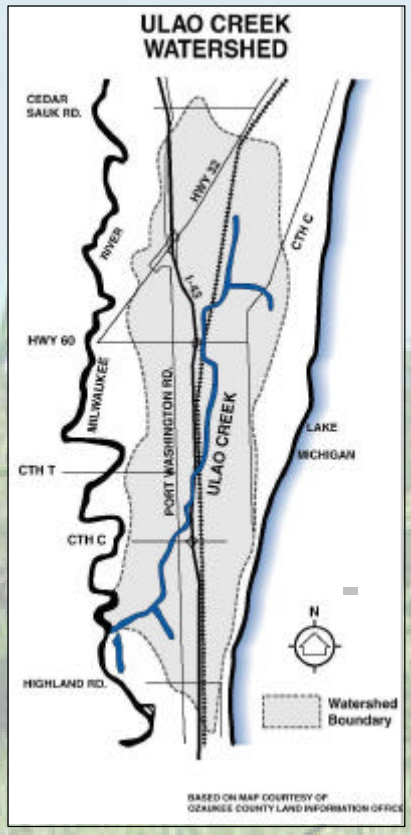

WDNR River Protection Grant:

Ulao Creek Watershed Restoration and Stewardship Plan

Stewardship and Long Term Management Objectives

-2003 –

*Funded by the Wisconsin Department of Natural Resources,
With much appreciation from the Ulao Creek Partnership
and its many volunteer partners.*

ACKNOWLEDGEMENTS

The following individuals and corporations are recognized for giving time, effort, and technical assistance toward development of this plan.
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Ulao Creek Restoration and Management Project Long-Term Management Plan
Prepared and Compiled by Cedarburg Science:
Ginny Plumeau, Gretchen Messer, Katie Halstead, Mike Grisar

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Overview

The goal of watershed management is to plan and work toward an environmentally and economically healthy watershed to benefit all who have a stake in it.

The **Ulao Swamp and Creek Restoration and Stewardship Plan** is a culmination of the work conducted under **The River Protection Grant Project** as well as many years of observation and study by landowners and volunteers. This report presents a summary of the work and findings of many technical leaders and **Ulao Creek Partnership** volunteers.

The information and references presented here, and the subsequent recommendations, are provided for use by local citizens and public officials to guide decision-making and advocacy.

The material presented is also intended for informational use to help inform and educate local area landowners, school children and municipal leaders in understanding and managing the sensitive - and changing - Ulao Creek Watershed.

The dedicated participation of local landowners and volunteers in developing future **watershed-level stewardship** decisions is an integral part of comprehensive planning. The Ulao Creek Partnership is grateful to all those who contributed time and hard work over the last few years to compile this Plan.

Many benefits stem from their work. The studies leading up to the development of this Plan have provided:

- Enhancement of the technical partners' scientific knowledge and goal-development for the Milwaukee River ecosystem and its important tributary, Ulao Creek;
- Compilation of resource information critical for the protection and improvement of natural resources within the Ulao Creek corridor system;
- Galvanized goal-setting in the mutual interest of the Ulao Creek Partnership (UCP) landowners and volunteers, the conservationists and planners of the Ozaukee Country Planning, Resources, and Land Management Department, and the technical specialists and leaders within the Wisconsin Department of Natural Resources (WDNR) as each moves forward with their respective land use protection initiatives;
- Demonstration that River Protection Grant funds can successfully supplement the data-gathering capacity of a partnership and/or volunteer based group;
- Local area assistance and information for those policy makers within the local units of government: Ozaukee County, Town of Grafton; Village of Grafton and the City of Mequon.

A prominent study of watershed management efforts ***(Purdue University Conservation Technology Information Center)*** identified several key elements to assure project success and sustainability:

- Include all stakeholders in the local partnership;
- Use sound technical information;
- Set clear objectives and priorities;
- Develop innovative educational and assistance programs;
- Use strong local leadership; and
- Use a systems approach that integrates all concerns and challenges.

With many thanks to all of the special technical and volunteer contributors to this Plan, the Ulao Creek Partnership is pleased to share a work plan that has incorporated these key elements.

Introduction

The Ulao Swamp and Creek Restoration and Stewardship Plan **serves to compile information related to the Ulao Creek corridor system, an important tributary of the Milwaukee River. It presents background information about the watershed, documents the findings of some recent studies, identifies areas of concern, and offers recommendations for the long-term management and stewardship of Ulao Creek and Swamp.**

This work was funded in large part by a **River Protection Grant**. The grant was provided by the Wisconsin Department of Natural Resources (WDNR) to the Ulao Creek Partnership (2002-2003).

The **Ulao Creek Watershed** is an irreplaceable treasure in southeast Wisconsin. Located just north of the city of Milwaukee, the tributaries within the watershed flow south into the Milwaukee River.

Located about 30 minutes north of Milwaukee in a rapidly urbanizing area, protection of the key natural resources within the creek corridor is vital. Increased urbanization is leading to loss of wetlands, as well as degradation and fragmentation of woodlands and grasslands.

The 16-square mile watershed includes 95 acres of Waterfowl Protection Lands, owned by the U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resources. In addition, the Ulao Lowland Forest (or "Swamp") has been designated as a Significant Natural Area, serving as Critical Species Habitat.

The River Protection Grant Project

The project funded by the River Protection Grant started in 2002. It had three primary objectives:

- To collect baseline information necessary to understand the existing hydrology and vegetation of the Ulao Swamp at the headwaters of Ulao Creek;
- To initiate small scale restoration projects for woody species which would be established, maintained, and monitored by the local community with coordination by the Ulao Creek Partnership;
- To gather species of concern information, including relative abundance and distribution correlated with general habitat conditions.

The collection of this baseline information was the first step in developing a stewardship and restoration plan for the Ulao Creek and Swamp watershed. The Plan serves as the backbone for an innovative, model program for long-term, locally supported efforts to restore the complex wetland system.

The restoration goals are achievable because community participants are involved in, and have ownership of, this project. Community ownership of this project is a vital part of continued study and monitoring.

Ulao Creek Partnership

The Ulao Creek Partnership (UCP), formed in 1995, is a well-established and focused alliance of concerned citizens, landowners, and public and private organizations dedicated to protecting and improving the water quality and natural habitats in the Ulao Creek Watershed of Ozaukee County.

UCP Goals

- ***Restore and enhance the creek's natural resources.***
- ***Improve water quality.***
- ***Promote comprehensive watershed planning based on land use, natural resource protection, and enhancement.***
- ***Stabilize/moderate water flows in the watershed.***

Important features of the Ulao Creek corridor include:

- Water quantity and quality in Ulao Creek have a significant effect on the quality of the Milwaukee River, especially if flooding in the Ulao Creek Basin delivers a large sediment load to the main channel.
- The vegetation of this wetland ecosystem has been disturbed by a long history of farming and ditching. However, the hydrology of the wetland system remains largely intact.
- Ulao Creek and its adjacent habitats, including woodlands and grasslands, have excellent potential for restoration of native wetland plant communities.
- The headwaters of Ulao creek stem from the Ulao Lowland Forest, a locally Significant Natural Area, in which rare plant species have been documented through this study.
- The Ulao Creek Watershed has been identified in the "Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin." Such areas are designated as such so that they can be preserved via protective ownership.

Organization of the Restoration and Stewardship Plan

This Plan is divided into two sections.

Part 1 **Ulao Creek Watershed, Current Conditions**, provides a summary report of the findings of the field surveys and observations to document the current condition of the Creek and Swamp's hydrology, vegetation and wildlife.

Part 2 **Ulao Creek Watershed, Stewardship and Restoration Goals**, explores the concerns facing this watershed. It briefly identifies some of the issues that are affecting the sustainability of the watershed.

The identification of concerns led to stakeholder discussion and commitment to develop management objectives:

- The findings and work products will be immediately used for identifying areas for critical habitat restoration and/or enhancement.
- The information will be immediately used for critical habitat protection and management.
- The information will be immediately used to influence land use planning decisions driven by the urban pressure of expanding communities.
- The information will be used immediately by the Partnership, the **Ozaukee County Planning, Resources, and Land Management Department** and by the WDNR to enhance conservation-minded involvement of local landowners and

communities through public education and informational outreach.

The progress toward restoration of the Ulao Creek and Swamp will help to make wetlands a focal point of community development plans. This project will help to focus attention on improving the wetland functional values of the Ulao Swamp. Improved water quality in the Ulao Swamp and Creek system, will directly benefit water quality in the Milwaukee River Basin, and ultimately, Lake Michigan.

The following Plan presents the overall methods, findings, and recommendations associated with this study. The recommendations present a need for a cohesive community-based planning effort based on focused goals, public awareness, and continued monitoring.

Part 1: Ulao Creek Watershed

Current Conditions

THE ULAO CREEK WATERSHED

The Ulao Creek Watershed is an irreplaceable natural resource treasure in southeast Wisconsin. Located just north of the city of Milwaukee, the tributaries within the watershed flow south into the Milwaukee River. The 16-square mile watershed includes 95 acres of Waterfowl Protection Lands owned by the U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resources.

Ulao Creek begins at the Ulao Swamp just south of Port Washington, Wisconsin. The Creek flows approximately 8.5 miles south through Grafton, Cedarburg, and Mequon, where it joins the Milwaukee River, just north of Thiensville.

The Ulao Swamp is a 490-acre wetland at the "heart" of the 16 square miles of the Ulao Creek Watershed. The Ulao Lowland Forest has been designated as a Significant Natural Area and is serves as critical species habitat.

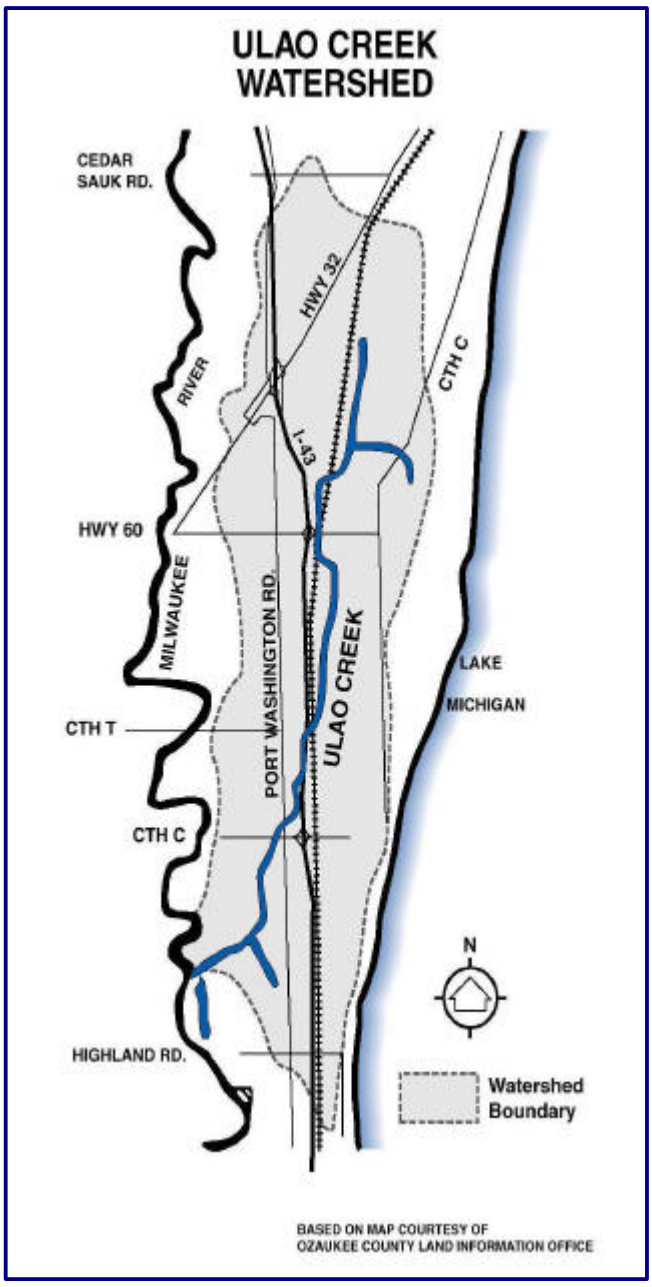
The Creek and Wwamp have become degraded in certain portions. ***The Milwaukee River State of the Basin Report – 2001***, prepared by the Wisconsin Department of Natural Resources, states the following about Ulao Creek *("based on visual observations and limited monitoring")*:

> Its existing biological use is as a warm water sport fisheries (surface waters supporting a community of warm water sport fish or serving as a spawning area for warm water fish species.)
>
> Its potential biological use is also for warm water fisheries – so long as the waterway is well managed and pollution sources are controlled.
>
> A portion of this waterway is affected or threatened by some manageable factor, and the biological use of the stream can probably be improved.
>
> The waterway's probable pollution sources include: cropland erosion, stream bank erosion, hydrologic modification, barnyard or exercise yard runoff, stream bank pasturing, and urban stormwater runoff.

The impacts of the pollutant sources include: impacts to the habitat (lack of cover, sedimentation, scouring etc.), bacteriological contamination, nutrient enrichment, stream flow fluctuations caused by unnatural conditions, and poor dissolved oxygen levels.

Pre-Settlement Vegetation

The pre-settlement vegetation of the Ulao Swamp, like that of most other large wetlands in the region, was a diverse mix of white cedar/tamarack conifer swamp, hardwood swamp, shrub-carr, sedge-meadow, wet-meadow, and shallow marsh communities. The complex patterning of these dominant plant communities could be correlated with subtle local variation in the hydrology of the wetland.



The conifer swamp, which occupies the greatest acreage of the wetland, was long enough from north to south to have been noted in the original land surveyors notes, and therefore to be included on the map of the ***"Original Vegetation Cover of Wisconsin"*** (R.W. Finley, 1976).

Much of the land in this watershed is in agricultural use or open land. Residential development is the second next largest land use in the watershed.

This is important as it is also the fastest growing land use, and one which dramatically affects the quality and quantity of the water within the watershed. Commercial and industrial development currently occupies a small percentage of the land use, but the demand is increasing rapidly.

LAND USE

The following land uses within the watershed were calculated for the ***Ulao Creek Stormwater Management Plan*** using SEWRPC 1995 aerial photographs:

1995 Land Use	% of Watershed
Agriculture	52
Open land	14
Residential	13
Wetlands	12
Woodlands	4
Commercial	2
Industrial	2
Other	1
Total	100

As referenced in the ***Ozaukee County Land Guide***, in June of 1998, the Ozaukee County Board of Supervisors adopted the ***Natural Areas and Critical Species Habitat Protection and Management Plan*** prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC).

The plan identified 55 natural areas and critical species habitats and 17 geological sites that should be protected in Ozaukee County. The Ulao Lowland Forest, located near the headwaters of the Ulao Creek watershed, was identified as a site worthy of regional protection.

The Natural Areas and Critical Species Habitat Protection and Management Plan also states "Several counties, including Ozaukee County, have experienced substantial loss of natural areas and critical species habitat."

An estimated 83% of the pre-European settlement vegetation has been lost in southeast Wisconsin since 1990. (Ozaukee County Land Guide). This is clearly indicative of the rapid and dramatic changes that have occurred in this area due to development.

Much of the Ulao Creek corridor has been identified as a "Primary Environmental Corridor" in the ***Ozaukee County Land and Water Resource Management Plan*** (October 1999). Primary environmental corridors often follow major stream systems, and contain almost all of the remaining high-value woodlands, wetlands and wildlife habitat areas as well as the undeveloped floodlands and shorelands within the County.

12% of the Ulao Creek watershed is wetlands.

Comparatively, the entire Milwaukee River South watershed has only 4% wetlands.

There is a high concentration of wetlands in the Ulao Watershed.

It demonstrates the need for preservation and long-term protection of wetland resources.

VEGETATION, HYDROLOGY AND WILDLIFE

Several natural resource elements of the watershed were reviewed as part of this project to determine the current condition and general sustainability of the system. Under the River Protection Grant, the Ulao Creek Partnership also identified known or suspected species of special concern, which could influence future protective conservation efforts or studies. The reports or data collection summaries upon which the following discussions are based may be found or referenced in the Appendix.

Vegetation

As previously presented, in 1995, up to 50% of the watershed was actively cropped. The dominant row crops in the county are corn and soybeans. The remainder of the agricultural lands was primarily associated with dairy production. As such, the vegetative cover of these areas included a mixture of pasturelands and line fence hedgerows.

According to 1995 aerial photographs, SEWRPC classified 14% of the watershed as “open land”. This includes a mix of forest, field and parkland areas - 12% of the area was designated wetlands.

Wetlands

According to 1995 aerial photographs, SEWRPC classified 12% of the watershed as wetlands.

The ***WDNR State of the Milwaukee River Basin Report*** identified five wetland types occurring within the Milwaukee River South Basin (which includes Ulao Creek), and presented the typical vegetation species associated with each wetland type, as follows:

Table 1: Wetland Types and Vegetation of Ulao Creek Watershed

Wetland Type	Typical Vegetation Species
Hardwood Swamp/Floodplain Forest	**Trees** include black and green ash, red maple, silver maple, yellow birch, cottonwood, box elder and elm. **Shrub layer and ground cover** include dogwoods, alder, skunk cabbage, marsh marigold, stinging nettle, jewelweed, sedges, ferns, grasses and forbs.
Coniferous Swamp	White cedar, tamarack, pitcher plant, leatherleaf, jack-in-the-pulpit, sedge, and the rare lady slipper orchid.
Shrub Swamp	Woody vegetation such as small willows, red osier and silky dogwoods dominate.
Marshes	Plants such as cattails, sedges and arrowhead dominate permanent and seasonal shallow standing water areas.
Wet Meadows	Grasses, goldenrods, asters and marsh milkweed dominate.

The vegetation presented in the table is representative of the wetland types and plants occurring within the Ulao Creek corridor system.

Ulao Swamp

The **Ulao Swamp encompasses approximately 490 acres**. It contains some of the highest quality wetlands within the watershed, despite numerous impacts since settlement of the watershed. The SEWRPC Natural Areas Management Plan classifies the **Ulao Swamp as a NA-2 natural area of regional significance.**

SEWRPC's Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin states that according to records for the ***U.S. Public Land Survey of 1835-1836***, ***Pre-***

- ***Approximately 22% of Ulao Swamp is mapped as <u>Closed Ash Forest</u>.***
- ***<u>Open Ash Forest</u>, which covers approximately 25% of Ulao Swamp, has the highest richness, diversity, and floristic quality values of any vegetation type in the lowland forest.***
- ***<u>Cattail marsh</u> comprises approximately 19% of Ulao Swamp.***
- ***Approximately 13% of Ulao Swamp comprises <u>Sedge/Shrub.</u>***
- ***The <u>Flooded Maple Forest</u> vegetation type covers nearly 15% of the Swamp.***

From Hewitt, "Vegetation of the Ulao Swamp, A Hardwood-Conifer Swamp in Southeastern Wisconsin"

Settlement Vegetation Map, much of the Ulao Swamp was conifer swamp/bog, and most likely a combination of cedar and tamarack swamp.

Under the River Protection Grant, the vegetation of the Ulao Swamp was most recently recorded by Jill Hewitt in her Masters thesis ***"Vegetation of the Ulao Swamp, A Hardwood-Conifer Swamp in Southeastern Wisconsin"*** (University of Wisconsin – Milwaukee, 2002).

The following habitat descriptions are from this thesis.

> "Since the Government Land Survey 167 years ago, the tamarack population has disappeared, the beech population has been greatly reduced, and only a small amount of cedar remains in the northern portion of Ulao Swamp.
>
> The current vegetation is a mosaic of degraded hardwood swamp (snags and damaged trees) and, using the Curtis (1959) classification system, southern wet-mesic forest *(Ulmus Americana, Acer saccharinum, Fraxinus nigra, Fraxinus pennsylvanica,* and *Tilia americana)*, shrub carr *(Spirea alba, Cornus sericea,* and *Salix* spp.). alder thicket *(Alnus incana, Spirea alba, Cornus sericea,* and *Ribes americana),* southern and northern sedge meadow *(Carex* spp., *Calamagrostis Canadensis, Glyceria striata, Poa palustris,* and *Phalaris arundinaceae)*, and southern cattail marsh *(Lemna, Scirpus* and *Typha* spp.)
>
> ***Active and fallow agricultural fields, commercial development, and private homes have largely replaced the pre-settlement beech-maple surrounding the swamp***."
>
> <u>"Two hundred thirty-one vascular plant species were collected in Ulao Swamp during the two field seasons the wetland was examined.</u> Of these, **97% are native**, 66% are obligate or facultative wet plants, and 92% are perennial.
>
> **The wetland flora includes 24 tree, 36 shrub and woody vine, and 171 herbaceous species**. Leading families are *Asteraceae*, *Cyperaceae*, and *Poaceae.* Mosses were present, but not recorded. *Larix laricina* and *Abies balsamea* have been recently planted in parts of the lowland forest."
>
> "Two herbaceous *(Phalaris arundinaceae* and *Allaria petiolata*) and three shrub *(Rhamnus cathartica, R. frangula,* and *Lonicera tatarica)* exotic species considered invasive in our region were recorded in sampling units. Reed canary grass was located in 19 sample points, while common buckthorn was found in 14. Glossy buckthorn, honeysuckle, and garlic mustard were each identified in 2 sample points"
>
> "My qualitative comparison of historic air photographs captured from **1950-1980** revealed a gradual **decrease in agricultural and grazing practices** in and around Ulao Swamp over that time period. **Successional changes in these abandoned old fields resulted in small patches of**

forest, shrub-carr, wet meadow, and cattail marsh. Ponds were constructed in some of these transitional stands while other patches were poorly stocked with commercial tree and shrub species (J.Peltier, personal communication, October 17, 2001). Selective harvesting was isolated to small areas in the northern, central, and southern portions of the lowland forest."

"Ulao Swamp was recently entirely forested, which is evident from the dead standing tree and stump data as well as documented by 50 years of aerial photography and life-time area residents. The present composition and condition of the vegetation in the wetland appears to be closely correlated to the degree of disturbance."

"**Loss of the continuous conifer cover has rendered the lowland forest vulnerable to the spread of exotic species**. Aggressive species that tolerate a wide range of light and hydrologic levels such as *Rhamnus cathartica* and *Phalaris arundinaceae* will dominate disturbed sites (Rinzel 2000, Thompson, 1995), which is apparent in the disturbed tree stands and cattail marsh areas of Ulao Swamp today."

HYDROLOGY – SURFACE AND GROUNDWATER FEATURES

The Ulao Creek Partnership established a **Hydrology Study Group** to examine the changes in water levels and the effect on the vegetative community.

According to this group, historic occurrences have contributed to some of the changes in the Ulao Swamp composition. Two events have triggered some of the changes: the die-off of large tracts of American elms due to Dutch elm disease, and extensive damage to trees caused by severe ice storms in the late 1960's – early 1970's.

Both of these events resulted in adding considerable loads of woody debris to the forest floor. The resultant log jams trapped significant sediment. The natural "dam" action created by the wood, debris and sediment may have contributed to the rise of water levels in the swamp.

The cycle continued to the extent that the rising water level has killed more trees, causing another heavy load of woody debris to accumulate. This has caused the water level to rise even more.

Surface Water Features

The following data is taken from the ***Ulao Creek Stormwater Management Plan*** prepared by Northern Environmental and Bonestroo and Associates (1998).

- The Ulao Creek is 8.5 miles in length from the Milwaukee River to its headwaters 1.5 miles northwest of the Ulao Swamp.
- **The Ulao Creek can be divided into four segments comprised of 1.75 miles in Mequon, 4.25 miles in the Town of Grafton, 1.25 miles through the Ulao Swamp, and 1.25 miles upstream from the Ulao Swamp**.
- A 1.5-mile major tributary to the Ulao Creek runs parallel to Interstate Highway-43 (I-43) and contributes flows to the Ulao Creek.
- The Creek's baseflow is modest (e.g., 100 gallons per minute or less in the summer).

- There are 13.4 acres of surface water bodies in the watershed.
- Eight major tributaries, totaling **approximately 9.3 miles of streams, flow into the Ulao Creek**. The largest of these is a two-mile, two-forked stream north of Pioneer Road and west of Port Road. Smaller in length are the I-43 stream immediately east of I-43 and the agricultural stream north of Pioneer Road and east of I-43, both of which are 1.5 miles long. The remainder of the tributaries ranges from 0.7 to 1.1 miles in length.

Wetland Restoration within the Ulao Creek Watershed

"A total of 51 wetlands have been restored in the watershed since 1990, according to the Ozaukee County Land Conservation Department's working wetland restoration map.

Most of these are small, 1-acre to 5-acre, shallow marsh and wet meadow restorations on agricultural lands.

About half of the total projects are on lands under the Crop Reduction Program (CRP).

The continued restoration of small wetlands by private landowners will improve water quality and wildlife habitat but will not provide storage in large rain events due to design constraints. Restorations will also provide valuable open space area in the Town."

Ulao Creek Stormwater Management Plan *– Northern Environmental, Bonestroo and Associates*

- The wetlands in the Watershed are a result of two major factors: 1) the drainage and soils associated with the Ulao Creek and its tributaries, and 2) isolated shallow sloped poorly drained soils in woods, agricultural fields, and open areas.

- **Wetlands account for 769 acres of the 8,246 acres in the Watershed, or 12 % of the Watershed**.

- **Ulao Swamp**, the largest wetland in the watershed, is 4190 acres in size (**52% of all the wetlands in the watershed**).

Groundwater Features

The occurrence of low or no flow conditions in the Ulao Creek has drawn attention to groundwater and how it may interact with surface water during these flow conditions.

It has been determined that the Milwaukee River has an impact on the Ulao Creek. Portions of the Milwaukee River can be called a "losing river" – one that loses water to the zone of saturation.

The Milwaukee River's "losing river" qualities, permeable soils, glacial till, and rock conditions cause surface and groundwater to be lost from the middle of the Ulao Creek.

Groundwater discharges to the surface in several areas. Important groundwater discharge areas include:

- The western flank of the Ulao Swamp, particularly north of Ulao Parkway.

- The lowland parallel to Interstate-43 north of Ulao Road.

- Small areas adjacent to Ulao Creek near the intersection of County Trunk Highways W and C.

According to the ***Ozaukee County Land Guide*** (October 2000):

> "Groundwater resources constitute an extremely valuable element of the natural resource base of Ozaukee County.
>
> The groundwater reservoir not only sustains lake levels and provides the base flow of streams in the County, but also comprises a major source of water for domestic, municipal, and industrial water users. Like surface water, groundwater is susceptible to depletion in quantity and to deterioration in quality.
>
> Therefore, **the protection of the quantity and quality of this valuable groundwater resource is an important consideration in land use planning and public facility development**."

Water Quality

The following table lists pollutant loads for sediment, phosphorus, lead, copper, and zinc found in Ulao Creek (documented in the 1998 Ulao Creek Stormwater Management Plan):

Table 2: Water Quality, 1998

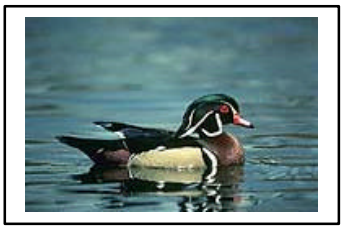
Condition	Sediment (lbs/yr)	Phosphorus (lbs/yr)	Lead (lbs/yr)	Copper (lbs/yr)	Zinc (lbs /yr)
Existing	2,161,419	3,466	1,754	841	2,432
Future (%change)	2,873,674 (+33%)	2,705 (-28%)	4,366 (+149%)	1,203 (+43%)	5,389 (+122%)
With BMP's recommended by Mgmt. Plan (% change)	775,892 (-73%)	838 (-69%)	2,183 (-50%)	601 (-50%)	2,694 (-50%)

The **WDNR Nonpoint Source Control Plan for the Milwaukee River South Priority Watershed** set goals for reducing nonpoint source pollutant loading in this watershed.

Volunteer monitoring efforts (reference discussion described later in this Plan) have found that the Ulao Creek exhibits poor stream health.

This is based on an average biotic index of 1.75-2.0. While overall habitat scores are slightly above average, the biotic index is low.

Clearly, quantity, stabilization and water quality improvements are needed within the Creek and Swamp system.



HABITAT AND WILDLIFE

The WDNR State of the Milwaukee River Basin identifies five wetland types occurring within the Milwaukee River South Basin (which includes Ulao Creek). It included the typical wildlife species associated with each wetland type as follows:

Table 3: Typical Wetland Wildlife Species by Habitat Type

Wetland Habitat	Reptiles and Amphibians	Birds	Mammals
Hardwood Swamp - Floodplain Forest	American toad, eastern grey tree frog, spring peeper, wood frog, blue-spotted salamanders, tiger salamander, central newt, redback salamander, painted turtle, snapping turtle, eastern garter snake, northern ringneck snake, northern water snake, red-bellied snake.	Belted kingfisher, green heron, spotted sandpiper, wood duck, mallard duck, flicker, pileated woodpecker, hooded merganser, barred owls. Rare birds include Acadian flycatcher, prothonotary warbler, red-shouldered hawk.	White-tailed deer, muskrat, mink, raccoon, opossum, beaver.
Coniferous Swamp	Blue spotted salamander, four-toed salamander, American toad, chorus frog, spring peeper, eastern gray tree frog, wood frog.	Saw-whet owl, hermit thrush, northern water thrush, veery, many species of sparrows and warblers.	White-tailed deer, red fox, coyote, various small mammals.
Shrub Swamp	American toad, chorus frog, eastern tiger salamander, eastern grey tree frog, pickerel frog, northern leopard frog.	Grouse, songbirds, pheasants, turkeys,	Small mammals, white-tailed deer, rabbits.
Marsh	Blue spotted salamander, eastern tiger salamander, central newt, American toad, chorus frog, spring peeper, Cope's gray tree frog, eastern gray tree frog, bullfrog, green frog pickerel frog, northern leopard frog.	Various ducks, rails, songbirds, herons, pheasants, turkeys.	Rabbits
Wet Meadow	American toad, chorus frog, spring peeper, leopard frog, Butler's garter snake.	Sandhill crane, shorebirds, hawks.	Small mammals, coyotes, fox, mink.

Herptiles of Ulao Creek

Frogs and Toads
Bullfrog
Eastern American Toad
Gray Tree Frog
Green Frog
Northern Leopard Frog
Northern Spring Peeper
Western Chorus Frog
Wood Frog

Salamanders
Blue-spotted
Tiger

Snakes
Butler's
Eastern Garter
Fox
Northern Redbelly

Turtles
Common Snapping
Musk (possible)
Painted

The listed species would be typical of the wetland wildlife occurring within the Ulao Creek Watershed (although not all were identified, see specific discussions and references).

To identify the general species mix and potential critical habitats within the Watershed, a study of certain targeted species of herptiles and birds was conducted under the River Protection Grant.

The purpose of conducting these limited surveys was to identify the presence and/or possible occurrence of species of concern. Notations about the location and quality of the community in which they were found or suspected to occur will lead to targeted habitat and landscape level protective measures and to restoration projects.

HERPTILE (AMPHIBIAN AND REPTILE) SURVEY

To evaluate the amphibians and reptiles of the Ulao Creek Watershed, a record review was first performed to construct a potential species list for the study area, using data from the ***Wisconsin Herp Atlas (Milwaukee Public Museum).***

The **Coordinating Herpetologist, Gary Casper**, then field checked the study area for habitat types available, and indexed the species potential occurrence list for probability of occurrence based on habitat availability, and on verified species records specific to the study area.

A number of surveys were conducted in 2001 targeting species on the potential occurrence list. Surveys utilized a volunteer task force coordinated by the herpetologist.

Training and informational meetings for the survey teams took place in the early spring and into the summer, 2001. The training helped the volunteers learn applicable field methods, identification skills, and how to record data consistently. Methods included **visual reconnaissance searching for all species, aquatic funnel trapping in ponds for amphibians, hoop net trapping for turtles, cover object surveys for snakes, road cruising for amphibians, and audio surveys for calling frogs and toads**.

Specimens captured were verified by Gary Casper when necessary, to confirm identifications. Most specimens were released at their capture sites, but vouchers were deposited at the Milwaukee Public Museum when warranted.

The ***Ulao Creek Amphibian and Reptile Checklist*** was produced (see Table 4) based on 2001 surveys and on the record review.

Fourteen species were confirmed present in the watershed (2 salamanders, 8 frogs and toads, 2 turtles, and 2 snakes). An additional salamander and 5 snake species could be present but additional survey efforts would be needed to confirm or rule out their presence.

Table 4: Ulao Creek Herptiles

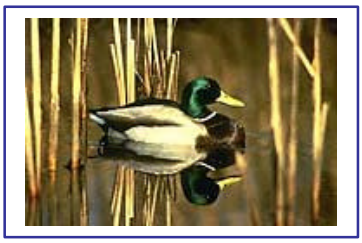
Species	Verified In County	Verified In Project Area	Status In Ulao Creek Watershed
Salamanders			
Blue-spotted Salamander, *Ambystoma laterale*	X	X	confirmed present
Spotted Salamander, *Ambystoma maculatum*	X		unlikely
Eastern Tiger Salamander, *Ambystoma tigrinum tigrinum*	X		confirmed present
Eastern Red-backed Salamander, *Plethodon cinereus cinereus*			considered extirpated
Central Newt, *Notophthalmus viridescens louisianensis*	X		possible
Common Mudpuppy, *Necturus maculosus maculosus*	X		unlikely
Frogs & Toads			
Eastern American Toad, *Bufo americanus americanus*	X	X	confirmed present
Blanchard's Cricket Frog*, *Acris crepitans blanchardi*			considered extirpated
Western Chorus Frog, *Pseudacris triseriata triseriata*	X		confirmed present
Northern Spring Peeper, *Pseudacris crucifer crucifer*	X		confirmed present
Gray Treefrog, *Hyla versicolor*	X	X	confirmed present
Cope's Gray Treefrog, *Hyla chrysoscelis*			unlikely
American Bullfrog, *Rana catesbeiana*	X		confirmed present
Northern Green Frog, *Rana clamitans melanota*	X	X	confirmed present
Northern Leopard Frog, *Rana pipiens*	X	X	confirmed present
Pickerel Frog, *Rana palustris*			unlikely
Wood Frog, *Rana sylvatica*	X	X	confirmed present
Turtles			
Eastern Snapping Turtle, *Chelydra serpentina serpentina*	X	X	confirmed present
Common Musk Turtle, *Sternotherus odoratus*			unlikely
Blanding's Turtle*, *Emydoidea blandingii*	X		unlikely
Painted Turtle, *Chrysemys picta*	X	X	confirmed present
Eastern Spiny Softshell, *Apalone spinifera spinifera*			unlikely
Snakes			
Smooth Greensnake, *Opheodrys vernalis*			possible

Northern Ring-necked Snake, *Diadophis punctatus edwardsii*			considered extirpated
Western Foxsnake, *Elaphe vulpina*	X		possible
Eastern Milksnake, *Lampropeltis triangulum triangulum*	X		possible
Butler's Gartersnake*, *Thamnophis butleri*	X	X	confirmed present
Eastern Gartersnake, *Thamnophis sirtalis sirtalis*	X	X	confirmed present
Midland Brownsnake, *Storeria dekayi wrightorum*	X		possible
Northern Red-bellied Snake, *Storeria occipitomaculata occipitomaculata*	X		possible
Queen Snake*, *Regina septemvittata*	X		unlikely
Northern Watersnake, *Nerodia sipedon sipedon*	X		unlikely

The checklist also lists regionally occurring species that are considered unlikely to be present in the Ulao Creek Watershed, or are considered extirpated.

The most significant finding was the presence of the State Threatened Butler's Garter Snake (*Thamnophis butlerii*).

The Checklist includes a number of species, which have habitat and management considerations. The Butler's Garter Snake was found at only one location. Given its Threatened status, more surveys and habitat management assessments are warranted.



BIRDS

The bird survey was conducted early spring through October 2001. Eleven stations were visited for documenting bird calls and sightings.

The birding surveys were conducted under the technical leadership of Noel Cutright, a Terrestrial Ecologist with WE Energies.

The survey continued through October 2001 to utilize the fall migration activity. Special focus was given to areas where species of special concern were noted or where they would be expected.

"Bird diversity and abundance are indicators of the condition of watershed habitats, both terrestrial and wetland. To keep these biological indicators healthy, watershed conditions should be managed to encourage bird survival and reproduction. *from Birds, Bellweathers of Watershed Health*

Grassland habitats within the watershed are of special concern. Grasslands have been locally altered from wide-open expanses to fragmented patches.

Hedgerows can further fragment these areas. They often serve as line fence boundaries, but they can cause increased edge effect.

Not allowing natural fires to sweep across grasslands has allowed an increase in woody vegetation, often by invasive species, into the few remaining grassland habitats.

Studies have shown that desirable species of grassland birds are negatively affected when grasslands are encroached by woody vegetation. It has an overall negative effect on occurrence, density and nesting success of both game and non-game grassland nesting birds.

Grasslands in the Watershed need to be protected!

FISHERIES

The WDNR has classified the Ulao Creek as capable of supporting warm water fish species – including pike, bass, sunfish, bluegill, and crappie. WDNR fish surveys indicate northern pike, green sunfish, bluegill, white crappie, and largemouth bass inhabit the Creek.

Volunteer monitoring efforts have found that the central mud minnow *(Umbra limi)* was the most abundant species observed in the upper ½ to 1/3 of the watershed.

Field investigations have identified several elements limiting the quality of the fisheries habitat in this waterway. These limiting factors include:

- Siltation;
- Bank erosion; and
- Poorly vegetated banks.

Before the accelerated degradation accompanying suburban sprawl in the Watershed, the low marshy areas along Ulao Creek provided a spawning area for very large numbers of northern pike. A restored, protected Ulao Creek could return to this important function.

Ulao Creek empties into the Milwaukee River just north of Thiensville. Migrating salmon from Lake Michigan have been shown to travel as far as the Grafton Dam, several miles upstream of the Ulao Creek entrance to the River. A cleaner Ulao Creek, with more stable flows, would be an enhancement to the migration of the salmon.

RESTORATION DEMONSTRATION PROJECTS

One goal of the Ulao Creek Partnership (UCP) is to restore native plant communities to the Ulao Creek Watershed. As part of this project, the UCP established experimental demonstration plots to explore and demonstrate methods for effectively accomplishing two essential parts of the restoration goal:

1) replacement of reed canary grass monocultures with native plant communities, and
2) reintroduction of tree species lost during post-settlement disturbance to the Ulao Swamp.

Key areas with a unique combination of existing vegetation and hydrology were chosen for demonstration projects. Young trees and shrubs were planted in the spring (April 2001 and April 2002).

This aspect of the project will involve, and provide ownership to, the local community in several ways. The Ulao Creek Partnership, an alliance of citizens, landowners, and public and private organizations, will coordinate and direct the project.

Private and corporate (Wisconsin Electric Power Company) landowners have helped conduct the field surveys install the vegetation, and have agreed to maintain, and monitor restoration plantings on their own land.

The Ulao Creek Partnership will summarize the findings related to the restorations in an easily understandable format. This information will be made available to the local community.

The long-term, continuing progress toward restoration of the Ulao Creek and Swamp will help to make the wetland a focal point of community development plans. Local government support of the effort to improve the diversity and quality of the Ulao Swamp will be a win-win proposition for local communities.

There were key reasons for conducting the restoration:

- To involve and provide ownership of the project to local citizens;
- To improve wildlife habitat by replacing lost woody vegetation species and cover;
- To improve water quality by re-stabilizing and enhancing stream banks and re-vegetating riparian buffers; and
- To explore the feasibility and success of controlling/eliminating invasive reed canary grass populations over time by shading their environment.

Re-foresting certain areas along the Creek corridor and in certain areas of Ulao Swamp has several advantages. First, the dominant pre-settlement vegetation in this area was forest, including the southern lowland forest, mesic forest and dry forest communities. Also, it will require less active management time and effort than a community dominated by invasives. Larger forested tracts are regionally scarce and the woodland fragments that remain have no sure protection from future development.

The areas selected were forested floodplain areas that had lost substantial forest cover and had been invaded by reed canary grass. Areas completely dominated by dense reed canary grass were not selected, as it was feared the reed canary grass would out-compete the newly planted vegetation.

Tree Planting at Falls Road – April 2001, 2002

Located north of Falls Road along the floodplain of Ulao Creek. This site is underlain by Sebewa silt loam (mineral), and is typical of heavily infested reed canary grass areas on mineral soils along the Ulao Creek floodplain. This area's pre-settlement vegetation included silver maple, American elm, black willow, cottonwood, green ash, swamp white oak, basswood, and red maple.

These sites will be monitored by volunteers to evaluate the number of trees surviving over time as well as to document if the thick areas of reed canary grass become reduced.

The trees were obtained from the WDNR, Ozaukee County and Washington County Land and Water Conservation Departments. The trees ranged in size from 2-4 feet in height. About twenty volunteers joined together on a cold rainy Saturday to help plant a total of 425 bare root trees.

To examine the effectiveness of controlling the reed canary grass through shading from the planted woody vegetation, as well as the ability of the woody vegetation to successfully compete with the reed canary grass, the two plots were planted at different densities. Plot one was planted at approximately twice the density as Plot two.

In all sites, the trees were planted in a random manner and marked with a flagged wire, color-coded to the tree species.

The planting areas were located on the north side of Falls Road, just east of where the road crosses the Creek. Three main areas were planted in adjacent, transitional zones along the eastern bank of Ulao Creek. The planting zones transitioned from wetter (bankside) to dryer (upland meadow/ floodplain forest edge).

***Creek Bank Zone*:**		*Upland Zone*	
Bur Oak	25	Red oak	25
Swamp White Oak	75	Paper birch	50
Elderberry	75		
Serviceberry	60		

***Transitional Zone**:*

Bur Oak	25
Swamp White Oak	25
Elderberry	25
Serviceberry	40

U.S. Fish and Wildlife Service Site

Located east of Ulao Parkway in Ulao Swamp, this site is underlain by organic muck, and is frequently flooded above the surface. This location exemplifies sites heavily infested by reed canary grass on organic soils along the margins of Ulao Swamp. The pre-settlement vegetation included white cedar, tamarack, black ash, green ash, yellow birch, paper birch, American elm, and red maple.

It was determined that this site was not feasible for planting since USFWS determined that planting trees along the tributary would hinder waterfowl production.

Ulao Parkway Site

Green ash and black ash are still common in the Ulao Swamp. White cedar, tamarack, paper birch, yellow birch, and red maple have been greatly reduced in numbers in this area. A hummock structure is still in place and the current vegetation is a flood damaged hardwood forest typical of many areas of the swamp. Very few, perhaps none, of these species may establish if they are planted where their roots are submerged for most of the growing season. In a natural swamp these species would grow on the hummocks, or higher mounds, on the muck soil.

This area was planted with white cedar, tamarack, yellow birch, paper birch, and red maple in a variety of locations to test methods for reintroduction of these species. The trees were installed at the same approximate density as the density of hummocks presently found in the swamp (1,600 / acre). This is higher than the density that these species would be found in a mature forest, but planting at a high density in a small area was thought to make following the establishment success easier. A total of 1,500 trees were planted in an approximately two-acre area.

The Partnership will continue to plant and monitor trees within designated areas of the Watershed, as well as to evaluate its efforts towards woodland restoration.

The volunteers monitor the following parameters:

- Temperature
- Turbidity
- Dissolved Oxygen, and
- Biotic Index

"Multiple stream indicators are needed to fully understand a watershed's dynamics over time. For example, fish may be a good indicator of broad habitat change, but may not always capture subtle changes in water chemistry, flow frequency or site modifications. Other indicators, such as aquatic macroinvertebrate surveys and direct habitat measurements, are often important pieces to complete the watershed "puzzle."

"The findings from the Tuckahoe Creek (Virginia) study are consistent with other stream ecology research that have discovered that a relatively small degree of watershed development can produce a dramatic change in the biological diversity of streams."

Historical Change in a Warm water Fish Community in an Urbanizing Watershed, Technical Note #93 from Watershed Protection Techniques 2(4), by the Center for Watershed Protection.

VOLUNTEER INVOLVEMENT AND COMMUNITY OUTREACH

The *WDNR 2001 State of Wisconsin's Natural Resources* report, the use of citizen water quality monitors is vital to providing a more complete picture of the quality of an area's waterways. Limited staff and resources resulted in a lack of data on Wisconsin's overall water resource quality. To address these concerns, the WDNR has developed a program for citizen water quality monitors that support standard assessment techniques for recording water chemistry and macroinvertebrate communities.

Tom Dueppen, with the Ozaukee County Land and Water Conservation Department, has worked to develop a comprehensive volunteer monitoring program within the Ulao Creek watershed. As shown on the map presented in the Appendices (Figure 5), the Ulao Creek volunteers currently monitor 6 sites.

The volunteer monitors have been trained according to a WDNR accepted protocol to ensure that parameters are measured in the same manner, and can then be compared across sites and over time. This program has been operating since 1999. Supported by the Ozaukee County Land Conservation Department, it is anticipated that this program will continue.

The following are the findings from their 1999 – 2002 monitoring:

- *Average temperature – approximately 64 degrees F, with high temperatures of 72-74 degrees F in mid-late July.*
- *Average turbidity ranges from 10-20 NTUs, with highs of 30-40 NTUs in mid August.*
- *Average oxygen concentrations of approximately 7.0 mg/L and 76% saturation. The highs and lows were variable.*
- *Average habitat score was 37.*
- *Average biotic index ranged from 1.75 to 2.0.*
- *Central mud minnow (Umbra limi) was the most abundant fish species observed – especially in the upper ½ to 1/3 of the watershed.*

Based on these volunteer findings, the following conclusions could be made:

- *Brook trout and small-mouth bass can survive within this watershed, however they prefer cooler waters (55-65 degrees F)*
- *Greater than 25 NTUs is a long-term limit for aquatic life. Therefore, the low flow events noted in August did not pose a concern at this time.*
- *Trout and stoneflies require 6 mg/L or greater levels of oxygen. Therefore, the variable oxygen levels will result in reduced biodiversity.*
- *The habitat scores were slightly above average, however the biotic index indicated poor stream health.*

In 2001, the monitoring program expanded to address hydrologic concerns. The Ulao Creek Partnership installed four flumes (see Figure 6 in the Appendices) to measure the baseflow of several stream sections and to estimate the affect these streams have on the current flow characteristics of Ulao Creek. The baseline information

would assist in watershed management practices: i.e. reduce flooding, increase understanding of dry-weather stream flows, improve water quality, and produce better game fish nursery areas.

The H flumes were designed/constructed for the Ulao Creek for use in stream sections no greater than 1 foot deep and a maximum flow rate of slightly less than 2 cubic feet per second.

Based on what is presently known about Ulao Creek's flow regime, the dry weather-baseflow of the stream is 50 gallons per minute (gpm) or less, while the spring baseflow may be two to four times higher. Consequently, the flume's capacity of 1.92 cfs (roughly 860 gpm) will be able to monitor all baseflows, and the effect of modest rainfall and snowmelt events.

The instruments to measure the flow rates were installed by Northern Environmental Technologies and maintained by Ozaukee County personnel and members of the Ulao Creek Partnership. The flumes were installed in riffle areas where the streambed is composed mainly of gravel, and where an appreciable slope exists.

An electronic pressure transducer and data logger were used to record water levels in the flumes at 30-minute or other appropriate intervals. The data is downloaded and processed monthly. To assure that valid data are produced, the flume installations are regularly inspected (approximately every 2 weeks). It is anticipated that these monitoring activities will continue for 2-3 years.

COMMUNITY EDUCATION AND OUTREACH

The involvement of local landowners and volunteers was encouraged. Several programs were held to inform the public about the project – the goals, methods, and value.

For example, the Ulao Creek Partnership made presentations to the local County, Town, Village and City Boards to demonstrate to the local governments how their support and enthusiasm for the project would benefit their communities. An Open House and informational meeting was held in May 2001 in the Town of Grafton. A number of family-oriented, hands-on demonstrations were presented, and over 100 people attended.

In addition, steps have been taken to educate the general public regarding the uniqueness of Ulao Creek and its watershed, and the natural resources it supports.

A brochure, The Flora and Fauna of the Ulao Creek Watershed, was produced for distribution to local municipal officials and landowners within the watershed. This brochure serves as an important informational and educational outreach tool. A copy of this brochure is presented in the Appendix.

The project coordinator and herptile survey team leaders have worked for several months with two classes of Concordia University ecology and zoology students. The students were trained to provide assistance in the field in conducting portions of the herptile surveys. In May 2001, a third science class of college students began working with the Project Coordinator and Team Leaders.

LANDOWNERS AND COMMUNITY VOLUNTEERS

The Ulao Creek Partnership worked with volunteers who became interested in the projects through a number of outreach venues:

- Local special interest stories,
- Newsletter articles of the Land Trust and Ozaukee County Land Conservation Department,
- A booth at the Ozaukee County Fair;
- Direct mailings to interested landowners and citizens, and
- Announcements to conservation organizations.

The Ulao Creek Partnership successfully worked with local area high school and middle school science teachers to design ways for their school groups and classes to have meaningful involvement in both the creation and monitoring of restorations. Concordia University provided local support by involving their Ecology and Zoology classes. Carroll College and UW – Milwaukee also have a number of interested students who served as volunteers.

Many new volunteers have participated in the survey work. Some of the volunteers include interested landowners and college students specializing in undergraduate and graduate level studies in botany, zoology, and ecology, along with teachers and naturalist-educators.

The first issue of the Ulao Whistler, the newsletter of the Ulao Creek partnership, was recently distributed to approximately 600 landowners in the Ulao Creek watershed. It is also available to the public at the Ozaukee County Land and Water Conservation Department and via the Partnership's website (**www.ulaocreek.org**). A copy of this newsletter is presented in the Appendix.

To communicate the project-related activities and goals of the Ulao Creek Partnership, a targeted program to provide outreach included encouraging media coverage.

- Tom Dueppen presented the Ulao Creek Partnership and its work under the River Protection Grant at the annual meeting of the ***Wisconsin Association of Land Conservation Employees (WALCE)*** in February 2002. Ginny Plumeau also attended and answered questions about the Partnership's work and mission.

- ***Tree Planting Day*** was held at Falls Road on April 22, 2002. Community volunteers assisted in planting a demonstration area with a diversity of tree species to help determine if dense stands of trees help to shade out and control reed canary grass, and to facilitate the restoration of the lowland and floodplain forest.

- Two segments from the ***Outdoor Wisconsin*** taping were aired early this spring. The segments had a number of featured speakers talking about the Partnership and the River Protection Grant. The features nicely demonstrated various aspects of the herptile surveys, stream monitoring activities, children's educational programs, as well as volunteer and technical partner involvement.

- A display booth was set up at the ***Ozaukee County Fair*** in August 2001 and 2002, featuring many of the highlights of the survey work, water quality monitoring, and purple loosestrife management.

- An open-to-the-public ***Volunteer Training*** meeting was held February 20, 2001, featuring ***Gary Casper and the herptile survey*** work. Approximately forty people attended this weeknight session.

- The project coordinator and herptile survey team leaders trained students from several ecology and zoology classes of ***Concordia University.*** These students later assisted in portions of the field herptile surveys.

- Press releases and announcements were sent to local newspapers to assure special interest coverage. In honor of Earth Day, Don Behm of the ***Milwaukee Journal-Sentinel*** published a widely read three-page article (Sunday, April 22, 2001) about the Ulao Creek Partnership and their work through the River Protection Grant. Another article, published in July, featured Jill Hewitt's excellent flora survey work in the swamp.

- A well-attended tree-planting day was held at Ulao Swamp on April 28, 2001. About 25 volunteers helped to plant over 2,000 trees in a swamp forest restoration plot.

- A ***Demonstration Field Day*** was held May 17, 2001. Dan Small with ***Outdoor Wisconsin*** (Channel 10) invited his film crew out to shoot a day full of activities for presentation in two television shows. Almost all of our technical leaders and volunteers were present to host a number of roadside-visible demonstrations about land use management vision, flora and fauna surveys, tree planting and more. Several families, including about 25 home-schooled children, attended the field day events.

- A ***community-oriented Open House*** took place May 31, 2001. Over 100 people attended the Open House, including area families and policymakers. A number of booths and some hands-on activities were planned to help visitors and volunteers learn more about Ulao Creek Partnership and the River Protection Grant. The Open House featured plants and animals of the Ulao Creek Watershed.

PART 2: ULAO CREEK WATERSHED

STEWARDSHIP AND RESTORATION

ECOLOGICAL CONCERNS IDENTIFIED WITHIN THE ULAO CREEK WATERSHED

The surrounding land use, hydrology, and vegetation of the Ulao Creek Watershed have changed with time, affecting the quality of its natural resources. This Restoration and Stewardship Plan was prepared to begin to address the concerns identified through various studies and to develop goals and objectives for long-term management and improvement.

As presented in Part 1 of this report, the ***WDNR's State of the Milwaukee River Basin 2001 Report*** identified the following general threats to the stream water quality in the Milwaukee River South Watershed, which includes Ulao Creek:

- Stream and wetland modification;
- Urban and agricultural runoff;
- Municipal and industrial point source pollution;
- Construction site erosion,
- Stream bank erosion; and
- Contaminated sediments.

In 1999, the citizens of Ozaukee County completed a mail survey as part of the development of the Ozaukee County Land and Water Resource Management Plan. In this survey, they identified and prioritized their issues and concerns regarding local natural resources within Ozaukee County. Their top issues are listed below:

Mail Survey Results – Top Five Issues

Rank	Issue
1	Loss of prime agricultural lands due to urban sprawl
2	Destruction of wetlands
3	Groundwater pollution
4	Fragmentation and loss of wildlife habitat
5	Pesticide use (herbicides, insecticides, etc.)

Having explored the natural resources of this watershed, the Ulao Creek Partnership identified specific concerns. These concerns correspond very closely to the issues set forth by the citizens of Ozaukee County.

WETLANDS, ULAO SWAMP AND HYDROLOGY

Continued impacts and loss of wetlands plague the Ulao Creek Watershed.

Ulao Swamp

Only a small number of conifer swamps remain in southeastern Wisconsin; most of this vegetation type has been lost to disturbance. Forested wetlands are the most difficult to restore.

Swamp is slowly changing to marsh – not forest, primarily due to flooding.

As stated in Jill Hewitt's thesis:

> "Surface water runoff from a dramatic increase in rural development, documented by the 1995 and 2000 aerial photographs, may now flow directly and indirectly into the swamp, possibly contributing to increased tree mortality."
>
> "Current vegetation structure, composition and condition of the Ulao Swamp is intricately linked with post-settlement land uses and disturbance regimes occurring in and around the wetland. Alteration of vegetation cover and hydrology has promoted setbacks to the natural hydrarch succession of the lowland forest, creating the degraded forest and patches of cattail marsh, sedge meadow, and shrub communities present in the swamp today."

Jill Hewitt further states in the Ulao Whistler (the Ulao Creek Partnership newsletter):

> "Since the Government Land Survey 167 years ago, the tamarack population has disappeared, the beech population has been reduced greatly, and only a small amount of cedar remains in the northern portion of Ulao Swamp. The current vegetation is a mosaic of degraded hardwood swamp (snags and damaged trees), southern wet-mesic forest, shrub-carr, alder thicket, southern and northern sedge meadow, and southern cattail marsh. Active and fallow agricultural fields, commercial development, and private homes have largely replaced the pre-settlement beech-maple forest surrounding the swamp."
>
> "Due to the complexity of the wetland hydrologic regime as well as impulsive anthropogenic influence on the area, it is difficult to predict the future course of the Ulao Swamp vegetation. My data suggest that ash and maple species may survive the flooding, and the wetland could regenerate an ash-maple hardwood forest, providing the future environmental requirements of these species are met. American elm remains susceptible to disease and will not become a future dominant in the swamp canopy. Recent plantings of tamarack and cedar seedlings may avoid the high water levels by clinging to the numerous hummocks created by the fallen trees and associated debris. Given the historical and present disturbance regime of Ulao Swamp, future changes in the vegetation of the lowland forest will be interesting to record."

"When natural groundcover is present over an entire site, normally 10% of precipitation runs off the land into nearby creeks, rivers, and lakes.

In contrast, when a site is 75 – 100% impervious, 55% of the precipitation runs off into these receiving waters.

However… the runoff rates can be reduced if developers take mitigating actions to develop and implement BMPs to control flooding or runoff."

USEPA

Clearly, if there is a desire to protect and maintain the forested swamp ecosystem of the Ulao Swamp, efforts must be made to address the generation and movement of stormwater runoff within this watershed.

Hydrology

The hydrology of the watershed must be considered given the identified concerns of surface and ground water quality, habitat protection, flood control, and stream and wetland alterations. The hydrologic cycle points out the interlocking aspect of all the land uses and land cover within this watershed.

In early 2002, the Ulao Creek Partnership helped create the **Hydrology Study Group,** comprised of landowners, scientists, and local municipal representatives, to examine the hydrologic data already collected, identify issues important to the vitality of Ulao Creek and Ulao Swamp, and set goals to protect and/or improve the creek and swamp habitat. Some of the issues identified by the group include:

- Higher than normal water levels in the Ulao Swamp;
- Vegetative change in the Ulao Swamp from a lowland forest to marsh;
- Low to no base flow in the creek during drought conditions; and
- Invasive species encroachment such as reed canary grass, hybrid cattail, and purple loosestrife.

With a desire to maintain/restore Ulao Creek to a stream suitable for providing nursery areas for migratory cool water game fish, the Hydrology Study Group established three goals:

- Prevent further decline of the forested wetland community in the Ulao Swamp;
- Control the spread of invasive species, with particular emphasis on the Ulao Swamp and the corridor immediately adjacent to Ulao Creek; and
- Stabilizing or increasing dry weather base flow for the benefit of aquatic and riparian plants and animals.

In studying the creek morphology, this group found large volumes of soft sediment trapped by piles of partially buried woody debris. Anecdotal information indicates that the creek was much deeper in the late 1960's.

Extrapolating from these facts, the group developed a hypothesis that the excessive woody debris within the creek has functioned to degrade the stream channel and raise the water level of the Swamp's discharge point and hence, the water level within the Swamp.

The theory continues that if the excessive woody debris were cleared from the creek channel, natural processes would return the streambed to a lower elevation. Lower water levels would allow

lowland hardwoods to survive areas that now flood for much of the year.

Streets, parking lots, rooftops, and other impervious surfaces all contribute to urban runoff.

Parking lots generate almost 16 times as much runoff as an undeveloped meadow.

Watershed Imperviousness

Research has shown that as the percentage of impervious cover increases within a watershed, biodiversity decreases.

Research conducted within Wisconsin (Bannerman 2001) found that once the level of connected imperviousness within a watershed reaches about 10%, streams tend to become be unstable – supporting poor diversity of fish and aquatic life due to poor water quality.

In 1995, the Ulao Creek Watershed had reached 9.6% imperviousness, as shown below.

IMPERVIOUS AREAS WITHIN THE ULAO CREEK DRAINAGE AREA: 1995

Percent Impervious	Acres	Percent of Drainage Area
75 – 100	797	9.6
50 - 74	47	0.6
20 – 49	155	1.9
10 – 19	558	6.8
< 10	6,689	81.1
Total	8,246	100.0

Source: SEWRPC

According to the EPA, urban runoff has increased throughout the United States since World War II - *"This increase is directly related to growth in the amount of impervious surfaces due to urban and suburban development and the construction of roads, highways, and other impervious surfaces."*

Recent research finds that the change from pervious to impervious surfaces dramatically alters the movement of water through a system:

- Less water infiltrates to groundwater;
- Surface runoff flow quicker to waterways;
- Increased water flow rates cause increased erosion;
- Sediments and nutrients are carried off site by the increased flow rates;
- Streams exhibit greater water level fluctuations (flashiness);
- Stream base flows are greatly reduced; and even
- Water temperature (and hence evaporation rates) is altered.

An examination of the watershed's composition of impervious surfaces, and their level of connectedness is vital to understanding and managing the hydrology of the system. The ***Center for Watershed Protection*** **summarizes** the importance of the role impervious surfaces play in our watershed and ultimately in our watershed management plans:

As the amount of paved and covered surfaces within a watershed grows, streambeds are widened, flooding is increased, and groundwater recharge is reduced.

As the amount of impervious surface within a watershed rises above 10%, impacts on local water bodies are significant.

Beyond 30% they are quite damaging.

The most recent National Water Quality Inventory reports that runoff from urban areas is the leading source of damage to estuaries and the third largest source of water-quality damage to lakes.

> *"Recent research has revealed a strong relationship between impervious cover and various indicators of stream quality. But while more than 40 scientific studies have confirmed this general relationship in different regions of the country (Sturm, in press), only a handful have directly explained how much impervious cover is produced by different urban land uses or zoning categories.*
>
> *… Impervious cover is an excellent index of watershed development, and can be used to predict potential stream quality within subwatersheds, identify which are most vulnerable to future development, and guide watershed zoning and protection efforts."*
>
> *(Land Use and Impervious Cover in the Chesapeake Bay Region, K. Cappiella, K. Brown, Watershed Protection Techniques Urban Lake Management, v 3 n 4 Dec 2001.)*

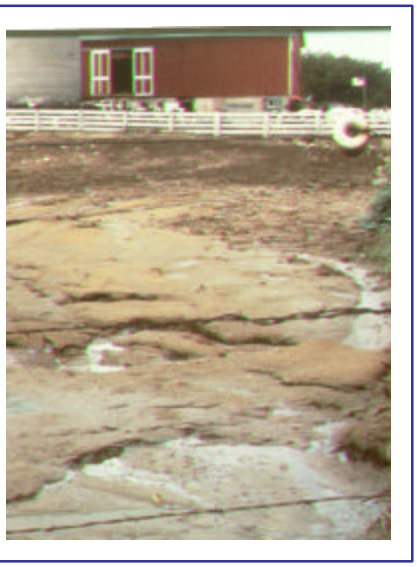
Floodplain ordinances set minimum standards for construction in floodplains in order to protect upstream and downstream properties from potential floodwaters.

According to the ***Ozaukee County Land Guide***:

> "The incorporated areas (Cities of Mequon, Cedarburg, and Port Washington, and the Villages of Thiensville, Grafton, Saukville, and Fredonia) administer their own floodplain zoning ordinances. The Ozaukee County Board of Supervisors has adopted a county floodplain ordinance that is effective in all unincorporated areas of the county (the 6 towns)."

The WDNR will enforce administrative rules that apply to stormwater management. Administrative Code Chapter NR 216 deals with stormwater discharge permits for municipalities as well as from private industry. Chapter NR 151 deals with water quality performance standards from transportation facilities and agricultural operations. Municipalities and construction sites that disturb more than one acre within the Watershed must comply to the greatest extent possible with these permit requirements.

The Watershed is at a critical point. Managing stormwater runoff and limiting development in floodplains and lowlands has become imperative.



AGRICULTURAL LANDS

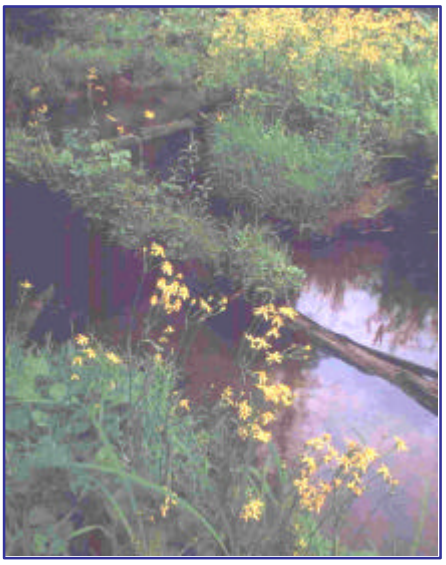
According to maps prepared by SEWRPC and the Ozaukee County Land and Water Resource Management Plan, much of the agricultural soils in the Ulao Creek watershed are classified as having moderate to severe erosion potential. Intensive agricultural practices have caused considerable amounts of eroded soils to reach the waterways within the Ulao Creek watershed.

A stated goal of the Ozaukee County Land and Water Resources Management Plan is to "Reduce cropland erosion to "T" or lower, and reduce sediment delivery by 50% in Agricultural Shoreland Management Areas (ASMA) to improve water quality of rivers, streams, and lakes. A second goal is to have vegetative buffers on all perennial and intermittent streams. A related goal identified in the Management Plan is to reduce phosphorus delivery to surface waters by 50% from agricultural runoff within the ASMA.

According to the Ozaukee County Land Conservation Department, currently there are 30-foot wide vegetative buffers only along 90% of the perennial streams within the Ulao Creek watershed, but only 65% of the buffers are 150 feet or wider.

Furthermore, there are few eligible lands participating in the statewide Cropland Reserve Enhancement Program (CREP) or other similar buffer cost sharing program.

Approximately 35% (approximately 5,000 feet or 40 acres) of the perennial streams are eligible, and all of the intermittent streams.



HABITAT CONSERVATION ISSUES

Research has found that greater wildlife diversity occurs in regions where habitats are connected by hydrologic corridors. Drainageways are important transportation corridors. In addition to the movement of floodwaters, these drainageways allow for the movement of wildlife.

According to the ***Ozaukee County Land and Water Resource Management Plan***:

> "Ulao Creek has the potential to support a balanced warm water forage fish community and partial body contact forms of recreation.
>
> Importantly, the creek is the only major tributary to this section of the Milwaukee River that supports northern pike spawning. The stream is only partially meeting its recreational and biological potential.
>
> Primary problems affecting recreational use include excessive fecal bacteria counts and habitat loss from sedimentation. In addition, the stream and its 13 tributaries suffer from extensive channelization and the loss of wetlands."

The following findings were taken from ***The Marsh Monitoring Program: 1995 – 1999 Monitoring Great Lakes Wetlands and Their Amphibian and Bird Inhabitants***, prepared by the U.S. EPA and the Great Lakes Protection Fund. Their concerns generally mirror those of the Ulao Creek Watershed partners:

> *"A high proportion of the Great Lakes basin's wildlife species inhabit wetlands during part of their life cycle, and many of the* ***species of special concern*** *in the basin are associated with wetlands. As a group, marsh birds are believed to have experienced population declines due to historical habitat loss and degradation, but it is unknown whether, and to what geographic extent, these declines are still occurring (Gibbs et al., 1992; Conway, 1995; Melvin & Gibbs, 1996). Similarly, there is growing international concern about declines of amphibian populations and an apparent increase in deformity rates (Heyer et al., 1994; Stebbins & Cohen, 1995).*
>
> *About two-thirds of the birds and three-fourths of the amphibians federally listed as threatened or endangered in the U.S. are associated with wetlands (Mitsch & Gosselink, 1993). In Ontario, at least 10 bird species of conservation concern are closely associated with Great Lakes coastal wetlands (Austen et al., 1994). Although much is known about many species of Great Lakes land birds, the ecology of most marsh-dependent species has received much less attention and very little is known about rails and many other secretive species (Gibbs et al., 1992; Conway, 1995; Melvin & Gibbs, 1996). Marsh birds are believed to be sensitive to habitat disturbances, and many scientists and conservationists consider their populations to be at risk due to the continuing loss and degradation of their habitats.*

Many amphibian species, including two species of conservation concern (Blanchard's Cricket Frog and Fowler's Toad), are closely associated with Great Lakes coastal wetlands (Green, 1992; Oldham, 1992). Because frogs and toads are relatively sedentary, have semi-permeable skins, and breed in and adjacent to aquatic systems, they are likely to be more sensitive to, and indicative of, local sources of contamination to wetlands than most other vertebrates (Stebbins & Cohen, 1995)."

REPTILE AND AMPHIBIAN HABITAT

The most significant finding was the presence of the State Threatened Butler's Garter Snake (*Thamnophis butleri*).

The Checklist in Table 4 includes a number of species, which have critical habitat and management considerations.

The Butler's Garter Snake was found at only one location. Given its Threatened status, more surveys and habitat management assessments are warranted.

The most important management issue for preserving a healthy amphibian community is to view breeding ponds as ecological hubs, which support a very large biomass of frogs and salamanders in the surrounding landscape.

These pond hubs are where all reproduction occurs, and amphibians fan out from there to complete the rest of their life cycle. Studies have shown that about a **1,000 foot buffer is needed around a breeding pond** to provide for the terrestrial habitat needs of adult amphibians.

Impaired quantity or quality of terrestrial habitat will directly reduce frog and salamander numbers on the entire landscape served by the breeding pond. **The best terrestrial habitat is generally restored to pre-settlement conditions. This needs to be evaluated before management proceeds**. Breeding ponds can be marshes, shrub wetlands, seasonally flooded swamps, or isolated discrete ponds.

What is important for amphibians is a hydroperiod that precludes fish. In addition, it must last long enough for larval development to complete.

These same conditions favor many aquatic invertebrates, such as fairy shrimp, water beetles, dragonflies, and damselflies. Also, many birds depend upon these food resources (invertebrates and amphibians) in spring, for example, wood ducks, pintails, sandhill cranes, and spotted sandpipers.

This Stewardship Plan recommends, provisions for appropriate amphibian aquatic and terrestrial habitat, which must be identified by characterizing wetland types, applying a landscape buffer of 1000 feet from wetland boundaries, and assessing terrestrial habitat management within this buffer.

Findings: Reptile and amphibian species were poorly represented in the Watershed. Most of the amphibians rely on wetland pockets and ephemeral woodlands for their survival.

Butlers Garter Snakes, a state threatened species, were found in one area only of the Watershed, and were rare. More surveys are needed to determine their true range and occurrence within the Watershed.

Primary concern: Habitat loss due to urbanization and development pressure.

The most significant ecological issue: Maintenance and enhancement of a fairly diverse community of frogs, toads and salamanders. These fall into two general ecological groups - terrestrial and aquatic.

Most important management issue for preserving a healthy amphibian community: View breeding ponds as ecological hubs.

Small agricultural wetland pockets should be preserved and improved to increase their quality and diversity.

Restoration of prior converted wetlands should be encouraged.

Ephemeral and wooded wetlands should be stringently conserved and protected.

Buffers around these areas should be installed and/or protected.

Another easily managed issue is the cessation of fish introductions, and the removal of fish from wetlands which would not normally support them, in order to improve amphibian and invertebrate communities.

These stewardship initiatives would convey benefits to most wildlife in the watershed by increasing primary productivity and improving habitat quality.

The most significant ecological issue is maintenance and enhancement of a fairly diverse community of frogs, toads and salamanders. These fall into two general ecological groups - terrestrial and aquatic.

Terrestrial amphibians are those which spend most of their life cycle on land, in the soil, vegetation and duff of forests and fields. They have aquatic egg and larval stages, however, and hence require wetlands to breed. Generally, adults are in these wetlands only for a few days or weeks per year. Eggs and larvae may occupy wetlands for weeks or months.

The wetland types used by this group are mostly temporary isolated ponds, seasonally flooded wetlands, and permanent deep ponds if no fish are present. This group avoids permanent lakes and streams. In the Ulao Creek watershed, Blue-spotted Salamanders, Eastern Tiger Salamanders, Eastern American Toads, Western Chorus Frogs, Northern Spring Peepers, Gray Tree frogs, and Wood Frogs fall into this category. These species are found throughout the watershed where breeding ponds are available in landscapes with appropriate upland terrestrial habitat.

Northern Leopard Frogs are somewhat unique in having an even more complex life cycle, with three distinct habitat needs: temporary ponds or seasonally flooded wetlands for breeding, terrestrial uplands for summer feeding (meadows are preferred), and permanent lakes and streams for hibernation. The other members of the terrestrial amphibian group hibernate on land.

Aquatic amphibians spend most of their life cycle in or very near permanent water bodies, such as lakes, streams and deep ponds. In the Ulao Creek watershed, only Northern Green Frogs and American Bullfrogs fall into this category. Northern Green Frogs were extremely abundant in 2001 surveys, American Bullfrogs less so and more localized. These two species are generally very tolerant of disturbed conditions such as pollution, siltation, fish introductions, and invasive plant species. In fact, such disturbances often convey competitive advantages to these species, which then out compete other, less tolerant, species, such as those in the terrestrial group.

An example of this shift in amphibian communities resulting from disturbance is when fish are introduced into previously fishless deep ponds. Northern Green Frogs and American Bullfrogs are tolerant of fish, but amphibians in the terrestrial group are not (fish out compete amphibians for food and directly prey on amphibian eggs and larvae). The result is a loss in amphibians species diversity in the community served by these ponds, with a cascading impact to the surrounding terrestrial communities, if these amphibians no longer have enough breeding sites available.

BIRD SURVEY

Findings: Almost 200 species of birds were identified within the watershed. Many utilize the wetlands, woodlands and grasslands for food and cover during migration.

Primary concern: Habitat loss due to increasing urbanization and development pressure.

Recommendations:

- Continue to periodically survey, monitor and evaluate the presence or absence of bird species within the Watershed.
- Develop habitat-specific management objectives.
- Identify and initiate habitat enhancement/restoration projects specifically for avian management.

AVIAN HABITAT

Many species of waterfowl, raptors, shorebirds, upland game birds and songbirds rely on grasslands within the Ulao Creek Watershed for nesting and other habitat needs. Population fluctuations have coincided with changes in land uses and agricultural practices ***(October 1999 Fish and Wildlife Habitat Management Leaflet Number 8)***. Many grassland-nesting birds species have experienced marked population declines in recent years. This has increased awareness for the need to preserve, manage, and restore adjacent grassland habitat.

Developing habitat-specific management objectives will be an important step for improving avian habitat within the Watershed. Maintenance, management, and restoration recommendations to improve targeted avian habitats need to be developed for sensitive grasslands, wetlands and woodlands.

Certain enhancements by landowners could include installation of species-specific nesting boxes or platforms. In woodland areas, several steps could be taken to improve the quality of wildlife habitat. If selective cutting is performed to manage invasive woody species, cut branches and brush can be left in consolidated piles for use by birds. In addition, dead snags and fallen trees should remain, since these are useful to birds and other wildlife for nesting, burrowing, and foraging.

Targeted woodland management plans should be developed by landowners for Ulao Swamp and larger blocks of forested lands within the watershed.

According to the ***Ozaukee County Land and Water Resource Management Plan*** (October 1999), "Woodlands can and should be maintained for their total values – scenic, wildlife, educational, recreational, and watershed protection – as well as for their forest products. Under balanced use and sustained yield management, woodlands can serve many of these benefits simultaneously."

Woodland management plans should include provisions to maintain any woodlands dominated by oaks. Oaks offer desirable browse for certain ground-foraging birds and provide nooks for cavity nesters. The deep furrowed bark attracts insects that in turn support bark-gleaning birds. The horizontal branches are attractive to turkeys for roosting. Acorns are indispensable to a variety of wildlife for food, especially in winter when food supplies are scarce and energy costs of keeping warm are high. The list of species that feed on acorns is long and includes wild turkeys, ruffed grouse, wood ducks, woodpeckers, ring-necked pheasants, and numerous other species.

Hedgerows, too, play an important role in rural landscapes, providing habitat, food, and travel corridors. Hedgerows (line fences) are strips of woodland that grew along old farm field fence lines. They were frequently allowed to remain as the surrounding land was cleared for agricultural purposes. The vegetation in these areas is important for trapping windblown sediments from adjacent farm fields and providing cover for a variety of songbirds and raptors. Hedgerows serve as safe haven travel routes through open land zones.

Any ephemeral pools within the watershed should be considered critical habitats. In addition to their wetland value for maintaining water quality, many bird and other species of wildlife utilize these areas as a source of water (when present) and for foraging sites due to the abundance of invertebrate prey. The presence of ephemeral pools adds to much needed habitat diversity.

Shallow marsh communities provide many benefits to birds and should be protected whenever possible from degradation due to filling or draining. Birds use shallow marshes for nesting in the summer and roosting in the fall. Marsh wrens, for example, utilize cattail marshes for foraging and nesting. The emergent vegetation offers winter cover and supplies nesting substrate for many species of birds. An increased diversity of bird species could be attracted to marshes within the watershed through the installation of species-specific nest boxes or platforms. Supplemental planting with native plant species, and control of exotic and invasive plant species, would be beneficial, as well.

"Bird diversity and abundance are indicators of the condition of watershed habitats, both terrestrial and wetland. Watershed conditions should be managed to encourage bird survival and reproduction. To protect resident birds and migratory species, here are some general considerations for protecting birds and their habitats:

- Both nesting and foraging habitat for resident birds should be protected from habitat loss and degradation, non-native species, and pollutants.
- Protect nesting habitat from temporary disturbances during the breeding season, so that nesting birds are not disturbed.
- For migratory species, protect critical nesting, foraging, or stop-over habitat.
- Protect and restore the habitat conditions sensitive species require.

Taken from Birds, Bellweathers of Watershed Health

Even though these plant communities are wetlands, bottomland hardwoods have limits to the amount of flooding they can withstand before a shift to a wetter plant community establishes itself, like alder thicket or shallow marsh.

A drastic change in water levels did not allow time for establishment of more water tolerant trees or a well- diversified shallow marsh community.

Often, aggressive reed canary grass will dominate the dead tree stands.

INVASIVE SPECIES

The cumulative loss of habitat from invasive species cannot be overstated. The most common invasive wetland plants are reed canary grass, purple loosestrife, buckthorn, and honeysuckle. These species may present greater problems in the future, and should clearly be addressed within this management plan.

Reed canary grass *(Phalaris arundinacea)*

Reed canary grass is one of the most prolific exotic species that invades wetlands throughout the United States. This grass has the ability to out compete most wetland herbaceous vegetation and forms dense monocultures blanketing poorly drained areas, stream banks, and lakeshores. The thick sod created by this grass's aggressive rhizomes reduces biodiversity. It was introduced from Eurasia as an agricultural plant for pasture, silage, and hay.

Dominant throughout the majority of wetlands within the Ulao Creek watershed, this species is among the top priority species to be considered for management throughout the watershed. Furthermore, this invasive species has acclimated to drier soil conditions and is also growing in undeveloped upland fields scattered throughout the area.

Reed canary grass is especially prevalent in the floodplain wetlands associated within Ulao Creek. It occurs in dense monocultures throughout the watershed where lowland forest communities with dense canopy growth do not exist. It is also located within younger stands of forest where the canopy of the trees is more open and allows sufficient sunlight through to the forest floor. This grass also dominates the majority of the open wet meadows within the watershed

Purple Loosestrife *(Lythrum salicaria)*

As a colorful flowering plant, purple loosestrife displays bright purple flowers throughout the latter part of June through July. This plant was first introduced to the United States as an ornamental garden plant from Eurasia. It now thrives in wet communities throughout the country and is similar to reed canary grass in that it out-competes native vegetation. It can be found in marshes, wet meadows, lacustrine and riverine shorelines, and ditches. The restricting growth of this plant reduces biodiversity and threatens available habitat for wildlife dependent on healthy native plant communities.

Purple loosestrife was first observed occurring in larger numbers during the early 1990's in the southern stretches of the watershed along Pioneer Road. By the mid to late 1990's this species was extremely prevalent in isolated colonies among the medians at the intersection of I-43 and Pioneer Road as well as just west of this intersection along Ulao Creek immediately south of Pioneer Road. These large populations appear to be the primary seed source for the dispersal of this plant within the watershed.

In the past 5 years, purple loosestrife has been observed to be spreading north, south, and east of the established populations found along Pioneer Road. It now occurs east of I-43 in a large stand just east of the railroad running parallel to I-43 and south of Pioneer Road. This plant continues to spread northward from Pioneer Road along Ulao Creek as well as in isolated populations north and south of Lakefield Road and west of I-43. In addition, several isolated communities have begun developing along Port Washington Road south of Pioneer Road and north of Highland Road.

Due to the invasion and raised concern of this species, a biological control program for the watershed was started in 1999 in coordination with the Wisconsin Department of Natural Resources biological management program for purple loosestrife. This effort involved the rearing and release of species-specific beetles to reduce the purple loosestrife population west of Port Washington Road and south of Pioneer Road. Additional rearing and beetle releases also occurred in 2000 when the population at the original site was supplemented and beetles were released at three new release sites along Port Washington Road between Pioneer Road and Highland Road.

The success of this release program is still under investigation as it takes up to a decade to evaluate the long-term success of this program. Continued monitoring efforts for the growth of beetle populations and affect of the beetles on the purple loosestrife is on going. Preliminary results show that beetle populations have become well established at some of the release locations. Visual damage to individual purple loosestrife plants indicates the beetle release program is working.

Buckthorn *(Rhamnus cathartica and R. frangula)*

These species, common and glossy buckthorn, are tall shrubs (up to 20 feet tall) that were introduced to the United States in the mid-1800's from Europe as ornamentals. They have naturalized and are now common in many natural areas throughout our landscape. Glossy buckthorn occurs in various wetland habitats, as it prefers wet soils; however, it can be less frequently found in a variety of upland plant communities. Common buckthorn occurs in a wide range of habitat ranging form wetland edges to dry, rocky sites. Both species are very competitive in full sun as well as densely shaded habitats.

As these species are well adapted to a variety of plant communities and environmental conditions, they are a problem species within the watershed. Some of the aggressive characteristics possessed by these non-native buckthorns include the following: rapid growth rates, long distance dispersal, abundant seed production, early spring leaf out and late fall leaf retention, and the ability to tolerate a variety of habitat conditions. Both species have the potential to colonize an area and decimate the native community that occurs there by shading out most herbaceous and shrubby vegetation. They also inhibit forest regeneration by shading out new tree seedlings.

Both common and glossy buckthorns are present in the Ulao Creek Watershed. Common buckthorn is more prevalent than glossy buckthorn. Where present, glossy buckthorn appears to be confined to the wetland fringe habitats in forested or partially forested lowland communities. Common buckthorn is not as confined as it occurs in many wetland edge communities, forested upland communities, fallow agricultural fields, and hedgerows.

Honeysuckle *(Lonicera tatarica. L. morrowii, and L. x bella)*

Three species of exotic honeysuckles have been introduced to the United States that are commonly found invading native Wisconsin plant communities: Tartarian, Morrow's, and Bella (hybrid between Tartarian and Morrow's) honeysuckle. These invasive shrubs produce a fragrant spring flower between May and June and can be found in various upland habitats as well as at the fringe of wetland communities where soils may be damp for a portion of the growing season.

Similar to the buckthorns, the honeysuckles tolerate a variety of habitat conditions including various shade and moisture levels. Also, these exotic shrubs tend to leaf out early in the spring before most natives do, and retain their leaves later in the fall. They typically thrive in disturbed sites, particularly woodland habitats; however, they will also infest open meadow communities such as fallow agricultural fields. As aggressive pioneer species in disturbed sites, they quickly become established and outcompete early successional native vegetation.

In the Ulao Creek Watershed, these species may be found at the edges of lowland forest communities especially where human induced disturbances have occurred. In addition, many of the agricultural hedgerows and fallow fields contain pioneering honeysuckles.

Garlic Mustard *(Alliaria petiolata)*

Garlic mustard was introduced from Europe in the late 1700's as a medicinal herb and for its use in cooking. This exotic forb is a biennial that can grow up to four feet tall. When the leaves and stem are crushed, a distinct onion or garlic odor is released. This plant produces a basal rosette in its first year of growth and typically sends up a single flowering stem with tiny white flowers the second year.

This invasive herb is shade tolerant and prefers woodland communities, although it can be found in partially shaded thickets, hedgerows, and roadsides. It also is capable of tolerating a variety of moisture regimes ranging from seasonally flooded lowland forest, hardwood forests, and coniferous communities. It is dispersed throughout theses habitats by animals, flowing water, and humans. Unfortunately, this species does not need a disturbance to take hold in a native community and does invade high quality habitats. It is a very destructive species as it displaces native woodland herbaceous vegetation thereby

reducing the wildlife value and displacing wildlife populations as well.

Garlic mustard potentially occurs throughout the watershed; however, it is most prevalent in the far southwestern portions upstream from Ulao Creek's confluence with the Milwaukee River. Large stands of garlic mustard along the Milwaukee River corridor are the likely sources for this species' invasion into the Ulao Creek Watershed.

RECOMMENDATIONS: STEWARDSHIP AND MANAGEMENT

To address the concerns identified, this Plan was developed in accordance with practices of other watershed-level stewardship programs. Such targeted programs can increase awareness of watershed management and restoration efforts. Community level involvement for stewardship will lead to the cooperative teamwork by private landowners and policymakers to take action on a watershed basis.

The **Center for Watershed Protection** identifies six basic programs – described below – to promote this sense of stewardship among the local public.

Watershed Advocacy: Promoting watershed advocacy lays the foundations for public support and greater watershed stewardship. Watershed organizations can be effective advocates for better land management and can develop broad popular support and involvement for watershed protection. In many watersheds, local governments create or direct the watershed management structure.

Watershed Education: It is necessary for people to understand their role and place within a watershed. These education programs must address awareness, personal responsibility, and opportunities for engagement.

Pollution Prevention: In some cases, local or state government may have a regulatory responsibility to develop pollution prevention programs for certain businesses and industrial categories (e.g., under industrial or municipal NPDES permits).

Watershed Maintenance: This maintenance refers to maintaining the functions and use of best management plans and ordinances. Actual protective structures such as buffer networks, septic systems, and sewer networks clearly must be maintained as well.

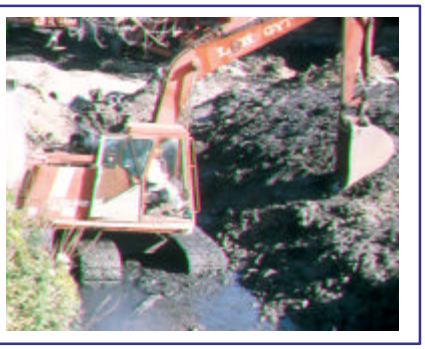
Watershed Indicator Monitoring: An ongoing stewardship responsibility is to track the health of the watershed. Monitoring water quality indicators (as is currently done by the citizen volunteers) is a cost effective method for obtaining this vital and timely information

Watershed Restoration: The last phase of watershed stewardship is to restore or rehabilitate streams that have been degraded by past development.

Techniques for conservation include:

- **Land acquisition**
- **Conservation easements**
- **Regulation of land alteration**
- **Exclusion setbacks of water pollution hazards**
- **Protection within open space designs**
- **Landowner stewardship**
- **Public sector stewardship**

Center for Watershed Protection, The Rapid Watershed Planning Handbook, Chapter 2



STORMWATER MANAGEMENT

In 1998, the Ozaukee County Land Conservation Department and the Ulao Creek Partnership documented their goals and objectives for the development of a Stormwater Management Plan for Ulao Creek. Northern Environmental and Bonestroo, Rosene, Anderlik & Associates prepared this report. While the goals and objectives focus on the waterway, they recognize the Creek's context within the watershed.

The goals and objectives of the Stormwater Management Plan are listed below:

Objectives:

1. Reduce flood risks and damages.
2. Preserve and improve water quality.
3. Reduce erosion, sedimentation, and pollution from surface runoff flows.
4. Assess existing and forecast future pollutant loading.
5. Serve as a blueprint for municipal staff to incorporate best management practices for new developments.
6. Protect and enhance fish and wildlife habitat.
7. Provide guidance for preventative measures and retrofitting of existing drainage facilities for improved water quality and reduced flooding.
8. Promote and improve ground-water recharge.
9. Enhance the natural beauty of the watershed and the quality of primary and secondary environmental corridors including floodplain, woodlands, wetlands, wildlife and aquatic life habitat, and agriculture lands.
10. Assess existing and forecast future water quantity flows on main stem.

Goals:

1. Provide 100-year floodplain protection for all residents and structures, by storing the future land use condition 100-year storm event and discharging the flow of the 10-year pre-development storm event.
2. Develop a watershed wide water quality education program.
3. Prevent hazardous wastes from entering the stormwater drainage system and the Ulao Creek.
4. Develop a program to ensure the successful operation of the stormwater drainage system.
5. Promote the reduction of phosphorus and other pollutant loadings into receiving water bodies (ponds, ditches, streams, Ulao Creek).
6. Evaluate water quality and update stormwater management practices.
7. Limit phosphorus and other pollutants from development areas to natural concentrations.
8. Equitably finance the construction and maintenance of the stormwater drainage system.
9. Adhere to federal and state watershed policies and regulations.

10. Promote the protection of and improve ground-water resources.
11. Enhance quality of primary and secondary environmental corridors including floodplain, woodlands, wetlands, wildlife and aquatic life habitat.

This list of goals was refined over time and reflects input from a number of different disciplines, including stormwater engineers (Bonestroo), regulators (WDNR), landowners (Partnership members), municipal representatives (Village and Town of Grafton), and the Ozaukee County Land Conservation Department.

Construction Site Erosion

Construction site erosion is one of the largest causes of siltation in waterways. Valuable wetland and waterway resources are often only protected by a thin, often improperly installed, silt fence.

None of the communities within the watershed require, by code, on-site inspection of the erosion control measures during the construction activities.

Increase Wetland Protection/Restoration Efforts

The conversion of tiled agricultural lands to wetlands can be a successful restoration first step. There are currently federal/state funds available to defray the costs to the landowners for converting their agricultural land. Any degraded isolated wetlands, prior converted wetlands, and stream corridors could be considered for restoration opportunities within the watershed.

Hydrology of the Swamp

To address concerns associated with the Ulao Swamp's hydrologic and vegetative change from lowland forest to marsh, the Hydrology Study Group began a small-scale experiment to remove excess woody debris that was choking the area downstream of the Ulao Swamp.

The woody debris was removed by hand, and the stream bottom cross-sections were measured. The stream bottoms will be re-

measured at a later date to determine if natural processes have caused the channel to deepen.

This study will be continued. Should significant findings be determined, efforts to remove additional debris and to monitor changes in the swamp water levels and vegetative community should be made. Funding to support these efforts should also obtained.

STORMWATER BEST MANAGEMENT PRACTICES: EROSION AND SEDIMENT CONTROL

Construction site erosion is one of the largest causes of siltation in waterways.

Sediment has an adverse impact on aquatic habitat. It impacts rivers and streams by filling in pools and riffles fish use for spawning habitat. Sediment also accumulates in lake bottoms, choking plant life and raising water levels.

Regulation of construction site erosion falls under several different programs in the State of Wisconsin:

- Locally, municipalities are required to adopt and enforce the Uniform Dwelling Code (UDC) under a program administered by the Department of Commerce. The UDC contains provisions to control erosion during construction of one and two family dwellings. Implementation of the UDC erosion control provisions is only as effective as the local municiality's willingness and ability to enforce the provisions. Oversight of a municipality's effectiveness at administering the UDC is handled by the Department of Commerce.
- Larger construction sites involving land-disturbing activities affecting one or more acres are regulated by the WDNR under Chapter NR 216, or equivalent programs administered by the Department of Commerce or the Department of Transportation.
- Some municipalities within the Milwaukee River Basin do not have an erosion control ordinance.

These watershed protection tools seek to reduce sediment loss during construction and to ensure that conservation areas, buffers, and forests are not cleared or otherwise disturbed during construction. Every community should have an effective erosion and sediment control program to reduce the potentially severe impacts generated by the construction process.

There are numerous techniques to provide erosion and sediment control (ESC), and the most effective is to minimize clearing.
An effective erosion and sediment control (ESC) plan should include the following elements:

- Minimize clearing and grading
- Protect waterways and stabilize drainage ways
- Phase construction to limit soil exposure
- Stabilize exposed soils immediately
- Protect steep slopes
- Install perimeter controls to filter sediments
- Employ advanced sediment settling controls
- Certify contractors regarding Construction Site Erosion Control implementation

Ordinances must be developed to outline erosion control requirements, and more importantly, must be enforced.

WNDR NR 216.01 Municipal Storm Water Discharge Permits: Communities with populations over 50,000 require a WPDES Municipal Storm Water permit. Municipalities in the Great Lakes Area of Concern must also obtain these permits.

Wisconsin's Department of Natural Resources has broadened the federal NPDES Stormwater Program requirements, requiring municipalities with populations greater than 50,000 to obtain Phase I NPDES permits. Furthermore, the state requires municipalities to obtain a NPDES permit if the municipality is found to significantly contribute stormwater pollutants to the waters of the state.

Table 5: Structural BMP Expected Pollutant Removal Efficiency

BMP Type	Typical Pollutant Removal (percent)				
	Suspended solids	Nitrogen	Phosphorus	Pathogens	Metals
Dry detention basins	30-65	15-45	15-45	<30	15-45
Retention basins	50-80	30-65	30-65	<30	50-80
Infiltration basins	50-80	50-80	50-80	65-100	50-80
Infiltration trenches/dry wells	50-80	50-80	15-45	65-100	50-80
Porous pavement	65-100	65-100	30-65	65-100	65-100
Grassed swales	30-65	15-45	15-45	<30	15-45
Vegetated filter strips	50-80	50-80	50-80	<30	30-65
Surface sand filters	50-80	<30	50-80	<30	50-80
Other media filters	65-100	15-45	<30	<30	50-80

According to a study conducted by the U.S. EPA (1999):

> *"Available data seem to indicate that urbanization and traditional urban development at almost any level can cause degradation of streams, and that BMP's (best management practices) may be able to mitigate these impacts to a certain level. Accordingly, stormwater management should start at the point of runoff generation, and incorporate site planning principles that prevent or minimize the generation of runoff, prevent development in floodplains, preserve natural drainage systems, and avoid disturbing sensitive areas such as wetlands and riparian areas."*

The management of stormwater involves monitoring the existing conditions, developing and implementing BMP programs to reduce pollutant discharges to the greatest extent practicable, and monitoring the results to ensure not only permit compliance but also effectiveness of the imposed BMP program. The goals of an effective BMP program include reducing stormwater pollutant loads, protecting stream channels, and controlling floodwaters.

BMPs can be structural – designed to trap and detain runoff until contaminants are filtered out (detention basins, catch basin inserts) or nonstructural – designed to prevent contaminants from entering stormwater initially (oil collection and recycling, pesticide controls, street sweeping, household and hazardous waste collections, and public education programs.)

A municipality must determine the most effective mix of structural and non-structural BMPs to meet the watershed water quality goals.

Grassed Swales

Subdivisions use either grass drainage swales or storm sewer systems to convey runoff away from properties. Use of grass swales instead of storm sewers as the drainage system in lower density residential areas has both water quality and quantity benefits. Road runoff is allowed to sheet flow over the grass swale, which will remove some of the pollutants. Swales also provide some infiltration if soil conditions permit. Rain gardens can also be constructed in the swales to increase runoff and pollutant removal.

Grass swales also provide a place for snow storage in winter months. An added benefit is that as the snow melts, the pollutants and salt carried from the street are contained in the ditches rather than going directly into the storm sewer as the snow melts.

Grass swales may not be feasible in medium- to high-density residential areas or in commercial areas.

Conservation and No Mow Buffers

Across the nation, nearly 90% of all buffer areas are in private ownership (*Center for Watershed Protection, Article 41*), and aquatic buffers play an important part in watershed protection. Their effectiveness, however is limited if their boundaries are altered, encroached, or disregarded.

Not only do buffer boundaries need to be recorded on clearing and construction plans for new development, they must be continually recorded on official municipal maps AND monitored.

Not all disturbances to buffer areas are obvious. Buffer disturbances can be simple – removal of trees, dumpsite for yard wastes, conversion to lawn area. Narrow buffers are particularly susceptible to this type of impact.

There are currently no buffer ordinances regulating the lands within the Ulao Creek Watershed.

Control of Non-stormwater Discharges

According to the ***Center for Watershed Protection***, most non-stormwater discharges are strictly governed under the National Pollutant Discharge Elimination System (NPDES) and require a state or federal permit.

"The three basic kinds of non-stormwater discharges in a subwatershed are:

1. **Septic Systems** (on-site sewage disposal systems) are used to treat and discharge wastewater from toilets, washbasins, bathtubs, washing machines, and other water consumptive items that can be sources of high pollutant loads. Unlike other non-stormwater discharges, septic systems are not regulated

under NPDES, but are approved by local and state health agencies.

2. **Sanitary sewers** collect wastewater in a central sewer pipe and send it to a municipal treatment plant. Ideally, this permits more efficient collection of wastewater, and often-higher levels of pollutant reduction. The extension of sanitary sewer lines however has the potential to induce more development than may have been possible in a watershed previously served only by on-site sewage disposal systems (particularly when soils are limiting).

3. **Other Examples** include industrial NPDES discharges, urban "return flows" (discharges caused by activities such as car washing and watering lawns), water diversions, and runoff from confined animal feeding lots.

CONTROL OF EXOTIC PLANT SPECIES

The integrity of the native plant communities depends on continuous monitoring for and control of aggressive exotic and invasive plant species. Species known to occur are common buckthorn, glossy buckthorn, Autumn olive, Eurasian honeysuckle, reed canary grass, purple loosestrife, garlic mustard, Dame's rocket, bull thistle, Canada thistle, and burdock. Other species probably occur and still others may occur incidentally during the disturbance associated with grassland establishment and with increased public use.

Monitoring will be done several times each year and timed to coincide with periods when particular species are easy to find, e.g. in late spring before the spring flowers set seed, and in late summer before the summer flowers set seed.

Available management techniques for controlling the various exotic invaders include a variety of mechanical, chemical, and biological methods. Guidance should be sought from appropriate experts in the field of invasive species management for target species identification and specific recommendations based on site conditions. In some instances, permits must be obtained from the appropriate regulatory agencies.

There are many literature resources and manuals available that provide guidance for invasive species management. One such resource is the Wisconsin Department of Natural Resources' "Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants." Much of the information below is summarized from this manual.

If a particular chemical application is chosen, appropriate herbicide products and solutions must be carefully selected depending on the species targeted for management, the time of year, and proximity to standing water. When prescribed burning is the chosen management tool, consideration must be given to the existing plant community's adaptability to fire. This is to insure no adverse impacts result to the plant community if fire is introduced.

Reed Canary Grass

The control of reed canary grass is one of the greatest concerns and challenges that faces the Ulao Creek Watershed from an exotic species control perspective. As it is widespread and difficult to control, it will be a long-term and on-going effort to try and manage this species throughout the watershed.

A baseline survey should be conducted to determine the location and extent of reed grass populations. These populations should then be monitored through aerial photograph interpretation and field reconnaissance. Long-term monitoring for the spread of this grass should be conducted and utilized in management planning.

Specific areas chosen for reed canary grass management should be those areas that have been identified as critical habitat, are isolated populations, or are owned by landowners interested in a management program on their property.

One of the most feasible and effective management tools to combat this species is reforestation. Trends have shown that the establishment of a dense canopy shades out this aggressive grass. To date, several reforestation efforts have been undertaken focusing in areas along Ulao Parkway and Falls Road. As it will take several decades for an established canopy to develop, this process is long-term. Additional tree plantings should continue and be the primary management tool by resource managers within the watershed.

Other effective measures that can be taken involve the following restorative measures: excavation of the reed canary sod and re-vegetation, hydrologic manipulation, and a combined herbicide and prescribed burning regimen. Each of these measures requires appropriate coordination and advanced planning.

Regardless of the technique utilized, projects targeting the control of reed canary grass should be done on a small-scale basis where collective efforts are focused on a smaller area. Once management of a given area appears to be working, subsequent management efforts should focus on the immediately surrounding areas.

Purple Loosestrife

As existing purple loosestrife populations continue to spread and new populations arise, this species will require annual monitoring and management efforts. The annual monitoring efforts should involve continued monitoring for the spread of this aggressive species.

On-going annual monitoring for the success of the beetle introductions will continue. This annual monitoring involves recording observations of beetle populations, affect of the beetles on individual purple loosestrife plants, and the overall health of purple loosestrife stands where beetles have been released.

To combat the existing stands of purple loosestrife where beetles have not been introduced, several measures should be taken. For small isolated populations (individual plants or low density colonies), manual control is recommended. This involves cutting plant stems and applying an appropriate herbicide to the cut stem. If the cut stems have already begun flowering, care needs to be taken when transporting the plants to a suitable disposal site. The entire cut stems should be immediately bagged, taken from the site, and burned at an appropriate location.

Where purple loosestrife colonies occur as medium to high-density populations covering larger areas, the biological control program should be implemented. Expansion of this management effort is planned for 2003.

Buckthorn

Management of both glossy and common buckthorn should begin with a baseline survey: mapping the location and extent of habitats infested by these species. Those areas where buckthorn poses a direct threat to healthy habitats dominated by native vegetation should be the priority areas for management. Priority should also be given to areas designated as critical habitats within the watershed.

Management of buckthorn can be accomplished through several methods: hand pulling, herbicide applications, and prescribed burning. Hand pulling is feasible for small diameter seedlings where small isolated patches occur. This method can also be effective in subsequent years following the cutting of mature individuals. It is important to tamp down the loosened soil where seedlings have been pulled to reduce reseeding in infested areas.

Several herbicide methods can also be utilized to control buckthorn. One of the most effective applications is cutting stems off near the ground immediately followed by an application of the appropriate herbicide solution. Foliar application can also be successful during the growing season. The best time to use chemicals as a management tool for controlling buckthorn is very early, or late during the growing season when native vegetation is dormant. This reduces the likelihood of impacting native vegetation adjacent to the plants being treated.

Prescribed burning can be effective in controlling buckthorn; however, it is often not feasible where large stands of buckthorn have shaded out the understory thereby reducing the ground litter (fuel) necessary to sustain a fire.

Regardless of the method utilized, on going management will be necessary for three to five years following the initial control effort. This follow-up usually targets newly germinated seedlings in established buckthorn stands, as the seeds remain viable for at least three years.

Honeysuckle

As with the buckthorns, identification of honeysuckle infestations should be coordinated prior to actively managing for these species. Honeysuckle management should target those areas where identified critical habitat within the watershed is present. It can be anticipated that active management over an established honeysuckle population will take up to five years to stop newly germinated plants from seed.

Methods for controlling honeysuckles are similar to that for controlling buckthorn. These methods include manual pulling of entire plants, prescribed burning, and herbicide applications. Unlike buckthorn, mature honeysuckle plants can be pulled or dug out relatively easily due to the shallow root systems found with honeysuckle. After pulling or digging out individual plants, it is important to tamp down the loosened soil to minimize reseeding and seedling regeneration.

Prescribed burning is often more easily accomplished than with buckthorn when attempting to control honeysuckle. Except in extreme infestations, honeysuckle usually does not completely inhibit the herbaceous growth needed as fuel for sustaining a fire.

Honeysuckle can be effectively controlled by herbicide applications as well. Stems should be cut near the ground and followed by the appropriate herbicide solution. If cut stems are not treated with herbicide, many new stems will re-sprout. Similar to buckthorn, the best time to use herbicides is very early in the growing season prior to the germination of native vegetation.

Garlic Mustard

Although likely present in other locations in the watershed, the most prolific infestation of garlic mustard occurs in the far southwest corner of the watershed. This area should be targeted for initial control efforts of this species. Annual monitoring for the spread of this infestation and identification of new populations should be accomplished at the onset of management for this species.

Controlling garlic mustard with herbicide can be the most effective management tool. Small populations or large infestations respond well to the appropriate herbicide

solution. The best time to exercise a foliar application is during the dormant season when native vegetation will not be adversely impacted. Herbicide can be applied during the growing season, but attention should be given to the effects on non-targeted species.

Garlic mustard can be effectively controlled through manually pulling or cutting individual plants. This is most effective on small isolated stands of this species. Manual control should be done at or just prior to flowering. When hand pulling individual plants, the soil should be tamped down so that seeds in the seed bank are not exposed and encouraged to germinate. Cutting of individual plants should be done at the soil surface. Equipment would likely be necessary to manually manage large areas covered by garlic mustard. All plants that have flowered should be bagged and removed from the site immediately.

Prescribed burning is a recommended tool for managing garlic mustard; however, this can enhance the survivability of the population and requires additional follow-up management efforts later in the season.

Garlic mustard seeds are viable for up to five years. It should be anticipated that garlic mustard management in a particular area would be required for at least five years following the first management effort.

WATERSHED-LEVEL PLANNING FOR NATURAL RESOURCE PROTECTION

According to the **Center for Watershed Protection**,

> "Watershed Planning is perhaps the most important watershed management tool because it involves decisions on the amount and location of development and impervious cover, and choices about appropriate land use management techniques."

In the past, environmental and economic and social issues have polarized people, often making it impossible to achieve a common vision of sustainability. For the watershed approach to become a reality there must be widespread recognition in the community that people and nature can coexist within the watershed.

The ***Center for Watershed Protection*** developed an approach that applies eight tools to protect the natural resources of a watershed:

- Land Use Planning;
- Land Conservation;
- Aquatic Buffers;
- Better Site Design;
- Erosion and Sediment Control;
- Stormwater Best Management Practices;

- Non-stormwater Discharges; and
- Watershed Stewardship Programs.

The following section assesses the application of these tools to the management of the Ulao Creek watershed. It is important to keep in mind that watershed protection tools are flexible. To be most effective, they should also be re-evaluated periodically as land uses change over time.

"Since impervious cover has such a strong influence on sub-watershed quality, a watershed manager must critically analyze the degree and location of future development (and impervious cover) that is expected to happen in a watershed.

Consequently, **land use planning** ranks as perhaps the single most important watershed protection tool."

(Center for Watershed Protection, The Rapid Watershed Planning Handbook, Chapter 2)

LAND USE PLANNING: WATERSHED-BASED ZONING

Land use planning techniques such as watershed-based zoning, overlay district zoning, and the transfer or purchase of development rights should be used to help direct and influence new development for the selected use, protection and care of sensitive areas.

To be most effective, coordinated and cooperative communication between local municipalities is needed. This includes the Village of Grafton, the Town of Grafton, and the City of Mequon.

Overlay District Zoning

There is a need for overlay districts to help restrict or guide development that will impact a group of resources across the entire watershed. Overlay districts may be useful to impose development restrictions in specific locations in a watershed, in addition to standard zoning requirements. These districts are created to protect natural resources, promote safety, and preserve land value. They are mapped districts that place additional restrictions or design criteria without altering the underlying land use zoning.

Some examples of applicable overlay districts are:

- Shoreland Wetland Overlay District
- Floodplain Overlay District
- Agricultural Overlay District
- Aquifer Protection Overlay District

Shoreland, floodplain, aquifer, and agricultural overlay districts can have a direct benefit on the water quality of a watershed by imposing additional restrictions on the type of land use allowed within their boundaries. Depending on the environmental conditions, more than one overlay district may apply to a single area. These overlay districts would be helpful to manage local natural resources if incorporated into local zoning codes.

<u>Shoreland Overlay District</u>

Shoreland overlay districts typically restrict development from occurring within 300 feet of the ordinary high water mark of navigable streams and rivers and within 1000 feet of a navigable lake, pond, or flowage. This overlay district also typically requires that a portion of the existing vegetation be maintained as a buffer, typically 100 feet, and limits the amount of tree and shrub clearing. Conditional uses and many earthmoving activities within the shoreland zone typically require review and public hearings.

<u>Floodplain Overlay Districts</u>

It is known that allowing uncontrolled development within floodplains results in damage to private and public facilities, creates safety hazards, impacts the tax base, and can lead to expensive floodway improvement projects. Floodplain overlay

districts try to minimize these impacts by allowing only uses that will not experience significant impact by floods and will not obstruct flood flows.

Aquifer Overlay Districts

The intent of an aquifer overlay district is to preserve and maintain groundwater supply and recharge by controlling the land cover and activities occurring within the primary recharge area. Limits may be placed on the amount of impervious area within an aquifer overlay zone in order to generate less runoff and allow for greater infiltration to the groundwater.

Some land uses that can be detrimental to water quality and are restricted in an aquifer overlay zone are:

- Fuel oil storage
- Gas stations
- Dumping of snow brought from outside the overlay zone
- Outdoor unenclosed or uncovered storage of road salt
- Landfills, solid waste transfer stations, and recycling or composting facilities.
- Certain other industrial uses such as chemical laboratories

Agricultural Overlay Districts

These districts promote agricultural land uses, protect prime soils, and prevent non-agricultural uses from negatively impacting agriculture as the primary land use. Using an agricultural overlay zone to confine development in primarily agricultural land use areas to a specific location can minimize sprawling or spot development

"The most effective method for reducing pollutant loads is to keep runoff on site and allow time for infiltration as well as for chemical, biological, and hydrological processes to take place."

Low-Impact Parking Lot Design Reduces Runoff and Pollutant Loads; B.T. Rushton, Journal of Water Resources Planning and Management. 2001: 127(3) p 172-179

Purchase/Transfer of Development Rights

Purchase or the transfer of development rights is a tool, which allow property owners to be compensated for voluntarily restricting the future use of their land. This is a powerful tool as these restrictions are placed on the land, and stay with the land regardless of future ownership.

Purchase of development rights has been used with great success across the nation as a way to preserve farmland and open space.

The Town of Dunn near Madison has not only preserved open space, but also actually gained a new dairy operation as a result of this program. Montgomery County, MD has successfully preserved over 47,000 acres of land in large blocks on the edge of the Washington D.C. metropolitan area. Kane County, IL has begun a farmland preservation program utilizing PDR and direct purchase of land.

The Ozaukee County Land and Water Resource Management Plan – "Plan Recommendations for Natural Areas and Critical Specie Habitat in Ozaukee County" lists one site within the Ulao Creek watershed as an NA-3 site. It is now in small part under protective ownership. As much of it as possible should be protected by perpetual conservation easements or Development Rights Easements.

Land Conservation

According to the ***Center for Watershed Protection***, there are five types of land that may need to be evaluated, managed and/or conserved in a watershed:

- **Critical habitats**
- **Aquatic corridor**
- **Hydrologic reserve area**
  (Maintenance of land areas that maintain the hydrologic regime of the system (forests, meadows, agricultural lands)
- **Water pollution hazards**
  (A Water Pollution Hazard is defined as any land use or activity that is expected to create a relatively high risk of potential water pollution. Examples of water pollution hazards may include septic systems, landfills, hazardous waste generators, above or below ground tanks, land application sites, impervious cover, stormwater "hotspots," and road and salt storage areas. One way to avoid possible contamination to waterways is to locate such facilities at a designated distance away from the waterbody in order to decrease the chance of contamination.)

- **Cultural areas**
  (Cultural areas provide a sense of place in the landscape and are important habitats for people. Examples of conservation areas include historic or archeological sites, trails, parkland, scenic views, water access, bridges, and recreational areas.)

SEWRPC has identified Ulao Swamp as an NA2 Natural Area, indicating it is an area of countywide and/or regional significance. SEWRPC further recommends this area for protection via local ownership.

Protected Lands

Currently, 95 acres of land are under public ownership. This includes:

WDNR (40 acres)
USFWS (55 acres)

Approximately 7,840 acres of land in the Ulao Creek Watershed are under private ownership. Of this land, a "Development Rights Easement" protects 57 acres, limiting the development or use of the land. The 57-acre easement is located in the Township of Grafton. This easement is through the Ozaukee Washington Land Trust. Private landowners have placed an additional 90 acres under protective easement.

The Town of Grafton is currently looking into Development Rights Easements in this area. There is also a possibility that Stewardship Funds and/or the Farmland Protection Grant programs would have funds available to assist in the purchase protection of this area.

RURAL LAND USE

As an area becomes more developed, continuation of traditional practices becomes increasingly more difficult for a number of reasons:

1. Low per-unit profit margins require larger fields and large expensive machinery. As development increases, it becomes more difficult to find enough large tracts of land close enough to a farmer's home base. Land must be within a reasonable distance of the farmstead in order to recover the cost of traveling to and from the fields.

2. Increased motor-vehicle traffic from suburban developments makes it difficult and dangerous for farmers to move large machinery over substantial distances. Once-quiet country roads have now become semi-suburban thoroughfares with significant traffic counts. Yet many of these roads have never been improved over their original design. Many have narrow lanes and little or no shoulder.

   It is not unusual for a modern combine to have a grain or corn gathering device that measures up to 16 feet across. The challenges of moving such equipment over roadways with total pavement widths of 20-22 feet are obvious.

3. While use-value tax assessments have lowered the property tax on land used for agriculture, a farmer still feels development pressure from the increased value of his or her land. The question of "opportunity cost" comes up. In other words, a farm operation that yields a poor income for all the hard work involved causes a farmer to wonder if he or she wouldn't be better off selling the farm and taking the profits from developing the land rather than trying to make a living by farming it.

Converted cropland, fallow fields, and abandoned orchards are good candidate sites for reforestation efforts in Ozaukee County.

CREP and other buffer cost share programs should continue to be actively promoted. Any unbuffered perennial or intermittent tributary stream within the Ulao Creek Watershed should be protected.

All activities within a rural watershed have an impact on its natural resources. Cities, homes, roads and factories modify the watershed and affect its natural resources. Farming, recreation, mining, construction and forestry can also significantly affect a watershed.

As stated earlier, large portions of the more rural areas within the Ulao Creek watershed are designated as Primary Environmental Corridor. Such environmental corridors, however, are often subject to urban encroachment because of their desirable natural resource amenities.

Unplanned or poorly planned intrusion of urban development into these corridors tends to destroy these resources. Local units of government should be empowered to discourage disruption to these

communities. If developers wish to encroach into them, construction plans should be carefully reviewed and tree ordinances should be applied.

While suburban development brings negative factors to farming areas, it can also offer opportunity to those farmers willing to change their way of doing business. Traditional agriculture relies on production of huge volumes for the mass market at a low per-unit profit for the producer. In contrast, organic and other specialty farm products rely on smaller volumes, sales to small "niche" markets and a high per-unit profit for the producer.

Organic farming, while still a small part of the total agriculture industry, has been growing at a rate of approximately 20% per year for the last few years. The largest and strongest markets for organic products are the large metropolitan areas. Thus, the Town of Grafton is well situated to have a viable organic and specialty farming industry. Downtown Milwaukee is but 20-25 miles away, and it is only a little over 100 miles to Chicago.

Another advantage of organic and specialty farming is that since per-unit profits are higher, at least some of these products can be grown on smaller parcels of land and thus allow the use of smaller equipment which can be more safely moves over busy, yet narrow, roadways.

Organic farm products must be raised without the use of pesticides and antibiotics. Also, organic meat and milk animals are supposed to have access to "free-range" feeding when weather permits. This means that pasture lands needs to be available for grazing. In many conventional farming operations, animals do not graze, but are fed at the farmyard with processed feed and baled hay. Organic farming can allow more erodable lands to be used for grazing (with proper rotation to avoid over-grazing conditions) while less erodable fields are used for cultivation.

Animals on free-range present fewer waste disposal problems than do those in concentrated feedlot or free-stall operations. Waste from animals in pasture is dispersed over a wide grassy area. With proper rotation and adequate streambank buffers, this waste can be reclaimed by nature without fouling waterways or creating odor problems such as those caused by spreading liquid manure over fields.

These strategies can help avoid pollution of Ulao Creek from pesticides and eroded soils.

SITE PLANNING, LOT DEVELOPMENT

The goal of site planning is to not increase the net amount of runoff flowing from a site compared to that site under natural vegetated conditions. Three categories of better site design that have special merit for watershed protection include residential streets and parking lots, lot development, and conservation of natural areas.

The following quote is from a report printed in the Journal of the ***American Planning Association*** (Winter 1994 v 60, I I, p 95.).

> *"Most communities currently require hydrologic design of new developments to prevent increased peak flows associated with stormwater runoff (because these cause local flooding and erosion problems), but these ordinances typically ignore the increase in stormwater volume. If the impact of land-use change on stormwater runoff volume, wetland hydrology and groundwater recharge is an issue, a logical policy response would be to extend the scope of current stormwater ordinances to require new development be designed to prevent total stormwater volumes from exceeding pre-development levels. This would reduce the flooding and recharge problems more effectively than current ordinances for peak discharge alone do. Specific measures that can be used to reduce stormwater volume and increase groundwater recharge include infiltration trenches, landscaping to increase on-site detention, infiltration basins, porous driveways and roads, water spreading devices and increased green space."*

Streets and Parking Lots

It has been estimated that streets account for 40-50% of the impervious cover in residential areas. Furthermore, roads generate the highest pollutant load in urban areas. The following recommendations can effectively reduce the amount of impervious area, and subsequent reductions in runoff volume and pollutants.

1. Many communities require residential streets to be 32 to 40 feet wide to allow for two driving lanes and up to two parking lanes. It has been shown that residential streets can be as narrow as 22 to 26 feet wide and still allow safe passage of emergency vehicles. Other design features such a mountable curbs can be used to address these concerns. On-street parking can still be provided on one side of the street even with the narrower width.

2. Many ordinances prohibit unpaved islands within cul-se-sacs. Traditional cul-de-sacs have a paved radius of 40 feet or more, are a significant source of pavement and runoff. Vegetated islands provide additional areas for the bio-retention of stormwater.

3. Street trees provide a canopy across roadways, becoming an important part of managing urban runoff. Street trees reduce the amount of runoff by intercepting rain in their canopies and allowing it to evaporate, and shade surfaces reducing the temperature of runoff waters. This BMP has equal application and effectiveness in existing or newly developing urban areas.

4. Research has shown that that in most instances, an oversupply of parking exists resulting in empty parking lots and excess impervious surface. Multiple studies have shown

that standard parking design ratios almost double to amount of parking that is actually needed.

Parking reduction strategies include:

- Reducing the recommended allocation of parking spaces in zoning codes;
- Express the allocation of parking spaces as a maximum rather than a minimum;
- Allow on-street parking spaces adjacent to a development to count toward minimum parking requirements;
- Permit the banking of parking spaces – allowing the initial construction of 2/3 the required parking and bank the remaining land on site for use in the future if deemed necessary;
- Encourage shared parking, joined parking or coordinated parking facilities.

Cluster Development (Open space design, conservation development)

Cluster development is a flexible planning tool that allows communities to meet both their development and conservation goals by concentrating homes in a small portion of a site in an effort to preserve the existing natural resource areas.
Cluster developments contain some design features that usually require departure from typical zoning ordinances, including:

- Street widths may be reduced.
- Roadside swales are typically used for drainage rather than curb and gutter.
- Lot sizes are typically smaller, and only a portion of the lot may be cleared for construction, minimizing turf area and maintaining existing vegetative buffers.
- Some conservation developments may also require relaxation of typical setbacks from streets and adjacent structures to minimize disruption to natural areas.

The benefits of cluster developments vital and effective in their protection of natural resources - impervious cover is minimized, reducing runoff and pollutants, and land disturbances are minimized, resulting in less construction site erosion if proper management techniques are used.

STEWARDSHIP AND RESTORATION:
SUMMARY OF GOALS AND OBJECTIVES

As a result of several years of habitat evaluation and The River Protection Grant-specific study, a number of targeted concerns were identified, as detailed previously.

Priorities must be set that will target efforts toward the most critical issues. The following criteria were used to begin prioritizing the efforts: Ability to influence change; Time delay between actions and results; willingness/ability to change; and cost/benefit ratio.

By assessing and prioritizing the issues facing the Ulao Creek watershed, actions towards matching resource needs with targeted efforts to get the greatest benefits can begin.

Goals

To accomplish the stewardship and long term management objectives identified as priorities by the Ulao Creek Partnership, several major goals were set forth:

- ***Restore and enhance the Ulao Creek Watershed natural resources - Restore degraded vegetation communities to increase biodiversity and improve wildlife habitat in woodland, grassland and wetland communities***

- ***Improve water quality - Improve fish and aquatic habitat in the creek corridor***

- ***Promote comprehensive watershed planning based on land use, natural resource protection, and enhancement – providing landowner opportunity for passive, recreational activity such as hiking, canoeing, fishing and wildlife observation***

- ***Stabilize/moderate water flows in the watershed.***

- ***Provide educational opportunities to area landowners***

- ***Support long term monitoring and experimental study in management techniques in cooperation with the University of Wisconsin and Wisconsin Department of Natural Resources.***

OBJECTIVES AND ACTION PLANS

To meet the goals set forth, a number of objectives were identified. Recommended actions and prospective time frames were developed. The Ulao Creek Partnership is committed to meeting these objectives in the months and years ahead.

Objective: Watershed Planning

Recommended Management Practice	Action	Time Frame
Have Ulao Creek Watershed representative on municipal boards	Support sensitive local representative. Have municipal official join Ulao Creek Partnership	On-going and continual Immediately

Objective: Land Conservation

Recommended Management Practice	Action	Time Frame
Protect critical habitats	Purchase easement or development rights for Ulao Swamp Support easements over acquisition in order to maintain tax base. Protect areas critical for herpes, birds etc	Less than 5 years, and on-going On-going On-going
Maintain aquatic corridors	Limit clearing of bankside vegetation Remove exotic species	Annually
Develop hydrologic reserve area	Identify key areas influencing areas surface and groundwater flows	1-2 years
Identify and limit water pollution hazards	Limit all development within floodplain (may be above and beyond state requirements) Manage existing septic systems Limit the expansion of connected impervious surfaces	Immediately and On-going On-going Immediately and On-going
Protect and enhance cultural areas	Protect historic or archeological sites, trails, parkland, scenic views, water access, bridges, and recreational areas.	On-going

Objective: Riparian Buffers

Recommended Management Practice	Action	Time Frame
Establish Buffers	Require all new development to establish vegetative buffer zones and “no-mow” zones. Encourage eligible private landowners to participate in CREP program	Immediately and on-going 1-2 years and on-going
Re-establish shoreline vegetation	Continue use of County tree program to re-vegetate shoreline areas. Require specified percentage of planting per year to offset losses due to increases in imperviousness within watershed.	Annual Annual

Objective: Better Site Design

Recommended Management Practice	Action	Time Frame
Establish flexible standards for residential streets and parking lots	Allow narrower residential streets	Immediately
	Limit use of curbs to allow runoff to recharge through swales	Immediately
	Encourage use of shared parking within commercial development	1-2 years and on-going
	Require street trees in all new developments and parking lots	Immediately
	Permit/encourage use of porous pavement in areas of low traffic or use	Immediately
Conservation subdivisions	Encourage use of conservation subdivision plans by making them permitted vs. special exception uses.	Immediately
Develop Brownfield sites	Provide cost share opportunities	On-going
Cap abandoned wells	Provide cost incentives	1-2 years

Objective: Erosion and Sediment Control

Recommended Management Practice	Action	Time Frame
Minimize site clearing	Require phasing plans	Immediately
	Require protection of trees over 3 inch DBH	Immediately
Control construction site erosion	Require erosion control inspectors for each project to ensure proper installation and maintenance of BMPs.	Immediately
	Work with developers to plan effective erosion control methods.	On-going
	Conduct demonstration of erosion control methods	Less than 5 years
	Find sponsor for watershed contractor of the year award	1-2 years
	Enforce existing regulations	On-going

Objective: Control of Non-Stormwater Discharges

Recommended Management Practice	Action	Time Frame
Control Non-stormwater discharges.	Manage septic systems	On-going
	Manage sanitary sewers	On-going
	Enforce and eliminate illicit discharges	On-going
	Cap abandoned farm wells.	On-going

Objective: Improve Stormwater Management Practices

Recommended Management Practice	Action	Time Frame
Reduce pollutant discharges	Reduce phosphorus runoff from developed areas	On-going
	Encourage participation in CREP programs	Immediately
	Encourage proper land practices.	On-going
	Use newsletters to educate proper fertilizer use, car washing techniques etc regarding runoff.	Immediately
	Encourage organic farming practices.	On-going
Protect stream channels	Keep livestock (cattle, horses etc out of waterways.	Immediately and on-going
	Require minimum 15-foot no-mow zones adjacent to waterways.	1-2 years
	Encourage organic farming practices.	On-going
Control flood waters	Retain and manage retention ponds.	Annual
	Limit development within floodplain.	Immediately
	Encourage cluster subdivision designs.	On-going
	Evaluate pervious/impervious percentages within each development.	On-going
	Support Smart Growth efforts.	On-going
Encourage use of non-structural BMP's	Improve public education regarding water quality and watersheds	On-going
	Provide street sweeping services	Less than 5 years
	Encourage recycling of household and hazardous wastes	On-going

Objective: Stewardship

Recommended Management Practice	Action	Time Frame
Watershed advocacy	Keep watershed protection issues in the news.	On-going
	Have local municipal official on Ulao Creek Partnership.	Immediately
Watershed Education/Pollution prevention	Support public awareness programs	On-going
	Take advantage of professional training opportunities.	On-going
Maintain public involvement	Continue Volunteer monitoring programs	On-going
Restoration	Work with landowners and developers to restore wetland areas.	Immediately and on-going