

Public entities, including Dane County, the Wisconsin DNR, the University of Wisconsin, the US Fish and Wildlife Service and municipal governments, together own approximately 15% of the 343,000 acres of county shorelands. Dane County should set a very high standard for environmental stewardship of its shoreland properties, meeting or exceeding buffer or performance standards recommended for each waterbody classification. The county should also encourage other public entities to protect or restore native vegetative buffers, remove unnecessary structures within setback areas, and reduce impervious surfaces. Shoreland restorations on public property can also serve as an excellent educational opportunity, helping private landowners learn about the benefits and techniques of buffer restoration and management, and instilling a sound stewardship ethic.

Table 8: Public Land Management Policy options

Standard	Rural Waters	Developing Waters	Urban Waters
Public Land Management			
Manage county-owned lands near Dane County waters to the highest possible standard of environmental stewardship.	●	●	●
Restore and manage vegetative buffers to meet or exceed zoning standards for each class.	●	●	●
Use county-owned land to demonstrate shoreland restoration pilot projects.	❍	⊙	●
Remove impervious surface area and restore native cover where feasible.	❍	●	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

C. *Public Infrastructure*

County, municipal, regional and state facilities have a significant effect on the condition of Dane County surface water resources. Infrastructure programs of particular importance to county surface waters include:

- the county Lake Management Program (including dam operation on the Yahara chain of lakes);
- Capital Area Regional Planning Commission approval of municipal sewer system extensions,
- runoff management from county, state and municipal facilities and road networks;
- municipal stormwater utilities and sanitary districts, and;
- agricultural drainage districts.

The following policy options apply to infrastructure management, operation and planning.

Table 9: Public Infrastructure Policy Options

Standard	Rural Waters	Developing Waters	Urban Waters
Infrastructure Planning			
Work to dissolve obsolete drainage districts and restore associated wetlands and stream characteristics as opportunities arise.	⊙	●	❍
Remove closed pipes and armored channels and establish natural waterways in their place where possible.	❍	⊙	●
Maximize removal of phosphorus, metals, and toxins, through constructed ponds, wetlands and other practices..	❍	●	●
Re-meander stream networks including drainage ditches	❍	●	⊙
Target public works dollars to protect stream channels and reduce channel erosion, where feasible.	❍	⊙	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

D. *Incentive and Technical Assistance Programs*

The Land Conservation Division of the Dane County Land and Water Resources Department utilizes a number of different programs to help achieve both urban and rural conservation goals in Dane County. The Land and Water Management Plan describes county incentives, cost-sharing and technical assistance strategies. In addition, the *Shoreland and Riparian Management Report* suggests that Dane County consider adopting an incentive program specifically targeted to shoreland restorations. Similar programs in Burnett County and elsewhere have succeeded in encouraging private landowners to restore shoreland areas, using modest tax credits, awards, and targeted cost-share funds. Tailoring financial incentive programs to meet the needs of each class of water, can help make sure limited cost-share and incentive funds are targeted where they will do the most good.

Table 10: Incentive Program Policy Options

Standard	Rural Waters	Developing Waters	Urban Waters
Incentives			
Incentive Programs	Provide incentives, including financial, technical assistance and public recognition, to landowners to complete shoreland restoration projects where there is existing development or vegetation removal. Consider county and other public investment where necessary and appropriate. Coordinate activities with state and federal agencies and nonprofit groups.		
Remove invasive and nuisance species	⊙	●	●
Improve aquatic habitat	⊙	●	❍
Improve fish passages	❍	⊙	●
Protect and manage existing riparian areas.	●	●	❍
Enhance riparian areas	❍	●	⊙
Enhance and restore aquatic and shoreland habitat	⊙	●	●
Restore aquatic diversity	⊙	●	❍
Improve baseflow and reduce stagnant water	❍	⊙	●
Replace concrete channels with natural surfaces.	❍	⊙	●
Remove obstructions to navigation, flow and floodwater discharge.	❍	⊙	●
Eliminate trash & debris	❍	⊙	●
Provide floodplain buffers for flood protection.	❍	●	⊙
Reduce flood damage; reconnect with floodplain	❍	●	⊙
Restore and expand native forest and prairie, wetlands and natural areas	●	⊙	❍
Promote wetland restoration and enhancement	●	⊙	❍
Improve scenic qualities	❍	●	⊙
Re-meander stream networks including drainage ditches and agricultural drainages	⊙	●	❍
Provide direct technical assistance to landowners who are interested in ecological restoration or management of their property.	●	⊙	❍

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

E. *Education and Outreach Programs*

The Dane County Office of Lakes and Watersheds conducts a variety of outreach and educational programs focused on protecting, restoring or enhancing Dane County's surface waters. Dane County University of Wisconsin Extension's Community, Natural Resources and Economic Development (CNRED) and Horticulture programs operate several programs to assist local governments, landowners and others with natural resource protection, invasive species control, habitat protection and native landscaping. Educational programs should be targeted to the specific needs of each waterbody class.

Table 11: Education and Outreach Policy options

Standard	Rural Waters	Developing Waters	Urban Waters
Education & Outreach			
Educational Programs			
Develop a public outreach campaign to promote sound environmental stewardship of waters, shorelands and resources.	●	●	●
Develop outreach materials indicating what a healthy shoreland looks like and what management practices may be most appropriate.	❍	⊙	●
Develop and make available guidelines for low-impact, sustainable recreation.	●	⊙	❍
Work with specific groups such as shore fishermen and motor boaters for low impact practices that will make them welcome on the lakes	❍	⊙	●
Develop a recreational use plan, with extensive public involvement, to address other issues or conflicts, and to manage waters and public shorelines for multiple recreational uses.	❍	⊙	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

VI. Implementation Costs

A. *Local Government*

Typically, applicants proposing land use changes pay most of the cost of county or municipal staff review and approval through permit fees. Based on county experience with enforcement of its shoreland erosion control ordinance, approximately 1% of all shoreland properties have active construction permits on them in any given year. Using this information, we can project the estimated number of shoreland permits for incorporated and unincorporated areas, and the estimated staff time needed to administer new permit applications for county, city and village government.

Hours spent per shoreland zoning permit under traditional lot design/buffer practices typically vary between one and four hours per permit issued, based on Dane County Zoning Division experience. Permits issued under performance mitigation practices can be expected to take longer to process. Based on estimates provided by Dane County Land Conservation Division staff experienced with stormwater control on small urban lots under current Dane County Board of Adjustment approvals, water quality review can take between two and four hours per permit. Finally, based on experience of similar shoreland restoration programs in several other Wisconsin counties, review of compliance with habitat standards can take between four and ten hours of staff time per permit.

Table 12: Projected Workload & Staffing Impacts

Unincorporated Areas (County)	*Projected permits per year*	*Hrs. per permit*	*Total hours*	*Change from current*	*Additional FTE staff needed*		*Estimated total additional staff cost*
Design/buffer standard	122	4.0	487.9	-	-	$	-
Habitat standard	7	10.0	72.0	72.0	0.03	$	2,437
WQ standard	50	4.0	200.1	200.1	0.10	$	6,770
County shoreland zoning permits	*179*	*18*	*760.0*	*272.1*	*0.13*	*$*	*9,207*
plus shoreland erosion control	179	3.5	627.2	-	-	$	-
Total projected workload/fiscal impact	*358*	*21.5*	*1,387*	*272*	*0.13*		*9,207*
Cities and Villages (all)							
Design/buffer standard	188	4.0	751.4	751.4	0.36	$	25,426
Habitat standard	6	10.0	63.0	63.0	0.03	$	2,132
WQ standard	165	4.0	658.5	658.5	0.32	$	22,280
City and Village shoreland zoning permits	*359*	*18*	*1,472.9*	*1,472.9*	*0.71*	*$*	*49,837*
plus shoreland erosion control	359	3.5	1,255.7	1,255.7	0.60	$	42,489
Total projected workload/fiscal impact	*718*	*21.5*	*2,729*	*2,729*	*1.31*	*$*	*92,326*

Table 12 above includes the higher end of these ranges in order to generate estimated workload, so actual costs and staff time could be lower. Also, this table assumes that incorporated cities and villages currently do not have comparable shoreland zoning responsibilities (since unlike the county, they are not required to do so under state law), so that they would be taking on all of these duties for the first time. In fact, some cities and villages may already be doing some of this work, particularly with respect to shoreland erosion control, small site stormwater control, environmental corridor management and shoreland zoning in areas annexed after 1985. To the extent that existing municipal practices meet or exceed suggested county standards, or can be easily adapted to do so, total fiscal impact to incorporated cities and villages may also be reduced.

Table 12 does not include workload associated with new development and land division. Under Chapter 14 of the Dane County Code, county government and all city and village governments within the county already review new development and significant redevelopment projects to comply with county stormwater and erosion control standards. In addition, the Capital Area Regional Planning Commission provides oversight of protection corridors for Future Urban Development Areas and Urban Service Areas, while existing Dane

County shoreland and wetland zoning establishes a process for managing riparian areas in unincorporated areas. These mechanisms should be easily adapted to meet new standards suggested under this report, without creating an additional significant workload impact to municipal, county and regional agencies.

B. *Shoreland Landowners*

(1) Landowners affected

Different aspects of suggested ordinance changes would affect shoreland landowners differently, depending on where their property is located, the type of project proposed and existing conditions on the site. Of the 57,530 existing parcels in Dane County shorelands, 18,867 are in unincorporated areas and are already subject to county shoreland zoning. Of the 38,663 incorporated shoreland parcels, 20,606 are estimated to meet simple lot size, buffer or impervious surface area standards and would not require additional practices. Another 17,366 parcels are not immediately adjacent to the water, and so would not have to meet suggested habitat or scenic standards. This leaves a total of only 691incorporated area parcels that would have to meet all water quality, habitat and scenic standards. In any given year, approximately 7 (1%) of these properties would be undergoing expansion, addition or reconstruction that would require mitigation under the proposal.

	Unincorporated	Incorporated	TOTAL
Total shoreland parcels	18,867	38,663	57,530
Parcels qualifying under design standards	-13,381	-20,606	-33,987
Parcels under WQ performance standard only	-4,696	-17,366	-22,062
Parcels under WQ, habitat & scenic performance stds.	790	691	1,481

(2) Potential Costs

Direct costs to landowners can be broken down into four categories:

- Permit fees
- Design costs (if any);
- Materials and installation (if any), and;
- Ongoing maintenance costs.

Costs will vary depending on:

- the type of practice chosen to meet ordinance standards;
- the size of the lot or restoration area;
- the terrain, existing vegetation, soils and natural features of the site, and;
- the classification of the adjacent water body.

Table 13 shows the relative costs of different practices that can be used to meet suggested water quality, habitat and scenic performance standards. This data is based on quotes provided by private engineering and natural landscape consultants and in consultation with Dane County Land Conservation Division staff.

Table 13: Relative Cost of Practices to Meet Suggested Standards

Practice	Urban		Developing		Rural	
	Low	*High*	*Low*	*High*	*Low*	*High*
Practices to meet all standards:						
Lot design / setbacks	$ 135	$ 135	$ 135	$ 135	$ 135	$ 135
Practices to meet water quality stds:						
Sediment & Infiltration practices	$ 1,420	$ 2,150	$ 1,420	$ 2,150	$ 1,500	$ 2,150
Practices to meet habitat/scenic stds.						
Passive buffer	$ 100	$ 350	$ 100	$ 350	$ 100	$ 350
Shoreland restoration	$ 873	$ 3,450	$ 1,010	$ 3,723	$ 1,280	$ 4,261

Based on this data, we can estimate a range for the total cost of compliance with water quality, habitat and scenic performance standards for each class of waterbody (Table 14). This includes projected permit fees, design costs, materials and installation, and ongoing maintenance costs.

Table 14: Estimated Direct Cost of Compliance to Landowner

	Urban		Developing		Rural	
	Low	*High*	*Low*	*High*	*Low*	*High*
Total estimated cost of compliance	$ 135	$ 2,150	$ 135	$ 5,873	$ 135	$ 6,411

It is quite possible that individual landowners may choose to spend considerably more than the figures above. For example, a landowner who hires a landscape architect, uses live plants instead of seed and chooses a high percentage of flowering species could pay considerably more than the $4,261 per site for shoreland restorations shown above. While certainly an acceptable alternative, such additional expenditures would clearly be a choice by the landowner, and not mandated.

VII. Analysis

The Shoreland and Riparian Management Report seeks to balance the private property rights of riparian and shoreland landowners with the obligation to protect publicly owned navigable waterways, as described in state and federal statute, the Wisconsin Constitution and the Public Trust Doctrine. It is intended to provide for flexibility to accommodate existing uses and development, maintain riparian access and private property rights, while providing better protection of water quality, habitat and natural scenic beauty and on-water uses.

A. *Suggested Shoreland Zoning changes*

1. Environmental Benefits

Just as the impacts of single-lot shoreland development accumulate gradually over time, environmental benefits of good shoreland management are also cumulative.

a) Water Quality standards

Based on typical development patterns, suggested water quality standards are conservatively estimated to prevent 3,800 tons of sediment from reaching Dane County's waters over the next 20 years, including 3,300 tons kept out of Developing and Rural Waters. Actual numbers could be considerably higher.

The figures above do not include sediment resulting from improved construction site erosion control practices in city or village shorelands incorporated prior to 1982. Since current Uniform Dwelling Code (UDC) erosion control practices currently enforced in older incorporated shorelands do not use quantifiable soil retention standards, it is impossible to estimate the current level of soil loss occurring in such areas. County and municipal engineers generally agree, however, that county shoreland erosion control standards provide a significantly higher degree of protection than do the UDC standards. Previous studies have shown that active construction sites contribute a disproportionate amount of sediment from runoff, so improved erosion control is likely to yield significant environmental benefits *(USGS, 2005; Dane County Land Conservation, 1996).*

The estimates above may also underestimate the benefit of improved on-site stormwater management, particularly in Urban shorelands. The county lacks sufficiently detailed building footprint, pavement and land cover data, particularly in Urban shorelands, to allow for sophisticated analysis of the range of development patterns occurring in Dane County shorelands. Consequently, planners used median lot characteristics and typical development patterns to generate estimated water quality benefits.

However, impacts of development vary greatly depending on the style and nature of the development and the soils, slopes and other characteristics of the lot. This is especially true on urban lots, where density of existing development is higher, apartment or commercial buildings may be significantly larger, there is less opportunity to select building sites that allow for natural drainage or infiltration, and it is possible to cover as much as 60-100% of a lot with impervious surfaces. Intensive development of this type in a shoreland area could produce significantly more sediment than median values.

b) Habitat and Scenic Standards

Based on existing shoreland lots, historic redevelopment rates and anticipated rural development, full implementation of suggested habitat standards is conservatively estimated to protect or restore approximately 20 acres and 1.81 linear miles of riparian habitat per year. Over twenty years, suggested habitat standards would protect or restore 36 linear miles of riparian habitat, including 10 miles in Developing Waters, and 26 miles in Rural Waters. Urban Waters are exempt from suggested habitat standards.

These numbers primarily reflect anticipated redevelopment activity on existing shoreland lots in Developing Waters and limited rezone activity consistent with adopted agricultural preservation area plans in Rural Waters. Incorporation of habitat standards into the *Dane County Comprehensive Plan* and *Future Urban Development Area* plans to capture new subdivision and urban development could increase the mileage and acreage of habitat protection or restoration considerably, particularly in Developing Waters shorelands.

2. Effects on Private Landowners

Land regulations can have both positive and negative effects on private property values. Positive effects can result from:

1. Improved public or environmental amenities, avoidance of nuisances or prevention of damages, or;
2. Scarcity of supply of economically productive land due to restrictions on use, density limitations or minimum frontage requirements.

Negative effects on property values from land regulation can result when:

3. Regulations create an oversupply of land dedicated to a particular use, such as zoning that allows for more commercial or industrial uses than demand would support;
4. The effort or expense needed to comply with regulations is disproportionate to the amenity (or avoidance of harm) produced;
5. The amenity produced is of little value to the community, or;
6. Benefits of amenities accrue to the general public, but not to the landowner bearing the cost.

(Jaeger, 2006)

In the case of the Shoreland and Riparian Management Report, the suggested regulations focus exclusively on site design. The suggested ordinance standards do not establish permitted or prohibited uses, mandate minimum lot frontages, or set caps for density of development. Consequently, neither scarcity effects described in 2 above, nor overabundance effects described in 3 above, would apply.

The purpose of the ordinance would be specifically to promote environmental amenities, such as clean water, high quality riparian habitat and attractive shorelines. Such amenities are highly valued by the Dane County population. A 2005 random sample survey of all Dane County residents showed that:

- 86% thought Dane County government should pay more attention to “managing water resources, such as lakes, ponds, streams, wetlands and groundwater;” and
- 61% thought Dane County government should pay more attention to “managing wildlife resources, such as hunting, fishing, wildlife observation and endangered plant and animal species.”

(Chamberlain Research, 2005)

The benefits of such amenities accrue, not only to the general public, but also in tangible and measurable ways, to those who live nearest the water. Similar county waterbody classification and shoreland zoning programs in Wisconsin have been shown to have a net positive effect on property values *(Papenfus & Provencher, 2006)*, indicating that the amenity value is reflected in the market for shoreland properties. Improved construction site erosion control and stormwater management would not only protect public waters, but would also protect neighboring properties from damage or nuisances caused by runoff.

Finally, the last question is whether or not the ordinance's requirements are proportional to the impacts prevented or benefit created. By its very nature, the Waterbody Classification system promotes proportionality. The report would apply less stringent protections for waters where the risk of environmental damage is slight (Urban Waters), and stronger protections for waters where the risk of environmental damage is greater (Developing and Rural Waters).

Ordinance requirements would be triggered only when substantial improvements are made to the property. The cost of compliance with suggested standards represents a marginal increase in the overall cost of construction, and a very small proportion of the likely increased property value of the improved property. The ordinance would work within existing county and municipal permitting processes, and would provide exemptions for properties with adequate protections in place, such as residential subdivisions that meet current county and state stormwater technical standards. This will avoid duplicative administration and permitting requirements. Finally, the ordinance would replace inflexible lot size, buffer and setback standards with more flexible performance standards that allow for a wide variety of options to satisfy suggested standards. Many properties that currently would require a county Board of Adjustment variance could be developed under a straightforward administrative permit instead. This expands options for landowners, reduces approval times and increases the predictability of the process.

B. *Incentive, Education, Infrastructure, Acquisition and Public Land Management Programs*

The Shoreland and Riparian Management Report does not propose significant new initiatives related to incentive, education, public infrastructure, land acquisition or public land management programs of Dane County. Instead, the report focuses is on helping county decision makers set priorities, allocate existing resources and update existing plans such as the *Land and Water Resource Management Plan* and the *Dane County Parks and Open Space Plan.* By targeting particular efforts toward the classes of waters most likely to benefit, these policy options should result in a more efficient allocation of limited public resources.

C. *Findings and Conclusions*

1. The Precautionary Principle

When evaluating measures to prevent serious irreversible damage to a public environmental resource, the appropriate legal and policy analysis standard is the "precautionary principle." The precautionary principle is commonly articulated as:

"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." (UNCED, 1992)

2. Findings

Navigable waterways are a publicly-owned natural resource that Dane County has an obligation to protect under the Public Trust Doctrine and Wisconsin Statute. An overwhelming majority of Dane County residents believe that Dane County government should do more to protect water resources. Many of the values of public waters, such as ecosystem benefits, aesthetics, fish and wildlife habitat and recreational value are not priced, or inadequately priced, in the marketplace. At the same time, some of the benefits of clean water, abundant fish and wildlife and attractive shorelines accrue to private property owners who live in shoreland areas. These amenities are reflected in shoreland property values, which are among the most valuable in the county.

The Wisconsin Legislature has determined that uncontrolled development in shoreland areas can cause serious damage to the public waters of the state. Numerous peer-reviewed scientific studies confirm such impacts, documenting negative effects on water quality, fish and wildlife populations that are directly attributable to shoreland development. Negative impacts on water resources as a result of shoreland development are essentially irreversible.

In response, the Shoreland and Riparian Management Report suggests a mix of regulation changes, educational programs, financial incentives, public land management and infrastructure policies that are consistent and integrated with adopted plans. Regulations would require that people undertaking development projects in shoreland areas take reasonable, cost-effective steps to prevent harm to nearby water resources. Suggested measures are tailored to be proportional to the anticipated impact of specific projects, based on characteristics of the site, the scope and timing of the project, and the environmental sensitivity of the nearby water. Conservative projections suggest that, over time, such measures will prevent significant damage and provide substantial environmental benefit to the county's water resources. The county's most environmentally sensitive and at-risk waters would receive the greatest levels of protection.

3. Conclusion

The Shoreland and Riparian Management Report represents a reasonable, cost-effective response to prevent serious environmental damage to the county's water resources. It does not create an undue burden on landowners and will provide significant levels of environmental protection.

VIII. Next Steps and Timeline

A. *Specific Policy Options by Entity*

Decision-Making Body	Policy option	Support Agencies	Target Dates
Dane County Board of Supervisors	1. If recommended by the Lakes and Watershed Commission, amend the Stormwater and Erosion Control Ordinance (Chapter 14, Dane County Code) to: • Require that, within 12 months, cities and villages amend their erosion control ordinances to meet or exceed the standards described in s. 11.05, Dane County Code. • Require or recommend that cities and villages follow the violations and enforcement procedures and penalties described in ss. 14.73 and 14.80, Dane County Code.	Land Conservation Division Department of Planning and Development Office of Lakes and Watersheds	2011-2012
	2. Amend the *Dane County Comprehensive Plan* to: • Bring mapped open space corridor standards into consistency with buffer policy options for Urban, Developing and Rural Waters, as well as new floodplain, wetland and slope mapping data, and; • Include new language to support mitigation or performance standard alternatives for new development that does not conform to enhanced buffer standards.	Department of Planning and Development	2011-2012
	3. Amend the Shoreland Zoning Ordinance (Chapter 11, Dane County Code) to: • Bring the ordinance into consistency with revised minimum standards under NR 115, Wis. Administrative Code (once finalized); • Apply state minimum standards to unincorporated Urban Waters, and; • Apply recommended enhanced water quality and habitat standards to Developing and Rural Waters.	Department of Planning and Development Land Conservation Division	2011-2012
	4. If recommended by the Lakes and Watershed Commission, amend the Standards for Water Quality Ordinance (Chapter 13, Dane County Code) to: • Require that, within 12 months, cities and villages adopt regulations to meet or exceed county water quality, habitat and scenic standards for shoreland areas; • Incorporate any changes recommended by the Lakes and Watershed Commission based on data collected from demonstration projects and projects in unincorporated areas.	Department of Planning and Development Office of Lakes and Watersheds Land Conservation Division	2011-2012

Capital Area Regional Planning Commission	1. Develop Future Urban Development Area Plan guidelines that: • Incorporate buffer policy options for Urban, Developing and Rural Waters into areas planned for resource protection, and; • Support mitigation or performance standard alternatives for new development that does not conform to enhanced buffer standards, consistent with policy options for Urban, Developing and Rural Waters.	CARPC staff Department of Planning and Development Municipal planning agencies	2010-2011
Dane County Land Conservation Committee	1. Identify potential cost-share, grants or other funding to support shoreland demonstration projects that: • Work with willing public and private landowners to design example sites that comply with recommended waterbody classification standards for Urban, Developing and Rural waters; • Include examples of both design and performance standards for each class (at least six sites), and; • Document installation and design costs, and if possible, measurements of localized environmental benefit and any impacts on property values.	Land Conservation Division Office of Lakes and Watersheds Department of Planning and Development	2010
	2. Consider priority-setting policy options for Urban, Developing and Rural Waters in future updates of the *Dane County Land and Water Resource Management Plan*.	Land Conservation Division	2018
Dane County Parks Commission	1. Consider priority-setting policy options for Urban, Developing and Rural Waters in future updates of the *Dane County Parks and Open Space Plan*.	Parks Division Land Acquisition Division	2011
City Common Councils Village Boards	1. Amend municipal erosion control ordinances to meet or exceed current standards of s. 11.05, Dane County Code for shoreland areas.	Municipal Staff Department of Planning and Development Office of Lakes and Watersheds Land Conservation Division	2011-2012
	2. If recommended by Lakes and Watershed Commission and adopted by the Dane County Board, adopt ordinances to: • Meet or exceed county water quality, habitat and scenic standards for shoreland areas; • Incorporate any changes recommended by the Lakes and Watershed Commission based on data collected from demonstration projects and projects in unincorporated areas.	Municipal Staff Department of Planning and Development Office of Lakes and Watersheds Land Conservation Division	2012-2014

B. *Anticipated Timeline*

2009

- Complete final report.
- Close out DNR grant.

2011-2012

- Lakes and Watershed Commission makes policy option to County Board and CARPC
- County Board adopts countywide shoreland erosion control ordinance
- Plan Amendments:
    - County Board considers revising open space corridors in Dane County Comprehensive Plan.
    - CARPC considers incorporating Waterbody Classification into Future Urban Development Area Plans.
    - Could also include new floodplain, wetland, slope and soils mapping.
    - Would primarily affect new development, not existing development or redevelopment.
    - Demonstration projects in cities and villages begin.

2011-2012

- Cities and villages adopt countywide shoreland erosion control standards.
- County board amends shoreland zoning in towns.
    - NR 115
    - Waterbody classification
- Complete and analyze demonstration projects.
- Lakes & Watershed & County Board finalize city and village ordinance policy options.

2012-2014

- Cities and villages adopt shoreland zoning to meet county standards.

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X. Appendix 1: Policy options for Watershed Management

A. *Background & Context*

Although comprehensive watershed policy falls outside the scope of this report, waterbody classification has policy implications for watershed management. The following policy options should be considered when updating guides for county, regional and state programs that operate on the watershed scale, such as the *Dane County Land and Water Resource Management Plan*, *Future Urban Development Area* plans, priority watershed plans, DNR basin plans and the *Dane County Comprehensive Plan*.

B. *Watershed Management Priorities*

1. Regulations

Table 15: (Appendix 1) Watershed Management Priorities for Regulations

Standard	Rural Waters	Developing Waters	Urban Waters
Land Use Regulations, Shoreland Zoning and Community Planning			
Require farm conservation and nutrient management plans for all farms.	●	⊙	❍
Work with communities to amend or adopt comprehensive plans that strictly limit new development within 300 feet of lakes, and within watershed of streams.	●	❍	❍
Work to designate shorelands and watersheds as TDR "sending areas."	●	❍	❍
Work to designate watersheds as TDR "receiving areas."	❍	❍	●
Establish conservation subdivision design and infiltration-friendly design standards.	❍	●	⊙
Develop countywide standards for municipal street cleaning and road salt use.	❍	⊙	●
Review the county land division and zoning ordinances and amend as necessary to promote more water-resources friendly design. For example, de-emphasize curb and gutter development in favor of grass swales. Develop model ordinances for use by cities and villages.	⊙	●	●
Establish watershed-scale caps on impervious surfaces, based on Waterbody Classification criteria.	●	●	❍

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

2. Land Acquisition

Table 16: (Appendix 1) Watershed Management Priorities for Land Acquisition

Standard	Rural Waters	Developing Waters	Urban Waters
Land Acquisition and Public Lands Management			
Identify and permanently protect specific areas (i.e. wetlands, well-drained soils, wooded slopes) that contribute significantly to recharge and groundwater baseflow of county waters. Protect or pay special attention to stream headwaters.	●	☉	❍
Continue to acquire high-quality environmental and recreational elements throughout watersheds, as identified in county priority setting documents such as the Parks & Open Space Plan, Land & Water Management Plan, and Flood Mitigation Plan, through fee title and conservation easements. Coordinate and cooperate with other local, state and federal programs.	●	●	●
Use county-owned land to demonstrate shoreland restoration pilot projects.	❍	☉	●
Remove impervious surface area and restore native cover where feasible.	❍	●	●

● Critical need / high potential for improvement / many opportunities
☉ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

3. Education and Incentives

Table 17: (Appendix 1) Watershed Management Priorities for Education and Incentives

Standard	Rural Waters	Developing Waters	Urban Waters
Education and Incentives			
Target financial assistance, educate about and encourage implementation of farm conservation and nutrient management plans for all agricultural properties.	●	●	❍
Identify opportunities, provide financial incentives and technical assistance to remove or mitigate existing areas of impervious surface area.	❍	●	⊙
Identify opportunities and implement cost-effective practices to improve baseflow (such as rain gardens, pervious pavement, disconnected downspouts, rain barrels).	❍	⊙	●
Increase native vegetative cover, prairie restorations and native landscaping	●	●	●
Promote leaf collection management to reduce phosphorus load to water bodies.	❍	⊙	●
Explore creating financial incentives for practices that exceed minimum county standards. Design programs to reward and encourage landowners or developers who install and maintain practices that improve water quality, habitat and natural scenic beauty	●	●	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities

4. Infrastructure

Table 18: (Appendix 1) Watershed Management Priorities for Public Infrastructure

Standard	Rural Waters	Developing Waters	Urban Waters
Infrastructure			
Target financial assistance, educate about and encourage implementation of farm conservation and nutrient management plans for all agricultural properties.	●	●	❍
Enhance the capacity of the county, local governments and regional water management agencies to address regional stormwater issues.	●	●	●
Emphasize regional stormwater treatment	⊙	●	●
Try to restore natural hydrology	❍	●	⊙
Demonstrate innovative and effective BMPs, ultimately widely applying effective new technologies.	❍	●	●
Retrofit existing development with practices to remove additional sediment, nutrients and pollutants.	❍	⊙	●
Identify opportunities and implement cost-effective practices to improve baseflow (such as rain gardens, pervious pavement, disconnected downspouts, rain barrels).	❍	⊙	●
Increase native vegetative cover, prairie restorations and native landscaping	●	●	●
Promote leaf collection management to reduce phosphorus load to water bodies.	❍	⊙	●
Explore creating financial incentives for practices that exceed minimum county standards. Design programs to reward and encourage landowners or developers who install and maintain practices that improve water quality, habitat and natural scenic beauty	⊙	●	●

5. Research and Data Collection

Table 19: (Appendix 1) Watershed Management Priorities for Research and Data Collection

Standard	Rural Waters	Developing Waters	Urban Waters
Research and Data Collection			
Conduct field studies to more accurately assess existing and future conditions, opportunities and constraints, using methodology from the Center for Watershed Protection and others.	⊙	●	⊙
Evaluate the potential, feasibility, cost and specific actions necessary to restore Urban or Developing waters to Developing or Rural Waters conditions.	❍	●	⊙
Develop indicators and benchmarks that are appropriate to each class of water, and monitor over time to evaluate program effectiveness.	●	●	●
Develop predictive models and other analytical tools to analyze the anticipated impacts of proposed growth and sufficiency of mitigation practices.	●	●	●

● Critical need / high potential for improvement / many opportunities
⊙ Significant need / moderate potential for improvement / some opportunities
❍ Less needed / low potential for improvement / fewer opportunities