A Report from the North Fork Pheasant Branch Watershed Committee

Information and recommendations for:

- Watershed Residents
- Town, City and County Officials
- Municipal and County Planning Staff
- Development Permitting Personnel
- Developers, Contractors, and Bankers
- Any Other Interested Citizens

March 1999

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Coming Together For The Future

Land use planning issues often polarize community groups, pitting farmers, developers, businesses, local units of government, taxpayers, enforcement agencies and environmentalists against one another to the point where civil communication seems impossible. Such conflicts usually result in battles where one side wins and others lose. This report describes a decision-making process in which many of these interest groups worked together to develop a land use plan where almost everyone won.

The fifty people who participated in this process are proud of their accomplishment and eager to share their results with others. Although their disparate interests are the fuel on which conflict thrives, these individuals committed themselves to a series of meetings. Over the course of several months, they developed respect for other views, gained new perspectives on old problems and, to their credit, became friends who wanted to share a common vision.

Pheasant Branch Marsh, just below the springs

The focus of their efforts is the Pheasant Branch Watershed, a 23-square- mile area which drains into Lake Mendota. Prior to settlement, precipitation falling on the North and South Forks of this watershed drained into a large wetland that formed on what was once Glacial Lake Middleton. This area is now a flood plain along Airport Road in the Town and City of Middleton, Wisconsin.

Early settlers drained the wetland depression and channelized Pheasant Branch in the 1800s in order to harvest peat and farm the old lake bed. These activities greatly diminished the flood plain's ability to stabilize downstream flows, protect water quality and recharge groundwater.*

Modern development in the flood plain and greater demand for municipal water threatens further to reduce groundwater supplies and increase stream bank erosion.

[* *Scientific terms used in this report are defined in Appendix 1: A Glossary of Scientific Terms*]

What happens in the watershed today will have a significant impact on the volume of groundwater flowing from the Pheasant Branch springs, the ecological health of Pheasant Branch Marsh and the quality of water in our wells and Lake Mendota.

Birth of the North Fork Pheasant Branch Watershed Committee

The Bruce Company tried for more than five years to develop a 160-acre parcel it owns along Airport Road in the City of Middleton, Wisconsin, into a commercial business park. Although the city's master plan targeted this area for development, the company encountered many problems along the way.

The Friends of Pheasant Branch (Friends) had delayed construction of a sewer line that would allow a feeder to serve the company's site. The area lay in a flood plain that was subject to a high degree of engineering and ecological scrutiny. And local residents were very concerned about the impact of development on the creek, Pheasant Branch Marsh and Lake Mendota. The situation had potential for drawings scientists, local developers, public agencies and environmentalists into a long, heated battle.

The turning point came in the spring of 1998 when The Bruce Company plans were undergoing review by the city and the Department of Natural Resources (DNR). When the Friends expressed concerns about the narrow perspective of the City's and DNR's review process, The Bruce Company agreed to work with the Friends in organizing a committee that would examine their project and other potential developments within the broader flood plain context.

Some people were skeptical about developers and environmentalists working together. Others, responsible for reviewing development plans, feared the committee's work would interfere with their permitting processes. But many were intrigued by the possibility that potential adversaries, scientists and government officials might be able to reach a meaningful agreement.

Two DNR facilitators helped a core group organize the committee and their assistance remains vital to the committee's work. (See Appendix 2: Description of Committee Process) At organizational meetings, the committee developed goals and decided that any solutions they proposed would need to:

- Protect irreplaceable resources in the North Fork Watershed
- Promote the preservation of prime farm land
- Recognize property owner's rights
- Enable appropriate development
- Respect local government land use planning

- Preserve taxpayer investments and
- Enhance the quality of community life.

About fifty people participated in the committee's work. They included watershed property owners, citizens, developers and their engineers, other business people, Middleton City officials, and U.W. engineering and geology professors. Other members represented Dane County Regional Planning, Dane County Land Conservation, the DNR and U.S. Geological Survey (USGS). (See Appendix 6: List of Committee Members) Another forty people were kept informed through regular mailings.

Committee members recognized that land use activities have affected the watershed's natural resources in the past, and will continue to do so in the future. Adverse land use practices harm natural resources not only at the site, but downstream as well. For example, past development of the South Fork Watershed in the Cities of Madison and Middleton may have been well-intentioned, but lacked the benefit of state of the art erosion control and stormwater management practices. As a result, the City of Middleton has committed more then $4 million to correct problems that, in hindsight, might have been avoided with better planning and construction site practices. The environmental costs are incalculable. The South Fork channel has become a highly erodible drainage ditch and high volumes of stormwater threaten structures along the main channel. Moreover, thousands of tons of silt have degraded the ecological value of Pheasant Branch Marsh, clogged the mouth of the Pheasant Branch channel and greatly reduced water quality in Lake Mendota.

Committee members also recognized that properly planned development and ecologically sound land use activities have the potential to protect natural resources and prevent further degradation. During eight months of meetings, committee members heard about soil and water conditions in the North Fork Watershed from many scientists. They learned how it is possible to enhance infiltration and storm water retention on some parcels of land in the flood plain. However, other parcels with highly permeable soils are best left undeveloped because they have a natural capacity to recharge groundwater supplies and reduce sediment and stormwater runoff. Groundwater helps to maintain water levels in the North Fork and main channel of Pheasant Branch, and is the main source of water for the Pheasant Branch springs.

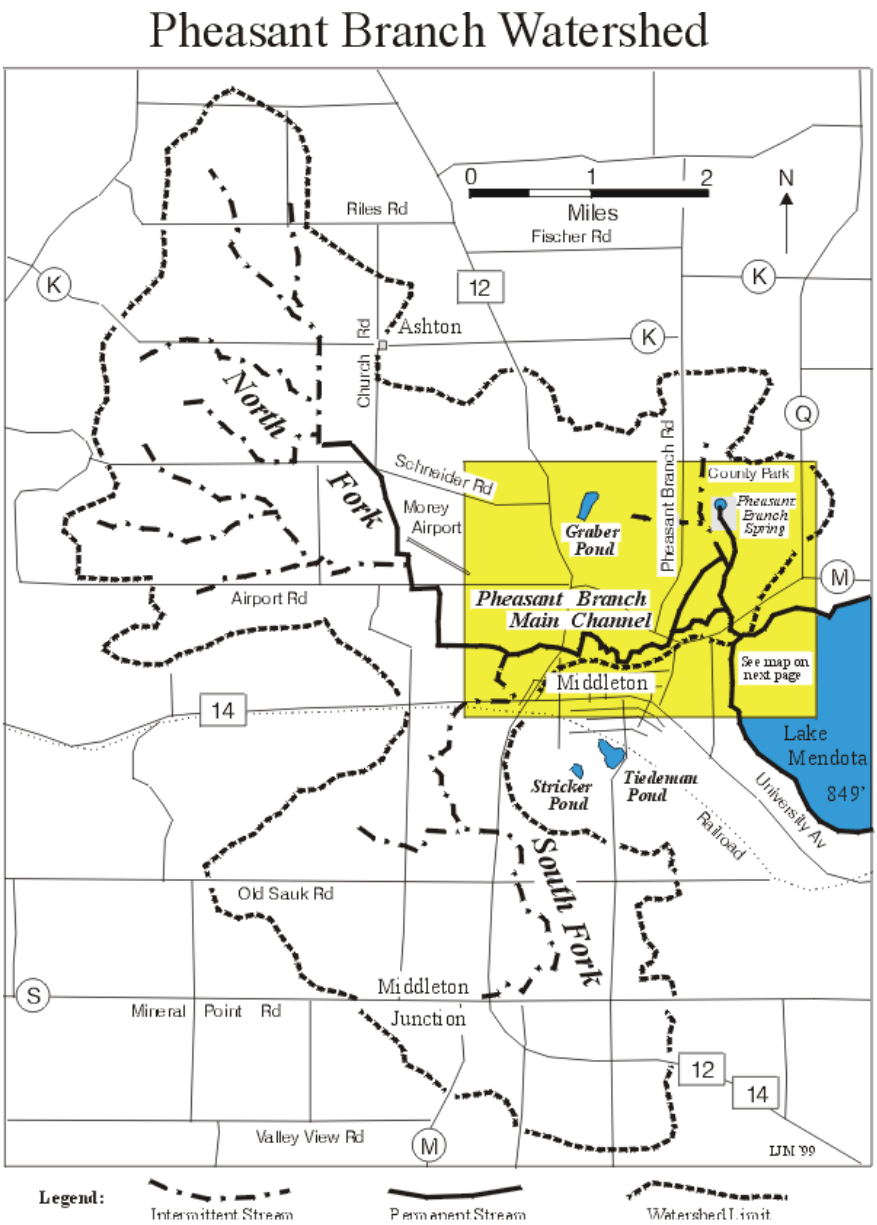
Working together, privately-funded and public agency experts defined a number of innovative construction site and stream restoration practices to enhance infiltration and stormwater retention on one parcel of land earmarked for development. DNR South Central Region personnel are now promoting the land engineering practices described in this report when they review other development proposals.

During their eight months of meeting, committee members learned to trust one another and became friends. As a result, their recommendations for local units of government, review agencies and developers reflect a consensus of broadly diverse interests. Now they are working together to secure funding for their plans and encourage groups they represent to support their proposals. The document summarizes their findings and recommendations, and provides an example for other groups who face similar land use challenges.

Description and Maps of Pheasant Branch * and its Watershed

[* *The words "branch," "stream" and "creek" are synonymous and used interchangeably in this report.*]

The Pheasant Branch Watershed drains into Lake Mendota. It covers approximately 23 square miles in an area that includes portions of the Towns of Middleton and Springfield and Cities of Madison and Middleton. (Please refer to the Pheasant Branch Watershed Map on Page 5) Until the mid-1800s, the Pheasant Branch Watershed above the elevation of Highway 12 drained into a large wetland flat that surrounds the present confluence of the North and South Forks of Pheasant Branch near Airport Road in Middleton.



Water stayed in the wetland most years, though it may have spilled westward into the Black Earth Creek Watershed during extremely wet conditions. Early settlers created the North Fork channel when they drained the wetlands in the 1800s and redirected water into a natural channel east of Highway 12. That channel, which has probably emptied into Lake Mendota for thousands of years, became the main Pheasant Branch channel. (See Appendix 3: The Early History of the Pheasant Branch Watershed)

Present-day Pheasant Branch originates out of the glacial moraine in the Towns of Middleton and Springfield, and flows through the City of Middleton before entering Lake Mendota. The seven-mile long creek has four distinct parts, the South and North Forks upstream from Highway 12, and the upper and lower portions of the main channel. Each of these reaches has its own particular conditions and problems.

Land in the **South Fork Watershed** is almost fully developed. This area probably had no well-defined channel prior to European settlement. The present channel results from agricultural and urban development, and is little more than a stormwater drainage ditch, with no baseflow and minimal ecological value. During intense rains, the channel has flashy flows which carry high concentrations of suspended sediment from channel and construction site erosion downstream to Pheasant Branch Marsh and Lake Mendota. Given the degree of development, opportunities for retrofitting stormwater retention devices and restoring the stream are limited.

The dry bed of the South Fork Channel between Old Sauk Road and University Avenue

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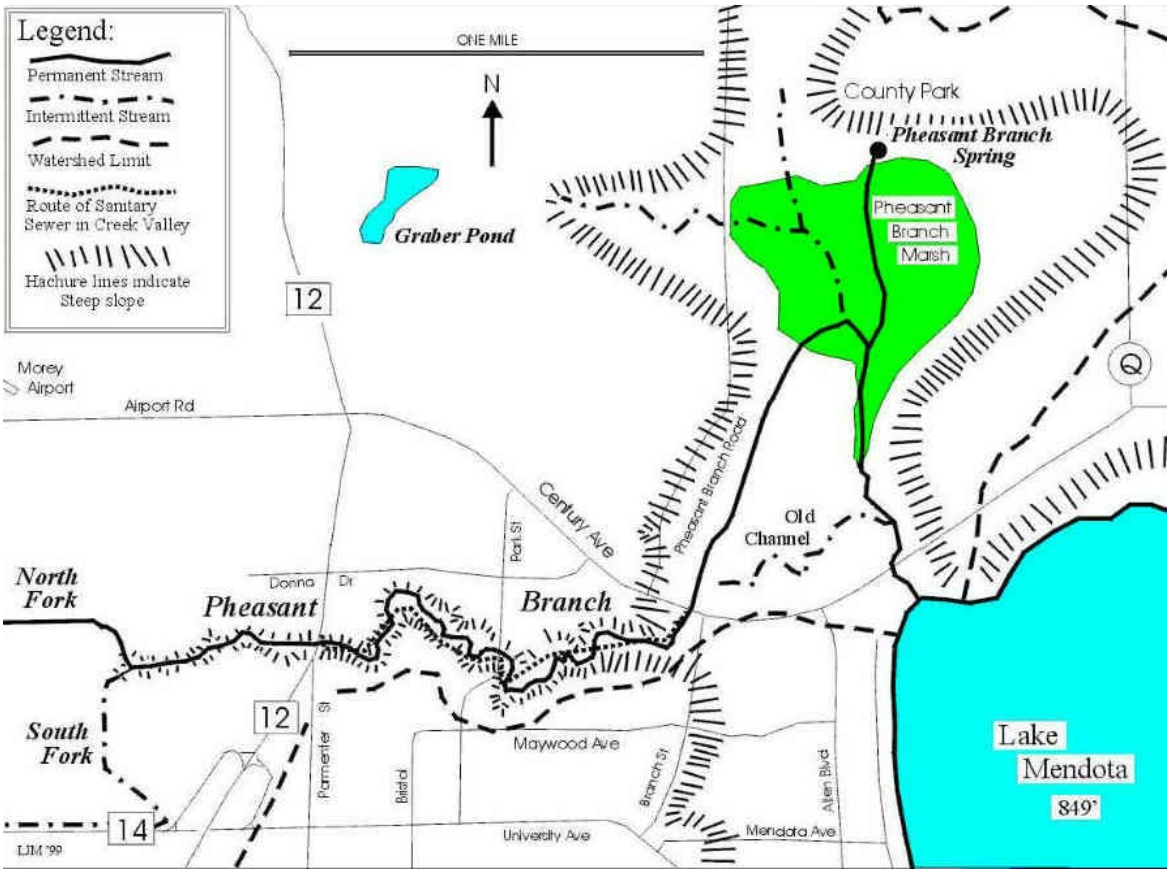
Land in the **North Fork Watershed** is mainly agricultural. Most of the North Fork channel consists of agricultural ditches constructed to drain extensive wetlands that once existed in the present flood plain. The channel has a small amount of baseflow, most of which occurs south of Schneider Road. Wetland destruction, sediments and nutrients from agricultural fields, and barnyard runoff have destabilized stream banks downstream, elevated water temperatures and destroyed fish habitats.

North Fork agricultural drainage ditch

If the **North Fork Watershed** were developed without adequate storm water management, heavy rains would accelerate channel erosion, and loss of groundwater recharge could further reduce channel baseflows. Inadequate management of construction site erosion would result in delivery of large quantities of sediment to the Pheasant Branch Marsh, causing further destruction of wildlife habitats. Increased loads of phosphorous that are associated with sediment would also cause more turbidity and exacerbate summer algae blooms in Lake Mendota. Conversely, good planning before development occurs, and use of sound management practices now would greatly enhance ecological conditions in the North Fork. Such practices include innovative storm water and erosion control techniques, improved agricultural conservation methods designed to reduce sediment and nutrient discharge, and wetland restoration to increase baseflow and trap sediment. (See Appendix 4: Land Engineering as a Water Management Technique)



Main Channel

The **Main Channel of Pheasant Branch** runs through the City of Middleton from Highway 12 downstream to Lake Mendota. (See Main Channel Map on Page 7) Stormwater runoff is largely responsible for eroding the upper portion of this channel. Since human settlement, farming, urban development and ditching have accelerated runoff and inhibited water infiltration. The channel's flow, accelerated by a large elevation drop (about 90 feet in 2 miles), has widened and deepened the channel banks which are composed of sandy, non-cohesive soils. Opportunity for erosion is further enhanced by a forest canopy along the stream which inhibits groundcover growth, leaving bare soil exposed.

Efforts to decrease stormwater runoff would reduce erosion rates and the public and private costs of repairing erosion damage. Presently, erosion in the upper reach of the main channel valley threatens several structures. The City of Middleton recently contracted for repairs of slope failure that endangers a private residence. Erosion also threatens two bridges, an old sanitary sewer interceptor buried along the channel and a newly constructed sewer crossing. Since the late sixties, the city has spent about a half million dollars for main channel stabilization. These attempts to mitigate upstream problems include stream bank reinforcement, and structures that reduce flow during peak periods but prevent upstream fish migration.

Slope failure endangers a private residence on the Main Channel

The lower portion of the main channel flows into Pheasant Branch Marsh where it receives an estimated 1840 gallons of water per minute from a spring complex to the north. The combined flow is then conveyed through the Pheasant Branch Marsh to Lake Mendota. Because the land in this area is very flat, the lake level controls water levels in the final section of the creek. This portion of the channel is ecologically important because it connects the lake to a spring-fed marsh. Until heavy silting occurred, fish and other aquatic species living in the lake used the lower channel for spawning and other functions.

Sedimentation is a major problem in the Lower Branch. Some of the sediment carried by the creek is deposited in the marsh; the rest is conveyed to Lake Mendota. Turbid water prevents vegetative growth in the channel and severely limits wildlife habitat potential. Better erosion control and storm water management would greatly improve conditions in this reach.

Ecological, Social, Economic and Legal/Regulatory Problems and Challenges in the Watershed

Nearly all the problems in the North Fork Pheasant Branch Watershed relate to municipal water use, sediment or stormwater runoff. Committee members viewed these problems from ecological, social, economic and legal/regulatory perspectives. The following summarizes their findings:

- A Dane County study estimated that the baseflow of Pheasant Branch at Highway 12 was 2.90 cubic feet per second (cfs) prior to development. The USGS presently records a baseflow of 0.86 cfs at that location. The large decrease in stream flow may be due to increased groundwater pumping. Unless appropriate steps are taken, future pumping is expected to produce periods where there is no flow in the Pheasant Branch by the year 2020. This problem requires regional action beyond the scope of this report.

- Sediment from construction, agriculture and channel erosion has seriously degraded water quality and wildlife habitat in the Pheasant Branch channel, marsh and Lake Mendota.
- Stormwater runoff carries sediment and chemicals into our lakes and streams. When stormwater infiltrates, it does not erode.
- Stormwater runoff leaves the watershed and does not replenish local groundwater reserves.
- Adequate supplies of groundwater are critical for maintaining stream baseflows and springs that feed high-quality water to our lakes and streams.

Social Problems and Challenges

- Degraded water quality has reduced the aesthetic and recreational value of Lake Mendota.
- Silting has promoted the invasion of undesirable plant species in the Pheasant Branch Marsh, degrading its functional, recreational and educational value.
- Past land management practices have turned the North Fork channel into an ugly drainage ditch.

Economic Problems and Challenges

- Sedimentation has devalued public and private land investments. For example, a recent Dane County Land Conservation study, "Evaluation of Potential Benefits of Water Quality Improvements in the Lake Mendota Watershed," showed that the appraisal values of Lake Mendota and Lake Monona lake front property are directly related to water quality.
- Development increases the tax base and enhances the health of local businesses, although studies show that some developments may be revenue neutral or negative when services are figured in. Well planned development provides opportunities to correct or improve ecologically degraded conditions resulting from past activities. Poorly planned development, however, can result in public and private problems downstream. For example, excessive storm water drainage into Tiedeman's and Stricker's Ponds in Middleton has flooded the ponds and adjacent park lands, and will be expensive to correct.
- Developers face many costs during the planning, permitting and construction phases of their operations. These expenses will undoubtedly rise as population pressures deplete the availability of suitable land. In trying to work with sites that have poor soil conditions and other challenges, developers will encounter more environmental issues and increasingly more difficult permitting procedures.

Legal/Regulatory Problems and Challenges

- Public officials and staff can spend a great deal of time formulating long range plans and working with developers to protect natural resources. However, those costs are insignificant compared to the time and resources required to mitigate the detrimental effects of poorly planned public and private development projects.

- Watersheds and surface water drainage cross political boundaries, requiring cooperation among many units of government.
- Groundwater systems extend well beyond political and watershed boundaries. They require the knowledge of experts to define how activities, such a municipal well drilling in one area, will affect groundwater supplies elsewhere.
- Local units of government and permitting agencies are used to working independently and evaluating individual projects as they come up for review, rather than working together to establish plans for ecologically sensitive areas in advance of development.

North Fork Recommendations and Implementation Strategies

The recommendations put forth in this report all relate directly or indirectly to two key issues:

- sediment and
- stormwater runoff

In order to protect valuable soil and water resources in Pheasant Branch Watershed, the North Fork Committee recommends the following:

1. Reduce erosion throughout the watershed

a. Institute a strong municipal erosion control program in the City of Middleton, the Towns of Middleton and Springfield, and Dane County that includes an effective ordinance, proper implementation, and timely enforcement based on Lake Mendota Priority Watershed Project goals.*

[Lake Mendota Priority Watershed Project has established goals to reduce the delivery of sediment and chemicals into the watershed's lakes and streams by measurable levels. These materials include sediment from crop land, stream bank and construction site erosion, and phosphorous (which is responsible for summertime algae blooms in the lake) from barnyards, construction sites and urban areas. The project also seeks to protect surface and groundwater quality by reducing applications of manure, chemical fertilizers and pesticides.]*

b. Give high priority to erosion control.

(1) Encourage the use of land engineering practices, such as diversion terraces, small dams and grassed waterways described in Appendix 4: Land Engineering as a Water Management Technique.

(2) Encourage the application of polymers, seeds and mulch to prevent construction site erosion.

c. Establish an erosion control implementor/educator/enforcer position and identify funding sources for that position.

d. Involve appropriate review agency personnel in the earliest phases of development to identify appropriate erosion control practices, and coordinate planning review with city,

town and county officials.

e. Educate developers and contractors about erosion control practices.

(1) Encourage attendance at Dane County-sponsored Erosion Control Workshops.

(2) Provide educational materials prepared by Lake Mendota Priority Watershed Project.

f. Promote agricultural conservation practices that reduce sediment and nutrient runoff.

(1) Stress the economic advantages of best management practices.

(2) Provide information about financial assistance for conservation practices.

2. Encourage stormwater management practices that reduce runoff and promote groundwater recharge in order to ensure safe well water supplies, continued flow from the Pheasant Branch springs and adequate baseflow in the Pheasant Branch.

a. When revising the City of Middleton's Stormwater Control Ordinance, incorporate goals of the Lake Mendota Priority Watershed Project.

(1) Give high priority to education about and enforcement of the stormwater control measures.

(2) Give credits to developers who use ecologically sound stormwater management practices.

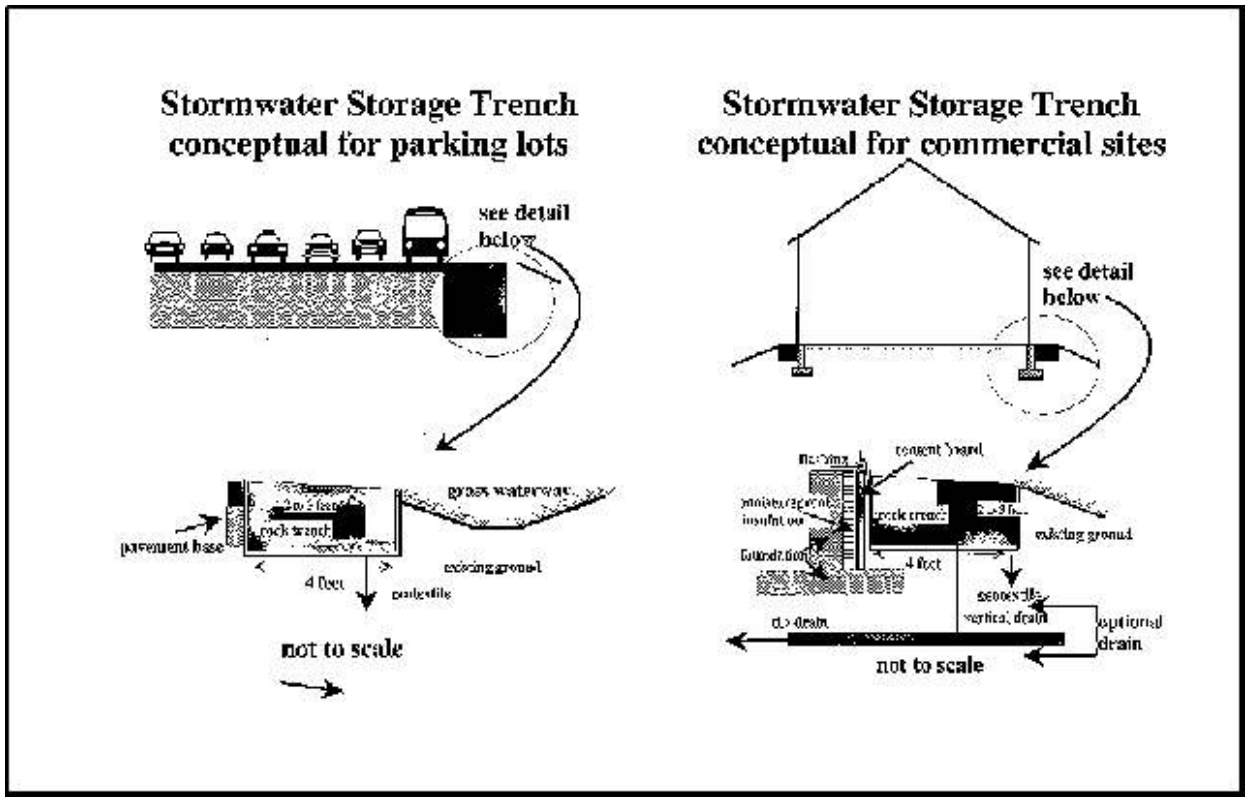
(3) Target infiltration measures to appropriate sites.

(4) Refer to high infiltration areas shown in Appendix 7: Probable Substratum Permeability in the North Fork Pheasant Branch Watershed. More information about these areas will be available upon completion of USGS studies late in 1999.

(5) Determine infiltration potential based on site-specific studies of soil types.

b. Construct and maintain well-designed detention/retention ponds described in Appendix 4: Land Engineering as a Water Management Technique.

c. Establish roof and parking lot drainage systems, such as those shown below, to collect and infiltrate runoff.



d. Use subsoiling (deep tilling) to reduce soil compaction from heavy construction equipment.
e. Use open grassed swales instead of concrete structures for water conveyance.
f. Evaluate the City of Middleton's present stormwater system throughout the North and South Fork Watersheds with the intent of reducing stormwater volumes emptying into in the main channel and Lake Mendota.
g. Develop long-range plans for correcting past problems and retrofitting stormwater practices as redevelopment occurs throughout the South Fork Watershed.

3. Change the structure and vegetation of the North Fork and main channel in order to reduce erosion.

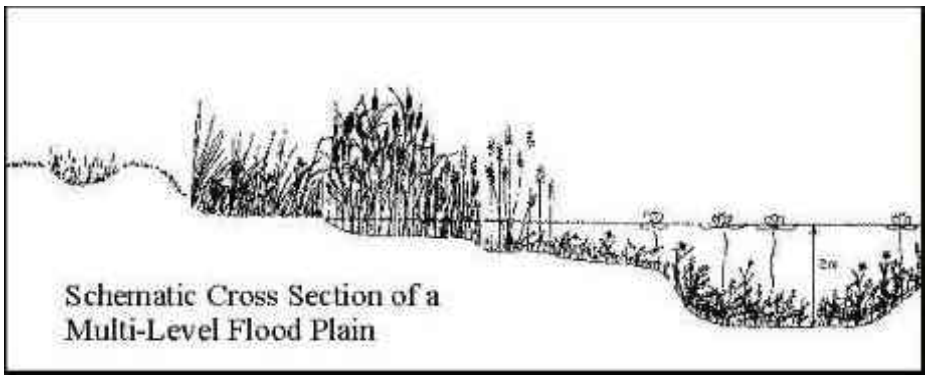
a. Reconfigure the existing drainage channel into a wide, meandering, multi-leveled flood terrace that is vegetated with native plant species and designed to accommodate stream spillover during heavy storms.

(1) Meandering and terracing of the North Fork channel will protect adjacent property from large floods, afford greater flexibility in land use planning, increase wildlife habitat, and provide attractive open spaces for pedestrian/bicycle trails and environmental education.

(2) Local ordinances provide for such structures and their construction is easy to implement.

(3) Costs may include acquisition of land or development rights, as well as movement of soil, planting and maintenance. (See Appendix 5: Potential Funding Sources for Implementing Recommendations)

b. If North Fork channel is reconfigured, reconsider the design of the confluence pond at the convergence of the North and South Forks from hydraulic, hydrologic and ecological perspectives, using both North and South Fork flows.
c. Stabilize streambank soils in the main channel by clearing overhead growth to facilitate groundcover vegetation.



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4. Preserve and restore wetlands in the North Fork Basin in order to trap sediment, increase baseflows and provide wildlife habitat.

a. Where possible, restore wetlands to reconstruct hydrologic functions lost long ago when large portions of the Pheasant Branch flood plain were drained.

(1) Wetland restoration is greatly preferred to wetland creation since natural wetlands are complex ecosystems that are almost impossible to fabricate.

(2) Restoration of historic wetlands is economically practical. Sites underlain with peat or muck soils are not well-suited for buildings or roads, but provide a natural environment for restoration.

b. Conduct studies of potential wetland restoration sites to determine their suitability.

(1) Target sites that are easily restored because they were formerly ditched or tiled.

(2) Target historic wetlands in the North Fork flood plain that are identified by their hydric soils. (See Appendix 8: Hydric Soils and Open Space Corridors in the North Fork Pheasant Branch Watershed)

c. Interconnect wetlands to improve water quality and increase the functional value of wildlife habitat by allowing greater range of movement.

5. Work with land owners to preserve ecologically sensitive parcels of land.

a. Help land owners to identify prime agricultural land. (See Appendix 9: Prime Agricultural Land in the North Fork Pheasant Branch Watershed)

b. Help land owners to identify open space corridors along significant tributaries to the North Fork channel. (See Appendix 8: Hydric Soils and Open Space Corridors in the North Fork Pheasant Branch Watershed)

c. Work with land owners to restore eroded stream channels in open space corridors.

(1) Channel restoration would involve a minimum 200-foot width, but might be wider depending on the channel's position in the watershed, anticipated flows and 100-year discharge rate.

(2) Identify funding for such projects. (See Appendix 5: Potential Funding Sources for Implementing Recommendations)

d. Work with land owners to preserve historic wetlands and open space corridors.

(1) Identify funding to purchase easements, development rights and other alternatives to offset development pressures. (See Appendix 5: Potential Funding Sources for Implementing Recommendations)

(2) Provide land owners with information about viable alternatives to protect or enhance their investments.

6. Develop master planning documents and distribute them to developers and contractors.

a. Identify prime agricultural land. (See Appendices 9a and 9b: Prime Agricultural Land in the North Fork Pheasant Branch Watershed)

b. Identify open space corridors and other ecologically sensitive areas where development is not encouraged. (See Appendix 8: Hydric Soils and Open Space Corridors in the North Fork Pheasant Branch Watershed)

c. Identify appropriate areas for new development and redevelopment.

d. Provide maps and documents that clearly define master plan requirements and goals.

e. Work with developers early in their planning process to address long-term stormwater management goals, and provide documents that describe recommended practices.

7. Improve coordination and cooperation among local units of government, USGS, various Dane County planning and advisory departments, various offices of the DNR, and citizen constituencies.

a. Hydrology issues are poorly understood; increase contacts between DNR and USGS personnel who have and continue to gather information about the watershed.

b. Recognize that Pheasant Branch Watershed and its hydrology issues cut across many jurisdictional boundaries.

c. Encourage area-wide planning and goal setting before a parcel-by-parcel review takes place.

d. Encourage citizen and group participation in the land use decision-making processes.

e. Streamline the review process. Instead of bouncing developers between permitting bodies, hold joint meetings with review agency personnel to discuss specific projects and work together on reaching solutions that meet the requirements of all involved permitting units and interested constituencies.

8. Improve coordination, cooperation and continuity on projects reviewed by the City of Middleton's Plan Commission; Public Works Committee; Water Resources Management Commission; Park, Recreation and Forestry Commission; and Conservancy Lands Committee.

a. Refer proposals for development and public works projects to the Water Resources Management Commission very early in the planning process to determine if selected sites are appropriate for proposed projects.

b. Determine early in the planning process what the developer and city must do to make a proposal acceptable from a water resource perspective.

c. Negotiate with developers to acquire wetlands and other ecologically sensitive areas, and to achieve best possible stormwater management solutions.

d. Encourage developers to seek advice from regulatory and advisory agency personnel early in their planning process.
e. Ensure that all city staff and committee members know and have materials available that concisely describe the requirements and sequence for obtaining regulatory permits.
f. Develop a list or flow chart for developers, city staff and committees showing what city committees, and county, state and federal agencies need to review development proposals, and what information and format they require. Also include contact names, telephone numbers and internet sites of advisory agencies such as Dane County Land Conservation, and citizen environmental constituencies, such as Friends of Pheasant Branch.
g. Coordinate requirements for pedestrian and bicycle paths, and other amenities.

9. Implement the 1999 recommendations of the Master Plan for the Pheasant Branch Conservancy as they pertain to protection of ecological resources in the Marsh and Watershed.

10. Apply North Fork committee process to other portions of the Pheasant Branch channel and watershed when land use conflicts arise.

a. Require further study of South Fork conditions that impact on the main channel and marsh.
b. Implement a South Fork Watershed Committee to identify problems and recommend solutions.

Future Action

This document represents a work in progress. It is simply the first step in a long, complex process to protect valuable resources in the Pheasant Branch Watershed. Even as it goes to press:

- Scientists are providing new information that requires the committee to constantly reevaluate its recommendations.
- Other bodies are drafting legislation that will strengthen or mandate some of the committee's recommendations.
- The committee is evaluating its implementation strategies in terms of their relative importance and practicality.

An ever-growing body of scientific knowledge clearly demonstrates the complexity of watershed issues, but also provides new techniques for mitigating past mistakes and preventing future problems. The North Fork Watershed Committee members will use these tools to enlist the cooperation of watershed citizens, property owners, developers and local units of governments.

The Committee will also seek funding to ensure that its recommendations are implemented before the North Fork is subjected to further development pressures. Timely action will ensure that:

- Ground water supplies are adequate to support Pheasant Branch springs and stream flow, and high quality well-water.
- Wildlife habitat and water quality will improve in Pheasant Branch Marsh and Lake Mendota.
- Owners of prime agricultural land will be better positioned to withstand pressures of development.
- Development will occur in ecologically and economically appropriate areas.
- The North Fork Pheasant Branch channel will be transformed into an attractive natural area that provides recreation and education opportunities for future generations of watershed residents.

Finally, North Fork Committee members will encourage their peers in the business and farming communities, government agencies and environmental organizations to use their committee process as a model for resolving land use conflicts. Widely diverse interest groups can reach consensus when they base their discussions on scientific information and understand one another's viewpoints.

Appendices

Appendix 1: A Glossary of Scientific Terms

Baseflow is that portion of the flow in a stream that originates from groundwater seepage.

Best Management Practices (BMP) are agricultural, forestry and development measures and engineering structures, such as retention ponds, that encourage the infiltration of surface water and the prevention of soil erosion.

Erodible soils are those soils that are likely to wash away when exposed to water runoff.

Erosion is the wearing away of soil or rock by wind, water, ice or gravity.

Grassed swales or **waterways** are shallow natural or constructed channels that filter barnyard runoff and urban stormwater pollutants through vegetation, and encourage infiltration. Urban grassed swales can be used in place of curb and gutter.

Groundwater is water contained in interconnected pores of rock or sediment layers.

Hydric soil is a soil that is saturated, ponded or flooded long enough during the growing season to develop oxygen-deficient conditions in its upper part. It is often called "muck" or "peat."

Infiltration is the process by which water from rainfall and snow melt flows down into and through the upper soil layers.

Land engineering involves the construction of swales, contoured terraces and other diversions such as retention ponds to reduce the velocity of stormwater runoff and increase infiltration.

Open space corridors are continuous open space systems are containing critical natural resource features, such as streams, lakes, shorelines, flood plains, wetlands, steep slopes and woodlands, that deserve the greatest degree of environmental protection. These systems are called **urban environmental corridors** when they preserve resources in urban service areas. Beyond municipal boundaries, open space corridors are identified as **rural resource protection areas** on town land use plans, and protected primarily through zoning. **Isolated resource features** lie outside open space corridors, but are protected because of their scientific, ecological or scenic importance.

Peak flow is the highest discharge flowing in a stream following a particular rain storm or snow melt.

Permeable soils are porous and allow water to pass through them.

Prime agricultural land is land having the best combination of physical and chemical characteristics, including soil quality, growing season, and moisture supply, needed to economically sustain high crop yields when managed according to acceptable farming methods.

Recharge is that portion of infiltrating water which reaches the water table.

Recharge area is an area in which infiltrating water readily replenishes ground water supplies.

Sediment is soil that has been eroded from land surfaces, often by water runoff, and deposited away from its original location.

Water table is the level at which soils and rock pores are saturated with groundwater.

Watershed is the entire area of land that drains into a given waterway, wetland or lake; also referred to as a drainage basin or catchment area.

Wetland is an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophilic (water-adapted) vegetation, and soil types reflecting wet conditions.

Wildlife habitat is a set of specific environmental conditions that provide cover, shelter, food, breeding and rearing sites necessary to support the life cycle of a given wildlife species or group of species.

Appendix 2: Description of Committee Process *

[Prepared by DNR Facilitators Darin Harris and Tom Mickelson.]*

As you might imagine, the subtle factors that allowed this committee to accomplish its goals are nearly impossible to put into words. The trust, communication, and teamwork that developed over the course of several months, however, resulted from a deliberate process used by the committee's facilitators and organizers. This short description highlights the need for a few key people to take leadership roles in the process. The following text summarizes the process.

Jan Coombs, from the Friends of Pheasant Branch in Middleton, originally recognized a potential problem in Pheasant Branch. Her initial interest, enthusiasm and effort cannot be emphasized enough.

A few things Jan did early in this process were key:

- First, she talked to a number of individuals representing environmental and business groups, and state, local and county officials to see if her concern had merit. Essentially, she validated her concern with others who would be needed to address the problem.
- Next, she contacted expert facilitators to help her design an approach that would involve as many people as possible in solving the problem.

Another important factor for the committee's success was the use of two facilitators, Tom Mickelson and Darin Harris, who had worked previously with Jan. Such a large effort would have been extremely difficult to undertake without organizational and group development assistance. Tom and Darin helped in various ways:

- Initially, they convinced Jan to enlist the help of "champions." Champions are committed representatives from various interest groups who need to be involved in solving a problem. To start, Jan, a few other key people (Middleton Planning Administrator--Eileen Kelley, U.W. Professor--Ken Potter and The Bruce Company Representative--Jeanne Whitish) and the facilitators identified several potential champions. These people met informally with others in small groups. Their meetings produced a core group of interested people who convened to define and clarify the problem, draft goals for their effort, and design a method that they would use to solve the problem. These champions served as the backbone for the committee's work throughout the process.
- The facilitators also helped to prepare an agenda for each meeting that detailed the use of committee members' time and talents. An organized process helped to set the tone for efficient work.
- The facilitators encouraged full participation and respect for all views at every opportunity. At the first large committee meeting, for example, they asked each member to write down on post-it notes why they came to the meeting and what they wanted to accomplish. People also identified what kinds of information they wanted the committee to collect.
- The facilitators identified, listed and grouped each participant's concerns and comments in a format that was clear, open, and non-judgmental. They collected everyone's ideas from the first meeting and carefully documented them in minutes, grouping them into categories that could be referred to later. No views were thrown out. Out of this listing came four distinct categories of issues: ecological, social, economic and legal/regulatory.

The committee then decided that they would explore ecological issues first, economic and social issues next, and legal issues last.

The third important factor in the success of the committee's work was their effective use of small subgroups.

- Before the second meeting, a group of interested scientists convened a subgroup and met several times to organize a presentation explaining the ecological issues identified by the committee.
- This same pattern was followed for each of the other issue categories. Volunteers created subgroups that worked between the major committee meetings in order to study the fine points of various issues and present their findings to the committee.

Countless other factors encouraged a high level of trust, involvement, and creativity in the committee:

- First and foremost the participants were committed to this effort.
- The champions shared committee leadership.
- Volunteers regularly distributed minutes and detailed information about the committee's progress to all participants and other interested observers.
- Since most of the meetings occurred over the dinner hour, volunteers provided refreshments to create a relaxed, social atmosphere.

Description of the Process Used By The North Fork Pheasant Branch Committee

1. Jan Coombs identifies a potential problem, she contacts local and state officials, but is not successful in catching their attention

2. Jan meets with DNR facilitators to discuss her concerns.

3. Jan and facilitators meet with DNR representatives for local region.

4. A series of small meetings and calls take place between various businesses, agencies, and environmental groups.

5. A few key "champions" from each group take an interest in addressing the problem.

6. Champions meet to design the committee process and produce goals statement.

7. Champions are asked to contact their representatives to attend first committee meeting.

8. First Committee Meeting occurs:

- Issues specified
- Categories defined
- Ecological subgroup formed

9. Second Committee Meeting held:

- Scientists speak
- Economic subgroup formed

10. Third Committee Meeting held:

- Scientists summarize info
- Business/city speak
- Institutional subgroup formed

11. Fourth Committee Meeting held:

- Legal/organizational findings presented
- Report drafting sub-group formed

12. Report drafted and presented to committee at Fifth Meeting for review.

Appendix 3: The Early History of the Pheasant Branch Watershed *

[* *Information presented here was extracted from a report prepared by Louis J. Maher, Department of Geology & Geophysics, University of Wisconsin in Madison. For a copy of his fully-referenced report, contract Prof. Maher at (608)262-9595 or maher@geology.wisc.edu or visit his Web site at www.geology.wisc.edu/~maher /history.html. Copies have also been deposited at the U.W. Geology Library and Wisconsin State Historical Society Library on the Madison Campus and at the Middleton Public Library.*]

Middleton Township was covered by ice of the Green Bay Lobe during the last glaciation. When the glacier began to waste away about 13,000 years ago, meltwater flowed westward to the Wisconsin River. By the time the ice retreated to present-day Middleton, a large lake had formed in a bedrock lowland along the western margin of the glacier. The lake remained deep until the ice receded further to the east, opening lower drainage routes to the south. A ninety-five foot core taken from this area in 1995 produced sand and mud samples with pollen from spruce, sedge and other herbaceous species growing more than 10,000 years ago. The evidence suggests that the old lake flat was a poorly-drained region of open lakes and marshes throughout post glacial time.

Part of Township 7 N, Range 8 East, 4th Meridian (Wisconsin Territory)

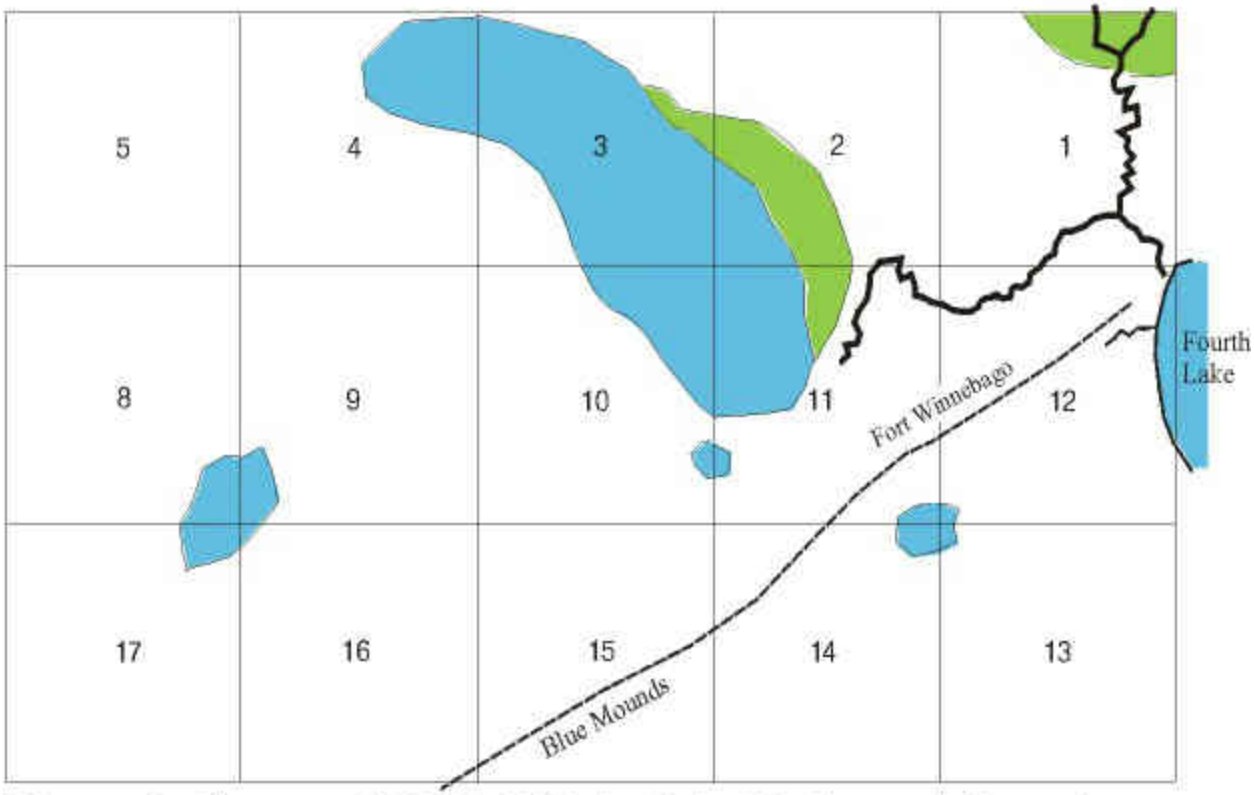

Figure 1. Survey of 1833-1834 by John Mullet and Orson Lyon
Copy of Original Plat made December 1, 1851, Dubuque, Iowa

Each section equals 1 square mile

The first detailed map of this area was part of the original U.S. Land Survey by Mullet and Lyon in 1833-1834. (See Figure 1) "Fourth Lake," on the eastern side of the map, is Lake Mendota. Woods were in the green areas and wetlands in the blue. Lyons also describes several areas of prairie and an upland oak savanna. The old lake bottom was about 90 feet above Fourth Lake's level, and the valley of what became Pheasant Branch is clearly shown extending from a location near present-day Highway 12 to the lake.

Ligowsky compiled the next detailed map of the same area in 1861, 27 years after the land survey. (See Figure 2) Ligowsky's map is unusually informative. It gives the names of property owners, and uses hachure lines to provide information about topography. Two railroads reached Madison in the mid-1850s and were later combined into one new company. A railroad right-of-way, shown as an unlabeled dotted line on the map, marks the intended route for the yet-to-be-named company.

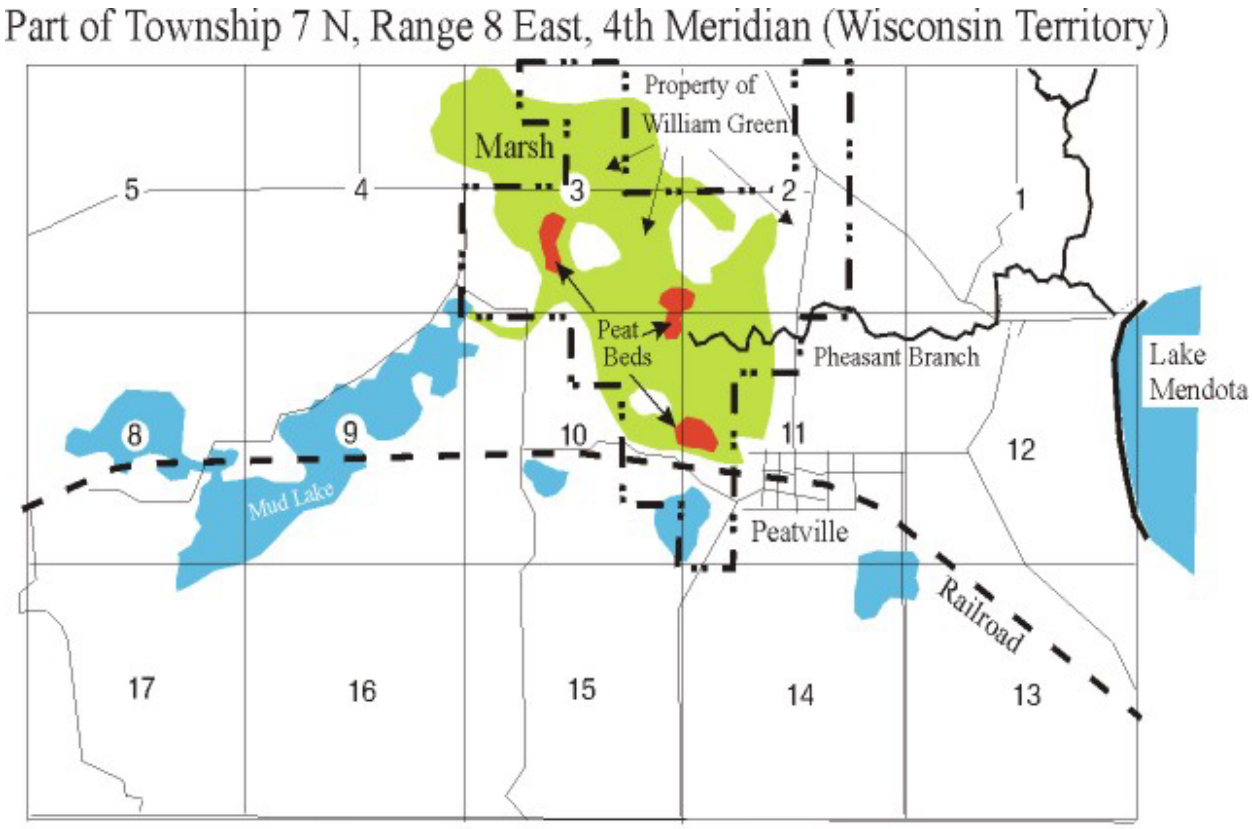

Figure 2. 1861 Map of Dane County, Wisconsin
Compiled by A. Ligowsky, Published by Menges & Ligowsky

Peatville, a community established in 1856, became Middleton Station in June 1862, Mendota in July 1862 , and finally Middleton in 1870. Burgess C. Slaughter, Peatville's first postmaster and probably its founder, had an interest is digging peat. Three separate "peat beds" are seen on the 1861 map. (Peat, a deposit of un-decomposed plant debris, is not preserved unless it is kept below the water table away from oxygen.)

It appears from Ligowsky's map that the Pheasant Branch channel was altered from its 1833-1834 position in order to draw down the watertable and harvest peat from the three beds, possibly as early as 1856 when Peatville was established. Some time before the 1861 map was compiled, a William Green purchased 1,120 acres of land in sections 2, 3, 10 and 11 (the boundary is represented by the dashed lines on the map). His purchase represents a large portion of the old lake bed. Though marshland, it must have cost a considerable sum.

The series of ditches we see today were carrying drainage water from the old lake bed into Pheasant Branch and Lake Mendota by the mid-1800s. These drainage channels are evident on a sketch of 1906 and 1909 topographic quadrangles shown in Figure 3. Note how the North and South Fork of Pheasant Branch passes exactly through the "peat beds" of Figure 2.

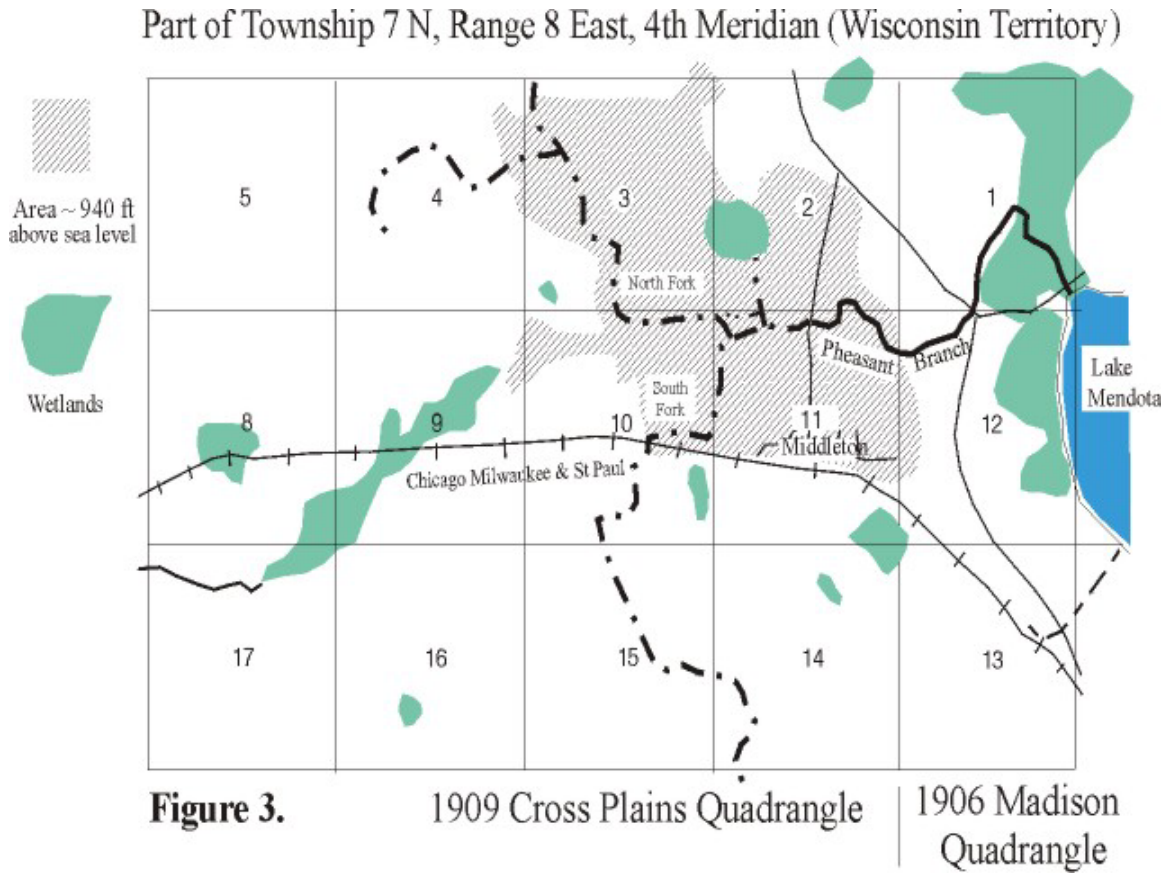

Figure 3.

Appendix 4: Land Engineering as a Water Management Technique

The Lake Mendota Priority Watershed includes 146,000 acres of land, 49 miles of streams and 10,025 acres of lakes. Wetlands, although reduced to 11 percent of the surface area, are still a significant natural resource for protecting water quality in the watershed. Streams and lakes in distressed watersheds have low dissolved oxygen and high bacteria levels. They support fewer fish and wildlife, but have many more nuisance aquatic plants, such as algae. Such conditions prevail in the Lake Mendota Watershed.

Urbanization increases sediment and chemical pollutants in stormwater runoff, aggravating water quality problems. Construction site erosion during development is a major source of sediment and phosphorous pollution. After development, contaminants that threaten water quality include oil, grease and chloride and heavy metals such as copper, zinc, cadmium, chromium and nickel.

A proliferation of roads, parking lots and buildings prevent absorption of rainfall and melting snow into the ground. As a result, urban growth reduces streamflow during dry periods. It also causes streambank erosion during storms and snow melts due to the increased volume and velocity of water runoff. Sediment from erosion degrades water quality and wildlife habitat in downstream marshes and lakes.

Water management techniques reduce erosion by increasing the ability of soils to absorb water. Absorption replenishes groundwater supplies and prevents soil loss. The ability of soils to capture, hold and absorb water can be significantly improved using the natural movement of water and existing land contours. Water management "structures," such as diversion terraces, small dams and grass waterways, disperse water horizontally. They slow runoff velocity, reduce its downhill force, and build permanent water retention and absorption capacity into fields.

Croplands and construction sites are both particularly vulnerable to erosion problems because soil is exposed. Erosion occurs when the kinetic energy or momentum of falling raindrops overcome the bonding forces of soil, causing small particles to break off. Some soils are more resistant to raindrop detachment than others due to the amounts of organic and inorganic colloidal materials they contain. Clusters of inorganic and organic particles bind fine soil particles into compound units of varying sizes. Without such bonding, these fine particles clog and seal the pathways through which water normally flows into the soil. Clear water penetrates into soils ten times faster than turbid water loaded with sediment. Conversely, soil surfaces encrusted with sediment effectively prevent water penetration.

Many Dane County farmers have used water management techniques for years. They know that fine soil particles enhance farm fertility, and soil loss reduces crop yields. They use water management structures to keep their soil where it belongs. For example, they contour terraces to create temporary pools of water on level surfaces. They use shallow ditches, or swales, cut along a hillside perpendicular to the flow of runoff to collect and hold water, slowing its downhill movement.

Construction site techniques to trap sediment and increase groundwater infiltration include:

- Applications of polymers, seed and mulch to hold the soil in place
- Contour terraces, diversions and swales
- Well-designed sediment catchment basins
- Rock-filled gabions
- "Subsoiling" or deep tilling to reduce soil compaction from heavy construction equipment.
- Stormwater storage trenches adjacent to buildings and parking lots.

Wetland restoration is another valuable tool for improving water quality. Wetlands control erosion, reduce sediment runoff and prevent flooding. Wetland plants hold soil in place, preventing erosion during heavy rains storms. They also improve water quality because they take up nutrients; purify surface and groundwater supplies; and alter toxic pollutants chemically and biologically to reduce their ecological impact. In addition to providing wildlife habitat and recreational opportunities, restored wetlands have great aesthetic value.

Appendix 5: Potential Funding Sources for Implementing Recommendations *

[* *Prepared by Andy Morton, Wisconsin DNR Southern District.*]

The Wetland Reserve Program is administered by the Natural Resource Conservation Service. It provides funding for easement acquisition, and restoration cost-sharing assistance for wetlands and riparian areas.

The Lake Mendota Priority Watershed Project is administered by the Dane County Land Conservation Department and the Department of Natural Resources. It provides cost-sharing assistance and will buy perpetual easements for streambank and wetland restoration. The program also provides funding and technical assistance for the design and installation of several other best management practices aimed at reducing non-point source pollution.

The Stewardship Program is administered by the DNR. It provides matching funding for the acquisition of land in several categories ranging from local park aids to streambank protection.

The U.S. Army Corps of Engineers Aquatic Restoration Program (206) provides technical assistance, and cost sharing for the restoration of aquatic habitats and land acquisition. Projects are evaluated on fish and wildlife benefits. Local sponsors can use in-kind services as part of their match.

Appendix 6: List of Committee Members (October 1998)

Diane Ballweg: Friends of Morey Airport
Tom Bernthal: DNR; Friends of Pheasant Branch
Brian Butler: Dane County Board
Kevin Connors: Dane County Land Conservation
Jan Coombs: Friends of Pheasant Branch
Don Damon: Middleton City Council
Betsey Day: Friends of Pheasant Branch
Chris DeRemer: DNR, South Central Region
Steve Fix: DNR Water Resource Planner
Jeff Freeman: Pleasant Company
Herb Garn: US Geological Survey; Middleton Conservancy Lands Committee
Steve Grant: RS Grant Consulting
Don Hammes: Dane County Conservation League; Friends of Pheasant Branch
Darin Harris: DNR Facilitator
Paul Helgeson: Middleton City Council
Don Hoffman: Springfield Town Board
Bruce Hollar: D'Onofrio, Kottke & Assoc., Inc.
David Howat: City of Middleton Planning Department
Randy Hunt: U.S. Geological Survey
Tom Jilot: Blettner Group
Sue Joshef: DNR, South Central Region
Ken Kailing: Consultant for Citizens for Responsible Growth
Michael Kakuska: Dane County Regional Planning
Janet Kane: Friends of Pheasant Branch

Sally Kefer: DNR; Friends of Pheasant Branch
Eileen Kelley: Middleton Planning Administrator
Jim Krohelski: U.S. Geological Survey
Tom Krull: Madison Gas and Electric
Jim Leverance: DNR, South Central Region
John Lichtenheld: Schreiber/Anderson Associates
Louis Maher, Jr.: U. W. Geology and Geophysics Department
Jan Marten: Middleton Chamber of Commerce
Kim Meadows: M&I Bank
Troy Mehlkoff: BCI, builder/developer
Tom Mickelson: DNR Facilitator
John Milligan: REA, Inc.; Consultant, Citizens for Responsible Growth
Field Morey: Morey Airplane Company
Gian Morrelli: St. Benedict Conference Center
Jim O'Brien: Middleton City Council
Mark Opitz: Middleton City Council; Dane County Board
Ann Peckham: Friends of Pheasant Branch
David Polich: Citizens for Responsible Growth
Ken Potter: U.W. Engineering Department
Dan Ramsey: Mayor, City of Middleton
Aicardo Roa: Dane County Land Conservation
Dorothy Shannon: Friends of Pheasant Branch
Hank Simon: Middleton Director of Public Works
Mike Sorge: DNR, South Central Region
Jeff Steuer: U.S. Geological Survey
Scott Storlid: Natural Resources Consulting
Pat Trainer: Middleton Conservancy Lands Committee
Tom Trotta: Colonial Motel owner
Monica Tuite: Friends of Pheasant Branch
Jim Wexler: Middleton City Council
Jeanne Whitish: The Bruce Company
Tom Wohlleber: Middleton-Cross Plains School District
Ralph Zahnow: Middleton City Council
Steven Ziegler: Citizens for Responsible Growth
Doug Zwank: Middleton City Council

Middleton City Council Resolution

RESOLUTION 1999-4
TO SUPPORT THE EFFORTS OF THE NORTH FORK WATERSHED COMMITTEE

WHEREAS future development in the North Fork Pheasant Branch Watershed will have an impact on the natural ecosystem of Pheasant Branch Marsh and its springs, and the water quality in Lake Mendota; and

WHEREAS these resources are valuable assets for all our residents; and

WHEREAS thoughtful planning can protect these resources; and

WHEREAS the rights of property owners in the Pheasant Branch Watershed must be respected; and

WHEREAS many farmers in the Town of Springfield and Town of Middleton want to preserve their prime agricultural land for farming; and

WHEREAS other property owners in the watershed may want to sell or develop their land; and

WHEREAS the City of Middleton wants to promote ecologically sound planning practices in the North Fork Watershed; and

WHEREAS the North Fork Watershed Committee has provided a vehicle for resolving land use conflict issues involving the protection of public resources, property and development rights; and

WHEREAS the North Fork Watershed Committee Report, March 1999, expresses the vision and recommendations of the Committee members,

NOW, THEREFORE, be it resolved that the Common Council wishes to thank the Friends of the Pheasant Branch, community members, city staff, and agency representatives for their dedication to making this a successful effort. In particular Jan Coombs, Jeanne Whitish, Eileen Kelley and David Howatt are congratulated for their efforts;

BE IT FURTHER RESOLVED, that the City of Middleton will continue to support the efforts of the North Fork Watershed Committee and will work with the Committee to assure that future development in the North Fork respect the ecological value of its resources and the rights of watershed stakeholders.

This resolution was adopted at a regular meeting of the Council on the 2nd day of March, 1999.

Dan A. Ramsey, Mayor

ATTEST:

Timothy R. Studer, City Clerk

Air View Looking North at Pheasant Branch Spring (photo by L.J. Maher)
The spring emerges from the clump of trees south of Frederick's hill. The Dane County Park is bordered on the east by a housing development.

March 11, 2003

Please send corrections and/or comments to *maher@geology.wisc.edu*
