White Oak Creek Watershed Action Plan & Inventory

Endorsed April 2004

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PLAN ENDORSEMENT

We, the supporter of the White Oak Creek Watershed Conservation Efforts, do hereby approve and agree to pursue implementation of this Watershed Action Plan prepared and written by the White Oak Creek Watershed Advisory Board.

Ohio Environmental Protection Agency	Ohio Department of Natural Resources	Area Assistance Team Member
Natural Resources Conservation Service	State Senator	State Representative
Highland SWCD	Ohio Valley RC&D	Ohio State University Extension
Brown County Commissioner	Highland County Commissioner	Brown SWCD
Brown County Health Department	Highland County Health Department	Mt. Orab Mayor
Brown County Engineer	Township Trustee Rep.	Farm Bureau

The White Oak Creek Watershed Advisory Board has strived to develop a watershed action plan which is reflective of the public input gathered. The development strategies and design were to create a plan which is adaptable, flexible and usable by the community in the process of constructing future watershed programs.

Melody Layford Dragoo
Watershed Coordinator

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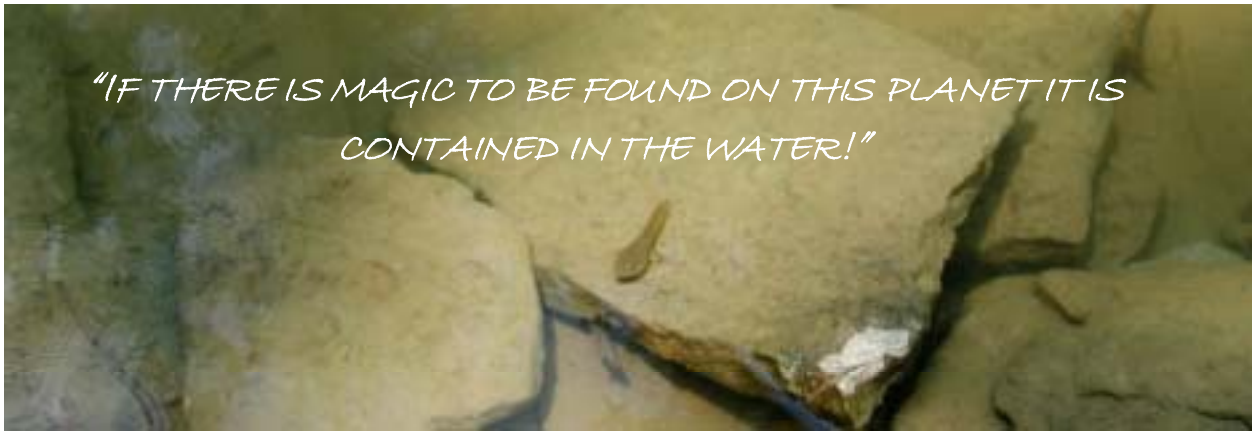


List of Acronyms Used

BOD	Biological Oxygen Demand
BMP	Best Management Practices
CRP	Conservation Reserve Program
DEFA	Department of Environmental Financial Assistance
FSA	Farm Service Agency
GIS	Geographic Information System
GPS	Global Positioning System
HUC #	Hydrologic Unit Code Number
HSTS	Household Sewage Treatment Systems
NPS	Non Point Source Pollution
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OSUE	Ohio State University Extension
NRCS	Natural Resource Conservation Service
N/A	Not Available
QAPP	Quality Assurance Project Plan
RC&D	Ohio Valley Resource Conservation & Development
RM	River Mile
SWCD	Soil & Water Conservation District
TMDL	Total Maximum Daily Load
USGS	United States Geological Society
WOC	White Oak Creek
WOCWS	White Oak Creek Watershed
WWTP	Wastewater Treatment Plant
319	Section 319 of the Clean Water Act
305(b)	Ohio Environmental Protection Agency Water Quality Report

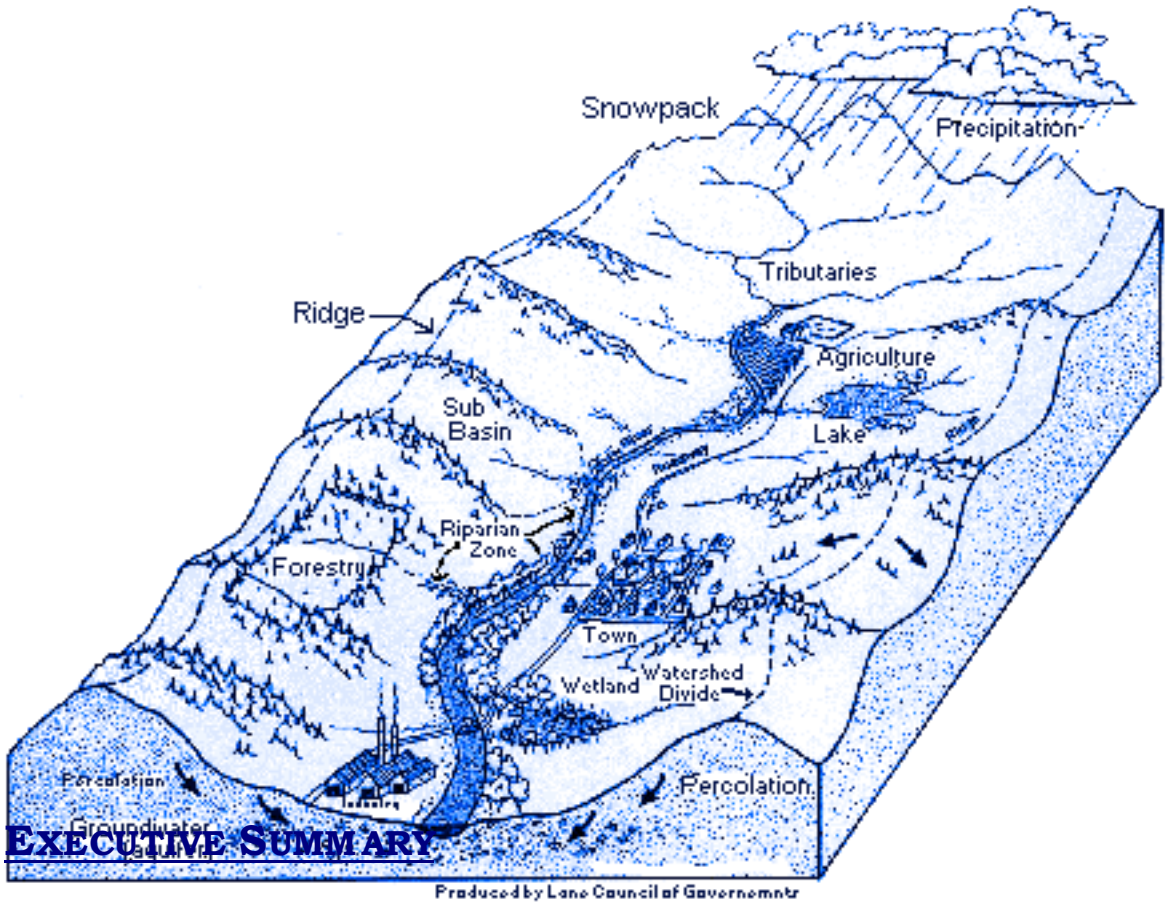
Water Quality Acronyms

EWH	Exceptional Warmwater Habitat
WWH	Warm Water Habitat
LRW	Limited Resource Waters
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
MIWB	Modified Index of Well Being
QHEI	Qualitative Habitat Evaluation Index

General Watershed Facts

No matter where you live, you live in a watershed. A watershed is the land area that drains to a single body of water such as a stream, lake, river, or wetland. Hills or ridgelines often bound watersheds; interior valleys collect precipitation in streams, rivers, and wetlands. These physical boundaries define the movement of water and delineate the watershed.

A "watershed approach" uses hydrologically defined areas (watersheds) to coordinate the management of water resources. The approach is advantageous because it considers all activities within a landscape that affect watershed health. Ideally, a watershed approach will integrate biology, chemistry, economics, and social considerations into decision-making. It considers local stakeholder input and national and state goals and regulations.
We all live in a watershed -- and our individual actions can directly affect it. *(Ohio Watershed Network)*



The White Oak Creek Watershed Action Plan is a "community driven" plan that reflects the public's concerns and water quality data. The overall goal of the White Oak Creek Watershed Group is to restore and maintain the chemical, physical and biological integrity of White Oak Creek. This plan will identify the shared vision of watershed residents, local government, state agencies and elected officials. Community input has been used to develop the White Oak Creek Watershed Action Plan and to determine what solutions can most effectively be used to protect water quality for future generations. The action plan sets goals and tasks for the reduction of pollutants that enter the stream. The plan includes an inventory of the watershed, water quality assessment, subwatershed specific data, problem statements, goals, implementation strategies, monitoring and funding. The plan will be a detailed picture of the watershed and the project partners dedicated to protecting it.

The White Oak Creek Watershed is located in Brown and Highland Counties in southern Ohio. The watershed encompasses 150,621 acres and 234.3 square miles of drainage area. The acres of land draining into White Oak Creek are known as its watershed and begin in the southwest corner of Highland County and drains through the center of Brown County into the Ohio River just west of Higginsport, OH. The main stem of White Oak Creek is 49.3 miles long with approximately 89 miles of tributaries draining into it. The total length of all the streams in the watershed is 138.3 miles. This whole drainage system makes up the White Oak Creek Watershed.

White Oak Creek has been identified as a priority watershed for restoration and the known causes for stream impairments are siltation and habitat alterations. White Oak Creek is also faced with water quality issues such as: sedimentation, nutrients, pesticides, total coliform, and e-coli. These nonpoint sources can be controlled through an integrated program of education, water quality monitoring, and voluntary compliance with best management practice implementation.

The White Oak Creek Watershed Action Plan will serve as a guide for the watershed group and community. Using the information and strategies outlined in this watershed action plan can keep us all working toward protecting and improving water quality in White Oak Creek.

The White Oak Creek Watershed Action Plan was developed to identify the issues facing the watershed and offer solutions and direction for the future. The goal is to bring all stream segments up to full water quality attainment. The plan is also a "living document" that will be updated on a regular basis to meet the future needs of the watershed and incorporate new data.

White Oak Creek Watershed Project Partners

- **Brown Soil & Water Conservation District**
- **Highland Soil & Water Conservation District**
- **Ohio Valley Resource Conservation & Development**
- **Ohio Environmental Protection Agency**
- **Ohio Department of Natural Resources**
- **Natural Resource Conservation Service**
- **Ohio State University Extension**
- **ODNR – Division of Wildlife**
- **ODNR – Division of Forestry**
- **ODNR – Division of Soil and Water Conservation**
- **Brown County Commissioners**
- **Ohio Farm Bureau**
- **Brown County Farm Bureau**
- **Brown County Solid Waste Authority**
- **East Fork Watershed Collaboration**
- **Brown County Health Department**
- **Highland County Health Department**
- **Adams – Brown Recycling Center & Glass Refractory**
- **Watershed Villages, Township Trustees**
- **Brown & Highland County Schools Water Monitoring Teams**
  ***Eastern Brown, Fayetteville, Western Brown, Lynchburg-Clay, White Oak, Ripley, Hillsboro, and Georgetown.**
- **Blue Chip Composition**
- **Oxbow Farm (Jim & Alta Beasley)**

I. Introduction

Mission Statement

"The mission of the White Oak Creek Watershed Partners is to bring together local communities to enhance water quality and encourage natural resource protection."

Goal to Improve White Oak Creek Watershed

- *"Restore and maintain the chemical, physical, and biological integrity of White Oak Creek"*
- *Reduce water resource impairment in all stream segments within the watershed that do not currently meet water quality standards and bring them to full attainment.*
- *Continue local community support for future water quality enhancements.*
- *Improve and maintain White Oak Creek's physical integrity by reducing the habitat alterations that are occurring in the watershed.*
- *Protect and restore natural floodplain function.*
- *Raise the levels of Aquatic Life Use from partial EWH attainment to full attainment.*
- *Evaluate and monitor the attributes of White Oak Creek to track improvement and further needs.*

Comprehensive White Oak Creek Watershed Goals

The following list of goals is for the entire White Oak Creek Watershed. These education and implementation goals below are needed in the entire watershed basin. More detailed implementation strategies are listed in the subwatershed section. Most water quality issues facing White Oak Creek are similar in each subwatershed. However critical target areas have been set up to prioritize the watershed and provide direct implementation to improve the attainment status in the streams. The following goal strategies are to be implemented throughout the watershed targeting each subwatershed.

** For more detailed goals see specific subwatershed goals in the subwatershed section.*

Activity	How	Timeframe
Education & Outreach	• Continue and enhance all ongoing educational events and organize new efforts. • Continue Nonpoint Source Pollution Education in local elementary and middle schools. • Continue all 8 watershed high schools' participation in water quality monitoring efforts. • Continue annual Stream Clean-Up. • Participate in county commissioner meetings. • Conduct water quality monitoring workshops with the public partnering with Ohio Farm Bureau. • Set up informational displays at community events (such as fairs and festivals). • Distribute the informational watershed brochure and homeowners guide for better water quality.	Continuous Efforts
	• Gather all previously involved and new community members to set up the "formal" Friends of White Oak Creek Group. • Organize and conduct quarterly watershed group meetings, workshops and demonstrations. • Participate in the OEPA TMDL process in the years of 2006 - 2008. • Distribute watershed wide newsletters to approx. 3000 residents quarterly. • Produce a yearly calendar of upcoming watershed events with scenes of White Oak Creek and fun educational facts about the stream.	2004

	• Educate students about the stream and ways to stop pollution at local SWCD Field Day events. • Participate in a day long County Commissions Day Tour. With stops at White Oak Creek to inform the commissions of local efforts and funding needs. • Hold stream walk and canoeing events on the stream. • Have the watershed coordinator participate in county planning efforts to set up local adoption of set back requirements. • Work closely with the local high schools science clubs to conduct more baseline water monitoring data for the stream.	
Watershed wide floodplain and erosion assessment. Measuring miles of streambank erosion sites and floodplain condition.	• Obtain funding for a formal floodplain analysis, along with a sinuosity study and an eroding banks assessment. • Assess and monitor the watershed's floodplains and streambank erosion sites through the proper training and funding.	March 2005 – September 2006
Illegal Trash Dumping & Littering	• Remove trash from creek and streambanks through the annual stream clean-up. • Educate students and adults and encourage them to report trash dumpers. • Partner with the Adams-Brown Recycling Center and Solid Waste Authority to hold more public clean-up events and hazardous material collection days.	Continuous
Improperly Treated Wastewater	• Work with the local homeowners to upgrade failing household sewage treatment systems (HSTS). • Monitor the amount of e-coli and fecal coliform in the stream at target areas. • Educate the homeowner of health concerns of pathogens in the stream and teach them the proper maintenance for their system. • Work with the local health department to create a countywide plan to address these problems and acquire funding to assist landowners. Through the Department of	March 2000 – December 2013

	Environmental Financial Assistance (DEFA) and 319 grant programs.	
Sedimentation and Habitat Alteration	• Set up a tree planting program to repair the loss of riparian buffer along the stream corridor. • Educate landowners of the importance of a good riparian habitat.	On going effort
Monitoring	• Work with OEPA and volunteers to fill in missing data gaps. Limited water quality data is available in the headwaters and tributaries of White Oak Creek. A goal to collect and analyze more data in these areas is a necessity. A Lab Monitoring Proposal has been submitted (2003) and is in the set-up process to begin water quality monitoring utilizing OEPA's lab.	January 2004 – December 2008
Habitat Protection	• The White Oak Creek Watershed Advisory Board and Partners will research the opportunity of developing a Riparian Easement Purchase Program. The watershed group will partner with the Brown & Highland Soil & Water Conservation Districts and county commissioners to hold the conservation easements to protect the already established riparian habitat. The watershed group will set up guidelines and funding objectives to start the easement purchase program beginning in 2004.	2004 – 2014
Soil Quality	• The White Oak Creek Technical Focus Group will partner with the Ohio Division of Natural Resources to conduct a Soil Quality Pilot Project to survey the current soil quality in continuous soy bean agricultural areas. The program is a pilot project for the state and will be used to determine future implementation practices. The results will be added to this plan.	2004 - 2005

Purpose of the Action Plan

The purpose of the White Oak Creek Watershed Action Plan is to reduce water resource impairments in all stream segments within the watershed that do not meet water quality standards. The Watershed Action Plan will also identify all areas of White Oak Creek that are currently meeting standards, and protect these areas with local programs. The programs will be administered on a local level by

the White Oak Creek Watershed Group with continued citizen input and involvement. The plan has goals and implementation strategies set up to bring all stream segments up to full water quality attainment.

The ultimate purpose of the White Oak Creek Watershed Action Plan is to restore and maintain the chemical, physical, and biological integrity of White Oak Creek's waterways. It is the watersheds group's ambition is to protect not only the water and land, but to provide protection for fish, wildlife and all living organisms in the White Oak Creek Watershed.

Updates & Revisions

The White Oak Creek Watershed Action Plan is a "living document" which will be updated and revised as new information emerges and implementation practices are put into place. As stakeholders reflect on the past accomplishments and forge ahead into the future to plan the watersheds new direction. The water quality of White Oak Creek is improving with each individual's effort. This action plan has been written to aid the development of water quality and community support. Short and long term benefits will come from the implementation of the action plan. The plan is designed to be flexible and continuously updated. The plan is written on a ten year time frame with updates inserted as needed. The ten year time frame runs from 2004 through 2014, this will allow for short and long term goals to be administered. The plan will be reevaluated on a yearly basis and additions to the plan can be submitted to the watershed coordinator at the local Soil & Water Conservation District. The added pages will be hole punched and included in the three ring-binder under the appropriate section.

Previous Water Quality Efforts

There is no knowledge of any formal previous water quality efforts on White Oak Creek Watershed. There have been no other previous planning documents produced to the advisory board's knowledge. The creation of the White Oak Creek Watershed Stakeholders took place in conjunction with other organizations missions. For example, many organizations in the watershed are working toward watershed goals, including county Health Departments, Planning Commissions, Soil & Water District, Natural Resources Conservation Service, and many others. The White Oak Creek Watershed goals are linked to all of this organizations and there planning efforts and goals. Currently, there are several projects going on in the White Oak Creek Watershed. The group is implementing an Ohio EPA 319 grants, a watershed coordinator grant, federal Farm Bill programs and continually works with local watershed stakeholders to educate them on pollution reductions alternatives. Prevention, education and implementation are the keys to pollution reduction in the White Oak Creek Watershed. Many programs have been implemented in the watershed since the project began in 2000. See the Previous & Active Programs Section to review all the programs that have been implemented.

White Oak Creek Watershed – Lower Main Stem at RM 3.3

White Oak Watershed Group

The White Oak Creek Watershed Group is a broad group of stakeholders that take a genuine interest and concern in the water quality in White Oak Creek. The group strives to educate the community and protect the quality of the watershed. The White Oak Creek Watershed Group consists of persons interested in conservation efforts in the watershed. The group is made up of many different stakeholders. One centralized watershed group will be able to address the current water quality issues on a subwatershed basis. To provide assistance, "Focus Groups" were formed to detail specifics for this plan. The group will continue to diversify and gather new members as the action plan will target the issues by critical areas. The watershed partners include groups and individuals such as:

- Brown & Highland County Commissioners
- Local 4-H Groups
- Local Watershed Citizens
- Watershed Villages
- Township Trustees
- Ohio Valley Resource Conservation & Development
- Ohio Environmental Protection Agency
- Brown Soil & Water Conservation District
- Highland Soil & Water Conservation District
- Natural Resource Conservation Service
- Ohio Department of Natural Resources
    - Division of Forestry
    - Division of Wildlife
    - Division of Soil & Water Conservation

- Local Farmers & Agricultural Leaders
- Brown County Planning Commission
- Adams-Brown Recycling Center
- Ohio Farm Bureau
- Brown & Highland County Farm Bureau
- 8 local school districts – Student & Teacher Volunteers
    - Ripley-Union-Lewis Huntington Schools
    - Eastern Brown Schools
    - Western Brown Schools
    - Fayetteville Schools
    - Georgetown Exempted Village Schools
    - Lynchburg-Clay Schools
    - Hillsboro Schools
    - White Oak Schools
- Brown County Health Department
- Highland County Health Department
- Brown County Rural Water Association – Wellhead Protection Committee
- Brown Solid Waste Authority
- Ohio State University Extension
- Brown County Engineer
- Brown County Educational Services
- Wildlife Officer
- Brown County Planning Commission

Advisory Board

The White Oak Creek Watershed Group represents a broad spectrum of individuals and organizations. A core group known as the White Oak Creek Watershed Advisory Board represents the larger watershed group on a smaller scale. The advisory board is composed of the individuals and agency personnel that put together implementation efforts among many other things. The broader watershed group generates the watershed concerns and issues in which the Advisory Board meets quarterly to discuss those issues along with financial decisions, implementation efforts and education programs. The advisory board also works diligently on finding new funding options and grant opportunities.

The White Oak Creek Watershed Advisory Board consists of representatives from all of the following agencies or groups:

- **Brown Soil & Water Conservation District**
    - District Administrator
    - District Technician
    - Education Coordinator/Wildlife Specialist
- **Highland Soil & Water Conservation District**
    - Wildlife Specialist/Education Coordinator
    - District Technicians
    - Administrative Assistant

- **Ohio Valley Resource Conservation & Development**
  Grant Fiscal Agents
  - Coordinator
  - Administrative Assistant
- **Natural Resource Conservation Service**
  - District Conservationists
- **Ohio Department of Natural Resources**
  - Division of Forestry – Forester
  - Division of Wildlife – Biologist
  - Division of Soil & Water – Resource Management Specialist
- **Brown County Health Department**
  - Environmental Specialist
  - Sanitarian
- **Highland County Health Department**
  - Sanitarian
- **Ohio Environmental Protection Agency**
  - Division of Surface Water
  - 319 coordinator
  - point source division
- **Ohio State University Extension**
  - Watershed Agent
  - Agriculture Agent

Focus Groups

Focus groups have been set up to work on watershed action plan tasks that require extensive time and research. These smaller, very productive groups are used for planning and implementation needs in the White Oak Creek Watershed. The focus groups meet as necessary to get the work accomplished. The groups and their members have and will remain to play the vital role in the watershed and its development. Focus Group members are chosen by the watershed coordinator and other advisory board members by their knowledge of the area being researched are implemented. Currently, there are 4 focus groups in place; Agricultural/Technical group, Urban/HSTS group, Education group, and a Fiscal group.

Structure

The legal structure of the White Oak Creek Watershed is currently under the fiscal advisory of the Ohio Valley RC&D. The watershed group meets once quarterly to discuss financial issues and review the quarter's activities. The watershed coordinator facilitates the meeting and discusses the previous and upcoming events. The coordinator also works to implement programs, determined by the watershed group, that improve water quality and promote conservation of aquatic resources. The White Oak Creek Group is planning in the future to pursue 501(c)(3) tax-exempt status to become a non-profit self-satiating

group. As a non-profit watershed group, the members will be able to pursue more independent options for funding and organization. However, currently the White Oak Creek Watershed Group is in active partnership with the Ohio Valley RC&D and currently utilizes the RC&D's nonprofit status. The RC&D is comfortable with the partnership by allowing the group to utilize the umbrella of support that it offers to start-up groups. Ohio Valley RC&D will continue to provide fiscal support, liability coverage, grant administration, and fiscal accountability to the group until it is determined locally that the White Oak Creek Group someday feels the need to form their own 501(c)(3) .

In addition to becoming a non-profit watershed group there will be "Codes of Ethics" formed, and the group's decision-making process and structure will be reorganized. At the current time the Advisory Board along with the watershed coordinator makes the majority of the decisions and determines the best options for the group and watershed to proceed in. At the time of reorganization all members will be formally inducted into the White Oak Creek Watershed Group and a Memo of Understanding (MOU) will be formed and signed by all current and new members. Term limits and other structure decisions will be set up at that time.

Watershed Group at a Community Outreach Meeting

The following is a timeline that will be used in the formation of the Friends of White Oak Creek Group.

2004	2005	2006-2010
Activities include: • Put together a "set-up committee" for the White Oak Creek Watershed Advisory Board. • Contact all community residents	Continue to support the process of creating a sustainable group under the umbrella of the USDA Ohio Valley Resource, Conservation and Development for financial management.	Activities include: • Consider the formation of a 501(c)(3). • Develop Articles of Incorporation. • Develop a Memo of Understanding

that have already shown interest in becoming a watershed group member. • Hold an evening "KICK OFF" meeting to promote citizen involvement. Activities already in place: • Logo created • Mission Statement • Quarterly newsletters • Media strategies • Brochures • Slide Shows • Technical & Focus Groups • Advisory Board • Educational Activities • Stream Clean-ups • Funding Strategies • White Oak Creek Watershed Action Plan.	Activities include: • Set up by-laws • Revise mission statement (if necessary) • Appoint community group members to serve on the Watershed Advisory Board.	(MOU) that will be signed by all current and new watershed group members. • Set up member term limits. • Build a sustainable group to be financially self supporting. • Continue to work closely with all supporting government organizations to become better at addressing watershed management.

Contributors

Everyone who participated in this planning and implementation process has been a major contributor in the watershed. The Action Plan reflects all of the stakeholders' ideas and concerns that face White Oak Creek. The plan is a tool to restore and maintain the integrity of the stream through data gathered and strategies laid out in the plan. Local citizens have participated in the planning and implementation phases through many different outlets. Community events have generated large numbers of participants through educational meetings, mailed surveys and monitoring programs. These programs have resulted in data that is included in this plan. The Watershed Advisory Board, Review Committee, Ohio Department of Natural Resources, Ohio State University Extension, Ohio Environmental Protection Agency, Ohio Valley Resource Conservation, and Development, and Natural Resource Conservation Service are all major participants and made this document possible. The watershed group and writers have worked through many rewrites and revision to make this document useful in carrying out the future implementation practices.

Development of the Action Plan

Watershed Community Meeting

Watershed Stakeholders came together to participate in the action plan efforts. Concerned citizens were gathered at many educational events over the past 3 years. At each event citizen data was gathered and compiled into a usable format. Surveys were used on 3 occasions to gather input from citizens. Verbal question and answer sessions were also used to obtain citizens' concerns. Survey data was prioritized based on survey results. The information listed below is all gathered data from watershed residents. (For raw data please see appendix)

Public Meeting Input
Citizens Concerns

March 27, 2001:

***voiced concerns**

- Mercury Concerns
- Mandatory Regulations
  - For fertilizers, etc…
- Rumpke Landfill Concerns
- Creek Obstructions
  - Log jams, etc…
- Public Access
  - Fishing, wading, or swimming
- State Route 221 – sanitary sewage disposal concerns
- Bank erosion

***written concerns**

#1 – Littering & illegal trash dumping
#2 – Sedimentation & erosion
#3 – Poor sewage treatment
#4 – Drinking water concerns
#5 – Flooding
#6 – Lack or public access & lack of recreation on the stream
#7 – Need for more picnic areas, wildlife habitat and dam concerns.

August 30, 2001

***voiced concerns**

- Need for tree removal
- Beaver problems
- Non-existent or failing septic systems
- Need for more cost-share dollars for BMP's
- Fish community concerns – less game fish

*** written concerns**

#1 – Sewage treatment
#2 – Sedimentation & erosion
#3 – Drinking water
#4 – Litter
#5 – Flooding
#6 – Lack of recreation on the stream
#7 – Lack of public access

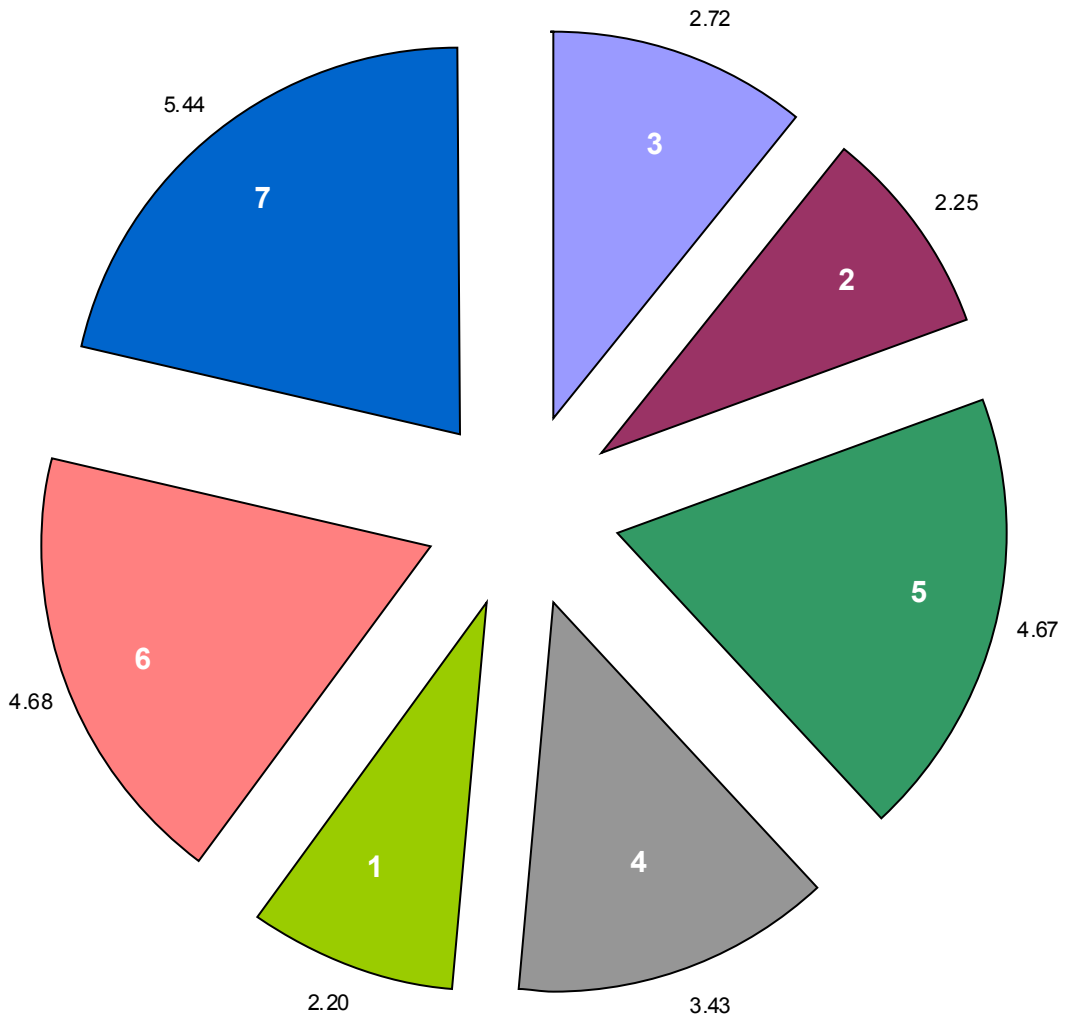
White Oak Creek Watershed Community Survey Results
Mailed - March 2002

*** refer to pie chart below**

Highest Concerns		**Average**
#1	Illegal stream-side dumpsites	2.2
#2	Failing septic systems	2.25
#3	Erosion & excess sediment	2.72
#4	Excess nutrient runoff & lawn fertilizer	3.43
#5	Lack of stream side forest	4.67
#6	Stream channelization & habitat alter.	4.68
#7	Lack of recreation opportunities	5.44

**1800 surveys mailed & 95 returned*

RESULTS OF THE WHITE OAK CREEK WATERSHED COMMUNITY PUBLIC SURVEY



- Erosion & Excess sediment
- Failing septic system
- Lack of stream-side forest
- Excess nutrient runoff & lawn fertilizer
- Illegal stream-side dumpsites
- Stream channelization & habitat alterations
- Lack of recreation opportunities

1 = higest concern
7 = lowest concern

* 1,800 surveys mailed & 95 returned

Education/Marketing Strategies & Outreach Goals

The goal table will be followed to enhance public understanding of the watershed project and insure continued participation from watershed residents and political leaders. The focuses for the information/education goals are to enhance participation in the push to bring all water quality needs up to attainment status and to educate citizens while completing that task. Education is the key to assuring a continuously healthy stream. The following chart is only a baseline goal to follow. Many other events will be added to the list as the watershed group continues to grow and expand.

Activity	Timeframe
White Oak Creek Watershed Calendar	November 2004
Field Day Presentations	Spring & Summer 2001 – 2013
Steam walks & Canoe floats	Summer 2004 – 2013
Annual Stream Clean-up	May 2002 – 2013
Commissioner's Tour	July 16, 2003
Local Work Group participation	On going effort
Wellhead protection committee participation	Quarterly
Brown County GIS Policy Board	On going effort
Planning Commission Meetings	Quarterly
Watershed Advisory Board Meetings	Quarterly
Watershed Community Involvement Meetings	Bi-yearly 2001 – 20013
AWARE water quality workshops	August 2002 – 2013
School Water Monitoring Project	Fall & Spring 2000 – 2013
Recycling Events	On going
Conservation Field Days	Yearly 2002 – 2013
Distribution of educational materials	On going
Set up displays at fairs and festivals	On going
Produce and distribute watershed newsletters	Quarterly 2000 – 2013
Nonpoint Source Pollution school programs	On going
Educational programs using the Streamulator and Enviroscape.	On going

Education & Community Outreach

The White Oak Creek Watershed Project has been involved with a variety of educational activities since the project started in 2000. Through the education and outreach, the project has gained insight to stakeholder concerns in the watershed. These concerns have been used to guide this plan. There has been an excellent response by stakeholders at education and outreach events. The following is a partial listing of education and community outreach activities that have been conducted from 2000 - 2003.

- **White Oak Creek Public Meeting** – On March 27, 2001, approximately 75 watershed stakeholders attended the first White Oak Creek public meeting. It was held in Mt. Orab in the Sterling Run Watershed. Stakeholder concerns were recorded and prioritized as follows:
  1. Littering & illegal trash dumping
  2. Sedimentation & erosion
  3. Poor sewage treatment
  4. Drinking water concerns

- **White Oak Creek Public Meeting** – The second meeting on August 30, 2001, was held in the headwaters of White Oak Creek at Hopewell Education Center. Over 60 watershed stakeholders attended. Concerns were recorded and prioritized as follows:
  1. Poor sewage treatment
  2. Sedimentation & erosion
  3. Drinking water
  4. Littering & trash dumping

- **Two Stream Clean-ups**
  1. April 7, 2001 – 10 local 4-H members helped clean up a 2 mile stretch of East Fork Subwatershed.
  2. May 18, 2002 – 22 community members cleaned appox. 2 miles of Sterling Run and filled over 30 bags of garbage.

- **Teachers Workshop**

August 14, 2001 – The White Oak Creek Watershed Group and the Brown SWCD sponsored the second water monitoring teacher workshop. This workshop enabled teacher volunteers to collect reliable water quality data when the water monitoring groups test the designated 20 sites within the White Oak Creek Watershed. Eight high school science teachers participated.

- **Storm water Stenciling**

Student volunteers participate in the watershed storm water stenciling projects throughout the year. This event helps educate the community against dumping chemical pollutants into the storm sewer.

- **AWARE Water Quality Training**

August 6, 2002 & October 5, 2003 – The White Oak Creek Watershed Partners along with Brown SWCD, Ohio Farm Bureau and Brown County Farm Bureau hosted an exciting hands on water monitoring training at a farm along White Oak Creek. Participants were introduced to the AWARE (Agricultural Watershed Awareness Resource Evaluation) Program; this is a volunteer member-based program for watershed residents to determine the quality and health of their watershed's physical, chemical and biological features.

- **Homeowners Guide**

The purpose of the Homeowners Guide is to help the individuals interested in building or buying a home sort out the broad range of considerations that need to be addressed before purchasing. The brochure will also assist prospective home buyers and home builders by providing a list of items to consider when evaluating a lot or building site, or selecting land for development. The information in the guide educates watershed residents about the facts and dangers to watch for when choosing a home site.

- **Watershed Brochure**

  The White Oak Creek Watershed Brochure was produced to educate Brown and Highland County residents about the activities and purpose of the watershed group. The brochure identifies the facts, activities and partners associated with the watershed project. The brochure is a trifold color pamphlet with the purpose of getting more volunteers educated and involved in the watershed.

- **Educational Field Days**

  The White Oak Creek Watershed conducts and presents at many different field day events throughout the year. These field days mainly focus on the education of students in the local school districts. Each field day is jam packed with educational stops that focus on agriculture, conservation and water quality.

- **Conservation Field Day**

  October 12, 2002 – The Brown SWCD hosted an adult conservation field day that focused on best management practices. The event was and will continue to be held at a local working farm where conservation practices have been implemented. This gives many farmers and watershed residents a chance to view the benefits of conservation practices. This provides opportunities for landowners to see and begin implementing best management practices to reduce nonpoint source pollution.

- **Highland County Farmers Club**

  The watershed coordinator spoke with the Highland County Farmers Club to inform them about the implementation opportunity for best management practices. The members viewed a working (319) funded buffer strip. This nonpoint source pollution reduction practice showed the benefit of installing these types of practices.

- **Ripley Farmers Club**
  The watershed coordinator showed a presentation about the water quality efforts taking place in the White Oak Creek Watershed. This was an educational opportunity for farmers and landowners to be educated about the local water quality efforts happening in the area.

- **Quarterly Watershed Newsletters**
  Each quarter (4 times per year) a watershed wide newsletter is produced. The newsletter is a great opportunity to inform and educate the entire watershed. Every watershed resident receives a newsletter with quarterly happenings published. The newsletter invites everyone to participate in watershed activities and updates them about upcoming events.

- **Adopt – a – Highway**
  The White Oak Creek Watershed Project and Brown SWCD co-sponsors a 2 miles section of St. Rt. 32 encompassing both sections of Highland and Brown County. The sections are cleaned 4 times per year by volunteers.

- **Local Water Quality Concerns Survey**
  Approximately 1,800 surveys were sent out enclosed in the watershed newsletter. The survey was accompanied by an article in the newsletter explaining the watershed action plan and how the information from the survey cards would be used in the identification of pollution concerns in the watershed. Approximately 100 surveys were returned with their issues ranked from highest to lowest concern. #1 was illegal dumpsites, #2 was failing septic systems and # 3 was erosion and sedimentation. These concerns are very similar to the direct impacts to which OEPA refers in the 305 (b) report as stream impairments. These concerns will be addressed in this plan.

- **Brown County Water Festival**
  The Water Festival is sponsored by the Brown County Rural Water Association. There are many educational and informative booths and exhibits with which the public can interact to learn about water quality and resources.

- **Brown & Highland County Fair Booth**

  Each year the White Oak Creek Watershed Group is represented at the local county fairs. The SWCD offices set up informational booths. Watershed information along with maps are displayed and distributed to local residents.

- **High School Water Monitoring Program**

A water monitoring program was set up with 8 local school districts in Brown and Highland County. Each school was equipped with $5,000 worth of state-of-the-art equipment. The school water monitoring teams monitor for 10 different physical, chemical, and biological parameters. This monitoring data has been used for baseline data. There has been little monitoring done in this watershed so the student monitoring data is a great baseline to begin with. The student data is included in this document under the water quality monitoring section.

- **Junior High Macroinvertebrate Monitoring Program**

  Students and teachers participate in the macroinvertebrate monitoring program. Activities include collecting, identifying and documenting the invertebrate life forms that inhabit the streams of White Oak Creek. Students have collected many invertebrates including cray-fish, water penny beetles, mayfly nymphs, aquatic worms caddisfly larvae, hellgram-mites, and many others.

White Oak Creek Watershed Fact Sheet

USGS Hydrologic Unit # 05090201 090/100

Counties:

Brown	50.80%
Highland	49.20%

Ecoregion: Interior Plateau

Watershed Size:

Total acres	150,621 acres
Drainage	234.3 sq. miles

Stream Length:

Main stream	49.3 miles
Tributary length	89 miles
Total length	138.3 miles

Elevation:

Source	1055 feet
Mouth	463 feet
Total fall	592 feet
Average fall	12.0 ft/mi

14 digit Sub-watersheds	HUC #	Principal Stream Miles	Drainage Area
Sterling Run	05090201 100 010	10.8	28.45
East Fork	05090201 090 010	22	80.8
North Fork	05090201 090 030	21	67.72
Little North Fork	05090201 090 020	5.2	13.26
Upper Main	05090201 100 020	21.5	
Lower Main	05090201 100 030	7.5	

Drains to the Ohio River **Mile Point: 423.9**

1994 Land Use Cover:	% of watershed
Urban	0.95%
Agriculture	80.29%
Shrub Area	0.11%
Wooded/Forested	17.97%
Open Water	0.29%
Wetlands	0.38%
Barren	0.01%

II. Watershed Inventory

White Oak Creek Watershed – Lower Main Stem at River Mile 3.4

Introduction

The watershed inventory section is a comprehensive list of data gathered about the White Oak Creek Watershed. This section inventories the physical and biological attributes, along with habitat and use characteristics of the watershed/subwatersheds. However, the White Oak Creek Watershed has been broken down in six different 14 digit hydrologic units for the planning and implementation purposes of this plan. The White Oak Creek Watershed consists of 6 sub watersheds; Upper Main, Lower Main, Sterling Run, North Fork, Little North Fork, and East Fork. The "Subwatershed Section" will go into greater detail about each area, addressing the physical characteristics, water quality assessment, livestock inventory and other specific details.

The subwatersheds are divided by tributary drainage and make the White Oak Creek Basin more manageable to address water quality concerns and specifically address implementation goals. This method will allow the watershed group to better plan and evaluate the areas being studied. This will also allow the plan to be much more helpful and accurately assess the areas studied. Water quality differs throughout the watershed, and with the help of the subwatershed inventory, it will allow for an accurate evaluation of each subwatershed while also providing for direct goal statements and specific implementation strategies.

Physical Characteristics

The White Oak Creek Watershed contains 150,621 acres in Brown and Highland Counties. Brown and Highland Counties are located in south/south-western Ohio. The entire watershed drainage area is 234.3 square miles and empties into the Ohio River. The watershed is positioned in the southwest corner of Highland County and in south central Brown County. The main channel of White Oak Creek is 49.3 miles long with approximately 89 miles of tributaries, making the total stream length 138.3 miles.

Total acres:	**150,621 acres**
Brown:	**50.8%**
Highland:	**49.2%**
Length:	**49.3 miles**
Source elev:	**1055 feet**
Mount elev:	**463 feet**
Total fall:	**592 feet**
Avg. fall:	**12.0 ft. per mi.**
Flow to:	**Ohio River**
Mouth in:	**Brown County**
Drainage:	**234.3 Sq. Mi.**
Mile Point:	**423.9mi.**

In 49 miles, the stream falls 592 feet or 12 feet per mile. The watershed of 234.3 square miles is 30 miles long and 15 miles wide in the upper portion, where broad plains are occupied by farmland. For the lower 12 miles, the watershed is only 3-4 miles wide, flanked by hills that rise abruptly 150 to 200 feet.

Administrative Boundaries

Counties:

Brown
Highland

Villages:

Georgetown
Sardinia
Mowrystown
Buford
Mt. Orab
Higginsport

Townships:

Brown:
Lewis
Pleasant
Clark
Scott
Washington
Pike
Green
Franklin
Eagle

Big Run Tributary in Lower Main Stem Subwatershed

Highland:
Whiteoak
New Market
Hamer
Salem
Clay
Concord

Districts

There are several different special districts located within the White Oak Creek Watershed that have made tremendous efforts to improve water quality and promote citizen educations.

- Brown and Highland County Soil & Water Conservation Districts
- School Districts include:
  - Ripley-Union-Lewis-Huntington
  - Eastern Brown
  - Western Brown
  - Georgetown Exempted Village
  - Fayetteville
  - Lynchburg
  - White Oak
  - Hillsboro
- Solid Waste/Recycling Districts are located in the watershed.
- Agricultural Districts in Brown & Highland Counties
- No Park Districts are located within the watershed.
- No Sewer Districts exist, only sewer systems are located within the villages.

Demographics

Population trends indicate a continued increase in the population within the watershed. The population of Brown County is 42,285 with 50.8% of the watershed land located within Brown County. The population of Highland County is 40,875 with 49.2% of the watershed land located within Highland County. Several major villages are located within the watershed boundary, Mt. Orab at a population of 2,307 and Georgetown at 3,691. Other incorporated villages include Sardinia at 862 residents and Mowrystown at 373 residents. However, much of the village over population is flowing into the local township areas. A more complete inventory of the urban population needs to be completed.

Township population vs. population in villages has changed dramatically over the past 40 years. Brown County has grown by 72% and only 64% in Highland County. Scott, Washington, Green, White Oak, Clay, Hamer, and Salem are all completely or somewhat fully located within the watershed boundary. Pleasant, Pike, Lewis, Franklin, Clark, Eagle, Sterling, New Market and Concord are all divided by the watershed breaks. The 2000 census totals from the townships

equal approximately 14,851 residents and the populations from the villages equal approximately 7,233. The watershed population is approximately 22,084 residents. *(Ohio County Profiles & Census Data)*

HIGHLAND COUNTY DECENNIAL CENSUS OF POPULATION 1800 - 2000

1800	1810	1820	1830	1840	1850	1860
	5,766	*12,308*	*16,345*	*22,269*	*25,781*	*27,773*
1870	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
29,133	*30,281*	*29,048*	*30,982*	*28,711*	*27,610*	*25,416*
1940	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**
27,099	*28,188*	*29,716*	*28,996*	*33,477*	*35,728*	*40,875*

BROWN COUNTY DECENNIAL CENSUS OF POPULATION 1800 - 2000

1800	1810	1820	1830	1840	1850	1860
		13,356	*17,867*	*22,715*	*27,332*	*29,958*
1870	**1880**	**1890**	**1900**	**1910**	**1920**	**1930**
30,802	*32,911*	*29,899*	*28,237*	*24,832*	*22,621*	*20,148*
1940	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**
21,638	*22,221*	*25,178*	*26,635*	*31,920*	*34,966*	*42,285*

Economics

The 2000 annual average civilian labor force estimates for Brown County were: total labor- 20,300, employment – 19,100, unemployment – 1,200, and unemployment rate at 6%. Brown County is ranked sixteenth highest in unemployment in Ohio.

In 2000 the total employment for all industries in Brown County was 7,399 with Government claiming the largest portion with 27.9%. Average weekly earnings for all industrial groups in Brown County were $459.75. *(Ohio County Profiles)*

The 2000 annual average civilian labor force estimates for Highland County were: total labor force – 18,600, employment – 17,700, unemployment – 900, and unemployment rate is 4.8. Highland County ranked thirty-seventh in unemployment in Ohio.

In 2000 the total employment for all industries in Highland County was 11,412, with the manufacturing industry claiming the largest portion – 31.3 percent. Average weekly earnings for all industrial groups in Highland County were $451.52. *(Ohio County Profiles)*

Agriculture & Economy

Agricultural Statistics By County

The following tables list agricultural statistics provided by the 2001 Ohio Department of Agriculture Annual Report and Statistics. This information is presented on a county basis.

Brown County

Average Farm Size	126 acres
Number of Farms	1,660
Land in Farms	209,000 acres
Total Land	315,673 acres
Total Cash Receipts	$39,955,000

2001 Crops	Acres Harvested	Yield	Production	Rank
Corn for Grain, Bu.	24,600	125.3	3,082,400	48
Soybeans, Bu.	74,000	42.1	3,114,900	33
Wheat, Bu.	3,500	65.0	227,400	56
Oats, Bu.	---	---	---	---
All Hay, Ton	23,800	1.95	46,500	37
Tobacco, lb.	2,130	1,980	4,217,700	1

Livestock	Number	Rank
All Cattle & Caves (01/01/02)	18,000	25
Milk Cows (01/01/02)	1,400	45
All Hogs & Pigs (12/01/01)	3,900	60
All Sheep & Lambs (01/01/02)	---	---

Highland County

Average Farm Size	174 acres
Number of Farms	1,410
Land in Farms	246,000 acres
Total Land	357,195 acres
Total Cash Receipts	$39,943,000

2001 Crops	Acres Harvested	Yield	Production	Rank
Corn for Grain, Bu.	37,500	147.4	5,527,500	39
Soybeans, Bu.	89,400	43.1	3,853,400	20
Wheat, Bu.	11,500	63.9	735,000	32
Oats, Bu.	---	---	---	---
All Hay, Ton	26,600	2.89	76,100	18
Tobacco, lb.	400	1,990	796,000	5

Livestock	Number	Rank
All Cattle & Caves (01/01/02)	22,700	12
Milk Cows (01/01/02)	1,000	54
All Hogs & Pigs (12/01/01)	9,200	47
All Sheep & Lambs (01/01/02)	1,700	25

Agriculture is the main land use in the White Oak Creek Watershed area. Land cover data in 1994 show that 80.29% is in agricultural rotation. Soil erosion is a serious problem in the watershed. The majority of sediment runoff is due to intensive agricultural practices and a lack of streamside filter strips. The White Oak Creek Watershed area is composed of both highly erodible and non-highly erodible land. Erosion takes place on both sloped and relatively flat ground due to the fine texture of the soil. The small soil participles move farther and erode quicker. Sediment reducing practices are being implemented in the headwaters of the stream to help control the sediment movement.

Geology and Topography

A glacier once covered most of Brown and Highland Counties completely encompassing the White Oak Creek Watershed region. White Oak Creek has cut through the glacial drift, and all the streams have reached bedrock in the lower reaches. The bedrock consists of imbedded clay shales and limestone in horizontal starta and is relatively impervious; hence the tributaries that have low dry-weather flow.

Water fall at the mouth of Unity Creek

At one time, all of Brown County was covered by a relatively shallow ocean. Marine creatures settled to the floor of this ocean, forming hundreds of layers of limy sediments. These sediments eventually turned into hard, highly fossiliferous limestone bedrock, which underlies the entire watershed. The bedrock material was deposited during the Ordovician times, roughly 400 millions years ago. The bedrock consists of thin, alternating layers of hard fossil limestone and relatively soft, gray shale. After the bedrock material was deposited, the ocean floor was lifted high above the water level. Subsequently, natural water erosion carved out many stream valleys.

The Illinoian glacier entered Brown County about 200,000 years ago. The glacier left deposits of glacial till over the majority of the watershed. This till is typically a very compact mixture of sand, silt, clay, rocks, and boulders and has a high content of lime. When the glaciers retreated, meltwater deposited sandy and gravelly material along the larger stream valleys. These areas still stand as benches below the stream valley walls and above the current flood plains.

After the retreat of the glaciers, windblown dust called loess was deposited in the counties. The loess has a high content of silt. Since glacial times, natural erosion has continued to form deeper stream valleys. It has removed the loess from many of the steep and very steep slopes that are located at the southern end of the watershed. Current streams have deposited sediment on nearly level flood plains that are parallel to one another. *(Brown County Soil Survey, 2)*

The oldest glacial deposits in the Highland County portion of White Oak Creek Watershed are also Illinoian. The glacial area of Illinoian age is the most extensive in Highland County and consists of two highly contracting topographic regions. One is the nearly level area in the western part of the county commonly called the "Crayfish Flats." The other is the gently sloping to moderately steep, dissected area in the north-central and southern parts of Highland County. The glacial till in the nearly level Illinoian till plains is generally 10 to 30 feet thick, but in the hilly Illinoian till plains it is only a few inches to normally less than 10 feet thick. Many streams in the central and southern parts of Highland County have cut into and are flowing on bedrock of limestone or shale. *(Highland County Soil Survey, 195)*

Land Form & Slope

Large limestone wall on White Oak Creek at RM 3.4

White Oak Creek has unique formation that exists primarily in southwestern Ohio. The bedrock material was deposited during the Ordovician times, roughly 400 millions years ago. The bedrock consists of thin, alternating layers of hard fossil limestone and relatively soft, gray shale. In 49 miles, the stream falls 592 feet or 12 feet per mile and is composed mainly of a sand cobble bottom. The watershed of 234.3 square miles is 30 miles wide in the upper portion, where broad plains are occupied by agriculture farmlands. For the lower 12 miles, the watershed is 3 or 4 miles wide, with flood plain averaging only about 600 feet in width, flanked by hills that rise abruptly 150 to 200 feet. And the stream bottom is composed of large limestone rocks, cobbles and boulders.

SOILS OF THE WATERSHED

(County Soil Surveys)
(See map of general soils)

Brown:

Clermont-Avonburg Association: Deep, nearly level and gently, sloping, poorly drained and somewhat poorly drained soils formed in loess and glacial till; on the Illinoian till plain.

Rossmoyne-Bonnell Association: Deep, gently sloping to very steep, moderately well drained and well drained soil formed in loess and glacial till; on the Illinoian till plain.

Eden-Pate-Faywood Association: Moderately deep and deep, strongly sloping to very steep, well drained and moderately well drained soils formed in residuum and colluvium derived from shale and limestone; on uplands.

Genesee-Williamsburg Association: Deep, nearly level and gently sloping, well drained soils formed in alluvium and in loess and glacial outwash; on flood plains and terraces.

Highland:

Avongburg-Clermont-Blanchester Association: Deep, nearly level to gently sloping, somewhat poorly drained and poorly drained soils that formed in loess and the underlying glacial till. This association is predominantly in the west and south-west parts of Highland County. Headwaters of White Oak Creek watershed area.

Rossmoyne-Hickory Association: Deep, nearly level to steep, moderately well drained and well drained soils that formed in loess and the underlying glacial till.

Boston-Rossmoyne-Bratton Association: Deep and moderately deep, nearly level to moderately steep, well drained and moderately well drained soils that formed in loess in the underlying glacial till.

Genesee-Algiers-Sardinia Association: Deep, nearly level to sloping, well drained, somewhat poorly drained, and moderately well drained soils that formed in alluvium or loess and the underlying water-deposited material.

- ***Additional soil data will be available after a 2004 – 2005 Soil Quality Pilot Project is conducted. The study will be done in conjunction with Brown SWCD and ODNR. The Soil Quality data will be added to this WOC Watershed Action Plan at the conclusion of the Soil Quality Pilot Project.***

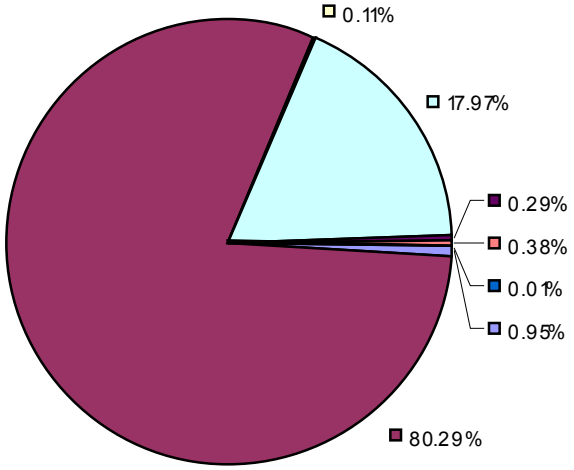
Land Use

See Map of Land Use

Land Use In White Oak Creek Watershed 1994 Land Coverage		
	Acres	Percent
Urban	1,430.90	0.95%
Agriculture	120,933.60	80.29%
Shrub Areas	165.68	0.11%
Wooded/Forested	27,066.59	17.97%
Open Water	436.80	0.29%
Wetlands	572.36	0.38%
Barren (mines,quarries)	15.06	0.01%
	150,621.00	100.00%

** Data provided by 1994 land use maps from Ohio Department of Natural Resources*

The land use in the White Oak Creek Watershed mainly consists of Agricultural areas and forested lands. The official 1994 land use data is the newest data on record. However, the White Oak Creek Watershed area has changed dramatically over the last 8 years. Urban sprawl is becoming a pressing issue in the village of Mt. Orab and the surrounding areas. Mt. Orab has been in the process of annexing large amounts of land into the village. The village has also added many new job opportunities and businesses to the town. Since the watershed area is located only 35-40 miles from Cincinnati, it is becoming a convenient "bedroom" community to the larger city.



Increased population and housing developments are expected in the near future. Agricultural farming areas in the area are being converted over into housing developments. The population of Brown County is rising at a very rapid pace, ultimately changing the landscape of the watershed and inducing new water quality issues.

The White Oak Creek Watershed land use is composed of 80.29 % agricultural use with an approximate 121,000 total acres of cropland. The watershed also consists of large area of pastureland containing mainly beef and dairy cows, hogs

and sheep. Agricultural lands consist mainly of corn, soybeans, tobacco, wheat and hay rotations. Annual tillage practices on these lands for crop production result in soil loss exceeding tolerable levels even though much of the watershed has level topography. The majority of sediment runoff is due to intensive agricultural practices and a lack of streamside filter strips. There are no other major mines or abandoned mines in the watershed.

The watershed is 30 miles long and 15 miles wide in the upper portion, where broad plains are occupied by farmland. For the lower 12 miles, the watershed is only 3-4 miles wide, with floodplains and forested lands averaging only about 600 feet in width, flanked by hills that rise abruptly 150 to 200 feet.

Livestock in Streams

Given the diverse topography of the White Oak Creek in both Highland and Brown Counties, there are numerous pasture-based livestock operations located within the watershed. Parts of the Upper and most all of the Lower Main sub watershed with their gently rolling to steep hill sides are predominantly permanent pasture. Portions of Sterling Run, North Fork, Little North Fork, and East Fork all have permanent pasture; however most of the pastureland in these areas is primarily located on soils that are not suitable for row crops. These areas not suitable for cropping tend to be near or adjacent to perennial and intermittent streams located through out each watershed.

Overall, pasture is a land use that if managed properly can have significant environmental benefits. Well-managed pastures have lower soil loss rates than most all of the other crops being grown in the watershed. Well-managed pastures also provide good wildlife habitat and have minimal to no impact on the streams.

Livestock in stream unrestricted access

Unmanaged pastures provide little to no environmental benefits. Unmanaged pastures tend to be under-grazed in some areas and over-grazed in others. Over-grazed pastures have increased soil erosion, greater runoff rates, and decreased habitat for wildlife. Under-grazed pastures tend to promote undesirable or invasive plant species and have less nutrient removal capability than well-managed pastures.

As stated previously, many of the pasture fields within the watershed either have a perennial, intermittent, or ephemeral stream flowing through or adjacent to them. The condition of each stream is largely determined by how well the operator is managing the pasture. Some of the streams located within pasture fields are achieving exceptional warm water habitat quality because of proper pasture

Bank erosion, embedded substrate, caused by livestock

management. However, some streams are experiencing excessive bank erosion, irregular width to depth ratios, and entrenchment due to livestock impacts.

One of the biggest challenges that pasture-based livestock operators have in the White Oak Creek Watershed is locating suitable winter-feeding sites. In pasture situations soil erosion and runoff rates are the highest during the winter feeding period and after drought conditions. Winter feeding areas if not moved frequently or armored with gravel or concrete tend to be barren, compacted areas that are primarily located on sloping land. Under these conditions when a rainfall event takes place, most all of the water runs off from winter-feeding sites with very little being absorbed into the soil profile. Best management practices for winter-feeding sites are needed on certain operations within the watershed.

Within the White Oak Creek watershed there is a need to promote proper pasture management. The watershed inventory has identified focus areas in each sub-watershed (see White Oak Inventory Spreadsheet, Unrestricted Livestock Access) where technical assistance could be offered. The goal of proper pasture management can be accomplished by working with land owners on developing conservation plans, promoting grazing schools within the watershed, showing on-site demonstrations of best management practices, and by providing cost-share funding to establish needed best management practices on individual operations.

Forested Areas & Riparian Corridors

See Map of wooded areas

Main stem of White Oak Creek that is surrounded by abundant riparian habitat

Healthy stream system provides the clean water we all require. A forested corridor along streams, rivers, and lakes help to prevent water pollution. These corridors can also yield a variety of timber products that may provide income for a landowner. The key is to maintain a healthy forest corridor, which in turn will help maintain a healthy stream system. All forest management decisions need to keep the health of the stream system in mind.

Forests protect water quality by stabilizing banks, shading the water, taking up nutrients, and filtering pollutants. The extensive network of tree roots hold the soils of the bank in place, reducing erosion and keeping the streambanks and shorelines stable. The shade helps to stabilize stream temperatures and maintain high oxygen levels that benefit many kinds of aquatic wildlife. Fallen leaves and other organic debris deposited in the water provide "food energy" to aquatic life.

Many nutrients, sediment, and pollutants contained in storm runoff are filtered out before they reach the water and are held in the leaf and humus layers on the forest floor. The nutrients are used for tree growth while pollutants are broken down into harmless compounds. Additionally, porous soils of the forest floor readily allow water to infiltrate, increasing groundwater recharge and reducing the potential for flash floods. *(Tim Wilson, ODNR Forester)*

The southern section (HUC 05090201 100) of the watershed, below New Hope for example, is covered by forested lands and steep cliffs. The watershed in this area is narrower, with floodplains and riparian areas averaging 600 feet in width and flanked by hills that rise abruptly 150 to 200 feet. In the upper reaches (HUC 05090201 090) of the headwaters, agriculture and development are much more prevalent. Areas of the watershed north of the Sterling Run and East Fork stream break are where the watershed drastically widens and becomes largely flat agricultural land. The watershed is 30 miles long and 15 miles wide, where broad plains are occupied by farmland. Riparian forests are sparser and not quite as broad like the lower reaches of the stream. Through the Ohio EPA 319 grant program has installed 200.7 acres of grass filter strips and 31.5 acres of riparian buffer strips. This has greatly impacted the sediment and nutrient runoff in the headwaters. The establishment of these riparian areas has helped produce wildlife habitat and streamside vegetation. One goal of this Action Plan is to install and enhance the riparian areas/forest lands in the upper reaches of White Oak Creek.

White Oak Creek Watershed Riparian Species List	
Common Name	***Scientific Name***
Swamp white oak	*Quercus bicolor*
White Oak	*Quercus alba*
Shingle oak	*Quercus imbricaria*
Bur oak	*Quercus macrocarpa*
Red oak	*Quercus rubra*
Pin oak	*Quercus palustris*
Shumard oak	*Quercus shumardii*
Chinquapin oak	*Quercus muhlenbergi*
Red maple	*Acer rubrum*
Silver maple	*Acer saccharinum*
Sugar maple	*Acer saccharum*
Boxelder	*Acer negundo*
Black maple	*Acer nigrum*
Green ash	*Fraxinus pennsylvanica*
White ash	*Fraxinus Americana*
Blue ash	*Fraxinus quadrangulata*
Yellow buckeye	*Aesculus octandra*
Ohio buckeye	*Aesculus glabra*
Shagbark hickory	*Carya ovata*
Shellbark hickory	*Carya laciniosa*
Bitternut hickory	*Carya cordiformis*
Slippery elm	*Ulmus rubra*
American elm	*Ulmus Americana*
Sycamore	*Plantus occidentalis*
Black walnut	*Juglans nigra*
Cottonwood	*Populus deltiodes*
Hackberry	*Celtis occidentalis*
American beech	*Fagus grandifolia*
Tulip tree	*Liriodendron tulipifera*
Black cherry	*Prunus serotina*
Basswood	*Tilia Americana*
Honey locust	*Gleditsia tricanthos*
Hawthorn	*Crataegus sp.*
Willow	*Salix spp.*
Redbud	*Cercis Canadensis*
Flowering Dogwood	*Cornus flordia*
Red mulberry	*Morus rubra*
Ironwood	*Ostrya virginiana*
Pawpaw	*Asimina triloba*
Eastern burningbush	*Euonymus atropurpureus*

Floodplains

White Oak Creek after a heavy rain event, creek is out of its banks

Floodplains are natural areas adjacent to the stream channel where excess water escapes to in flood events. The active floodplain is the flat, depositional surface adjacent to many stream channels. It is the best indicator of bankfull stages. Floodplains are most prominent along the low gradient, meandering reaches of White Oak Creek. They are often hard or impossible to identify along the steeper parts of the stream.

White Oak Creek's floodplains change considerably from the headwaters to the mouth. According to ODNR's Division of Water Fact Sheet, the character of Ohio's streams and floodplains has changed drastically, and the natural function of riparian ecosystems (vegetated areas along streams) has been significantly altered by human actions. In Ohio and the White Oak Creek watershed area floodplain resources, including wetlands, are experiencing increasing pressure for development. Streamside forests have been removed to make way for agricultural activities. Expanding urbanization of the White Oak Creek region and impervious surfaces produce increased amounts of surface water into the stream. Several small, headwater sections of the stream have been channelized due to agricultural reasons. This produces the effect of allowing water runoff to flow faster.

There has been no formal floodplain assessment conducted in the White Oak Creek Watershed. The only data used at this time is from watershed visual assessments and best professional judgment of the floodplains. The watershed group is planning to obtain funding for a formal floodplain analysis, along with a sinuosity study and an eroding banks assessment. With proper training and funding the watershed's floodplains and streambank erosion sites will be assessed and monitored. This is a goal that has been included in the "Comprehensive Watershed Goals" table.

The following identifies some of the specific benefits and values associated with floodplain resources in their naturalized, undisturbed condition; natural flood and erosion control, water quality maintenance, support flora, provide fish and wildlife habitat.

** Source: Ohio Department of Natural Resources, Division of Water Fact Sheet. U.S. Water Resources Council. A Unified National Program for Floodplain Management. Washington D.C.: U.S. Water Resource Council, 1979.*

Detrimental Impacts on Stream and Floodplains from Development

Changes in Hydrology	Changes in Geomorphology
o Increase in magnitude and frequency of severe floods o Increased frequency of erosive bankfull floods o Increase in annual volume of surface runoff o More rapid stream velocities o Decrease in dry weather baseflow on stream	o Stream channel widening and downcutting o Increased streambank erosion o Shifting bars of coarse-grained sediment o Elimination of pool/riffle structure o Imbedding of stream sediments o Stream relocation/enclosure of channelization o Stream crossing form fish barriers

Changes in Water Quality	Changes in Aquatic & Terrestrial Habitat and Ecology
o Massive pulse of sediment during construction stage o Increased washoff of pollutants o Nutrient enrichment leads to benthic algal growth o Bacterial contamination during dry and wet weather o Increased organic carbon loads o Higher toxic levels, trace metals, and hydrocarbons o Increased water temperatures o Trash/debris jams	o Shift from external to internal stream energy production o Reduction in diversity of aquatic insects o Reduction in diversity of aquatic and terrestrial species o Destruction of wetlands, riparian buffers, and springs

** Source: Ohio Department of Natural Resources, Division of Water Fact Sheet.*
** Source: Metropolitan Washington Council of Governments. Watershed Restoration Sourcebook. Washington, D.C.: Anacostia Restoration Team, 1992.*

The White Oak Creek Watershed experiences small areas of flooding during high water events. The village of Mt. Orab, upstream of Lake Grant, seems to be the most affected by these localized events. According to citizens, culverts cannot adequately handle the increased water from new development areas located upstream. The 100 year floodplain map shows in blue shades the flood prone areas.

Agriculture

In the White Oak Creek Watershed (Hydrologic Unit Codes of: 05090201-090 and 05090201-100) agriculture makes up eighty (80) percent of the land use in the entire watershed.

There are six (6) sub watersheds in the White Oak Creek Watershed, they are: Sterling Run, Little North Fork, North Fork, East Fork, Upper Main and Lower Main. Due to the differing soil types, the crop rotations vary greatly throughout the different sub watersheds. The rotations range from continuous soybeans; corn/soybean and corn/soybeans/cover crop (i.e. wheat, rye or speltz). Some areas have tobacco and hayland in the crop rotation.

In the sub watersheds of Sterling Run, Little North Fork, North Fork and East Fork, a high percentage of the cropland has continuous soybeans grown on that acreage. This is due to the soil types in those sub watersheds. These soils are classified as Non Highly Erodible (NHEL) land. These soils may be NHEL, but we are finding that soil erosion is still a concern. The reasons for the soil erosion occurring are decreased soil tilth **(definition: The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence and root penetration.) from Brown County Soil Survey,** lowered crop residue on the soil surface and soil compaction.

The decrease in soil tilth causes erosion by not having the organic matter in the soil to hold soil particles together. With soybeans being a low residue producing crop, this aids in erosion as well. There is not a protective layer between the soil surface and any water that comes in contact with the soil surface. The last concern is soil compaction; this problem is created by several different situations. The first being farming the soil when it is too wet, which is common in these areas due to the soils having a high water table during the spring of the year. Soil compaction is also created by a decrease in the soil tilth, without organic matter, the soil looses its porosity, and becomes a very tight dense soil. All of these situations lead to higher rates of runoff from cropland fields. The runoff contains sediment and nutrients; these are both considered pollutants to waters of the state.

When crop rotations (i.e. corn/soybeans) are utilized, we find fewer problems occurring on cropland. The soil conditions improve greatly with rotation of crops; increased soil tilth, less runoff of nutrients and sediment and soil compaction is reduced. All of these improvements come from there being higher amounts of residue to protect and enhance soil conditions, (a decrease in soil erosion, increased organic matter).

Based on data collected through the Conservation Technology Information Center for the crop years on 1998, 2000 and 2002, there is a trend that area farmers are changing their tillage methods. Generally, there has been an increase of eight (8) percent in the use of conservation tillage.

Conservation tillage is the practice of leaving significant amounts of residue on the soil surface during the entire year, more than thirty (30) percent residue. The two (2) main conservation tillage methods used heavily in the White Oak Creek Watershed are No-till and Mulch till.

No-till is the practice of doing "NO" tillage whatsoever; Mulch till is the practice of minimum tillage. The top picture shows the practice of no-till.

Reduced tillage is the practice of leaving fifteen (15) to thirty (30) percent residue on the soil surface**.** The use of this type of tillage method has essentially stayed the same over the last four (4) years.

This tillage method happens when the spring planting season has been affected by wet weather. Reduced tillage allows for the soil to dry out enough for spring planting to take place. The soils that make up the majority of the watershed have tight, impermeable sub-soils, causing them to hold water longer than other soils. With these conditions being in place this also causes the soils to tend to be colder than others, which also delays seed germination. There are high rates of seed spoilage due to the wet, damp conditions.

Conventional tillage is the practice of leaving less than fifteen (15) percent residue on the soil surface. On Highly Erodible Land this tillage practice will cause a severe amount of erosion. There has been a decrease in this practice, due to labor and fuel savings.

In the East Fork, Upper Main and Lower Main, there are more hay and tobacco produced than anywhere else in the watershed. The soils that are located in these three (3) sub watersheds are more suited for production of these two (2) crops. Tobacco production is very important to the agricultural economy to these sub watersheds. Hay is also an important crop for the sub watersheds and is usually included in a crop rotation with corn, soybeans and wheat.

With agriculture being the main land use in the White Oak Creek Watershed, it is very important that proper care of the land is practiced. According to the Ohio Environmental Protection Agency 305 (b) water quality report, soil loss and sedimentation is a major concern within the watershed. Therefore, we need to better educate area producers on the benefits of crop rotation, in regards to soil erosion, soil compaction and soil tilth. These items can be accomplished through conservation planning with the producers and being able to offer needed cost-share funds to establish needed best management practices to improve water quality.

Chemical Use Patterns

The chemical use patterns within the White Oak Creek Watershed have changed significantly over the past few years; due to the advent of Glyphosate ready crops. The main areas of chemical use in the White Oak Creek Watershed would be wherever row crops are produced.

The months of March, April and May would have the highest amount of chemical usage in the watershed; this is planting season. After this time period, some chemicals are used in July to control weed pressures that may arise in the summer months. There also may be a time in the fall months when chemicals are used to control unwanted weeds.

Chemical use throughout the watershed is important, especially in Mt. Orab, this village gets its water supply from surface water. It is continually doing water testing to ensure that it has a clean, safe drinking water supply.

We need to be proactive in this endeavor to protect against water contamination.

Precipitation & Climate

The average rainfall for the White Oak Creek Watershed (both Brown and Highland Counties) is approximately 42 inches per year. The months with the normal highest amount of rainfall would be between March and August, the total would be around 4.5 inches in those months. The normal yearly average for snowfall is 22 inches per year, with January being the highest month with approximately 7 inches. Nearly 60% of the total annual precipitation falls in April through September. The growing season for most crops falls within this period. Thunderstorms occur on about 50 days each year. Floods and droughts are natural periodic occurrences in Ohio. Floods can happen at any time and are the results of many factors. Droughts can occur during any season, but are usually more noticeable during the spring and summer months. Floods usually last from a few hours to a few days; whereas, droughts generally last for a few months.

The watershed's climate is mainly cold in the winter and quite hot in the summer, with the average temperature being 53 degrees Fahrenheit, with below 0 and above 100 degree days as possibilities. The average relative humidity in midafternoon is about 60%. Humidity is higher at night, and the average at dawn is about 80 %. The sun shines 65 percent of the time possible in the summer and 45 percent in the winter.

Surface Water Resources

Water resources and water quantity have become great concerns in Brown and Highland Counties in the recent years. An average of approximately 42 inches of rain falls in the White Oak Creek Watershed area annually. Totals were collected from rainfall averages between 1961-1990. By understanding where water is obtained and how it is used in the watershed area, residents can gain a better appreciation for their water supply.

White Oak Creek is made up of approximately 138.3 miles of streams with over 89 miles of tributaries. The main stem of the creek is 49.3 miles long and drains the entire basin at 234.3 square miles. There are four main tributaries that make up 4 of the 6 subwatersheds. Sterling Run is 10.8 miles in length and drains 28.45 square miles in the Mt. Orab area. Little North Fork is 5.2 miles longs and drains 13.26 square miles in Highland County. North Fork is 21 miles in length and drains 67.72 square miles south of Little North Fork. Finally the East Fork is

located in both Highland and Brown Counties and is 22 miles long and drains 80.8 square miles.

Upper Main Stem Subwatershed near New Hope

The main stem of White Oak Creek runs from several miles north of New Hope continuously to the Ohio River. The stream flows in a southerly direction and is well protected by the topography and riparian corridor in its southern reaches. The northern tributaries are not as well protected. Due to the rise in population and urban sprawl, forested areas and farm fields are being converted to housing areas. Also in the central and northern reaches of the watershed, farming is a major land use. The farm fields run close to the stream side, therefore, reducing the amount of protected riparian areas. However, the trend is not always consistent throughout the entire watershed, mainly the farmed areas. This is due to the fact that White Oak Creek's bedrock consists of imbedded clay, shale and large amounts of limestone in horizontal layers, and is relatively impervious. Hence, the tributaries have low dry-weather flow.

The surface water quality is directly affected by the soil type and topography of the land adjacent to the stream; the way humans use the land also affects the water quality. Land use, such as residential development, construction, and agricultural production, can increase the amount of sediment entering the body of water. The type of soils in an area also influences water runoff because of the soil's infiltration and water holding characteristics. With some soils, rainfall is more likely to run off; while other soils, such as floodplain soils, allow water to infiltrate more readily.

One aspect of surface water quality in the watershed is sediment loading in the streams and tributaries. Soil erosion, which produces sediment, is a continuously occurring, natural process in the watershed. The United States Geological Survey operated a test station on White Oak Creek near Georgetown for 25 years and determined that approximately 820 pounds of soil per acre per year in the White Oak Creek watershed was entering the surface water through erosion. Runoff and sediment from residential development, construction sites, and agricultural lands

may enter the stream and fill the stream channel. Also, runoff may carry pollutants, such as lawn and agricultural chemicals (pesticides and fertilizers), effluent from septic systems, oil and gas from spills and industrial wastes. (OSU Extension Fact Sheets)

Wetlands

(See Map of Wetlands)

Wetlands are important to the function of ecological systems for many reasons. They serve to buffer natural waters against runoff of agricultural chemicals and sediment, provide hydrologic flood damping, and maintain wildlife habitat. They may also help recharge aquifers, improve water quality, and provide an aesthetic value to property. In addition, they are home to a disproportionately high percentage of endangered and threatened species. Of the 209 endangered species listed in 1986, approximately half depended on wetlands for survival and viability. At a global scale, wetlands may be a significant factor in global cycles of nitrogen, sulfur, methane, and carbon dioxide *(Mitsch, 1993 and Richardson, 2000).* Wetlands are often degraded or destroyed when lands are converted to agriculture. Wetlands drained for agriculture can result in high yield croplands for several reasons, but are generally associated with a steady decline in innate production as the soils revert to a nutrient poor state *(Stoeckel, 1997).*

Categories

- Wet meadow
- Farmed wetland
- Open water
- Numerous quarter-acre, half-acre, or larger ponds are used for livestock and recreation in the watershed.
- Lake Grant
- Reservoirs (Georgetown, Sardinia, Mt. Orab)
- Shallow march
- Shrub/scrub wetland
- Woods on hydric soils

Tributaries

The White Oak Creek Watershed has over 36 streams and tributaries. This list from the **Gazetteer of Ohio Streams** lists many of the stream names and includes details about the fall characteristics (steepness) and drainage area of each tributary. The streams are divided into subwatersheds.

WHITE OAK CREEK BASIN							
Stream Name	**Length (miles)**	**Elev. at Source**	**Elev. At Mouth**	**Av. fall Ft. per mile**	**Flows into**	**Mouth in County**	**Drains Sq. Mi.**
White Oak Creek	49.3	1055	463	12	Ohio River	Brown	234.3
LOWER MAIN STEM							
Big Run	0.6	550	480	116.5	White Oak Creek	Brown	2.5
Lyon Run	1.5	885	715	113.4	Big Run	Brown	0.9
Boat Run	1.7	860	490	217.6	White Oak Creek	Brown	1.06
Cochran Run	1.5	900	533	244.5	White Oak Creek	Brown	0.92
Ross Run	1	880	548	332	White Oak Creek	Brown	0.45
Opossum Run	3.1	920	572	112.3	White Oak Creek	Brown	1.99
Town Run	3	930	576	124.7	White Oak Creek	Brown	1.74
UPPER MAIN STEM							
Walnut Creek	2	955	754	100.5	White Oak Creek	Brown	2.01
Indian Run	0.3	850	767	276.5	White Oak Creek	Brown	1.9
Unity Creek	3.6	967	787	50	White Oak Creek	Brown	2.6
Miranda Run	0.9	844	706	53.4	White Oak Creek	Brown	5.96
Shot Pouch Run	0.8	843	816	33.7	White Oak Creek	Brown	2.9
Goose Run	2.9	962	867	34.5	White Oak Creek	Brown	2.46
STERLING RUN							
Sterling Run	10.8	939	846	8.6	White Oak Creek	Brown	28.45
Snapping Turtle Run	2.5	950	888	24.8	Sterling Run	Brown	1.43
Plum Run	0.3	904	900	13.3	Sterling Run	Brown	2.32
EAST FORK							
East Fork	22	1055	887	7.6	White Oak Creek	Brown	80.8
Turkeyhole Run	0.4	898	888	25	East Fork/White Oak	Brown	1.58
Browns Run	0.8	912	895	21.2	East Fork/White Oak	Brown	4.05
Middle Run	0.7	929	901	40	East Fork/White Oak	Brown	1.99
Slabcamp Run	2.5	938	907	12.4	East Fork/White Oak	Brown	9.2
Twin Run	2.7	990	922	25.1	Slabcamp Run	Brown	1.4
Bells Run	2.1	930	920	4.8	East Fork/White Oak	Brown	5.72
Plum Run	1.8	952	938	7.8	East Fork/White Oak	Highland	6.36
Sugar Run	1.4	1042	1006	25.7	East Fork/White Oak	Highland	2.82
NORTH FORK							
North Fork	21	1003	887	5.3	White Oak Creek	Brown	67.72
Flat Run	4.9	942	892	10.2	No. Fork/White Oak	Brown	12.4
Brush Run	2.4	963	905	20.8	Flat Run	Highland	1.37
Yellow Run	0.2	910	901	45	No. Fork/White Oak	Brown	0.83
Ruble Run	0.2	935	928	35	No. Fork/White Oak	Highland	3.19
Indian Run	0.5	943	933	20	No. Fork/White Oak	Highland	2.96

LITTLE NORTH FORK							
Little North Fork	5.2	988	936	10	No. Fork/White Oak	Highland	13.26
Lick Run	2.5	1035	950	34	No. Fork/White Oak	Highland	1.04
Stony Branch	2.9	1045	959	29.6	No. Fork/White Oak	Highland	2.66
Barr Run	2.1	1040	976	30.5	No. Fork/White Oak	Highland	1.84

Ground Water Resources

The White Oak Creek Watershed area is predominantly rural, and over 80 percent of households in Brown and Highland counties rely on ground water for their water supply.

Public water systems provide water to residents at approximately 81% of ground water in Brown County and 70 % in Highland County. These water sources are primarily drawn from ground water sources, such as aquifer. Aquifers are geologic formations that have the ability to receive, store and transmit water. The unconsolidated deposits of sand and gravel adjacent to the Ohio River have the highest yield potential in the watershed. Yields of as much as 700 gallons per minute (gpm) have been reported near the mouth of White Oak Creek. However, yields in the remainder of the watershed are seldom more than 3 gpm. The estimated usage from private water systems for domestic use is 400,000 gallons per day and nearly 98% come from ground water. Approximately 30% of Highland County and estimates show 14.7% of Brown County obtain their water from private wells. *(OSU Extension factsheet AEX-490.08)*

Human activities, such as agriculture production, domestic waste disposal, and lawn care, may have some influence on the county's groundwater quality. Bacterial counts are another indicator of groundwater quality. The Brown County Health Department tests water samples for concerned citizens. Results of these tests indicate that a very small percentage of wells tested have bacterial problems. Wells that do test positive are usually corrected after shock chlorination treatment to the well or the addition of a chlorination system.

Other ground water components such as the Source Water Assessment Plan (SWAP) is not existent, however, it might be developed in the future. DRASTIC maps have also not been prepared for the area and are not available.

Water Suppliers in the Watershed

Water System Name	County	Users	Primary Water Source Type
Highland County Water Company, INC.	Highland	30,450	Ground water
Brown County Rural Water	Brown	22,565	Ground water

Village of Mt. Orab PWS	Brown	3,600	Surface water
Village of Sardinia PWS	Brown	940	Surface water
Village of Georgetown	Brown	3,627	Purchased ground water
Village of Hamersville	Brown	850	Purchased ground water

** USEPA Safe Drinking Water Website*

Flow & Depth (USGS station)

USGS Gaging Station at the Georgetown Dam

The station operated in cooperation with Ohio Department of Natural Resources, Division of Water. The gage monitors water height in feet and discharge in cubic feet per second.

3238500 White Oak Creek near Georgetown, OH.

Location – lat 38°51'29'', long 83°55'43''m Brown County, Hydrologic Unit 05090201, on left bank 150 ft upstream from diversion dam for Georgetown water treatment plant, 0.7 mi upstream from Town Run, 1.4 mi southwest of Georgetown, and 7.2 mi upstream from mouth.

Drainage Area – 218 mi2

Period of Record – October 1923 to November 1935, October 1939 to current year.

Gage – Water-stage recorder. Datum of gage is 604.20ft above sea level. Prior to Oct. 12, 1972 non-recording gage at a site 1.0 mi downstream at datum 35.24 ft lower.

Remarks – Water quality data collected at this site 1965 to 1977. Sediment data collected 1970 to 1974. Satellite telemeter at this station.

**A notebook of weekly reading is kept on file at the watershed coordinator's office. Records have been downloaded off the real time USGS website.*

Threatened & Endangered Species

A review of the White Oak Creek Watershed area was conducted by the Division of Natural Areas and Preserves. The data received from the department indicated to finding of 4 rare and endangered species. The organisms are the Loggerhead Shrike (endangered), Bigeye Shiner (threatened) at two sites, and the Butternut Tree (potentially threatened). These three different species are all located within the White Oak Creek Watershed boundary. There are no existing or proposed state nature preserves or scenic rivers within the watershed area. There is also no data listed by the Division of Natural Areas and Preserves of any geologic features, breeding or non-breeding animal concentrations, champion trees, or state parks, forests or wildlife areas in the project vicinity. However, the division relies on information supplied by individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from this watershed area.

Maps of the species and the area there are located are attached at the end of this document in the Appendix

<u>USFWS check for endangered for endangered/threatened species (USFWS 2000)</u>
Brown County is located within the known or historic range of the Federally Endangered ***Indiana Bat*** (Myotis sodalis). Source – ODOT report.

Wildlife

According to Alan Wright, Brown County's Wildlife Officer, the White Oak Creek Watershed is truly a unique biota system, with the upper reaches of the creek running through flat farm lands and the lower reaches winding through the steep foothills of the Ohio River Valley. This unique system holds a variety of wildlife ranging from swimmers to flyers. The following is a list of wildlife that Alan Wright has personally encountered on the White Oak Creek in the last 10 years of being a Wildlife Officer in Brown County.

Fish:	***Mammals:***
Large Mouth Bass	Beaver
Small Mouth Bass	Otter
Rock Bass	Muskrats
White Bass	Raccoons
Crappie (black & white)	Coyotes
Sunfish (all types)	Red Fox
Sauger	Gray Fox
Walleye	Weasels
Catfish (channel, shovelhead, bullhead)	Mink
Carp	Ground Hogs
Suckers	Badgers
Drum	White-tailed Deer
Minnow and Darter (many types)	

Reptiles:	***Amphibians:***
Water Snake	Green Frog
Musk Turtle	Leopard Frog
Snapping Turtle	Bull Frog
Map Turtle	Salamanders
Midland Painted Turtle	
Eastern Spiny Soft Shell Turtle	

Waterfowl:	***Birds:***
Canada Geese	Bald Eagle
Mallard	Osprey
Black Duck	Great Blue Heron

Wood Duck Pintail Duck Widgeon Duck Teal Duck Gadwall Duck Mergansers	King Fishers

This picture includes a tadpole and two crayfish

Recreation

The following list describes the recreational areas located within the White Oak Creek Watershed Area. The subwatershed in which the place is located is in parenthesis.

Golf Courses
(Lower Main Subwatershed)
Buttermilk Falls Golf Club
3539 Eden Road
Georgetown, OH 45121

(East Fork Subwatershed)
White Oak Golf Course
5510 Tri-County Highway
Sardinia, OH 45171

Marina
(Lower Main Subwatershed)
White Oak Creek Marina & Campground
3068 US RT. 52
Higginsport, OH 45131
* Marina, Campground and Restaurant

Wildlife Areas
(Sterling Run Subwatershed)
Lake Grant Wildlife Area
Located three miles south of Mt. Orab, accessible from SR 774. Launch ramp, fishing, sailing, canoeing, picnic area, electric motors only. 181 acres.

Historical Information

Native American Indians were the first inhabitants of the watershed area. They inhabited the area when nearly all of the acreage was woodland. Numerous artifacts still remain in all areas of Brown County. Also, there are a few Indian mounds located in Brown County.

Settlement began in the latter part of the eighteenth century. The early settlers came chiefly from other states to the south and east. They established themselves in areas along the Ohio River, near the mouths of tributaries. By 1805, most of the choice tracts of the flatter, wetter lands to the north remained unsurveyed and unoccupied. The settlers cleared trees from the land for plowing and farming.

Village of Georgetown
In 1808, Allen Woods bought 200 acres of wilderness and in 1819 presented a plat of 22 lots and four streets, which he named Georgetown after his hometown in Kentucky.

When Brown County was carved out of the Clermont and Adams Counties in 1817, the realignment stirred up several years of political bickering over location of the county seat. The issue was settled in 1821 when a commission appointed by the Ohio General Assembly unanimously recommended Georgetown as the seat of justice for the new county.

White Oak Creek runs to the direct west of the village of Georgetown, with one main tributary (Town Run) flowing directly through town.

Village of Higginsport
Higginsport is located at the mouth of White Oak Creek; however, water quality is not directly affected by the runoff of the village. Higginsport is one of the oldest villages in the county. It was originally laid out in 1804 by Col. Robert Higgins and was called White Haven. When the settlement failed to grow, it was replatted and renamed Higginsport in 1816.

Over the years, this new community became an active business center with two hotels, two taverns, two wineries, seven warehouses, flour mills, lumber companies, a tannery, a furniture factory, a boat yard, and an abundance of river traffic – including showboats.

Village of Mt. Orab

Daniel Keethler established the village of Mt. Orab in 1850, laying out 19 lots on the east bank of Sterling Fork of White Oak Creek. While there is no doubt that Keethler took the name of the new community from the Bible there's still some controversy over whether it was intended to be Mt. Orab, Mt. Oreb, or Mt. Horeb.

Growth was slow until the Cincinnati & Eastern Railroad reached town on April 19, 1877. In that same year, 31 lots were added, and by 1880 Mt. Orab had become an incorporated village.

While the railroad brought a measure of prosperity to Mt. Orab and the surrounding area, the C & E itself was a financial basket case and was finally acquired by the Norfolk & Western in 1901.

The Mt. Orab depot, built in 1884, is the oldest building in town and is on the National Register of Historic Places. The depot is owned by the Mt. Orab Women's Club and has been moved across the tracks where it is on display along with a vintage wood caboose.

Village of Sardinia

In March of 1833, William B. Lilley and Josiah Moore laid out 16 lots near the East Branch of White Oak Creek. Dr. Isaac Beck, one of the first physicians in the area, was given the honor of naming the new community and he chose Sardinia, the name of his favorite tune in the Methodist hymnal. More lots were surveyed and added to the village in 1836 and 1837.

One of the oldest business buildings in the county is in Sardinia at the corner of Winchester and Main. This brick building was constructed in 1837 by Reverend John Mahan, an ardent abolitionist who operated both a "Temperance Tavern" and a station of the Underground Railroad.

Sardinia and the surrounding area received a substantial economic boost in 1877 when the narrow gauge Cincinnati & Eastern Railroad reached town. The railroad was eventually extended to Portsmouth on the Ohio River and converted to standard gauge.

Historical Sites

1. Grant Boyhood Home
   219 East Grant Ave.
   Georgetown, OH 45121

2. Grant Schoolhouse
   Water Street
   Georgetown, OH 45121

3. Bethel - New Hope Covered Bridge
   Main Stem White Oak Creek
   Bethel – New Hope Road

4. Brown Covered Bridge
   Main Stem White Oak Creek

   New Hope – White Oak Station Road

- *Bridge undergoing structural rehabilitation*

Bethel – New Hope Covered Bridge

5. Georgetown Water Treatment Plant & Dam
   State Route 221
   Georgetown, OH 45121

6. Griss Mill
   State Route 221
   Georgetown, OH 45121

7. Georgetown Court House
   101 South Main St.
   Georgetown, OH 45121

Griss Mill

Dams in White Oak Creek

Mowrystown – Diehl Park – St. Rt. 321

Lake Grant Wildlife Area – St. Rt. 774 Mt. Orab, OH 45154
***** Reconstructed 2004

Georgetown – St. Rt. 221 Georgetown, OH 45121

Sardinia – Purdy Road. (Old Railroad Crossing) * No picture

Additional information will be gathered in the future and included into this document. Dam removal may be a possibility for some of the White Oak Creek dams in the future.

Physical Attributes of the Stream and Floodplain Area

The following is a brief narrative of the Subwatershed Inventory Tables that have been completed for all 6 subwatersheds. The complete Subwatershed Inventory Table is located in the "Subwatershed Section" and the tables are at the end of each subwatershed implementation table. These inventory tables are specific summaries of the physical attributes of the stream segments and surrounding land use areas. These spreadsheets are also referred to as habitat modification inventories. In the inventory table each stream segment was targeted and assessed by the White Oak Creek Watershed Inventory Focus Group. The subwatershed stream and its tributaries were measured for total length, with each section broken down into footages (and miles) of stream channelized, levied, dammed maintained or unmaintained as petition ditches. The inventory spreadsheet also contains the length of stream that has established riparian buffer area present and the length of riparian buffer that is needed along the streambank. The inventory contains data on unrestricted livestock access to the stream, livestock operations that need improvements and livestock operations that are in compliance. The inventory addresses the number of new homes in the area and approximate number of bridges and culverts in the subwatershed. In addition, the spreadsheet also contains a livestock inventory.

LOWER MAIN SUBWATERSHED
HUC 05090201 100 030

Attribute	Total
Total Stream Length	27.36 miles
Channelized stream	4.75 miles
Levied	0
Dammed	0
Unmaintained petition ditch	0
Riparian buffer present	22.08 miles
Riparian buffer needed	3.19 miles
Livestock operations needing improvements	17
Livestock operations complying	3
Number of new homes	Approx. 131
Bridges/culverts	Approx. 73
Beef	734
Goat	22
Sheep	0

UPPER MAIN SUBWATERSHED
HUC 05090201 100 020

Attribute	Total
Total Stream Length	53.79 miles
Channelized stream	9.08 miles
Levied	0.21 miles
Dammed	0.09 miles
Unmaintained petition ditch	6.46 miles
Riparian buffer present	36.28 miles
Riparian buffer needed	14.56 miles
Livestock operations needing improvements	39
Livestock operations complying	15
Number of new homes	Approx. 139
Bridges/culverts	Approx. 50
Beef	825
Goat	41
Sheep	48
Buffalo	8

STERLING RUN SUBWATERSHED
HUC 05090201 100 010

Attribute	Total
Total Stream Length	48.29 miles
Channelized stream	33.98 miles
Levied	0.76 miles
Dammed	1.89 miles
Unmaintained petition ditch	15.83 miles
Riparian buffer present	19.07 miles
Riparian buffer needed	27.92 miles
Livestock operations needing improvements	11
Livestock operations complying	3
Number of new homes	Approx. 249
Bridges/culverts	Approx. 77
Beef	226
Goat	2
Sheep	2
Hogs	2400

NORTH FORK SUBWATERSHED
HUC 05090201 090 030

Attribute	Total
Total Stream Length	54.22 miles
Channelized stream	14.66 miles
Levied	0.21 miles
Dammed	0
Unmaintained petition ditch	13.96 miles
Riparian buffer present	30.13 miles
Riparian buffer needed	17.29 miles
Livestock operations needing improvements	11
Livestock operations complying	2
Number of new homes	Approx. 106
Bridges/culverts	Approx. 48
Beef	752
Goat	0
Sheep	0

LITTLE NORTH FORK SUBWATERSHED
HUC 05090201 090 020

Attribute	Total
Total Stream Length	58.52 miles
Channelized stream	26.63 miles
Levied	0.57 miles
Dammed	0.13 miles
Unmaintained petition ditch	20.74 miles
Riparian buffer present	26.95 miles
Riparian buffer needed	27.33 miles
Livestock operations needing improvements	6
Livestock operations complying	14
Number of new homes	Approx. 44
Bridges/culverts	Approx. 67
Beef	790
Goat	0
Hogs	150

EAST FORK SUBWATERSHED
HUC 05090201 090 010

Attribute	Total
Total Stream Length	132.64 miles
Channelized stream	38.34 miles
Levied	1.17 miles
Dammed	0.51 miles
Unmaintained petition ditch	26.71 miles
Riparian buffer present	75.57 miles
Riparian buffer needed	57.32 miles
Livestock operations needing improvements	48
Livestock operations complying	37
Number of new homes	Approx. 137
Bridges/culverts	Approx. 126
Beef	3,640
Goat	66
Sheep	29

Section III. Water Quality Data

Point & Nonpoint Source Pollution

Natural processes and human activities affect the quality of our water supplies. Human activities contribute to both point and nonpoint source pollution. Point source pollution is the contamination of impurities into the water body from a determined point or known location. Examples of point sources include sewer treatment plants, industries, power plants and businesses.

Nonpoint source pollution is the discharge of impurities into a water body that is not from a specific point. A major portion of the sediment, nutrients and pathogens enter White Oak Creek's water through nonpoint source pollution, affecting both surface and ground water. Examples include runoff from parking lots, runoff and drainage from farm fields, feedlots, home lawns, residential developments, construction, logging and improperly functioning septic systems.

Designated Uses and Subcategories for Surface Water Resources

Aquatic Life Habitat in White Oak Creek

Warmwater – Water bodies capable of supporting and maintaining a balanced, integrated and adaptive community of warmwater aquatic organisms. The typical assemblage of fish and invertebrates are present, similar to least impact reference condition. This is the baseline regulatory requirements in line with the Clean Water Act "fishable goal" expectations.

Exceptional Warmwater – Water bodies capable of supporting and maintaining an exceptional or unusual community of warmwater aquatic organisms. There is a unique and diverse assemblage of fish and invertebrate.

Limited Resource Water – This designation has less restrictive aquatic life criteria for the majority of pollutants which may result in less restrictive wastewater treatment requirements. The fish and macroinvertebrates are severely limited by physical habitat or other irretrievable condition.

Water Supply

Based on language found in the Clean Water Act, Ohio EPA recognized three categories of water supply uses.

Public – Waters that with conventional treatment will be suitable for human intake and meet federal regulations for drinking water.

Agriculture – Waters that are suitable for irrigation and livestock watering without treatment.

Industrial – Waters that are suitable for commercial and industrial uses with or without treatment.

Recreation

Based on language found in the Clean Water Act, Ohio EPA recognized three categories of recreational uses.

Bathing Waters – Waters that during the recreational season are suitable for swimming where a lifeguard and/or bathhouse facilities are present.

Primary Contact – Waters that during the recreational season are suitable for full-body contact recreation such as swimming, canoeing and scuba diving.

Secondary Contact – Waters that during the recreational season are suitable for partial body contact recreation such as but not limited to wading.

State Resource Water

The water is among the very best within Ohio; supports very diverse aquatic life and/or endangered or threatened species.

Stream Segments Designated By Ohio EPA (report 3745-1-17)

- White Oak Creek – EPA testing results
- Indian Run - Designated
- Unity Creek - Designated
- Miranda Run - Designated
- Shot Pouch Run - Designated
- East Fork – Designated
- North Fork – Designated
- Flat Run – Designated
- Brush Run – Designated
- Yellow Run – Designated
- Ruble Run – Designated
- Indian Run (North Fork) – Designated

AQUATIC LIFE USE DESIGNATIONS

- **Exceptional Warmwater Habitat** is the most biologically productive environment. These waters support unusual and exceptional assemblages of aquatic organisms, which are characterized by a high density of species, particularly those that are highly intolerant and/or rare, threatened, endangered or special status. This use represents a protection goal for water resource management efforts dealing with Ohio's best water resources. The standards for ammonia and dissolved oxygen are more stringent than in the other use designations.

  Segments categorized EWH

  1. Most of the **Main Stem** of White Oak Creek is meeting partial attainment.
  2. A small section of **North Fork** is meeting partial attainment.
  3. **Sterling Run** near the mouth of the main stem is in partial attainment.
  4. **Snapping Turtle Run** is in NON attainment of EWH.

- **Warmwater Habitat** defines the typical warmwater assemblage of aquatic organisms for Ohio rivers and streams. It is the principal restoration target for the majority of water resource management efforts in Ohio. Criteria vary by ecoregion and site type.

  Segments categorized WWH

  1. Most of the **East Fork Branch** of White Oak Creek is meeting Full attainment of WWH.
  2. **Slabcamp Run** is in NON attainment of WWH.
  3. Upper Reaches of **Sterling Run,** north of Lake Grant, is NON attainment of WWH.

- **Limited Resource Water** applies to streams that have drainage area of less than three square miles and either may lack water on a recurring annual basis, or have been irretrievable altered to the extent that no appreciable assemblage of aquatic life can be supported; no formal biological criteria are established for this designation.

  Segments categorized LRW

  1. Upstream of the Georgetown Wastewater Treatment Plant is the stream segment of **Town Run** is in Full attainment of LRW.
  2. Downstream of the wastewater treatment plant the segment of **Town Run** is in NON attainment of LRW.

(Ohio EPA – Division of Surface Water. A Guide to Developing Local Watershed Action Plans in Ohio.)

BIOLOGICAL CRITERIA

- ***IBI – Index of Biological Integrity***
  The index of biological integrity is a measure of fish species diversity and species populations. The criteria used to establish the index of each of the five ecoregions reflects the biological performance exhibited by natural or least impacted habitats of each region based on specific reference sites. The index is a number that reflects total native species composition, indicator species composition, pollutant intolerant and tolerant species composition, and fish condition. Combined, the higher the calculation, the healthier the aquatic ecosystem; conversely, the lower the index, the poorer the health of the aquatic ecosystem. *The highest score is 60.*
- ***ICI – Invertebrate Community Index***
  The invertebrate community index is based on measurements of the macroinvertebrate communities living in a stream or river. It is particularly useful in evaluating stream health because: (1) there are a wide variety of macroinvertebrate taxa, which are known to be pollutant intolerant; and (2) there are a number of macroinvertebrate taxa, which are known to be pollution tolerant. Like IBI, the ICI scale is 0 to 60 with higher scores representing healthier macroinvertebrate communities and, therefore, more biologically diverse communities.

- ***MIwb – Modified Index of Well Being***
  The modified index of well being factors out 13 pollutant tolerant species of fish and includes fish mass in the final analysis. Thus, if the IBI and the MIwb are examined together, an even clearer picture of the health of the biological community emerges. For example, if the IBI is coupled with a low MIwb, it could tell us that while there is a variety of species and a good number of individuals of each species (high IBI) individual members of these species are smaller than what is expected. This might indicate that while fish are numerous, they are not maturing fully. In turn, this information could be useful in determining which pollution source is impacting the biological community more than others. *(Ohio EPA – Division of Surface Water. A Guide to Developing Local Watershed Action Plans in Ohio.)*

EPA Water Quality Monitoring Sites

**Testing years included 1983, 1987, 1990, & 1997

Site testing code	Stream Name	River Mile	Date	IBI	ICI	MiWB	QHEI
White Oak Main Stem Subwateshed							
WOMS 300	White Oak Creek Main Stem	6.6	10/6/1987	52		11.3	72
		6.6	8/26/1997	46	46	8	79.5
		6.6	7/22/1997	42		8.5	79.5
WOMS 400	White Oak Creek Main Stem	12.8	8/24/1983		36		82
		12.8	9/7/1983	32		8.5	82
		12.8	9/28/1983	38		9.1	82
		12.8	7/22/1997	42		8.6	77.5
		12.8	8/26/1997	46	44	8.6	77.5
WOMS 700	White Oak Creek Main Stem	20.2	7/14/1997	38		9.3	73
		20.2	8/26/1997	48		9.3	73
WOMS 900	White Oak Creek Main Stem	27.5	3/14/1990	Raw data			
		27.6	7/14/1997	38	46	7.9	56
		27.6	8/26/1997	36	46	7.4	56
Lower Main Stem Subwatershed							
TR 200	Town Run (dst. WWTP)	0.7	8/18/1997	20			70.5
TR 300	Town Run (upst. WWTP)	0.9	8/18/1997	26			66.5
Upper Main Stem Subwatershed							
MR 200	Miranda Run	0.7	3/14/1990	Raw data			
SB 100	Stony Branch	0.1	3/14/1990	Raw data			
East Fork Subwatershed							
WOEF 200	White Oak Creek East Fork	3.2	10/6/1987	52		10.5	69.5
		3.2	7/8/1997	42		8	66
		3.2	8/27/1997	42		7.1	66
WOEF 300	White Oak Creek East Fork	3.9	3/8/1990	Raw data			
WOEF 350	White Oak Creek East Fork	4.9	3/8/1990	Raw data			
WOEF 400	White Oak Creek East Fork	5.8	3/8/1990	Raw data			
		5.8	7/7/1997	44	52	8.8	65
		5.8	8/20/1997	50	52	8.8	65
WOEF 500	White Oak Creek East Fork	10.5	3/7/1990	Raw data			

WOEF 600	White Oak Creek East Fork	14.2	3/7/1990	Raw data			
		14.2	7/7/1997	44	54	8.9	64
		14.2	8/25/1997	40	54	8.9	64
WOEF 700	White Oak Creek East Fork	16.4	3/7/1990	Raw data			
WOEF 800	White Oak Creek East Fork	18.7	3/7/1990	Raw data			
SCR 200	Slabcamp Run (dst. WWTP)	0.9	7/8/1997	38			62
		0.9	8/14/1997	28			62
SCR 300	Slabcamp Run (upst. WWTP)	1.1	7/8/1997	28			41.5
		1.1	8/14/1997	24			41.5
North Fork Subwatershed							
WONF 200	White Oak Creek North Fork	1.6	3/8/1990	Raw data			
WONF 250	White Oak Creek North Fork	2.7	3/8/1990	Raw data			
WONF 300	White Oak Creek North Fork	6.8	7/26/1983	36	22	6.8	55.5
		6.8	9/7/1983	42	22	7.9	55.5
		6.8	9/28/1983	40	22	7.9	55.5
WONF 310	White Oak Creek North Fork	6.9	7/10/1997	44	46	8.1	52.5
		6.9	8/25/1997	42	46	7.6	52.5
WONF 320	White Oak Creek North Fork	7.0	3/14/1990	Raw data			
Sterling Run Subwatershed							
SR 150	Sterling Run (3rd crossing)	0.4	1997				50
SR 250	Sterling Run (3rd crossing)	0.9	3/14/1990	Raw data			
		0.9	7/9/1997	42		8.1	65.5
		0.9	8/14/1997	46		8.7	65.5
SR 600	Sterling Run	6.4	7/9/1997	20			52
		6.4	8/14/1997	24			52
STR 150	Snapping Turtle Run (dst. WWTP)	0.2	7/9/1997	28			56
		0.2	8/14/1997	30			56
STR 200	Snapping Turtle Run (upst. WWTP)	0.4	7/9/1997	34			46.5
		0.4	8/14/1997	38			46.5

**** See maps for IBI, ICI, QHEI scores and monitoring sites***

Potential Contamination Sources in White Oak Creek

Source: US Environmental Protection Agency. Envirofacts, Query Results.

Landfills

Rumpke Landfill
Upper Main Stem Subwatershed

Licensed Municipal Solid Waste Landfill Facilities - Wednesday, October 23, 2002
Brown County -- SWDO
Rumpke Waste Inc Brown County Sanitary Landfill *
Brown Co - MSWL 9427 Beyers Rd - Georgetown, OH 45121
513-851-0122 12/31/02 3916

Toxics Release Inventory (TRI)

MAC Tools Inc.
9301 Hamer Rd.
Georgetown, OH 45121
* Lower Main Stem Subwatershed

Milacron Inc.
418 West Main Street
Mt. Orab, OH 45154
* Sterling Run Subwatershed

Trinity Industries Inc.
Front & Woodward Streets
Mt. Orab, OH 45154
* Sterling Run Subwatershed

Water Discharge Permits (PCS)

Barber Trucking
Mt. Orab, OH 45154
*Sterling Run Subwatershed

Village of Georgetown Sewerage Systems
1500 Influent Dr.
Georgetown, OH 45121
* Lower Main Stem Subwatershed

Village of Sardinia Sewerage Systems
Purdy Road
Sardinia, OH 45171
*East Fork Subwatershed, Slabcamp Run Tributary

Village of Mt. Orab
12943 US 68
Mt. Orab, OH 45154
* Sterling Run Subwatershed, Snapping Turtle Run Tributary

Wardlow Septic Tank Pumping
Mt. Orab, OH 45154
* Sterling Run Subwatershed

White Oak Creek School
44 North High Street
Mowrystown, OH 45155
* East Fork Subwatershed

Overview of Water Quality Impairments

Use Designation/Attainment

According to the Ohio Unified Watershed Assessment, White Oak Creek has been identified as a Category #1 Priority Watershed based on the known sources of pollution identified in the Ohio Non-Point Source Hydrologic Unit Water Quality Report. These reports have listed the watershed as a priority for restoration and have identified the known cause of stream impairment as:

1. Siltation
2. Habitat Alteration

Categories of Known or Suspected Impact

Agriculture, crop production, sanitary landfills, sanitary sewers, and on-site wastewater treatment systems impact these known causes. Nearly 90% of the watershed is in agriculture, which affects the known causes of water quality impairment relating to siltation and habitat alterations.

Causes of Impairment

The (305b) report identifies Nutrients, Pathogens, Pesticides, Siltation, Zinc, Copper, Flow Alterations, Organic Enrichment/Dissolved Oxygen and Unionized Ammonia.

Sources of Impairments

The (305b) report includes Minor Municipal Point Source, Pastureland, Non-irrigated Crop Production and Natural.

1997 OEPA Aquatic Use Attainment Status

Stream Segment and Use Attainment Data

Main Stem White Oak Creek –
Exceptional Warm Water Habitat (EWH) – Partial Attainment

Town Run –
Limited Resource Waters (LRW) – NON Attainment

North Fork -
Exceptional Warm Water Habitat (EWH) – Partial Attainment

East Fork –
Warm Water Habitat (WWH) – Full Attainment

Slabcamp Run - Warm Water Habitat (WWH) – NON Attainment

Sterling Run –
Warm Water Habitat (WWH) – NON Attainment
Exceptional Warm Water (EWH) – Partial Attainment

Snapping Turtle Run - Exceptional Warm Water Habitat (EWH) – Partial Attainment

Section IV. Water Quality Issues

Critical Areas

The following chart prioritizes critical areas by subwatersheds and known impairments. Implementation strategies will be prioritized by these critical areas, water quality impairments and community support. *(Impairment from 305b report)* The following timeline will be a guide for the White Oak Creek Watershed group to work towards. Priority 1 and 2 streams will be targeted for implementation funding first and then on. However, preservation is also a consideration, so protection will also be a priority in all subwatershed stream segments.

Priority	Target Area	Subwatershed	Impairments	Timeline
1	Upstream of Lake Grant	Sterling Run	Habitat Alterations Pathogens Sediment Nutrients	2004 - 2006
2	Stream Segments near Mowrystown & Slabcamp Run	East Fork	Flow Alteration Pathogens Nutrients	2004 - 2006
3	Headwater Streams	Little North Fork North Fork	Channelization Sedimentation	2006 – 2008
4	Main Stem	Upper Main Stem	Pathogens Nutrients Sedimentation	2006 – 2008
5	Below Georgetown	Lower Main Stem	Flow Alteration Pathogens	2008 – 2010

As TMDL data becomes available in 2006 – 2008 critical areas will be reassessed.

Major Water Quality Issues

White Oak Creek Watershed is faced with many different water quality issues that contribute to the degradation of the stream. Each water pollution issue will be explained in this section. However, the targeted area and solution strategies are explained in the subwatershed section. Some water quality issues are a concern in all subwatersheds. For example, household sewage treatment systems are a major contributor of nonpoint source pollution according to the OEPA 305 (b) list. Therefore, HSTS upgrades will be a targeted solution goal for each subwatershed. The following is a list and description of each major water quality issue present in the White Oak Creek Watershed.

Issue: Sedimentation & Loss of Riparian Area

Stream Erosion/Sedimentation

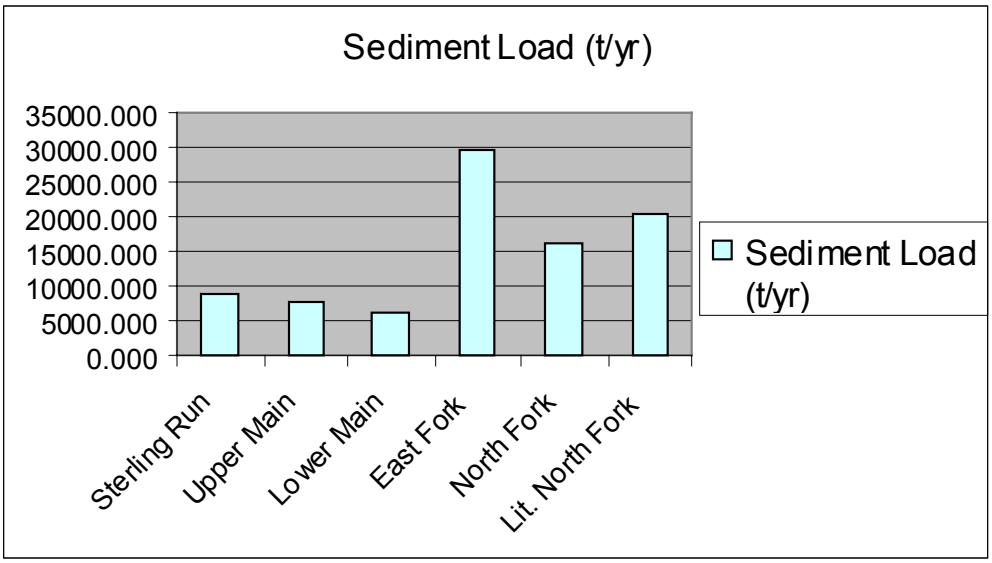
According to Ohio EPA 305(b) report sediment is one of the main sources of impairment in all of the sub-watersheds in White Oak Creek. Sources of sediment within these sub-watersheds come from adjacent land uses in the watershed as well as from within the stream itself (e.g. stream bank erosion). Excessive sediment in the stream can lead to lower oxygen levels, increased nutrients levels, and fewer species.

Erosion within the stream channel itself is a naturally occurring process. Channels are continually working on reaching equilibrium for size, shape, and stability. For the most part, sub-watersheds in White Oak Creek are stable especially in the Lower Main and parts of the Upper Main watersheds. Most all of the bank erosion problems that have been reported within the watershed are primarily near roads and bridges. In most all of these situations the roads or bridges are located within the stream's belt width. In 1996 the first Emergency Watershed Protection (EWP) program was implemented to help stabilize some of the roads and bridges damaged by bank erosion. Since this time, EWP projects have been installed in some part of Highland or Brown counties in almost every year. As of this date 11, EWP projects have been installed in the White Oak Creek watershed.

Streams that experience accelerated erosion are primarily caused by a land use change or by construction activity in the stream itself. Some of the side effects of accelerated erosion on the channel itself included down cutting, irregular width to depth ratios, and embedded substrates.

One of the main sources of sediment in the stream comes from adjacent land uses within the watershed. Because agriculture makes up 80 percent of land in the watershed, it is the highest source of sediment. Runoff from cropland and pastureland combined contribute approximately 95% of the sediment load in the

watershed. Other land uses such as urban and forestland contributes to sediment loadings in the stream as well. Urban land uses tend to have the highest pollutant loadings during the construction phase.



Subwatershed Sediment Loading

East Fork	33%
Little North Fork	23%
North Fork	19%
Sterling Run	10%
Upper Main	8%
Lower Main	7%

Sediment loadings and erosion taking place in the stream itself can be addressed by using best management practices. In agricultural areas, filter strips have a proven track record of reducing sediment loadings to the stream. Only a minimal percent of the land next to streams has an established filter strip enrolled in a long-term maintenance program. There is a need for more filter strips both grass and trees in the White Oak Creek watershed. In addition, educational efforts regarding the effects of channelized streams during construction activities is also needed in portions of all of the following sub-watersheds: Sterling Run, North Fork, Little North Fork and East Fork Watersheds.

Issue: Improperly Treated Wastewater

Improperly treated wastewater causes an increase in fecal coliform levels.

Household Sewage Treatment Systems

Reasons for high failure rates:

The age, design, and lack of maintenance of many septic systems in the watershed are reasons for malfunctioning systems and nuisance complaints. Approximately 40% of Highland County is on public sewage. The remaining 60% rely on some form of onsite Household Sewage Treatment System (HSTS). Most of the soils in the watershed have some limitations for treatment of effluent, such as, high water table, restricted permeability, poor natural drainage, flooding, and limited depth to bedrock or limiting clay layers. Variations in soils can occur within short distances that complicate septic suitability. The majority of soils in the counties are rated severe due to high clay content resulting in low permeability. Septic systems in areas of Avonburg, Clermont, and Rossmoyne soils are most likely to be failing. These soils are more common in the northern two-thirds of the watershed. Septic systems on soils with >6 percent slope, (and especially >12 percent) may be allowing untreated waste to surface downslope. Larger lot sizes have been used to provide additional area for HSTS and their replacements. Small lots with limited space for replacements, older systems that discharge, and very poor Avonburg and Clermont soils characterize the White Oak Creek watershed area. Target areas in the watershed include the community of Buford and surrounding vicinity. The State Route 134 corridor, North and South Buford and parallel with White Oak Creek, is a known area of outdated and failing private septic systems. The Village of Mowrystown is currently working on providing centralized sewage to its residents. A new area of requests for repairs and nuisance complaints is in the community of Danville where, as stated above, soils and space are limiting factors. Highland County currently has no sewered areas in the watershed

The systems rely almost completely on the native soil to treat the effluent. The Ohio Sate University states that "Up to four feet of unsaturated soil is required underneath a soil absorption system and above a limiting condition to protect public health and the environment." The Ohio Administrative Code also has the same rule in effect for leaching systems. The soils in the White Oak Creek Watershed for the most part do not meet these minimum standards. Most of these soils have slow percolation rates, and as a result, these soils have seasonal high water tables. It is during the time of seasonal high water table that the conventional sewage systems fail. This is due to the effluent being introduced into soil that is already saturated with the high water table.

Concerns are not focused on new systems that are being installed but with the systems that have been installed in the past. The new systems are designed to

overcome the limiting layer of soil that is present. In Brown County, mound systems are installed above the ground so that the four feet of treatment area needed is available for the effluent. Given the numbers for the year of 2002, it is possible to estimate that as many as 860 systems have been installed in the Brown County portion of the White Oak Creek Watershed in the past 10 years. It is safe to assume that at least 15% of the systems in this area are failing. This would mean that approximately 129 systems could be failing. The 15% failure rate is a very conservative number. At the end of the 2001 year, the Brown County Health Department did a random survey of the HSTS's installed in the last 10 years. 200 systems were surveyed during a 3 month period, and it was found that 55% of those systems has some type of failure. Given these numbers, it is very possible that as many as 430 systems, of the 860 systems installed in Brown County in the last 10 years, could be failing in this area.

Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Failing Septic Systems	N Load, lb/yr	P Load, lb/yr	BOD, lb/yr
Sterling Run	1747	2.69	25	436.75	15030.55	5886.96	61374.73
Upper Main	1536	2.69	15	230.4	7929.11	3105.57	32377.19
Lower Main	1017	2.69	10	101.7	3499.96	1370.82	14291.49
East Fork	720	2.6	25	180	5987.36	2345.05	24448.39
North Fork	230	2.6	25	57.5	1912.63	749.11	7809.90
Lit. North Fork	305	2.6	25	76.25	2536.31	993.39	10356.61

The Brown County Health Department has taken steps to assure that new installation is monitored. An operation and maintenance program was implemented in April of 2002 and will require a yearly inspection for mechanical systems. All other systems are checked on a three year basis. It is the hope that this will give the Health Department an opportunity to catch and correct any failing systems. The Health Department is also actively pursuing all nuisance complaints that come into the office. The Health Department is working in conjunction with the Prosecutor's Office to see that all complaints are resolved. However, in almost all situations the biggest factor in getting the corrections made is lack of funds. This plan will actively help pursue funding to significantly reduce the amount of sewage that is entering White Oak Creek.

Both Brown and Highland County Health Departments are currently in the finishing stages of there county-wide plans. The plans will address all household septic treatment systems problems and solutions. The plan will also set forth a operation and maintenance plan for each county.

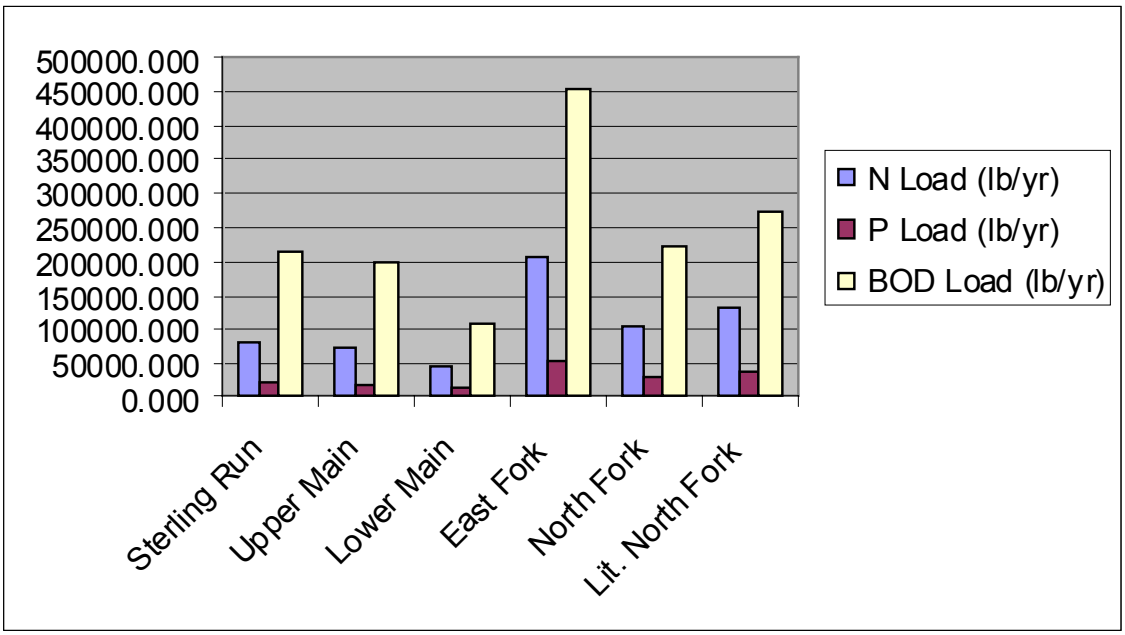
Issue: Excessive nutrient and pesticide runoff from cropland.

Agriculture & Urban Runoff

There are several issues that lead to nutrients and pesticides being found in the White Oak Creek. The issue known as nutrient enrichment happens to the stream as a result of the improper application (over applying and/or application without a proper setback from a stream) of fertilizers and pesticides. This is an urban and rural problem. Without proper soil testing taking place, knowledge of the current nutrient levels are unknown; therefore, high or low levels are unknown. When fertilization is not done properly, not only is there a loss of funds to the home owner or producer, but also it leads to runoff and a nutrient enrichment problem in the stream and tributaries. Other causes of nutrient enrichment are wastewater treatment plants, household sewage treatment systems (HSTS), industrial discharges and animal production operations. The two common nutrients applied to the land are nitrogen and phosphorus.

In the subwatersheds of Sterling Run, Little North Fork, North Fork and East Fork, a high percentage of the cropland has continuous soybeans grown on that acreage. Without crop rotation, the soil loses tilth, becomes compacted and erosion is increasing, all of which lead to runoff. Erosion is the number one cause of nutrient enrichment to our local streams.

Small headwater stream running through a farm field.



Some concerns with nutrient enrichment are excessive algae and aquatic plant growth. This occurrence may choke out open water organisms and consume oxygen (oxygen depletion comes from the decomposition of dead plants and algae). Oxygen is also taken out of the water column by living alga cells when sunlight is not sufficient to support photosynthesis. If the algal population is large enough it can cause oxygen concentrations to drop below 5 ppm and cause stress on the animal populations of the stream. This condition usually indicates a nutrient enriched stream ecosystem. The adverse conditions will affect fish and aquatic organisms, fishing and swimming, and the taste and odor of water.

The most important concern that arises every spring is from the over application of nitrogen to lawns, this is a bigger concern in major urban areas. However, almost every year nitrogen levels in drinking water in urban areas are higher than other seasons of the year.

In conclusion, not only is nutrient and pesticide runoff a major problem in area streams, but also it is a health concern. Since the village of Mt. Orab gets its drinking water from surface water, it is important that the residents of Sterling Run understand the importance of the use of filter strips/buffer strips and proper application of fertilizers and pesticides. Education is needed to get the residents of the White Oak Creek Watershed to better understand application rates, soil testing and filter strip/buffer strips on land adjacent to streams.

Section V. Load Reductions and STEPL

To further define impairments, causes, and sources in each sub-watershed of White Oak Creek, a two-fold method of evaluating pollutant loadings and reductions is used. The two-fold method involves using two different models; one of the models calculates the total load produced, while the other method quantifies how much load is being reduced by installing BMPs

The first model used for quantification is a spread sheet based computer model called STEPL. The STEPL model was used to determine pollutant loading based on land use in each of the fourteen digit HUC watersheds in White Oak Creek. Loading measurements included sediment, N, P, and BOD for each of the six sub-watersheds. These measurements will be used to help determine priority areas and also be used to help set measurable goals for attainment in each of the sub-watersheds (See spreadsheet below).

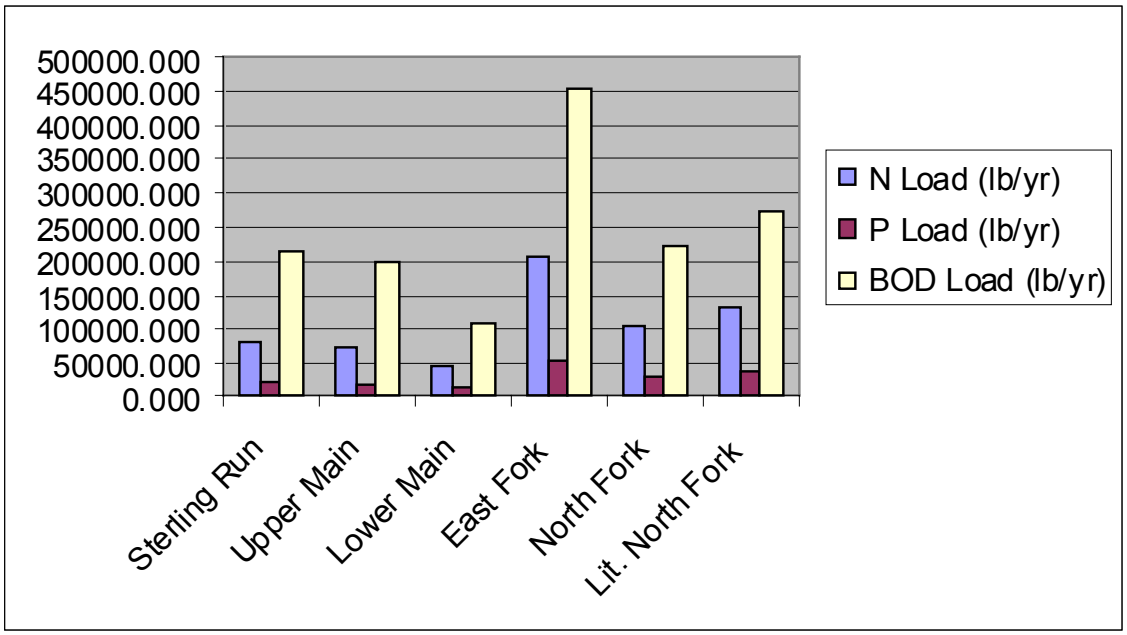
Total Load by Subwatershed for White Oak Creek Watershed

1. Total load by subwatershed(s)

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)
	lb/year	lb/year	lb/year	t/year
Sterling Run	79792.6	22038.5	213340.4	8684.8
Upper Main	72956.6	17868.2	197981.4	7657.8
Lower Main	46342.1	12870.8	107204.1	6170.7
East Fork	205294.0	56038.1	451981.0	29261.9
North Fork	106057.8	30333.0	220811.7	16359.2
Lit North Fork	131707.6	37572.3	274569.6	20206.9
Total	642150.6	176720.8	1465888.4	88341.2

2. Total load by land uses

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban and Septic	82913.9	18665.9	321541.0	1535.7
Cropland	481959.9	140944.3	962227.6	79367.7
Pastureland	63776.2	13405.2	157910.4	6581.6
Forest	7225.5	2551.2	15495.4	856.1
Feedlots	6275.1	1154.2	8713.8	0.0
User Defined	0.0	0.0	0.0	0.0

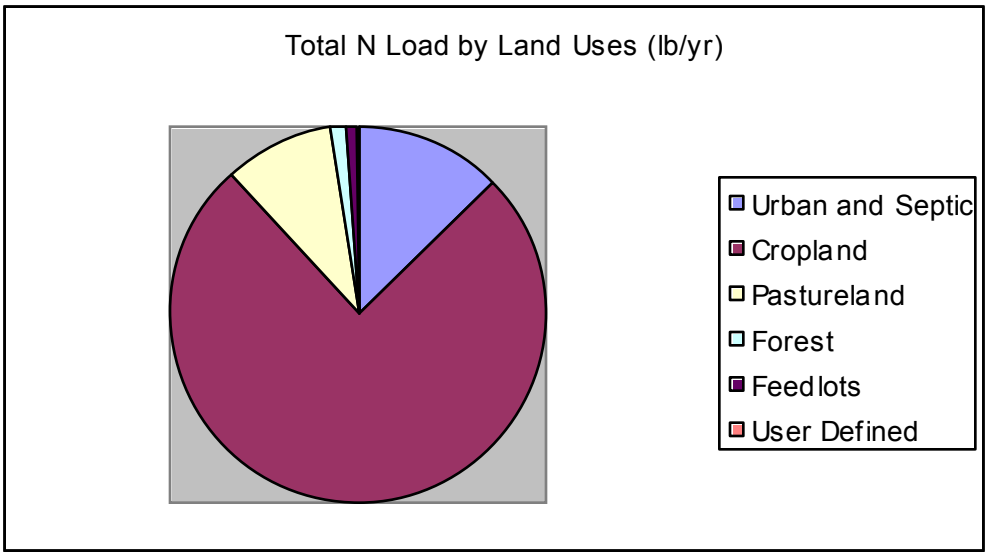


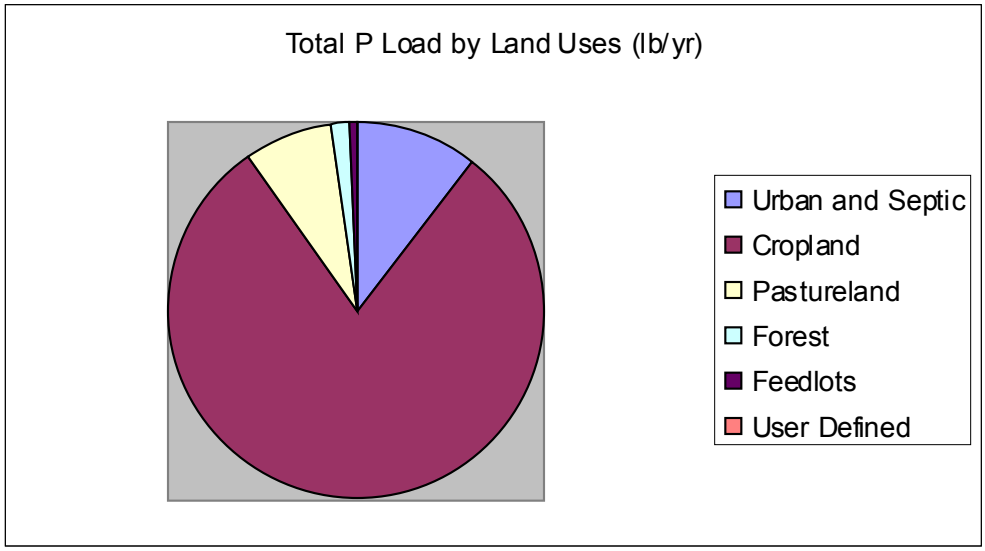
2. Erosion and sediment delivery (ton/year)

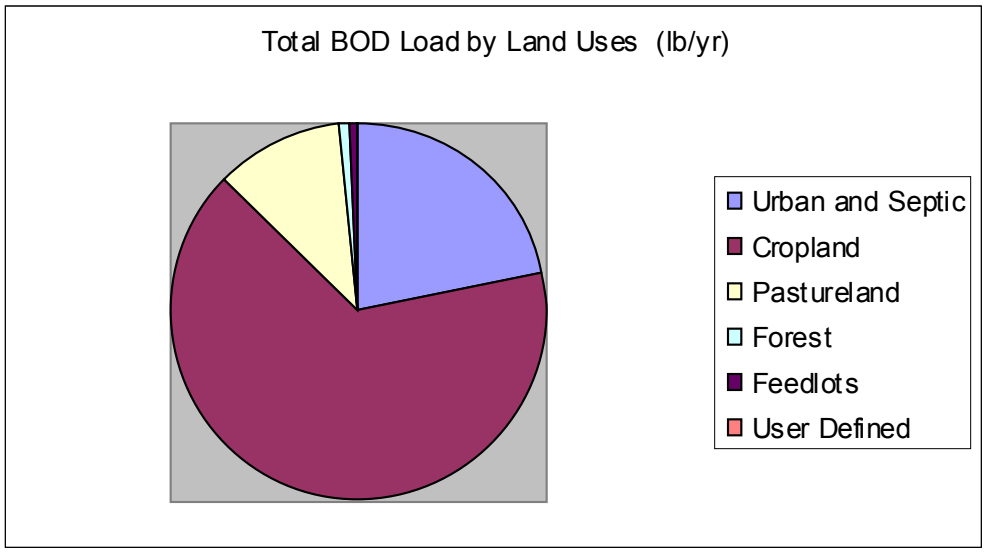
Watershed	Cropland	Pasture land	Forest	Erosion	Sediment
Sterling Run	57359.424	3219.840	471.744	61051.008	8353.532
Upper Main	45342.522	8784.126	2616.984	56743.632	7174.621
Lower Main	29706.120	6589.707	2510.248	38806.075	6079.233
East Fork	251247.108	24927.33	364.818	276539.256	28779.459
North Fork	114568.125	4548.457	121.215	119237.798	16292.440
Lit. North Fork	149501.583	6051.043	99.610	155652.235	20126.197

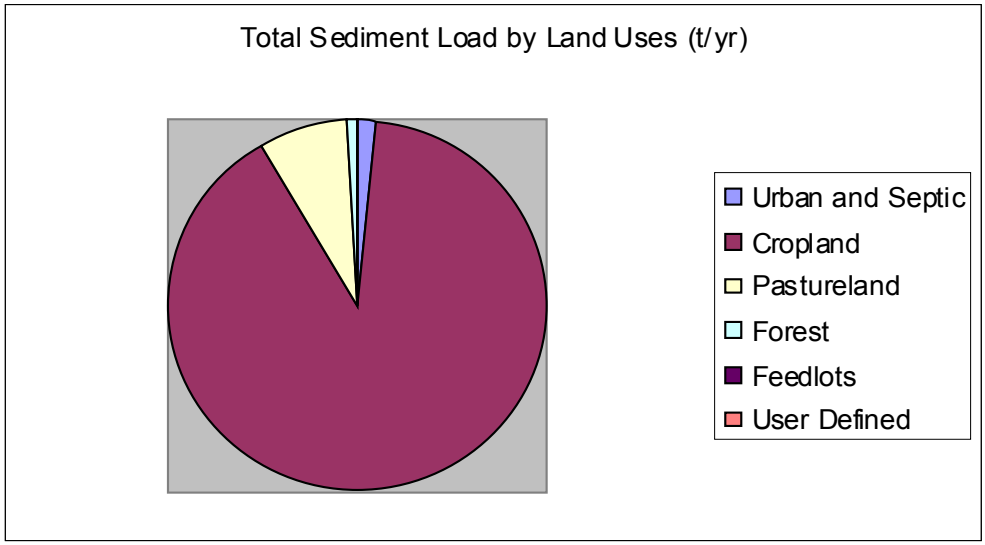
Subwatershed Sediment Loading

Subwatershed	Sediment Loading %
East Fork	33%
Little North Fork	23%
North Fork	19%
Sterling Run	10%
Upper Main	8%
Lower Main	7%


Total N Load by Land Uses (lb/yr)
Urban and Septic
Cropland
Pastureland
Forest
Feedlots
User Defined


Total P Load by Land Uses (lb/yr)
Urban and Septic
Cropland
Pastureland
Forest
Feedlots
User Defined


Total BOD Load by Land Uses (lb/yr)
Urban and Septic
Cropland
Pastureland
Forest
Feedlots
User Defined



Watershed	No. of Septic Systems	Population per Septic System	Septic Failure Rate, %	Failing Septic Systems	N Load, lb/yr	P Load, lb/yr	BOD, lb/yr
Sterling Run	1747	2.69	25	436.75	15030.55	5886.96	61374.73
Upper Main	1536	2.69	15	230.4	7929.11	3105.57	32377.19
Lower Main	1017	2.69	10	101.7	3499.96	1370.82	14291.49
East Fork	720	2.6	25	180	5987.36	2345.05	24448.39
North Fork	230	2.6	25	57.5	1912.63	749.11	7809.90
Lit. North Fork	305	2.6	25	76.25	2536.31	993.39	10356.61

The second model used in each sub-watershed is the USEPA Region 5 Load Reduction Program. This program measures the amount of sediment, N, P, and BOD removed when best management practices are installed on individual properties. Within the White Oak Creek, all best management practices that have been installed using EPA 319 funding have been accounted for and are summarized in this section. Any future best management practices installed within the White Oak will be measured and accounted on an individual basis for its contribution to reducing loadings. (See spreadsheets below)

Both the STEPL and Load Reduction models when used together will help determine measurable, attainable goals for White Oak Creek sub-watersheds. Data collected from the models will also be used in determining priority areas for the installation of best management practices.

Home Sewage Treatment System Upgrades

Semi Annual Report Date	
319 Project Name	**Highland Septic Sys. Improved**
OEPA Project Number	

County	Owners initials	14 digit HUC	Latitude	Longitude	Stream Segment Name	Gallons per day adequately treated
Highland	GB	0509.0201.090.030	39-06-12	83-50-35	North Fork	360
Highland	BCOC	0509.0201.090.030	39-04-38	83-50-36	North Fork	360
Highland	DC	0509.0201.090.030	39-10-07	83-50-24	North Fork	360
Highland	MT	0509.0201.090.030	39-09-57	83-49-50	North Fork	360
Highland	SR	0509.0201.090.030	39-06-04	83-47-51	North Fork	240
Highland	ML	0509.0201.090.030	39-04-39	83-50-31	North Fork	360
Highland	LE	0509.0201.090.030	39-06-19	83-47-12	North Fork	360
Highland	BM	0509.0201.090.030	39-08-58	83-46-48	North Fork	240
Highland	SM	0509.0201.090.030	39-08-38	83-44-22	North Fork	360
Highland	TL	0509.0201.090.030	39-08-59	83-46-48	North Fork	360
Highland	GR	0509.0201.090.030	39-07-20	83-43-32	North Fork	360
Highland	HF	0509.0201.090.010	39-06-52	83-41-56	East Fork	360
Highland	SL	0509.0201.090.010	39-07-02	83-41-05	East Fork	360
Highland	DB	0509.0201.090.010	39-04-38	83-44-01	East Fork	360
Highland	JD	0509.0201.090.010	39-05-17	83-40-54	East Fork	360
Highland	RS	0509.0201.090.010	39-05-17	83-40-31	East Fork	360
Highland	PL	0509.0201.090.010	39-05-07	83-40-30	East Fork	480
Highland	DR	0509.0201.090.010	39-01-40	83-44-05	East Fork	360

Gallons per day adequately treated 6360

TSS	**1392.8**	**lbs/yr**
BOD	**2716.0**	**lbs/yr**
Phosphorous	**290.2**	**lbs/yr**
Nitrogen	**766.1**	**lbs/yr**
Ammonia	**580.4**	**lbs/yr**
Fecal Coliform		

Home Sewage Treatment System Upgrades

Semi Annual Report Date	
319 Project Name	**Brown Co. Septic Sys. Improved**
OEPA Project Number	

County	Owners initials	14 digit HUC	Latitude	Longitude	Stream Segment Name	Gallons per day adequately treated
Brown	EH	05090201100010	39-06-18	83-54-28	Sterling Run	360
Brown	RR	05090201100010	39-06-17	83-53-59	Sterling Run	360
Brown	FY	05090201100010	39-06-08	83-52-40	North Fork	360
Brown	MR	05090201100010	39-05-25	83-54-06	Sterling Run	360
Brown	MD	05090201100010	39-04-47	83-56-15	Sterling Run	360
Brown	LL	05090201100010	39-03-16	83-55-27	Sterling Run	360
Brown	SS	05090201100010	39-04-29	83-53-37	Sterling Run	360
Brown	SH	05090201100010	39-04-51	83-54-40	Sterling Run	360
Brown	JB	05090201100010	39-03-55	83-56-00	Sterling Run	360
Brown	RM	05090201100010	39-04-03	83-55-59	Sterling Run	360
Brown	RH	05090201100010	39-04-34	83-55-44	Sterling Run	360
Brown	MH	05090201100010	39-03-53	83-55-31	Sterling Run	360
Brown	BG	05090201100010	39-03-23	83-54-09	Sterling Run	360
Brown	RB	05090201100010	39-04-33	83-55-34	Sterling Run	360
Brown	DS	05090201100010	39-01-30	83-54-24	Sterling Run	360
			Gallons per day adequately treated			**5400**

TSS	**1182.6**	**lbs/yr**
BOD	**2306.1**	**lbs/yr**
Phosphorous	**246.4**	**lbs/yr**
Nitrogen	**650.4**	**lbs/yr**
Ammonia	**492.8**	**lbs/yr**

Total BMP est. Load Reductions

Site No.	Acres eff.	Sediment	Phosphorus	Nitrogen
Grass Filter Strips		(ton/yr.)	(lb./yr)	(lb./yr)
35	129	104	173	346
36	95	141	207	413
37	15	16	25	50
38	10	11	17	35
39a	29	57	79	158
39	31	53	76	151
40	1.3	2	3	6
41	30	51	73	146
42	155	140	228	454
43	160	144	234	467
44	32	35	55	110
45	65	65	104	208
46	25	32	48	97
47	118	97	160	319
48	57	51	83	166
49	54	63	97	193
50	65	177	230	460
51	23	63	82	164
52	150	136	221	440
53	105	100	160	320
54	68	77	119	237
55	62	170	221	440
56	120	126	199	396
57	24	31	47	93
58	65	74	114	228
Sub-total		**2016**	**3055**	**6097**
Riparian Buffer Strips		(ton/yr.)	(lb./yr)	(lb./yr)
59RBS	27	34	52	103
60RBS	64	73	113	225
Sub-total		**107**	**165**	**328**
Grass Waterways		(ton/yr.)	(lb./yr)	(lb./yr)
61		70	70	140
62		5	5	10
63		32	32	65
64		35	35	69
Sub-total		**142**	**142**	**284**

Total est. Load Reductions

Sediment	Phosphorus	Nitrogen
(ton/yr.)	(lb./yr)	(lb./yr)

SECTION VI. SUBWATERSHED INVENTORIES

White Oak Creek Watershed has been broken down into six different 14 digit hydrologic units for planning and implementation purposes to inventory physical, biologic, habitat and use characteristics of the watershed on a subwatershed basis. These watersheds are named as follows: Lower Main, Upper Main, Sterling Run, East Fork, North Fork, and Little North Fork. The White Oak Creek Watershed Action Plan is using these smaller hydrologic units to better detail the plan. This "Subwatershed Section" goes into greater detail about each area, addressing the physical characteristics, inventory spreadsheet, water quality assessment, livestock inventory, land use and other specific details. The section also contains the goals and implementation strategies for the specific subwatershed.

14 digit Sub-watersheds	HUC #	Principal Stream Miles
Sterling Run	**05090201 100 010**	**10.8**
East Fork	**05090201 090 010**	**22**
North Fork	**05090201 090 030**	**21**
Little North Fork	**05090201 090 020**	**5.2**
Upper Main	**05090201 100 020**	**21.5**
Lower Main	**05090201 100 030**	**7.5**

The following sections will inventory each subwatershed. This method will allow the watershed group to better plan and evaluate the areas being studied. This will also allow the plan to be much more helpful and accurately assess the areas studied. Water quality differs throughout the watershed, and with the help of this subwatershed inventory it will allow for an accurate evaluation of each subwatershed, while also providing for direct goal statements and specific implementation strategies.

Each subwatershed section has an Excel spreadsheet program that is a complete tributary –by-tributary inventory of the stream. These inventory spreadsheets are specific summaries of the physical attributes of the stream segments and surrounding land use areas. These spreadsheets are also referred to as habitat modification inventories. In the inventory each stream segment was targeted and assessed by the White Oak Creek Watershed Inventory Focus Group. The group met on several occasions using aerial

maps, location visits and their professional knowledge and judgment of the study area to accurately determine the condition of the stream segment. Each stream segment is referred to by its river mile. The stream and its tributaries were measured for total length, with each section broken down in footage of stream channelized, levied, dammed, maintained or unmaintained as petition ditches. The inventory spreadsheet also contains the length of stream that has an established riparian buffer area present and the length of riparian buffer that is needed along the streambank. The inventory contains data on unrestricted livestock access to the stream, livestock operations that need improvements and livestock operations that are in compliance. The inventory also addresses the number of new homes in the area and if there is any additional development expected, in addition to approximate number of bridges and culverts in the subwatershed. The spreadsheet also contains a livestock inventory and a Water Quality Assessment Table. The livestock inventory data was collected from the Farm Service Agency and shows the total number of animals that are grazed in the subwatershed area. The Water Quality Assessment table shows the stream name, use designation, attainment status, and OEPA scores for each stream segment that is designated. Some stream segments have been monitored by OEPA. Those monitoring scores are shown in the table; however, most of the small tributaries have not been monitored and those streams are shown in the table as "untested".

Subwatershed Goals

The overall goal of the watershed action plan is to move all stream segments towards full water quality attainment. Entire White Oak Creek Watershed goals are listed in the "introduction" chapter of this plan. The goals listed in each subwatershed section are specific to that subwatershed and critical area. Each 14 digit subwatershed is affected differently by nonpoint source pollution; however, most segments are facing very similar pollutant problems. Some of the subwatersheds have more protection from agricultural runoff, and other segments are vulnerable to livestock causing habitat alterations. Reducing the amount of e. coli and fecal colform loading and protecting the riparian buffer is a very important goal in all subwatersheds.

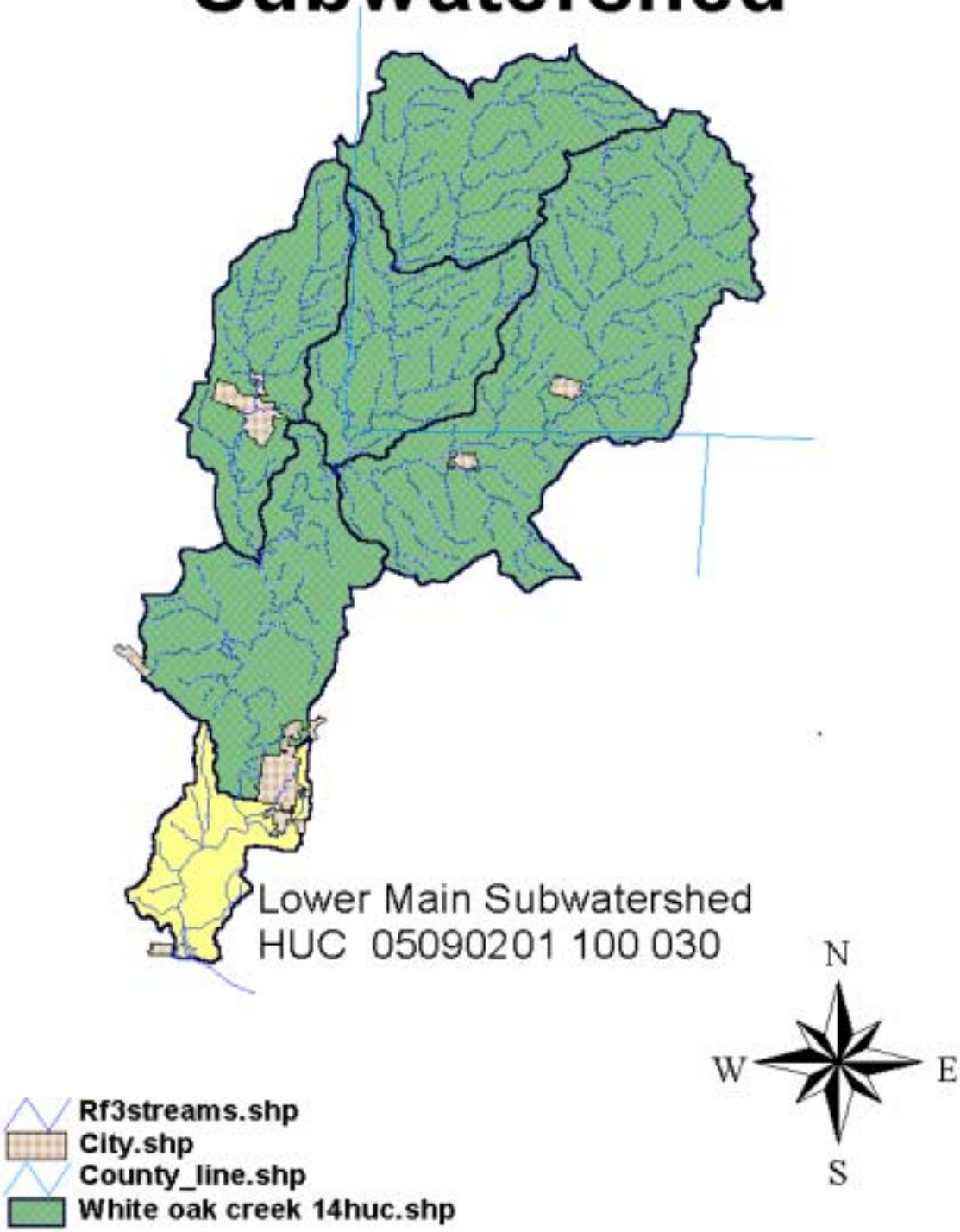
Goals are based on measurable indicators to meet the water quality standards set forth by OEPA. Best management practices along with education are the objectives that will be used to accomplish the goals of the watershed action plan.

The following chart is an overview of the OEPA monitoring statistics collected and analyzed in 1997. The data is also compiled on 4 maps located after this chart. EWH stands for Exceptional Warmwater Habitat, WWH stands for Warmwater Habitat, and LRW stands for Limited Resource Water.

1997 OEPA AQUATIC USE ATTAINMENT STATUS

Stream Name	Site Code	River Mile fish/invert	IBI	Miwb	ICI	QHEI	Attainment Status
WHITE OAK CREEK	***EWH Use designation***						
	WOMS 900	27.6/27.5	37	7.7	46	56	PARTIAL
	WOMS 700	20.2/20.3	43	9.3ns	VG	73	PARTIAL
	WOMS 400	12.8/12.7	44	8.6	44	77.5	PARTIAL
	WOMS 300	6.6/6.5	44	8.3	46	79.5	PARTIAL
NORTH FORK	***EWH Use designation (existing) / WWH (recommended)***						
	WONF 310	6.9/7.0	43	7.9	46	52.5	PARTIAL / FULL
EAST FORK	***WWH Use designation***						
	WOEF 600	14.2/14.3	42	8.9	54	64	FULL
	WOEF 400	5.8/5.7	47	8.8	52	65	FULL
	WOEF 200	3.2/3.3	42	7.6	G	66	FULL
SLABCAMP RUN	***WWH Use designation***						
	SCR 300	1.1/1.1	26	NA	MG	41.5	NON
	SCR 200	.9/.9	33	NA	P	62	NON
STERLING RUN	***WWH Use designation***						
	SR 600	6.4/6.8	22	NA	F	52	NON
	EWH Use designation (existing) / WWH (recommended)						
	SR 250/150	.9/.4	44	8.4	50	65.5	PARTIAL / FULL
SNAPPING TURTLE RUN	***EWH Use designation (existing) / WWH (recommended)***						
	STR 200	.4/.4	36	NA	MG	46.5	NON / FULL
	STR 150	.2/.2	29	NA	P	56	NON / NON
TOWN RUN	***LRW Use designation***						
	TR 300	0.9	26	NA	P	66.5	FULL
	TR 200	0.7	20	NA	VP	70.5	NON

Lower Main Subwatershed



Lower Main Stem Subwatershed
HUC 05090201 100 030

View of White Oak Creek at River Mile 6.6 on Rt. 221

Lower Main Stem subwatershed encompasses 11,224.2 acres. The topography changes drastically in this area. The Lower Main Stem of White Oak Creek starts directly south of Georgetown and flows into the Ohio River. The backwater of the Ohio River backs up approximately 2 miles upstream into the creek. All of White Oak Creek drains directly into this section of stream.

Small unnamed tributary

This 14 digit HUC is unique because of its topography. The lower 12 miles of the watershed is 3 to 4 miles wide, with flood plain averaging only about 600 feet in width, flanked by hills on each side that rise abruptly 150 to 200 feet. The stream substrate is comprised of sand, gravel and cobble; while some boulders provide additional cover.

Pasture and other agriculture land use is not as prevalent in this subwatershed as all the others. The terrain is more difficult to farm. The riparian area is wide and well established. Nonpoint source pollution issues arise by the way of nonexistent or failing home septic systems and unrestricted livestock access.

One bridge replacement is set to take place in the lower main stem at approximate river mile 8.6. This is a concern for excess sedimentation from construction. The county engineer will be overseeing the project.

The major tributaries are Cochran Run, Lyon Run, Big Run, Boat Run, Opossum Run and Town Run. Town Run is designated as a Limited Resource Water; however, it does not meet this attainment status below the Georgetown Wastewater Treatment Plant.

Georgetown Old Water Treatment Plant & Dam

The Georgetown Water Treatment Plant is located at River Mile (RM) 7.6 therefore actually establishing the watershed break between Upper and Lower Main Stem Subwatersheds. The dam is considered to be located in Lower Main; however the stream is impounded into Upper Main Stem subwatershed. The plant is no longer in use. Georgetown and the surrounding areas now use Brown County Rural Water Association to distribute water to the residents.

The dam at the water treatment plant is still in place, however the structure is no long in stable condition and discussions to remove the dam are being held. More studies need to be conducted to produce plans for the dam's upkeep or removal. A feasibility study needs to be conducted to assess the impacts of removing the Georgetown Lowhead Dam. The dam is a hydromodification that greatly affects the health of White Oak Creek. The structure prevents fish and other organisms from migrating up and down the stream. The dam not only affects the impounded area but it also has an effect on areas directly downstream of the dam. In addition to the ecological impacts that the Georgetown Dam has on White Oak Creek, it is also extremely dangerous to canoeists.

The Georgetown Dam, note the structural impairment.

The Georgetown Water Treatment Plant, which is no longer in use.

Emergency Watershed Protection Sites

The Emergency Watershed Protection (EWP) program is run through the Natural Resources Conservation Service (NRCS) and provides help for severely eroding stream banks that are affecting the roadways. Erosion sites are checked and monitored by NRCS and assessed for funding. The site is then fixed to stop the erosion from continuing to take out the roadway. There are 5 sites in the Lower Main subwatershed, all located on Big Run tributary, where the streambank has been stabilized between the years of 1996 and 2002.

Big Run Road – Big Run trib. – site 1
Big Run Road – Big Run trib. – site 2
Big Run Road – Big Run trib. – site 3
Big Run Road – Big Run trib. – site 4
Big Run Road – Big Run trib. – site 5

Site in need of the EWP Program

Marina

White Oak Creek Marina is a recreation spot for boaters located at the mouth of the stream on the Ohio River. The marina is a functioning boating and camping area, serving approximately 300 campsites and numerous boat docks. The land is owned by the state and leased to a private individual.

Reservoir

The Georgetown Water Treatment Plant is out of production and no longer supplies surface water to the Village of Georgetown. The old reservoir is privately owned and located approximately ½ mile from the stream on State Route 221.

Georgetown Reservoir – currently unused

	NonPoint Source Pollution	* H = High *M=Moderate	* S = Slight * T = Threat
	Causes:	**Sources:**	
Town Run	Nutrients - H Pathogens - S Pesticides - S Siltation - S	Minor Municipal Point Sources - H Pasture land - S Nonirrigated crop production - S	
	Nutrients - H Pathogens - M Pesticides - S Zinc - S Copper - S	Minor Municipal Point Source - H	

Point Source Pollution Sources				
*Permitted Discharge Loadings (30 day average-Kg/day)				
Facility	**suspended solids**	**nitrogen-ammonia**	**CBOD5**	**River Mile**
Georgetown Wastewater Treatment Plant	36.4	14	30	Town Run RM 0.8

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	**3%**	**337 acres**
Forest	**50%**	**5,612 acres**
Pasture	**20%**	**2,245 acres**
Cropland	**27%**	**3,030 acres**

Total Acres = 11,224.2

**** Data provide by 1994 land use maps from Ohio Department of Natural Resources***

Lower Main Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
6.6	1987		36		**82**
6.6	1997	46	46	8	**79.5**
6.6	1997	42		8.5	**79.5**
Town Run					
0.7	1997	20			**70.5**
0.9	1997	26			**66.5**

Lower Main Stem Subwatershed
HUC 05090201 100 030
Georgetown
Wasterwater
Treatment Plant
Limited
Resource
Water (LRW)
RM 7.6
Town Run
Opossum
Run
Lower Main Stem
Partial Attainment EWH
Boat Run
Big Run
Higginsport
RM 0.0
OHIO RIVER
N
W
E
S
Stream.shp
Lower_main_stem.shp
High_school_sites_030.shp
Cities_030.shp

Lower Main Stem Subwatershed
HUC 05090501 100 030

Impairment: Nutrients & Pathogens

Background

The Lower Stem subwatershed from river mile (RM) 7.6 to the mouth 0.0 is reaching partial EWH Aquatic Life Use Attainment. However, it is threatened due to impairments from nutrients, pathogens, pesticides and siltation. Sources of these impairments arrive from minor municipal point sources, failing household sewage treatment systems (HSTS), pastureland and nonirrigated crop production. According to the OEPA 1997 data the biological stations on White Oak Creek have very good to exceptional macro invertebrate and good fish communities. However, elevated nutrient levels at several locations may be moderately impacting biological communities. The wastewater treatment plant in Georgetown located on Town Run is the primary source of nutrients in the basin along with household sewage treatment systems. High bacterial counts of e. coli and fecal coliform were present. Additionally, elevated levels of pesticides are present at river mile 6.6.

The lower 12 miles of the watershed is 3 to 4 miles wide, with flood plain averaging only about 600 feet in width, flanked by hills on each side that rise abruptly 150 to 200 feet. The stream substrate is comprised of sand, gravel and cobble; while some boulders provide additional cover. These geological features reduce the residential and agricultural areas. Because of the terrain residential and/or agricultural lands are primarily located on very steep hillsides or in the floodplain. With agricultural land and livestock areas being located on hillsides that creates a high tendency of erosion. When the agricultural land is located in the floodplain it contributes to excessive sedimentation.

Winter view of the lower main stem of White Oak Creek

The largest land use in the Lower Main Stem land use is forestland at 5,612 aces (50%). The remaining consists of 3,030 acres of cropland (27%), 2,245 acres pf pasture (20%) and 337 acres of urban land development (3%).

Problem Statement

The Lower Main Stem Subwatershed currently has 22.08 miles of protected riparian buffers. The remaining 3.19 miles is in need of riparian corridor protection to reduce sedimentation and nutrient loading. Pathogen loadings have resulted from malfunctioning or nonexistent household sewage treatment systems (HSTS). There are 1017 systems in the Lower Main Stem Subwatershed failing at a rate of 10% resulting in approximately 102 of the systems not working properly. These nonworking systems are resulting in the pollution load of 3,500 lbs/year of Nitrogen, 1,370.8 lbs/year of Phosphorus, and 14,291.5 lbs/year of BOD.

Other known pollutant loads within this segment of stream includes 46,342.1 lbs. of nitrogen (N) per year, 12,870.8 lbs. of phosphorus (P) per year, 107,204.1 lbs. biological oxygen demand (BOD) per year and 6,079.2 tons per year of sediment.

Twenty livestock operations totaling approximately 740 animal units exist in this segment of stream with 17 of these operations needing improvements, mainly to restrict livestock access to the stream or tributaries. There are approximately 734 head of cattle, 22 goats and 10 hogs in this subwatershed. Restricting the animals from the stream through a livestock fencing program will help reduce nutrients, pathogens and sedimentation from impacting the stream.

Livestock operation

Town Run and Opossum Run borders Georgetown's southern corporation limits. These tributaries have some development pressures leading to sedimentation and fecal coliform issues. Town Run is designated a Limited Resource Water. Stream segments south of the Georgetown Wastewater Treatment Plant (WWTP) at River Mile 0.8 are in non attainment of the Limited Resource Water designation. Town Run is a major concern of pollution contamination. Downstream of the WWTP the macroinvertebrate community was very poor due to high densities of tolerant taxa. High concentrations of nutrients appear to be the primary cause of the community decline. High numbers of E. coli and fecal coliforms indicate the Georgetown WWTP needs to upgrade its treatment. The biological communities were also poor upstream from the WWTP, apparently due to periodic intermittent flow conditions and urban development.

Goals

1. Complete and obtain approval of Brown & Highland countywide HSTS plans to identify needed sewage treatment upgrades and there locations.
2. Upgrade 50% of those identified 102 failing HSTS systems in the Lower Main Stem Subwatershed.
3. Protect approximately 8 miles of stream from livestock access to reduce nutrient and sediment loading, while improving QHEI scores (all fence will include a 10-15 year riparian forest protection area).
4. Raise Town Run's use attainment from LRW to WWH through a reduction of 75% of all pollutants entering the tributary.

Task Table

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	1. Work with the local Health Departments to complete the HSTS inventory, which identifies the failing systems in the watershed along with other pollution public health concerns that may affect the water quality in WOC. It also identifies the needs and types of systems necessary to correct the problem sites in the subwatershed. The countywide plan will also include an operation and maintenance program for the	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	Approved County-wide HSTS plan by OEPA & local Health Boards.

	counties.				
Pathogens / bacteria	2. Replace or upgrade 50% of the identified (through the HSTS plan) failing HSTS systems reducing the amount of fecal coliform and e. coli present in the stream.	Replace approx. 51 systems with grant cost share, DEFA low interest loan funds and homeowner contribution. Repair 51 HSTS @ $5,000 per system totals $255,000.	WOC watershed group along with HSTS homeowners will work with the Division of Financial Assistance and OEPA to obtain funds for replacements.	Jan. 2004 to Jan 2014	Systems upgrade will reduce the amounts of e. coli and fecal coliform present in the stream. Amounts reduced will be calculated in the STEPL program.
Sediment, Nutrients, & Habitat Alterations	3. Target 8 livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with landowners to install 8 miles of streambank fencing and needed auxiliary practices to protect at least 42,240 feet of streambank.	$146,720 dollars for the fence and auxiliary practices. *42,240 ft * $3.00 /foot = $126,720 * $2,500 * 8 practices = 20,000 Total $146,720	Division of Wildlife, US Fish and Wildlife, US Forest Service, SOACDF, USDA CRP, 319 grant funds.	Jan. 2006 to Jan. 2008	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.
Nutrients & Pathogens	4. Raise Town Run's use attainment from LRW to WWH through a reduction of 75% of all pollutants. Discuss Wastewater Treatment Plant issues and upgrade options with the Village of	Study WWTP infrastructure upgrades. Further research NonPoint Source pollution that enters the stream from	Prepare a meeting between OEPA, White Oak Creek Watershed Group, Georgetown WWTP officials, and Georgetown Village	2004 through 2008	Reduction in pollution. Higher attainments scores. Rise in use designation for LRW to WWH.

	Georgetown. Also control the amount of pollutant that enter from Georgetown's urban area	Georgetown. Study impervious surface effects.	officials.		

Sedimentation, Flow Alterations & Habitat Protection

Background

The entire length 7.6 miles of Lower Stem subwatershed is reaching partial EWH aquatic life use attainment. However, the stream is threatened by flow alterations and sedimentation. Sources of these impairments arrive from the degradation of the riparian habitat. High to moderate siltation was recorded at all sites in the segment. Sediment loadings in the Lower Main Stem subwatershed are 6,079.2 tons per year according to the OEPA STEPL reduction program.

Example of a good riparian buffer cover on Lower Main Stem

There are 5,612 acres of forestland in this subwatershed. The harvesting of the riparian timber is a threat that can be overcome by proper timber management through Forest Stewardship Plans and Permanent Conservation Easements.

Problem Statement

The Subwatershed Inventory Table states that the Lower Main Stem Subwatershed currently has 22.08 miles of protected riparian buffers in the entire Lower Main Stem subwatershed; however there is a direct treat to forested areas of the streams floodplain. With the establishment of a conservation easement program those areas may be saved from further degradation and excessive sedimentation.

From RM 7.6 to 0.0 timber management can be accomplished on 50% of all forest land through producing a Forest Stewardship Plan that will protect 2,800 acres from degradation. This will be accomplished through proper forest planning and implementation through the partnership with Ohio Department of Natural Resources,

Division of Forestry. This implementation practice will raise and maintain QHEI scores while protecting healthy forestland.

Permanent Conservation Easements are a priority for the Lower Main Stem subwatershed. The easements will protect the 92 acres of streamside corridor (approximately 50ft on each streambank). The White Oak Creek Watershed Group will establish a workgroup that will determine easement requirements. Establishing the permanent conservation easement program will protect the stream from sedimentation and the loss of habitat riparian buffer from RM 7.6 to 0.0.

Cleared riparian area on White Oak Creek, RM 3.3

Sediment loadings in the Lower Main Stem subwatershed are 6,079.2 tons per year. Other known pollutant loads within this segment of stream includes 33,476.7 lbs. of nitrogen (N) per year, 12,577.2 lbs. of phosphorus (P) per year and 81,618.7 lbs. biological oxygen demand (BOD) per year.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland	29,706.1
Pasture	6,589.7
Forest	2,510.25
TOTAL EROSION	**38,806.1**
Amount of sediment from erosion that is entering the stream	***6,079.2 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

1. Improve timber management in the forested areas with a Forest Stewardship Plan to protect 2,800 acres (50%) of forestland.
2. Study the removal options of the Old Georgetown Water Treatment Plant Dam at RM 7.6 to restore the natural flow and habitat to the effected area.
3. Establish a riparian easement program to purchase and protect 92 acres of targeted riparian forest.

Task Table

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sedimentation	1. From RM 7.6 to 0.0 implement forest management protection on approximately 50% 2,800 acres of forest land. This implementation practice will help with the reduction of sedimentation reaching the stream. There are 5,612 total acres of forestland in the Lower Main Stem subwatershed.	$56,000 for the Forester to produce plans for all 2,800 acres. *Approximately $20 per acres to produce the plans.*	Work in conjunction with the Forester from the Division of Forestry to produce quality timber management plans for the 2,800 acres of forest land in the subwatershed.	January 2004 to January 2010 Approximately 400 acres per year targeted for a Forest Stewardship Plan.	Have approximately 2,800 or more acres in a Forest Stewardship Plan following to promote proper timber harvest procedures, etc. The ultimate indicator is a healthy functioning and fully intact riparian forest.
Habitat Alterations	2. Conduct a feasibility	Research costs of the	Partner with OEPA,	Study: 2005-2006	Higher QHEI, IBI, and ICI

	study to assess the impacts of removing the Georgetown dam. If feasible, remove dam and restore natural stream flow.	removal through a feasibility study. The study will research impoundment, structure, habitat alteration, sediment movement, and removal options.	ODNR and ODOT to fund the study and removal project.	If feasible, remove dam: 2006-2007	scores. Overall improvement in water quality and bank stabilization.
Sedimentation /habitat alteration	3. Establish a permanent conservation easement program that will protect 92 acres of riparian buffer from RM 7.6 to 0.0. Permanent conservation easements will reduce sedimentation and the loss of habitat.	$368,000 to protect an average of a 50' buffer on each side of White Oak Creek from RM 7.6 to 0.0. $7,000 for conservation easement educational materials & meetings to reach riparian landowners. *calculation: 7.6 miles * 2 sides = 15.2 mi. * 5,280 ft. = 80,256 ft. * 50 ft buffer = 4,012,800 ft2 / 43,560 =* ***92.12 acres****. 92 acres * $500(fees) + $3,500 value per acre (Brown Co. Auditor) = $368,000*	Ohio Department of Natural Resources, Ohio EPA, Brown County Soil & Water Conservation District, and Natural Resources Conservation Service. All agencies plus local landowners will be pulled together to form a local easement work group to work out all easement details.	January 2005 though January 2014 * 2005 – begin the process of researching conservation easements, proper procedures, legal & tax ramifications. * 2006– begin program, by producing educational materials and start the direct targeting of Lower Main Stem riparian landowners.	92 acres are established in permanent conservations easements. Improved QHEI score from RM 7.6 to RM 0.0.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 100 030
Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 42
Stream or Tributary	White Oak Creek (Sterling Run to Ohio River
Segment Length (miles)	21
Stream Assessment Status	NPS impaired
Aquatic Life Designated Use	EWH
Source of Impact	agriculture, crop production, sanitary landfills
Cause of Impairment	Habitat alteration

Waterbody ID	OH 49 43
Stream or Tributary	Big Run
Segment Length (miles)	1
Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Known cause of Impairment	

Waterbody ID	OH 49 44
Stream or Tributary	Lyon Run
Segment Length (miles)	2
Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 45
Stream or Tributary	Boat Run
Segment Length (miles)	2
Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 46
Stream or Tributary	Cochran Run
Segment Length (miles)	2

Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 47
Stream or Tributary	Ross Run
Segment Length (miles)	1
Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 48
Stream or Tributary	Opossum Run
Segment Length (miles)	3
Stream Assessment Status	Some info
Aquatic Life Designated Use	WWH
Source of Impact	sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 49
Stream or Tributary	Town Run
Segment Length (miles)	3
Stream Assessment Status	Some info
Aquatic Life Designated Use	LRW
Source of Impact	sanitary landfills
Cause of Impairment	

White Oak Creek Watershed Inventory
Lower Main Stem Subwatershed
HUC 05090201 100 030

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access	Livestock oper. needing improvements	Livestock oper. complying	Number of New Homes	Expected Development	Bridges/ Culverts
White Oak Creek	7.6 - 6.95	2,870					2,870	0	no	0	1	0	no	0
Town Run	6.95	14,750	9,000				5,750		yes	1	0	>30	yes	>50
White Oak Creek	6.95 - 6.8	1,000					1,000			1	0	0	no	0
Opossum Run	6.8	15,700	2,600				15,700	0	no	0	0	>45	yes	3
White Oak Creek	6.8 - 4.7	10,955					10,955	0	no	1	0	0	no	1
Ross Run	5.4	3,600					3,600	0	no	0	0	0	yes	0
White Oak Creek Trib 1	4.8	19,540	6,800				12,740	6,800	yes	4	0	>15	yes	6
Cochran Run	4.7	7,400	2,500				4,900	2,500	yes	1	0	20	yes	1
White Oak Creek	4.7 - 3.7	5,300					5,300	0	no	0	0	0	no	3
White Oak Creek Trib 2	3.7	7,050	1,560				5,490	1,560	no	0	0	1	possible	2
White Oak Creek	3.7 - 3.3	2,120					2,120	0	no	0	0	0	no	0
White Oak Creek Trib 3	3.3	6,120					5,220	900	yes	1	0	0	no	1
white Oak Creek	3.3 - 2.5	4,450					4,450	0	no	0	0	0	no	0
Boat Run	2.5	8,900					6,400	2,500	yes	1	0	0	no	1
White Oak Creek	2.5 - 1.8	3,715					3,715	0	no	0	0	0	no	
Big Run	1.8	21,280	2,600				16,680	2,600	yes	6	2	20	possible	5
White Oak Creek - confluence with Ohio River	1.8 -0	9,700					9,700	0	no	1	0	1	no	
TOTAL		**144,450**	**25,060**	**0**	**0**	**0**	**116,590**	**16,860**		**17**	**3**	**>131**		**73**
	Miles=	**27.36**	**4.75**	**0**	**0**	**0**	**22.08**	**3.19**						

* Petition ditch defined as a old township ditch

Livestock Inventory	Beef	Goat	Sheep
Totals	734	22	0

** Totals gathered from Farm Service Agency's Livestock Compensation Program (LCP) applications filled out by the livestock owners.*

Subwatershed Total Acres
11,224.20

Water Quality Assessment

All Data from OEPA

Stream Name	Designation	Attainment Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
RM 6.6	EWH	PARTIAL	44	8	46	80		WOMS 300
Town Run (RM .9)	LRW	FULL	26	n/a		67	Upstream of WWTP	TR 300
Town Run (RM .7)	LRW	NON	20	n/a		71	Downstream of WWTP	TR 200
Oppssium Run	WWH	Untested						
Ross Run	WWH	Untested						
Boat Run	WWH	Untested						
Lyon Run	WWH	Untested						
Big Run	WWH	Untestec						

Point Source Pollution Sources

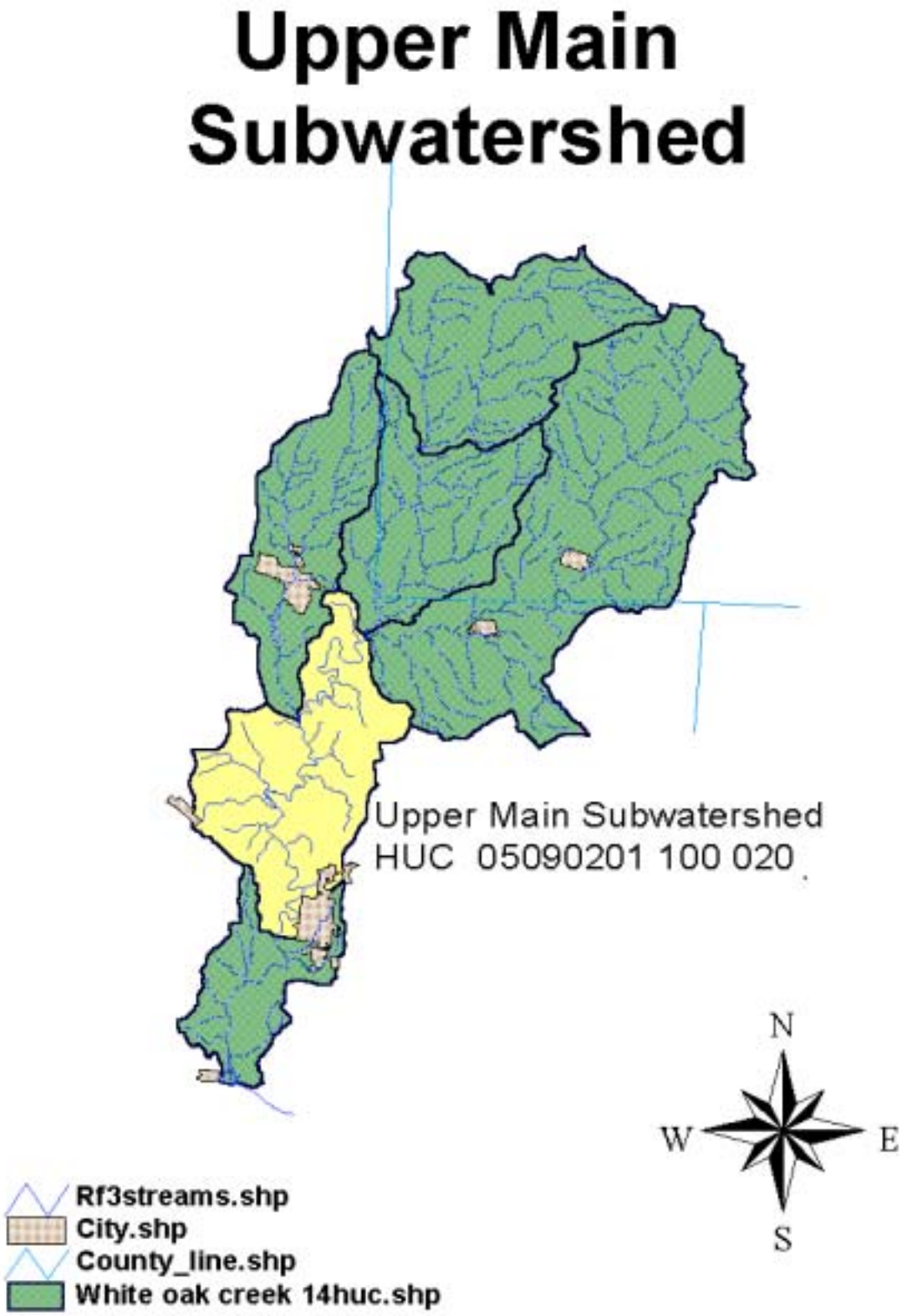
*Permitted Discharge Loadings (30 day average-Kg/day)

Facility	suspended solids	nitrogen-ammonia	CBOD5
Georgetown Wastewater	36.4	14	30

NonPoint Source Pollution

* H = High * S = Slight
* M = Moderate * T = Threat

	Causes:	Sources:
	Nutrients - H	Minor Municipal Point Sources - H
	Pathogens - S	Pasture land - S
	Pesticides - S	Nonirrigated crop production - S
	Siltation - S	
Town Run		
	Nutrients - H	Minor Municipal Point Source - H
	Pathogens - M	
	Pesticides - S	
	Zinc - S	
	Copper - S	


Upper Main Subwatershed
Upper Main Subwatershed
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Upper Main Stem Subwatershed

HUC 05090201 100 020

Physical Description:

View of Unity Creek at River Mile 15

The Upper Main Stem Watershed encompasses 25,852.4 acres. This subwatershed drains all three main headwater subwatersheds; North Fork, Sterling Run and East Fork. This entire stream segment between river mile 7.6 and 27.6 meets partial attainment of EWH. These areas include wide riparian forested streambanks, large floodplains, limestone stream bottoms and an abundance of macroinvertebrates and fish communities. The size of the stream increases dramatically as all the headwater streams flow into one.

Sections of the Main Stem are threatened due to impairments from nutrients, pathogens, pesticides and siltation. Sources of these impairments arrive from sanitary sewers, agriculture, sanitary landfills, pastureland and nonirrigated crop production. Although some of the stream is covered by a adequate riparian buffer, cropland runoff and livestock pastureland are still a concern.

Georgetown, the county seat for Brown County, is located in both the Upper Main Stem and Lower Main Stem subwatersheds. Georgetown is the largest village in the entire watershed with a population of 3,691 residents.

Major tributaries include Miranda Run, Unity Creek, Goose Run, Shotpouch Run, and Indian Run.

Tributary of White Oak Creek

TRIBUTARY DESCRIPTION

Unity Creek

Unity Creek flows from western Hamersville for approximately 3.5 miles where it intersects with White Oak Creek at River Mile 15.25. Unity Creek has a drainage area of 7 mi^2 and an average gradient of approximately 14 ft./mi. where it passes under CR 21. The creek flows in a southern direction and discharges into the White Oak Creek at the bridge over Unity Creek. Upstream of CR 21 the waterway is bordered by a narrow wooded riparian zone, beyond which lie residential areas and agricultural lands. Downstream of CR 21 the stream falls into White Oak Creek over a small 20' waterfall. No specific sampling for fish and macroinvertebrates was conducted by ODOT at this location due to the nature of possible impacts. However, a QHEI was performed at the site and Unity Creek received a score of 70.25. This score is higher than White Oak Creek because of better substrate types and higher sinuosity. This score is well within the range for EWH. The bridges over Unity Creek and White Oak Creek at this location are going to be replaced. This is a concern for excess sedimentation from construction. The county engineer will be overseeing the project.

Waterfall near the mouth of Unity Creek

Unity Creek during summer low flow

Emergency Watershed Protection Sites

The Emergency Watershed Protection (EWP) program is run through the Natural Resources Conservation Service (NRCS) and provides help for severely eroding stream banks that are affecting the roadways. Erosion sites are checked and monitored by NRCS and assessed for funding. The site is then fixed to stop the erosion from continuing to take out the roadway. There are 7 sites in the Upper Main subwatershed where the streambank has been stabilized between the years of 1996 and 2002.

- East Sterling Run Road – White Oak Creek Main Stem
- New Hope – White Oak Station Road – White Oak Creek Trib 1 – RM 28.96
- Stony Hollow Road – Stony Hollow Tributary – site 1
- Stony Hollow Road – Stony Hollow Tributary – site 2
- Stony Hollow Road – Stony Hollow Tributary – site 3
- Stony Hollow Road – Stony Hollow Tributary – site 4
- Sunshine Road – White Oak Creek Main Stem

Rumpke Landfill

Potential Contamination Source in White Oak Creek

Source: US Environmental Protection Agency. Envirofacts, Query Results.

Rumpke Waste Inc.
Brown County Sanitary Landfill
Licensed Municipal Solid Waste Landfill
9427 Beyers Rd.
Georgetown, OH 24212

Rumpke Landfill is located on US Rt. 68 and Sunshine Rd, just north of Village of Georgetown.

Rumpke Sanitary Landfill is also located in Upper Main Subwatershed and poses a threat to water quality.

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	5%	1,293 acres
Forest	37%	9,565 acres
Pasture	17%	4,395 acres
Cropland	41%	10,599 acres

Total Acres = 25,852

** Data provide by 1994 land use maps from Ohio Department of Natural Resources*

NonPoint Source Pollution

* H = High * S = Slight
* M = Moderate * T - Threat

Causes:	Sources:
Siltation - H	Nonirrigated crop production - H
Pathogens - S	Pasture land - S
Pesticides – S	

Upper Main Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
12.8	1983	32,38	36	8.5,9.1	**82**
12.8	1997	43,46	44	8.6	**77.5**
20.2	1997	38,48		9.3	**73**
27.6	1997	38,36	46	7.9,7.4	**56**

Biological Diversity

Fish Collected from White Oak Creek White Oak Valley Study Area

Taxa	Number of Individual
Golden redhorse	6
Northern hog sucker	23
Common carp	1
Silverjaw minnow	4
Bluntnose minnow	26
Central stoneroller	3
N. Rock bass	11
Smallmouth bass	23
Green sunfish	7
Bluegill sunfish	2
Longear sunfish	37
Greenside darter	12
Orangethroat darter	1
Fantail darter	4

Macroinvertebrates collected from White Oak Creek White Oak Valley Study Area

Taxa	Number of individual
Planaridae (flatworms)	9
Asellidae (Aquatic sow bugs)	2
Gammaradae (Scud)	1
Baetidae (Mayfly)	6
Heptageniidae (Mayfly)	
Stenonema sp.	9
Stenacron sp.	14
Isnychiidae	1

Coenagrionidae (damselfly)	3
Peridae (stonefly)	1
Corydalidae (dobsonfly & fishfly)	1
Hydropsychidae (caddisfly)	
Cheumatopsyche sp.	23
Hydropsyche sp.	14
Chimarra sp.	1
Psephenidae (water penny beetle)	6
Elmidae	15
Chironomidae (midge)	10
Pulmonata	9
Planorbidae (ram horns)	1
Corbiculidae (asian clams)	1
Sphaeriidae (fingernail clams)	1

Mammals, Amphibians and Reptiles sighted White Oak Valley Study Area

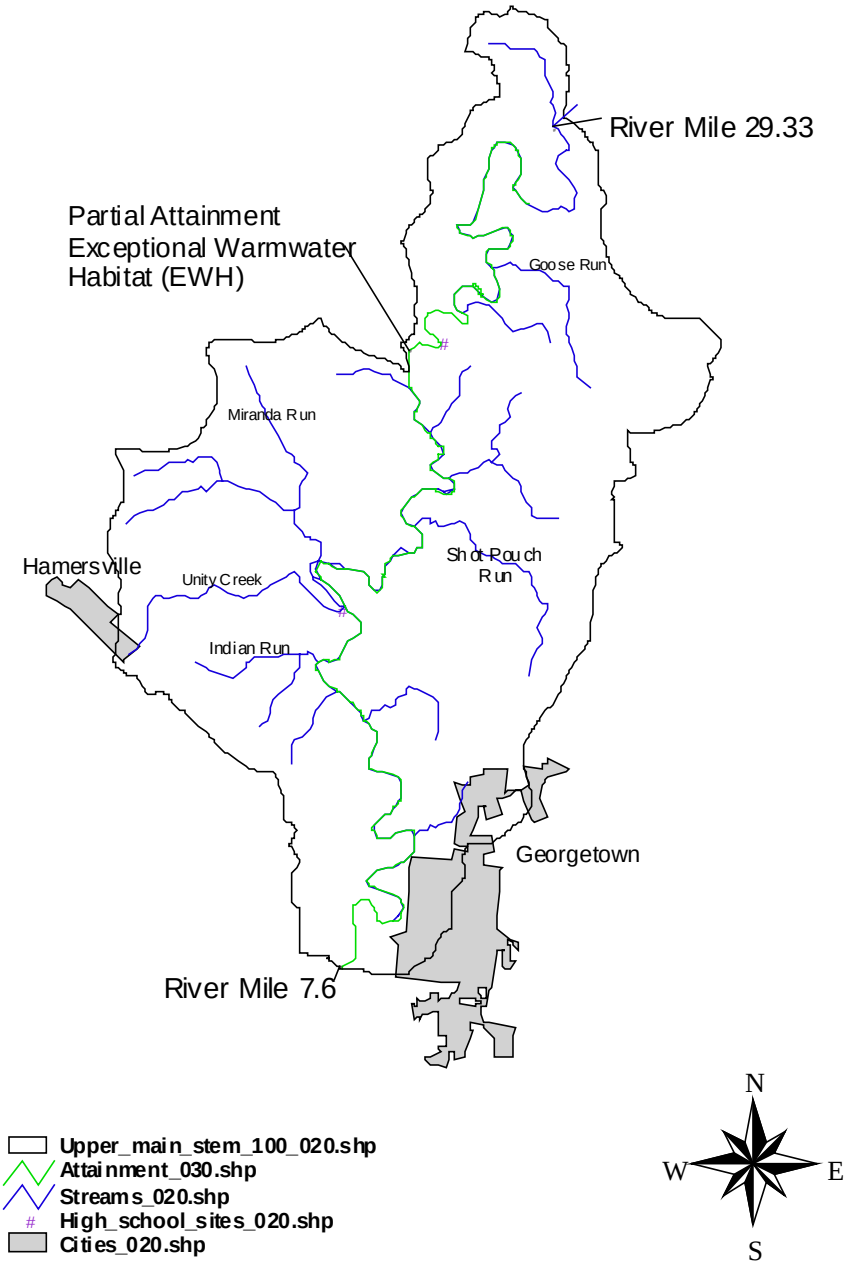
Common Name	Scientific Name
Bull frog	Rana catebeiana
Northern water snake	Nerodia s. sipedon
Queen snake	Regina septemvittata
Eastern Garter snake	Thamnophis s. sirtalis
Virginia opossum	Didelphis virginiana
White-tailed deer	Odocoilius virginianus
Deer mouse	Peromyscus maniculatus
Raccoon	Procyon lotor
Gray squirrel	Sciurus carolininsis
Eastern cottontail	Sylvilagus floridanus

Phylogenetic Bird Data Table – White Oak Valley Study Area

Common Name
Great Blue Heron
Turkey Vulture
Mourning Dove
N. Flicker
Eastern Phoebe
Tree Swallow
Purple Martin
Blue Jay
American Crow
Northern Mockingbird
Gray Catbird
American Robin
Eastern Bluebird
European Starling
Warbling Vireo
Common Grackle
Brown-headed Cowbird
Northern Cardinal
Purple Finch
Red-winged Blackbird
Chipping Sparrow
Field Sparrow

Ohio Department of Transportation "Ecological Survey Report" Study Area: White Oak Valley Road – Scott Township. BRO-CR-21-4.989/5.134

Upper Main Stem Subwatershed
HUC 05090201 100 020



Upper Main Stem Subwatershed
HUC 05090201 100 020

Impairment: Nutrients & Pathogens

Background

Small limestone rock ledge on Upper Main Subwatershed

Much of the White Oak Creek main stream segment is partially meeting exceptional waterwater habitat (EWH) and flows over a predominantly bedrock substrate. Pools are greater than 28 inches deep, oxbows and overhanging vegetation provide a sparse amount of instream cover. The stream has low sinuosity and good to excellent development. The stream has well developed highly stable pool-riffle-run complexes. With pools greater than 28 inches deep, and riffles greater than 10cm deep, the stream's habitat is capable of supporting diverse fish and macroinvertebrate communities. The three EPA test points show QHEI scores in these areas as 82, 77.5, 73, and 56.

The Upper Main Stem is only reaching partial EWH aquatic life use attainment because both the main stem from river mile (RM) 7.6 to 29.33 and tributaries are threatened due to impairments from nutrients, pathogens, pesticides and sedimentation. Sources of these impairments arrive from sanitary sewers, agriculture, sanitary landfills pastureland and nonirrigated crop production.

OEPA water monitoring score from 1997 show an average IBI (fish) score of 45 at RM 12.8, an average score of 43 at RM 20.2 and an average of 37 at RM 27.6. The ICI (macroinvertebrate) scores are 44 at RM 12.8 and 46 at RM 27.6.

Problem Statement

The biological stations on White Oak Creek have very good to exceptional macro invertebrate and good fish communities. However, the stream is not meeting Full EWH because of elevated nutrients and sedimentation at several locations that may be moderately impacting biological communities. In addition household sewage treatment systems are a primary source of pathogens in the basin. High bacterial counts of e. coli and fecal coliform were present. Loadings have resulted from malfunctioning or nonexistent household sewage treatment systems (HSTS). There are 1,536 systems in the Upper Main Stem Subwatershed failing at a rate of 15% resulting in approximately 230 of the systems not working properly.

Additionally, elevated levels of pesticides are present at river mile 12.8. Cropland makes up 10,599 acres (41%) of Upper Main Stem Subwatershed. With cropland making up 41% of the land use in this subwatershed, there exists the potential for nutrient loading and pesticide runoff, and OEPA has stated in the 305(b) report from 1997 that pesticides are a concern.

The way(s) cropland contributes nutrient and pesticides to the stream are through improper application of fertilizer, pesticides and soil erosion (runoff). If over application has occurred, nutrients can enter the stream in a couple different ways, the first being during a runoff event. This removes the soil particles from the soil surface, nutrients and pesticides can be or are attached to the soil particles and enter the stream. The second way would be leaching through the soil, this allows nutrients and pesticides to enter the groundwater, and the groundwater then carries the nutrients and pesticides to the stream. This situation can happen with proper application as well, but is more likely to occur during an over application. The next way for nutrients to enter the stream would be improper manure application to cropland. Lastly, increased rainfall frequency and intensity over the past 7 years have shown incidents of runoff; even if fertilizers, pesticides, and manure are applied properly.

The subwatershed currently has 36.28 miles of riparian buffers. The remaining 14.56 miles are in need of riparian corridor reestablishment and protection to reduce cropland and sediment runoff. Sediment loadings in the Upper Main Stem Subwatershed are 7,657.8 tons per year. Other pollution loads for the entire subwatershed include 72,956.6 lbs. of nitrogen (N) per year, 17,868.2 lbs. of phosphorus (P) per year and 197,981.4 lbs. biological oxygen demand (BOD) per year.

There are 54 livestock operations totaling approximately 875 animal units exist in this segment of stream with 39 of these operations needing improvements. Improvements include proper use of Best Management Practices (BMP's) and improved pasture management. There are approximately 825 beef cattle, 41 goats, 48 sheep and 8 buffalo in the Upper Main Subwatershed.

Goals

1. Complete and obtain approval of Brown & Highland countywide HSTS plans to identify needed sewage treatment upgrades and there locations.
2. Upgrade 50% of those identified 230 failing HSTS systems in the Lower Main Stem Subwatershed.
3. Protect approximately 5 miles of stream from livestock access to reduce nutrient and sediment loading and improve QHEI scores (all fence will include a 10-15 year riparian forest protection area).
4. Use education as a protective measure in cropland pesticide set back requirements, proper application methods, and improving cropland management.
5. Establish 88.24 acres of streamside buffer habitat to reduce the amount of nutrients and pesticides that leads to the degradation of water quality.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	1. Work with the local Health Departments to complete the HSTS inventory, which identifies the failing systems in the watershed. The plan will also identify the needs and types of systems necessary to correct the problem sites in the subwatershed. Lastly, the countywide plan will include an operation and maintenance	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	Approved County-wide HSTS plan by OEPA & local Health Boards.

	program for the counties.				
Pathogens / bacteria	2. Replace or upgrade 50% of the identified (through the HSTS plan) failing HSTS systems reducing the amount of fecal coliform and e. coli present in the stream.	Replace approx. 115 systems with grant cost share, DEFA low interest loan funds and homeowner contribution. Repair 115 HSTS @ $5,000 per system totals $575,000.	WOC watershed group along with HSTS homeowners will work with the Division of Financial Assistance and OEPA to obtain funds for replacements.	Jan. 2004 to Jan 2014	System upgrades will reduce the amounts of e. coli and fecal coliform present in the stream. Amounts reduced will be calculated in the STEPL program.
Sediment, Nutrients, & Habitat Alterations	3. Target 5 livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with landowners to install 5 miles of streambank fencing and needed auxiliary practices to protect at least 26,400 feet of streambank.	$91,700 dollars for the fence and auxiliary practices. *26,400 ft * $3.00 /foot = $79,200 * $2,500 * 5 practices = $12,500 Total $91,700	Division of Wildlife, US Fish and Wildlife, US Forest Service, USDA CRP, SOACDF, 319 grant funds.	Jan. 2006 to Jan. 2008	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.
Sedimentation & Nutrients	4. Educate cropland producers on set back requirements for pesticide application. * Educate landowners on proper	$8,000 in education to inform cropland owners & farmers about pesticide application and runoff.	Education grants, SWCD donations, or 319 grant funds	April 2005 to Jan. 2008	Document the number of landowners and crop produces that have been educated through the educational workshops.

	application method. *Improve cropland management.	* Have agriculture workshops to reach all watershed crop growers and landowners.			
Nutrients, Pesticides & Sediment	5. Establish 88.24 acres of streamside buffer habitat to reduce the amount of nutrients and pesticides and increase QHEI scores.	$8,382.8 for CRP to set aside 88.24 acres of cropland to establish a buffer area (average buffer 50 foot minimum). * 14.56 miles (of riparian area needed) *5,280 ft. = 76,876.8 ft * 50 ft buffer = 3,843,840 ft2/ 43,560 = 88.24 acres.	USDA – NRCS Conservation Reserve Program	April 2004 – Dec. 2007	88.24 acres established and put aside in the CRP program to protect that land and stream. Improved QHEI scores.

Impairment: Sedimentation

Background

Much of the White Oak Creek's main stream segment is EWH and flows over a predominantly bedrock substrate. The stream has low sinuosity and good to excellent development. The stream has well developed highly stable pool-riffle-run complexes. However, there are several sites of excessive streambank erosion that are contributing to the sediment load. In the upper river miles the QHEI scores begin to degrade. The riparian habitat is sparse and the pasture and/or cropland pushes closer to the streambank.

Area of White Oak Creek where a large field is buffered from the stream by a strip of riparian trees

The main stem of White Oak Creek in this subwatershed is partially meeting EWH criteria. However, the tributaries are the most susceptible to habitat degradation and high sediment loading. The tributaries and main stream are threatened due to impairments from nutrients, pathogens, pesticides and sedimentation. Sources of these impairments arrive from sanitary sewers, agriculture, sanitary landfills pastureland and nonirrigated crop production. There are approximately 4,395 acres (17%) of pasture land and 10,599 acres (41%) of cropland. The high number of crop fields that are close to the streambank directly impacts the stream and water quality by contributing high loads of sediment and nutrients if not managed properly.

Forest land is also a concern in the Upper Main Stem Subwatershed. There are 9,565 acres of forestland making up approximately 37% of the watershed land use. Woodland improvements are needed to protect and improve timber areas in the watershed. Riparian habitat is very important on the streambanks to maintain and/or create a stable stream channel network. Forested floodplains are abundant in this subwatershed therefore; keeping the channel connected to those floodplains is a priority.

View of White Oak Creek showing a well established riparian buffer area.

Problem Statement

Excessive siltation in Upper Main Stem Subwatershed is impairing use attainment from RM 7.6 to 29.33. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program there is an estimated sediment loss of 56,743.6 tons/year from cropland, pasture and forest; with a delivery ratio of 7,174.6 tons/year entering the stream system.

Tributary stream where both a crop field and pasture area boarder the stream

The Ohio EPA 305(b) report states that nonirrigated crop production is the highest source of sediment, with pasture land as a slight source during the 1997 sampling season. However, since 1997 pasture land in the Upper Main subwatershed has risen to be a moderate to high source of impairment. This is happening due to unmanaged grazing (no planned grazing system) on many of the tributary streams.

Many of the livestock operations that exist in the subwatershed are in desperate need of improvement. There are 39 of 54 operations in need of some type of upgrade. The upgrades that will help eliminate pollutants are livestock exclusion fencing, winter feeding structures, prescribed grazing systems, and forestland protection and establishment.

The Upper Main Stem watershed is also slightly affected by a rise in urbanization. The new homes and businesses in the subwatershed have grown by approximately 50% in the past 10 years. Several steps need to be taken to better control and plan development. The Brown County Commissioners have set up a committee to evaluate and administer a sediment and erosion control program.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland	45,342.5
Pasture	8,784.1
Forest	2,617
TOTAL EROSION	**56,743.6**
Amount of sediment from erosion that is entering the stream	***7,174.6 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

6. Improve pasture management by getting 100% of all pasture land following an approved "Prescribed Grazing System" to reduce sedimentation and nutrient runoff.
7. Reduce runoff by 90% from livestock winter feeding sites.
8. Reduce sedimentation by 50% from agricultural fields.
9. Reduce erosion on construction sites through sediment & erosion control regulations.
10. Improve timber management in the forest areas with a Forest Stewardship Plan or Woodland Reestablishment Plan to protect 2,800 acres (30%) of forestland.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sedimentation & Nutrients	6. Establish "Prescribed Grazing Systems" on 4,395 acres of pasture land. First priority being pastures that are split or adjacent to perennial or intermittent streams. * Prescribed Grazing System plans promote better utilization of forage available, which in turn leaves more cover to reduce sediment and nutrient runoff. The grazing plans will	$65,925 for establishment of planned grazing systems. $15 per acre.	Environment Quality Incentive Program(EQIP) (USDA), 319 grant funds, Pollution Abatement cost share funding	Jan. 2004 to Jan. 2007	Documentation of number of pasture land acres planned. STEPL program will be used to calculate nutrient reductions.

	include the placement of livestock watering systems.				
	7. Reduce runoff by 90% from 10 winter feeding sites by installing hard surface feeding areas, runoff controls or alternative site selection.	$150,000 to correct existing winter feeding areas. *$15,000 per structure installed.*	Environment Quality Incentive Program(EQIP) (USDA). 319 grant funds. Pollution Abatement cost share funding.	June 2004 to Dec. 2007	STEPL program will be used to calculate all nutrient and sediment load reductions from the sites.
Sedimentation	8. Reduce sedimentation by 50% from agricultural fields through conservation tillage, crop rotation, establishment of filter strips, riparian buffer strips and hayland.	$200,000 to establish those tasks.	Conservation Reserve Program, EQIP, apply for 319 funding.	Jan. 2004 to Jan. 2014	Sediment reduction of approximately 4,000 tons calculated by the STEPL program.
Sedimentation & Habitat Alterations	9. Reduce conservation site runoff through subdivision regulations that establish a site review and require the use of Best Management Practices (BMP).	$ 5,000 for staff time to review sites and implement reduction plans. * $2,000 for an educational program for prospective homeowners and builders to inform them on	SWCD & Engineers Offices implementing site reviews and sediment control regulations.	March 2003 and ongoing	Number of site reviews completed in the White Oak Creek Watershed. Construction site sediment controls and measurements in place.

		proper and appropriate sediment and erosion control.			
Sedimentation	10. From RM 29.33 to 7.6 implement forest management protection on approximately 2,800 acres (30%) of forest land. This implementation practice will aid in the reduction of sediment entering the stream. There are 9,565 total acres of forestland in the Upper Main Stem subwatershed.	$56,000 for the Forester to produce plans for all 2,800 acres. *Approximately $20 per acres to produce the plans.*	Work in conjunction with the Forester from the Division of Forestry to produce quality timber management plans for the 2,800 acres of forest land in the subwatershed. Partner with NRCS through the EQIP to establish woodland protection and reestablishment.	January 2004 to January 2010 Approximately 400 acres per year targeted for a Forest Stewardship Plan.	Have approximately 2,800 or more acres in a Forest Stewardship Plan following to promote proper timber harvest procedures, etc. The ultimate indicator is a healthy functioning and fully intact riparian forest.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 100 020

Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 58
Stream or Tributary	White Oak Creek (East Fork to Sterling Run)
Segment Length (miles)	9
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Sanitary landfills
Cause of Impairment	

Waterbody ID	OH 49 59
Stream or Tributary	Goose Run
Segment Length (miles)	3
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 50
Stream or Tributary	Walnut Creek
Segment Length (miles)	2
Stream Assessment Status	No info
Aquatic Life Designated Use	WWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 51
Stream or Tributary	Indian Run
Segment Length (miles)	0
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 52
Stream or Tributary	Unity Creek
Segment Length (miles)	4
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 53
Stream or Tributary	Miranda Run
Segment Length (miles)	1
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 54
Stream or Tributary	Shot Pouch Run
Segment Length (miles)	1
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

White Oak Creek Watershed Inventory
Upper Main Stem Subwatershed
HUC 05090201 100 020

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access	Livestock oper. needing improvements	Livestock oper. complying	Number of New Homes	Expected Development	Bridges/ Culverts
White Oak Creek where North Fork meets East Fork	29.33-28.96	2,133					2,100	2,100	?			1		
White Oak Creek Trib 1	28.96	11,160	4,000			4,000	3,660	7,500	yes	1	0	1		2
White Oak Creek	28.96-23.81	27,660						10,000	yes	2		25	yes	1
Goose Run	23.81	12,400	6,000				5,000	7,400				3	yes	3
White Oak Creek	23.81 - 22.50	7,100					7,100	0	yes	1				0
White Oak Creek Trib 2	22.50	7,700	2,500			2,500	5,200	2,500	yes	1		2		1
White Oak Creek	22.5-20.14	10,460	200				10,460	0		1		13	yes	4
White Oak Creek Trib 3	20.14	5,100	2,700			2,700	2,400	2,700	no	0	0	0		2
White Oak Creek	20.53-19.91	3,620		1,100			3,620	0	no	1	2	10	yes	1
White Oak Creek Trib 4	19.91	5,200	1,633			1,633	3,567	1,633	no	0	0		yes	2
White Oak Creek	19.91 - 19.15	4,280					4,280	0	no	0	0			0
Stony Hollow	19.15	15,150	1,000				14,000	1,150	yes	2	3	15 - 20	yes	10
White Oak Creek	19.15 - 18.00	6,850					6,850	0	no	0	0	4	yes	0
Shot Pouch Run	18.00	17,800					9,720	8,080	yes	5	0	15-20	yes	4
White Oak Creek	18.00 - 16.02	13,277					13,277	0	no	0	3	0	no	0
Miranda Run	16.02	15,040					12,740	2,300	yes	2	2	10	yes	
Miranda Run Tribs	*.85*	19,110	7,497			7,497	11,613	7,496	yes	2	1	17	yes	6
White Oak Creek	16.02-15.25	8,460	3,100				8,460	0	no	0	0	1	no	0
Unity Creek	15.25	18,500	8,700			6,700	11,800	6,700	yes	7	0	30	yes	5
White Oak Creek	15.25 - 14.14	5,620					5,620	0	no	0	0	4	yes	3
Indian Run	14.14	14,600	7,300			7,300	7,300	7,300	yes	3	2	15	yes	3
White Oak Creek	14.14 - 13.69	2,425					2,425	0	no	3	0	1	no	1
White Oak Creek Trib 5	13.69	5,935	1,000				3,435	2,500	yes	2	0			
White Oak Creek	13.69 - 13.15	2,623					2,623	0	no	0	0	0	no	0
White Oak Creek Trib 6	13.15	8,400	1,800			1,800	6,600	1,800	yes	3	0	2	yes	2
White Oak Creek	13.15 - 10.81	9,700					7,900	1,800	yes	1	2	0	no	0
White Oak Creek Trib 7	10.81	5,600					5,600	0	no	0	0	0	no	
White Oak Creek	10.81 - 7.6	18,100	500		500		14,200	3,900	yes	2	0	0	no	
TOTAL		**284,003**	**47,930**	**1,100**	**500**	**34,130**	**191,550**	**76,859**		**39**	**15**	**139**		**50**
	Miles=	**53.79**	**9.08**	**0.21**	**0.09**	**6.46**	**36.28**	**14.56**						

* Petition ditch defined as a old township ditch

Livestock Inventory Totals	Beef	Goat	Sheep	Buffalo
	825.00	41	48	8

Totals gathered from Farm Service Agency's Livestock compensation Program (LCP) applications filled out by the livestock owners.

Subwatershed Total Acres
25,852.40

Water Quality Assessment

**All Data from OEPA*

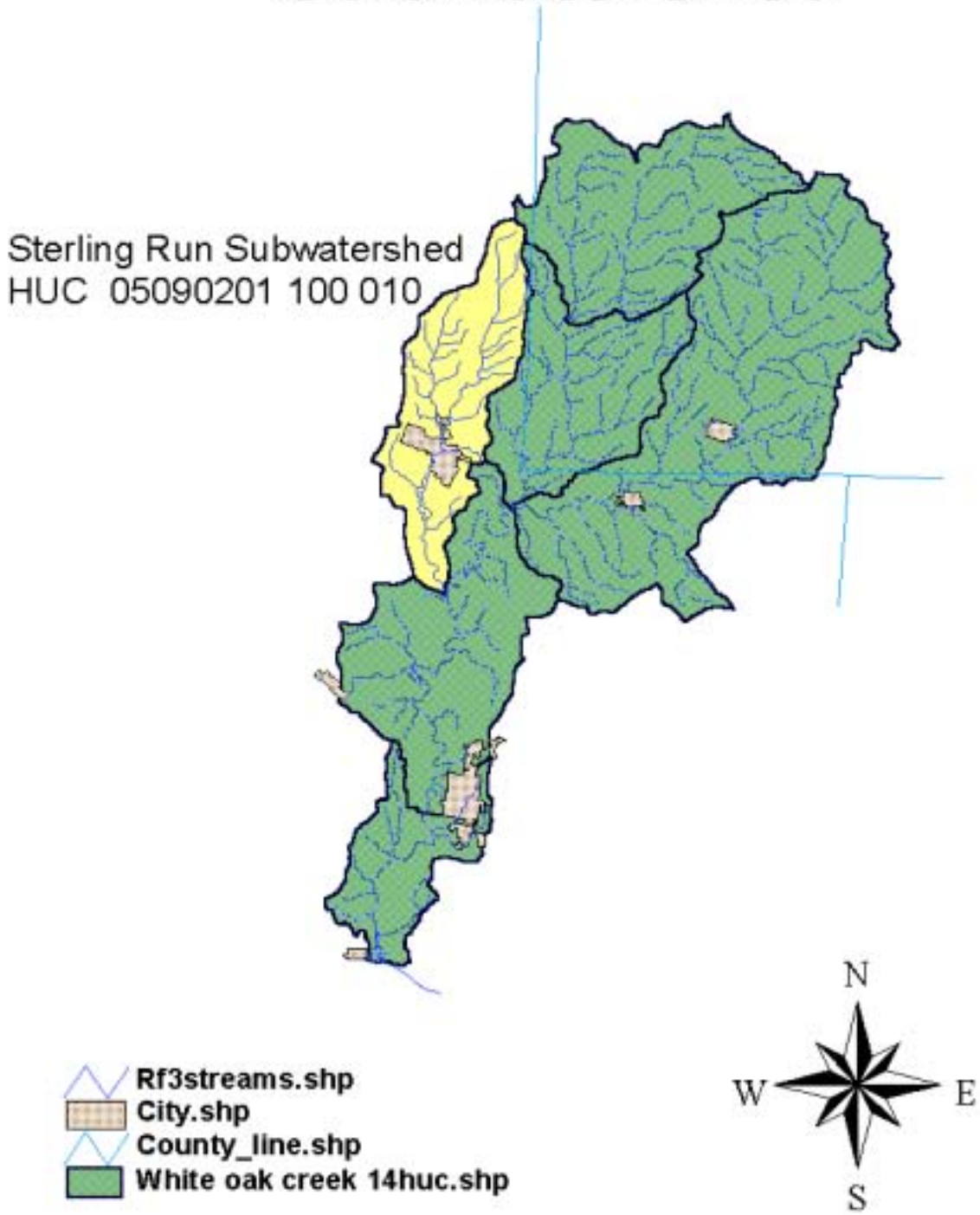
Stream Name	Designation	Attainment Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
RM 27.6	EWH	PARTIAL	37	8	46	56		WOMS 900
RM 20.2	EWH	PARTIAL	43	9		73		WOMS 700
RM 12.8	EWH	PARTIAL	44	9	44	78		WOMS 400
Walnut Creek	EWH	Untested						
Indian Run	WWH	Untested						
Unity Creek	WWH	Untested						
Miranda Run	WWH	Untested						
Shot Pouch Ru	WWH	Untestec						

NonPoint Source Pollution

* H = High * S = Slight
* M = Moderate * T - Threat

Causes:	Sources:
Siltation - H	Nonirrigated crop production - H
Pathogens - S	Pasture land - S
Pesticides - S	

Sterling Run Subwatershed



Sterling Run Subwatershed

HUC 05090201 100 0101

Physical Description:

View of Sterling Run

Channelized stream adjacent to an agricultural field

Sterling Run Subwatershed encompasses 19,197.6 acres of Brown County. There is approximately 48.29 miles of streams (including all tributaries) in the Sterling Run Subwatershed. It contains Grant Lake, the small town of Greenbush and the growing Village of Mt. Orab. The majority of tributaries north of State Route 32 are mainly channelized due to agricultural reasons. Water quality in these channelized areas show drastic impacts from nonpoint source pollution. However, monitoring results below Grant Lake reflect better water quality with less impact. Lower Sterling Run meets partial EWH attainment.

Man fishing south of the Grant Lake Dam

Possible concerns in this subwatershed include faulty or nonworking household sewage treatment systems, stream channelization and lack of riparian buffer areas. These issues and land use changes are the causes of non attainment in the Sterling Run. Grant Lake also suffers from severe sediment loading due to it acting as a sediment catch basin for tons of sediment from Sterling Run headwaters that run directly to the lake.

The village of Mt. Orab is growing at a rapid pace. Urbanization of this area is happening due to State Route 32 which connects Mt. Orab to Cincinnati, OH. Cincinnati is less than 35 miles from the watershed and becoming a suburb community of the city.

Plum Creek and Snapping Turtle Run are the major tributaries of Sterling Run. Most of the tributaries in Sterling Run are small unmaintained ditches that are unnamed. However, these streams are vital in the overall health and prosperity of the watershed.

Lake Grant

Lake Grant from the south side, facing north

Lake Grant is a public lake located south of Mt. Orab, Ohio on Sterling Run, a tributary of White Oak Creek that runs through the village. The lake covers 167 acres and is surrounded by 205 acres of public land. The lake and adjacent lands make up the Lake Grant Wildlife Area. This area was purchased with funds from the Pittman-Robertson and Dingell-Johnson federal excise tax programs for the purpose of recreational hunting and fishing. The lake was built in 1948 and came to full pool in the spring of 1949. Since 1978 the lake and surrounding land have been leased to the Village of Mt. Orab which has added additional recreational facilities such as picnic grounds. Grant Lake is rated for electric motors only; no gasoline motors are allowed.

Erosion problems in the watershed above the lake have resulted in sediments entering the lake. Over the years this has resulted in portions of the lake becoming very shallow. Sedimentation has a negative effect on much of the lake and on the lake's ecology.

Lake Grant frozen during the winter

The amount of sediment entering the lake has most likely varied from year to year. There have been no specific studies on the rate of sedimentation or the impact of the

sediments to the lake's ecological and recreational values. However, because the lake has trapped much of the sediments from the upper watershed, it has reduced the sediment load downstream of the lake.

Changes in the watershed that reduce erosion, thereby reducing the amount of sediment entering the lake, would improve the water resources and prolong the ability of the lake to provide recreational activities.

Lakes are vulnerable to contamination because of impacts surrounding them. Many lakeside residents are coming together to encourage the adoption of best management practices to protect the lake's ecological integrity.

Reservoirs

There are three reservoirs located in the Sterling Run Subwatershed within the Village of Mt. Orab. The reservoirs are used by the village to supply the residents with drinking water. Mt. Orab is the only village to currently use surface water. Water is taken directly from Sterling Run and pumped into the reservoirs. The eldest of the reservoirs (constructed in 1950's) is located at the water treatment plant while the other two are located about ¼ mile upstream, just below the confluence of the east and west branches of Sterling Run (RM 7.0). The remaining two reservoirs were constructed in 1975 and 2002.

Before water is taken from the stream to the reservoirs tests for pH, manganese and atrazine are taken. Elevated levels of atrazine have been found in the spring when this happens pumping is halted until the levels have been lowered to an acceptable reading. The reservoirs have an overflow that leads to a small tributary; however the reservoirs feed to each other so the overflow is rarely used.

Mt. Orab's newest reservoir during construction in 2002

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	5%	960 acres
Forest	15%	2,880 acres
Pasture	15%	2,880 acres
Cropland	65%	12,478 acres

Total Acres = 19,198

** Data provide by 1994 land use maps from Ohio Department of Natural Resources*

Sterling Run Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
.4	1997				50
.9	1997	42		8.1	65.5
.9	1997	46		8.7	65.5
6.4	1997	20			52
6.4	1997	24			52
Snapping Turtle Run					
.2 (downstream of WWTP)	1997	28			56
.2	1997	30			56
.4 (Upstream of WWTP)	1997	34			46.5
.4	1997	38			46.5

Point Source Pollution Sources

*Permitted Discharge Loadings (30 day average-Kg/day)

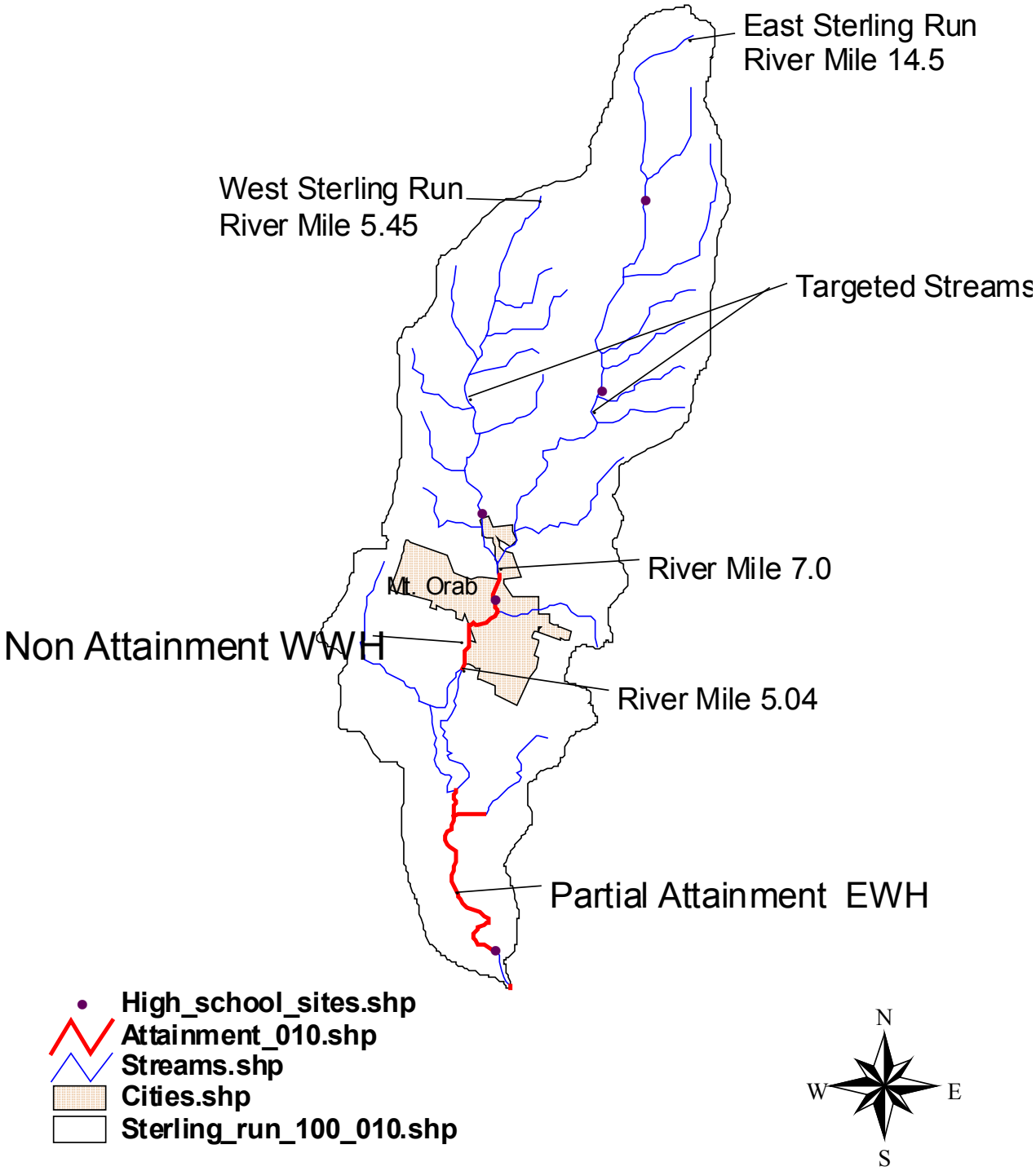
Facility	suspended solids	nitrogen-ammonia	CBOD5	River Mile
Mt. Orab Wastewater Treatment Plant	16	1.94	13	Snapping Turtle Run RM 2.78

NonPoint Source Pollution

* H = High
* M = Moderate
* S = Small
* T = Threat

Causes:	Sources:
Flow Alteration - H	Nonirrigated crop production - H
Nutrients - S	Natural - M
Pathogens - S	Pature lands - S
Snapping Turtle Run	
Nutrients - H	Minor Municipal Point Source - H
Siltation – M	Nonirrigated crop production - M
Pathogens - S	Pasture land - M
Pesticides - S	Nonirrigated crop production - T
Nutrients - T	
Siltation – T	

Sterling Run Subwatershed
HUC 05090201 100 010



Sterling Run Subwatershed
HUC 05090201 100 010

Impairment: Pathogens

Background

Along the East & West Branch of Sterling Run pathogens are the major contributors to the stream not meeting warmwater habitat use designation status. The streams and tributaries north of Mount Orab, OEPA monitoring site at river mile (RM) 6.4, are the most severely impacted. OEPA results show pollution impacts come from pathogens. Several sites monitored show severely elevated levels of bacteria. Elevated levels of pathogens have been connected to livestock having uncontrolled accesses to the stream, a large number of pasture acres, and the failure of household sewage treatment systems. Septic systems are known to fail in this subwatershed because of a seasonally high water table, high clay content in the soil, and increasing impervious surfaces. Unacceptable levels of e-coli and fecal coliform has been found though student and volunteer monitoring. All pollution reductions will be calculated in the STEPL program at the time of repair. Septic system upgrades along with the livestock exclusion fencing practices should prove to be a direct impact in water quality raising the stream attaining status from non attainment to full attainment of Warmwater Habitat (WWH).

Problem Statement

The Brown County Health Department estimates there are approximately 1,747 total systems in the area, with 25% of all septic systems in Sterling Run subwatershed failing. Therefore, there are 437 systems targeted for repair. From year 2004 to 2014 the goal is to repair 50% (approximately 218) of the malfunction systems in this subwatershed. The repair of 218 systems will result in 78,480 gallons per day adequately treated. This will also show a direct reduction in TSS, BOD, Phosphorus, Nitrogen and Ammonia. According to the STEPL Load Reduction Program there is 15,031 lbs/yr. nutrient load, 5887 lbs/yr phosphorus load, and 61,375 lbs/yr of BOD. New health department regulations along with household sewage treatment system upgrades will reduce amounts of these pollutants and e-coli & fecal coliform from entering in the stream.

Fourteen livestock operations totaling approximately 227 animal units exist in this segment of stream with 11 of these operations needing improvements. There are

2,880 acres of pastureland in the subwatershed with approximately 226 beef cows, and 2400 hogs. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, and reducing (nutrient, sediment, & manure) runoff from winter feeding sites.

Goals

1. Complete and obtain approval of countywide HSTS plan to identify needed sewage treatment upgrades and there locations.
2. Upgrade 50% of those identified failing HSTS systems in the Sterling Run subwatershed.
3. Protect approximately 3 miles of stream from livestock access to reduce nutrient and sediment loading (all fence will include a 10-15 year riparian forest protection area).

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	1. Work with the local Health Departments to complete the HSTS inventory, which identifies the failing systems in the watershed along with other pollution public health concerns that may effect the water quality in WOC. It also identifies the needs and types of systems	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	Approved County-wide HSTS plan by OEPA & local Health Boards.

	necessary to correct the problem sites in the subwatershed.				
Pathogens / bacteria	2. Replace or upgrade 50% of the identified (through the HSTS plan) failing HSTS systems reducing the amount of fecal coliform and e. coli present in the stream.	Replace approx. 218 systems with grant cost share, DEFA low interest loan funds and homeowner contribution. Repair 218 HSTS @ $5,000 per system totals 1,090,000.	WOC watershed group along with HSTS homeowners will work with the Division of Financial Assistance and OEPA to obtain funds for replacements.	Jan. 2004 to Jan 2014	Systems upgrade will reduce the amounts of e. coli and fecal coliform present in the stream. Amounts reduced will be calculated in the STEPL program.
Sediment, Nutrients, & Habitat Alterations	3. Contact 3 livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with landowners to install 3 miles of streambank fencing and needed auxiliary practices to protect at least 15,840 feet of streambank.	$ 55,020 dollars for the fence and auxiliary practices. *15,840 ft * $3.00 /foot = $47,520 * $2,500 * 3 practices = $7,500 Total $55,020	Division of Wildlife, US Fish and Wildlife, US Forest Service, USDA CRP, SOACDF, 319 grant funds.	Jan. 2004 to Jan. 2006	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.

Impairment: Flow Alterations

Background

Sterling Run flowing through an agricultural area

According to OEPA monitoring (1997) flow alterations are the highest cause of impairment in the Sterling Run Subwatershed. Upstream from Lake Grant, small stream size and possible intermittent flow conditions influence the biological communities. Small tributaries in the upper reaches of Sterling Run are continually maintained as drainage ditches between agricultural fields. A majority of the streams in this area are entrenched. Sources that contribute to flow alterations are channelization, levied/dammed areas, lack of riparian habitat and livestock degradation areas. These flow/habitat alteration areas contribute to the **non attainment of WWH in Sterling Run north of RM 6.4**.

Problem Statement

All subwatershed tributaries North of Lake Grant are in need of some type of habitat improvements. From East Sterling Run RM 5.04 to 14.5 and West Sterling Run RM 0 to 5.45 there is a major need for riparian habitat improvements. (*see map p.6 for targeted stream locations)* According to the "Inventory Table" this area of Sterling Run is in need of 27.92 miles of riparian habitat. Studies of this subwatershed also show that as a whole there is 33.98 miles of stream that has been channelized. There are 4,000 feet levied and 10,000 feet dammed. Studies also show approximately 83,600 feet (15.83 miles) as unmaintained petition ditches. The Sterling Run tributaries are in desperate need of riparian habitat (buffer) to raise QHEI scores along with water quality attainment. The only area monitored by OEPA is RM 6.4, most recent scores in 1997show IBI as 20 & 24 (below average) and QHEI as 52 (generally a value above 60 is needed to achieve Warmwater habitat). However, from numerous visits to this site and others, data from RM 6.4 is actually much better than most stream segments in the Sterling Run subwatershed. Therefore, showing a desperate need to repair riparian buffers and eliminate field channelization. Site specific calculations includes the establishment of 27.92 miles of riparian corridor with an average buffer width of 90 ft (45 feet each side) equals the revitalization of 304 acres of newly functioning

riparian buffer habitat. With the establishment of new riparian habitat in the channelization areas the stream corridor will begin to revitalize itself creating new habitat, while reducing the amounts of other pollutants entering the stream. Most of the tributaries in the subwatershed are very small therefore the average buffer width of 90 ft (45ft on each side) should be adequate in most cases to repair the riparian area. A direct marketing approach will be taken to target individual landowners where flow/habitat alteration solutions are needed.

Goals

4. Reestablish 27.92 miles of tree riparian corridors to improve the QHEI scores and reduce pollution runoff.
5. Protect & improve streambank stabilization by upgrading 5 degraded livestock feeding areas by installing 3 miles of livestock exclusion fencing and auxiliary practices.
6. Reduce channelization in small headwater streams through installing a demo site to demonstrate the channel morphology concept on approximately 5,000ft. This project will aid in watershed resident education and outreach.
7. Establish a riparian habitat protection program to protect the 19.7 miles of habitat that is currently in place.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Habitat Alterations	4. Reestablish 27.92 miles of riparian corridor through tree plantings and installation of riparian buffer strips. Site specific calculations includes the establishment of 27.92 miles	97,280 at 90% cost share ($87,552). Establishing 27.92 miles of buffer along the targeted non-attaining stream segment. East Sterling Run RM	Work with the Division of Forestry to obtain trees and plan tree plantings utilizing Forest Land Enhancement Program (FLEP). Work in conjunction with USDA	2004 thru 2014 YEARS 2004-06 establish 4.52 miles 2007 – 10 establish 15 miles 2010 – 14 establish 8.4 miles	Reestablish-ment of all 27.92 miles of riparian corridor. Higher QHEI scores obtained in the targeted stream segments.

	of riparian corridor with a average buffer width of 90 ft (45 each side) equals the revitalization of 304 acres of newly functioning riparian buffer.	5.04 to 14.5 and West Sterling Run RM 0 to 5.45. *calculation: (27.92*5280 =147,416.6*90ft = 13,267,584 ft^2/43,560ft^2 = 304.5 acres)*	NRCS to establish Riparian Buffers through CRP and other USDA programs. Work with Division of Wildlife to promote warm season grasses.		
Habitat Alterations	5. Same as task statement in goal 3.				

Habitat Alterations	6. Use education & outreach programs to save headwater streams from continuous channelization from local residents. Install a demo site to demonstrate the channel morphology concept on approximately 5,000 ft. of streambank. This will help landowners seek alternative ways to improve drainage in the Sterling Run subwatershed.	Work with all local landowners and farmers to education them on the harm of channelizing and entrenching the small streams. Hold citizen outreach programs to educate the community members about channelization and habitat alterations and why these effect streambank erosion and water quality. Install a demo site to demonstrate the channel morphology concept on approximately 5,000 ft. of streambank.	SWCD & NRCS information and assistance. Use funds from Brown or Highland SWCD or grant dollars.	2004 – 2014 or until it is widely accepted to allow natural drainage to occur rather than channelization practices.	Higher QHEI scores and continual growth of the riparian habitat. Citizen education influencing there farming practices.

Habitat Alterations	7. Establish a protection program to save the current 19.7 miles of riparian habitat that is currently in place in the Sterling Run subwatershed.	Work with state agencies to set up a riparian easement program. Partner with the Brown & Highland SWCD to hold easements to protect the riparian habitat. Set up guidelines and funding objectives to start a easement purchase program to protect the habitat.	Partner with all persons involved to get the program up and running. Use ODNR & OEPA to set up the program. Obtain grant and other funding. Use Brown & Highland SWCD's, County Commissioners, & public funds.	2004 - Start researching the program and funding options. 2005 – Partner with all appropriate agencies to obtain and hold the easements. Set up all legal logistics and target riparian areas. 2006 – Start program.	Easements purchased and riparian habitat protected from degradation.

Impairment: Sedimentation

Background

Sterling Run Subwatershed north of Lake Grant (RM5.04) is not meeting WWH because of excess sedimentation (siltation) and nutrient loadings. Sterling Run subwatershed has sediment loadings of 8,684.8 tons per year entering the stream. Other known pollutant loads within this segment of stream include 79,792.6bs. of nitrogen (N) per year, 22,038.5 lbs. of phosphorus (P) per year and 213,340.4 lbs. biological oxygen demand (BOD) per year. Loading are over the expectable level for WWH.

Problem Statement

Sterling Run in Mt. Orab, loaded with sediment

Fourteen livestock operations totaling approximately 227 animal units exist in this segment of stream with 11 of these operations needing improvements. By improving these operations there will be a reduction in nutrient loadings and sediment runoff. This will be accomplished by restricting the livestock access from the stream, improving pasture management, and reducing (nutrient, sediment, & manure) runoff from winter feeding sites. Largely, the main issue in this subwatershed is sediment and nutrient runoff from cropland. Cropland contributes approximately 7,800 tons per year, therefore over 90% of total sediment entering the stream results from cropland. The following benefits will be achieved through installing best management practices; interception of sediment, nutrients and pesticides, the lowering of water temperature, increased infiltration, and improved habitat. Through the installation of the best management practices sediment will be reduced by approximately 4,300 tons per year.

The subwatershed currently has 19.7 miles of protected riparian buffers. The remaining 27.92 miles are in need of riparian corridor protection to reduce sedimentation and runoff. Sterling Run subwatershed has sediment loadings of 8,353.5 tons per year entering the stream, according to the Erosion & Sediment Delivery Model. Sedimentation in the Sterling Run subwatershed is also a direct effect of urbanization and intense construction. Subdivision regulations have been

put into place to regulate the sediment that leaves a construction site. Erosion will be controlled though proper planning and best management practices.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland Pasture Forest **TOTAL EROSION**	57,359.4 3,219.8 471.7 **61,051**
Amount of sediment from erosion that is entering the stream	***8,353.5 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

8. Improve pasture management on 800 acres to reduce (nutrient, sediment, & manure) runoff from winter feeding sites.
9. Reduce sedimentation by 50% from agricultural fields.
10. Reduce erosion on construction sites.
11. Reduce nonpoint source pollution such as: sedimentation and pathogens by educating contractors on best management practices.
12. Install a USGS gauging station in Sterling Run to monitor flow and pollution loadings.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sediment, Habitat Alterations & Nutrients	8. Establish planned grazing systems on 800 acres of pasture land. First priority being pastures	$12,000 for establishment of planned grazing systems. $90,000 to	Environment Quality Incentive Program(EQIP) (USDA). 319 grant funds. Pollution	Jan. 2004 to Jan. 2007	Documentation of number of pasture land acres planned. STEPL

	that are split or adjacent to perennial or intermittent streams. * Reduce runoff from 6 winter feeding sites by installing hard surface feeding areas, runoff controls or alternative site selection.	correct existing winter feeding areas.	Abatement cost share funding.		program will be used to calculate nutrient reductions.
Sediment, Habitat Alterations & Nutrients	9. Reduce sedimentation by 50% from agricultural fields through conservation tillage, crop rotation, establishment of filter strips, riparian buffer strips and hayland.	$250,000 to establish those tasks.	Conservation Reserve Program, EQIP, USDA programs, and 319 funding.	Jan. 2004 to Jan. 2010	Sediment reduction of approximately 4,300 tons calculated by the STEPL program.
Sediment	10. Reduce construction site erosion through subdivision regulation that establish a site review and require the use of Best Management Practices (BMP).	$ 7,350 for staff time to review sites and implement sediment reduction plans.	SWCD implementing site reviews and sediment control regulations.	March 2003 and ongoing	Number of site reviews completed in the White Oak Creek Watershed. Construction site sediment controls regulation and measures in place.

ALL	11. Promote education through contractors' workshops to reduce nonpoint source pollution. This will be a HSTS installer certification program, which the installer will be educated on proper & acceptable ways to install and repairs systems to eliminate nonpoint source pollution.	$2,000 yearly for speakers and supplies.	Partner with health departments, Ohio State Extension, NRCS, soil and water districts and local construction equipment dealers.	Yearly, starting 2005	Number of certified contractors.
ALL	12. Install a USGS gauging station in Sterling Run to monitor water quality parameters and flow/loadings.	$100,000	Partner with USGS to install a monitor station on Sterling Run.	2007-2010	Station installed and reporting flow and loading data.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 100 010
Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 55
Stream or Tributary	Sterling Run
Segment Length (miles)	15
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 56
Stream or Tributary	Snapping Turtle Run
Segment Length (miles)	3
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 57
Stream or Tributary	Plum Creek
Segment Length (miles)	0
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

White Oak Creek Watershed Inventory
Sterling Run Sub watershed
HUC 05090201 100 010

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access	Livestock oper. needing improvements	Livestock operations complying	Number of New Homes	Expected Development	Bridges/ Culverts
East Sterling Run														
Headwaters of Sterling Run	14.5-12.54	13,600	13,600				13,600					1		1
Sterling Run Trib 1	12.54	7,500	7,500			7,500		7,500		2		1		2
Sterling Run Trib 2	12.69	2,000	1,500					3,000						
Sterling Run	12.54-11.2	7,500					7,500	5,000				2	yes	2
Sterling Run Trib 3	11.2	13,600	13,600			13,600		13,600					yes (intersection)	2
Sterling Run	11.2-10.16	5,500	5,500	1,200			5,500	5,500		1		5	yes	1
Sterling Run Trib 4	10.16	8,200	8,200			1,200	2,000	6,200				2	yes	1
Sterling Run	10.16-9.94	1,100	1,100				2,200					3	yes	0
Sterling Run Trib 5	9.94	6,400	3,200			1,000	2,700	3,700						1
Sterling Run	9.94-9.58	2,000	2,000				4,000			1		3	yes	1
Sterling Run Trib 6	9.58	6,800	6,800				800	6,000				1	yes	4
Sterling Run	9.58-9.21	2,000	5,000					5,000		1		5	yes	5
Sterling Run Trib 7	9.21	6,300	5,500					5,500		1		10	yes	3
Sterling Run	9.21-7.00	11,100	8,000				8,000			2		45	yes	1
Sterling Run Trib 8	7.00-	10,000	7,000				5,000	2,500				15	yes	2
Sterling Run at intersection	7.00-6.68	2,500	2,000				1,000	1,500					yes commercial	3
Sterling Run (Mt. Orab)	6.68-6.00	3,350	1,700				2,700	1,000					yes commercial	3
Sterling Run Trib 9	6.00-	9,000	4,500					2,200				2		2
Sterling Run to lake	6.00-5.04	5,500					5,500					2		1
Sterling Run (Grant Lake)	5.04-4.24	10,000			10,000		10,000			2		10	yes	1
Plum Creek	4.24	12,800	5,000				4,000	5,000				125	yes	5
Sterling Run	3.07-2.78	1,800					1,800							
Snapping Turtle Run	2.78	12,000	4,000				4,000	4,000		1			yes	2
Sterling Run enters White Oak Creek Main Stem	2.78-0.00	14,600					12,000	2,000						2
Sterling Run West														
Headwaters of Sterling Run	5.45-3.87	8,200	8,200			8,200	8,200	8,000			1	3	yes	
Sterling Run Trib 1	3.87	6,000	6,000			6,000		6,000						2
Sterling Run	3.87-3.43	2,500	2,500					2,500						
Sterling Run Trib 2	3.43	7,400	7,400			7,400		7,400						2
Sterling Run	3.43-3.10	2,000	2,000				1,000	1,000			1			1
Sterling Run Trib 3	3.1	6,900	6,900			6,900		6,900						2
Sterling Run	3.10-2.80	1,100	1,100			1,100		1,100						2
Sterling Run Trib 4	2.8	5,200	5,200			5,200		5,200			1	3		3
Sterling Run	2.8-2.4	2,500	2,500			1,800	2,500					1		2
Sterling Run Trib 5	2.4	7,400	7,400			7,400		7,400				4	yes	3
Sterling Run	2.4-1.97	2,200	2,200					2,200				1	yes	1
Sterling Run Trib 6	1.97	6,600	6,600			6,600		6,600						2
Sterling Run	1.97-1.30	3,000	3,000			3,000		3,000				2	yes	0
Sterling Run Trib 7	1.3	5,600	2,600			2,600		2,600						2
Sterling Run	1.3-0.48	4,200	1,100			1,100		1,100						2
Sterling Run Trib 8	0.48	6,200	6,200			3,000		6,200				3	yes	4
West Sterling Run intersects wit East Sterling Run	0.48-0.00	2,800	2,800	2,800				1,000					yes (commercial)	4
TOTAL		**254,950**	**179,400**	**4,000**	**10,000**	**83,600**	**104,000**	**147,400**		**11**	**3**	**249**		**77**
	Miles=	**48.29**	**33.98**	**0.76**	**1.89**	**15.83**	**19.70**	**27.92**						

* Petition ditch defined as a old township ditch

Livestock Inventory	Beef	Goat	Sheep	Hogs
Totals	226	2	2	2400

** Totals gathered from Farm Service Agency's Livestock Compensation Program (LCP) applications filled out by the livestock owners.*

Subwatershed Total Acres
19,197.60

Water Quality Assessment

**All Data from OEPA*

Stream Name	Designation	Attainment Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
Sterling Run- Grant Lake wildlife area (RM 5.4 to 3.0)	EWH	untested						
RM 6.47	WWH	NON						SR 600
all other segments	WWH	untested						
Snapping Turtle Run - (RM .4)	WWH	FULL	36	n/a		46.5	Upstream of WWTP	STR 200
Snapping Turtle Run - (RM .2)	WWH	NON	29	n/a		56	Downstream of WWTP	STR 150
Plum Creek	EWH	untested						
all other segment:	EWH	untestec						

Point Source Pollution Sources

*Permitted Discharge Loadings (30 day average-Kg/day)

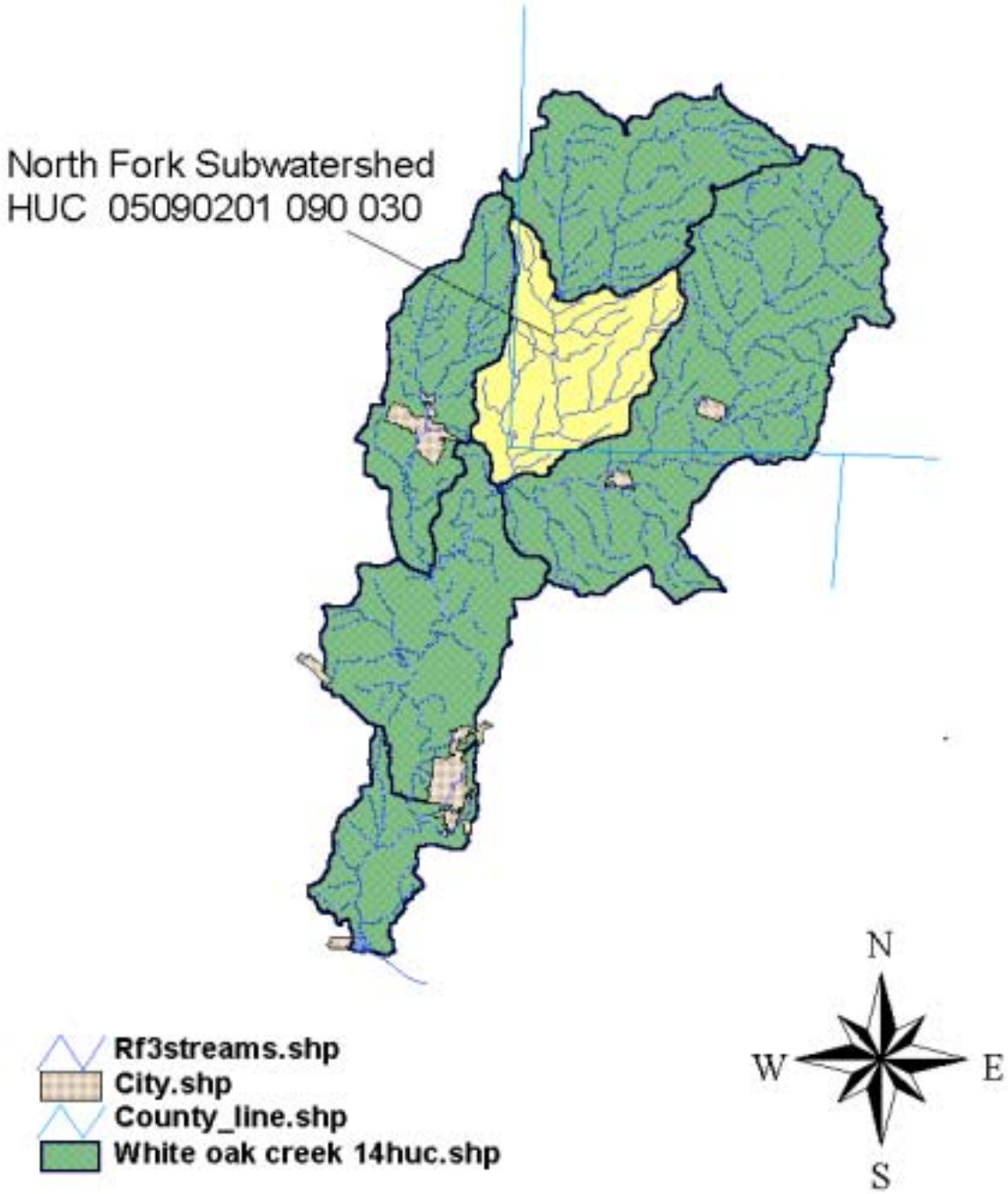
Facility	solids	ammonia	CBOD5
Mt. Orab Wastewater Treatment Plant	16	1.94	13

NonPoint Source Pollution

* H = High * S = Small
* M = Moderate * T = Threat

	Causes:	Sources:
Sterling Run		
Main Stem	Flow Alteration - H	Nonirrigated crop production - H
	Nutrients - S	natural - M
	Pathogens - S	Pature lands - S
Snapping Turtle Run		
	Nutrients - H	Minor Municipal Point Source - H
	Siltation - M	Nonirrigated crop production - M
	Pathogens - S	Pasture land - M
	Pesticides - S	Nonirrigated crop production - T
	Nutrients - T	
	Siltation - T	

North Fork Subwatershed



North Fork Subwatershed

HUC 05090201 090 030
Physical Description:

Stream running through a wooded area

The North Fork subwatershed encompasses 19,300.9 acres. The small town of Buford in located in this subwatershed. A small area of the North Fork stream is in partial attainment of EWH, while the remainder of stream has been untested by OEPA. There are some data available through student monitoring. However, more OEPA data needs to be done to completely assess the entire subwatershed.

North Fork Subwatershed contains approximately 54.22 miles of total stream length of all tributaries. There are 14.66 miles of that channelized and 17.29 miles in need of a riparian buffer area between the current land use and the stream.

Stream running through a cropland area

Agriculture is the main land use in the North Fork subwatershed. There are 13,124 acres (68%) of cropland in the North Fork Subwatershed. Impairments in this subwatershed include channelization, sedimentation and pathogens. Repairing faulty septic systems and increasing the amount of streamside filter strips have been priorities in this area.

Flat Run is a major tributary of North Fork that drains 12.7 square miles. Yellow Run, Brush Run, Ruble Run (near Buford) and Indian Run (north of Buford) are all named tributaries in this subwatershed.

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	3%	579 acres
Forest	15%	2895 acres
Pasture	14%	2702 acres
Cropland	68%	13,124 acres

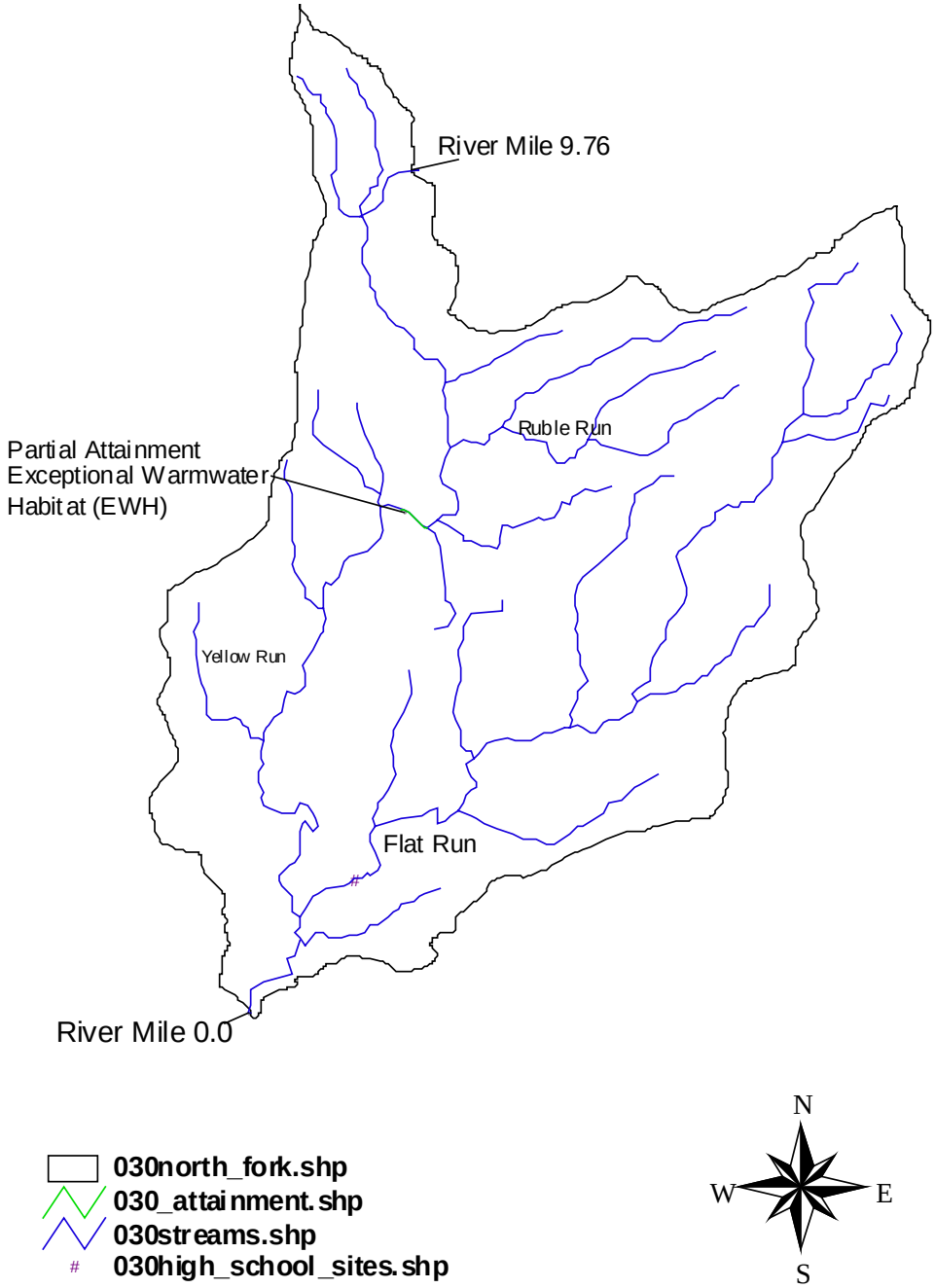
Total Acres = 19,300.9

** Data provide by 1994 land use maps from Ohio Department of Natural Resources*

North Fork Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
6.8	1983	36	22	6.8	**55.5**
6.8	1983	42	22	7.9	**55.5**
6.8	1983	40	22	7.9	**55.5**
6.9	1997	44	46	8.1	**52.5**
6.9	1997	42	46	7.6	**52.5**

North Fork Subwatershed
HUC 05090201 090 030



North Fork Subwatershed
HUC 05090201 090 030

IMPAIRMENT: NUTRIENTS & SEDIMENTS

Background

Based on biological sampling done in 1997, the North Fork Subwatershed from RM 0 to 9.1 is not meeting full exceptional warmwater habitat (EWH) and should be redesignated from EWH to warmwater habitat (WWH). Cropland production and pastureland have been identified as sources of impairment.

Problem Statement

According to land use calculations cropland makes of 68% or 13,124 acres of the total land use. Pasture land makes up 14% or 2,702 acres of land use. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program there is an estimated sediment loss of 114,568.1 tons/year from cropland, pasture and forest; with a delivery ratio of 16,292.4 tons per year. This is the 3rd highest sediment producing subwatershed in the White Oak Creek drainage area. The sediment amount in tons/year makes of 19% of all the sediment impairing the entire White Oak Creek Watershed.

Cropland adjacent to the main channel of North Fork –White Oak Creek

Livestock operations in need of Best Management Practices (including livestock fencing)

The highest source of sediment and nutrients come from nonirrigated crop production, 68% of the land use being agriculture. A slight to moderate amount come from pasture land. There are 13 livestock operations totaling approximately 752 animal units that exist in this segment of stream with 11 of these operations needing improvements, mainly to restrict livestock access to the stream or tributaries. Restricting the animals from the stream through a livestock fencing program will help reduce nutrients, pathogens and sedimentation from impacting the stream. Cropland rotation is also a fundamental idea that needs to be exercised in this subwatershed. Continuous soybeans are depleting the soil of its sustainability and productivity.

Cropland located within the floodplain adjacent to the stream

Cropland contributes nutrients and pesticides to the stream through improper application of fertilizers and pesticides. If over application of fertilizers and pesticides has occurred, nutrients can enter the stream through several different ways, the first being a runoff event. This removes the soil particles from the soil surface, nutrients and pesticides can be or are attached to the soil particles and enter the stream. The second way is leaching through the soil, this allows nutrients and pesticides to enter ground water then carry the nutrients to the stream. The next way for nutrients to enter the stream would be improper manure application to

cropland. Lastly, increased rainfall frequency and intensity over the past 7 years have shown incidents of runoff; even if fertilizers, pesticides, and manure are applied properly.

The subwatershed currently has 30.13 miles of protected riparian buffers. The QHEI score at RM 6.9 in 1997 was 52.5 (generally a score of 60 or above is needed to achieve warmwater biological criteria). That riparian buffer is in need of protection from further degradation. The remaining 17.29 miles is in need of riparian corridor establishment to increase QHEI scores and reduce sedimentation and nutrient loadings. Riparian buffer establishment and cropland setbacks are a priority.

Known pollutant loads within this segment of stream includes 106,057.8 lbs. of nitrogen (N) per year, 30,333 lbs. of phosphorus (P) per year and 220,811.7 lbs. biological oxygen demand (BOD) per year.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland	114,568.1
Pasture	4,548.5
Forest	121.2
TOTAL EROSION	**119,237.8**
Amount of sediment from erosion that is entering the stream	***16,292.4 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

1. Protect approximately 3 miles of stream from livestock access to reduce nutrient and sediment loadings (all fence will include a 10-15 year riparian forest protection area).
2. Improve pasture management by getting 65% of all pasture land following an approved "Prescribed Grazing System" to reduce sedimentation and manure runoff.
3. Reduce sedimentation and nutrient runoff by 50% from cropland areas.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sediment, Nutrients, & Habitat Alterations	1. Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with landowners to install 3 miles of streambank fencing and needed auxiliary practices to protect at least 15,840 feet of streambank.	$55,020 dollars for the fence and auxiliary practices. ** $47,520 (15,840 ft * $3.00 per/ft). for fencing + $7,500 ($2,500 per watering system * 3 systems) = $55,020 total cost*	Division of Wildlife, US Fish and Wildlife, US Forest Service, SOACDF, and USDA CRP, Farm Bill Funds.	Jan. 2006 to Jan. 2008	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.
Nutrients, Sediments and Pathogens	2. Establish "Prescribed Grazing Systems" on 1,756 acres of pasture land. First priority being pastures that are split or adjacent to perennial or intermittent streams.	$ 26,340 for establishment of planned grazing systems. $15 per acre.	Environment Quality Incentive Program (EQIP) USDA, 319 grant funds or special project money.	Mar. 2004 to June 2007.	Documentation of the number of pasture land that participated in the program. STEPL program will be used to calculate nutrient and sediment reductions.
Sedimentation	3. Reduce sedimentation by 50% (8,146.2 tons) from agricultural fields through conservation tillage, crop rotation,	$250,000 to establish those tasks.	Conservation Reserve Program, EQIP, apply for 319 funding.	Jan. 2005 to Jan. 2014	Sediment reduction of approximately 8,146.2 tons calculated by the STEPL program.

	establishment of filter strips, riparian buffer strips and hayland.				

Impairment: Pathogens

Background

In the North Fork Subwatershed malfunctioning household sewage treatment systems contribute to the stream not meeting full warmwater habitat use designation status. The streams and tributaries are impacted by pathogens. Several sites monitored show severely elevated levels of bacteria. Elevated levels of pathogens have been connected to livestock having uncontrolled accesses to the stream, a large number of pasture acres, and the failure of household sewage treatment systems (HSTS).

Septic systems are known to fail in this subwatershed because of a seasonally high water table, slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found though student and volunteer monitoring. At the time of system repair, pollution reductions will be calculated in the STEPL program. Septic system upgrades along with the livestock exclusion fencing practices should prove to have a direct impact in water quality, raising the stream attainment status to full attainment of Warmwater Habitat (WWH).

Problem Statement

The Highland County Health Department estimates there are approximately 230 total systems in the area, with 25% of all septic systems in North Fork subwatershed failing. Therefore, there are 58 systems targeted for repair. From year 2004 to 2014 the goal is to repair 50% (approximately 29) of the malfunctioning systems in this subwatershed. The repair of 29 systems will result in 10,440 gallons per day adequately treated. This will also show a direct reduction in TSS, BOD, Phosphorus, Nitrogen and Ammonia. According to the STEPL Load Reduction Program there is 1,912.63 lbs/yr. nutrient load, 749.11 lbs/yr phosphorus load, and 7,809.9 lbs/yr of BOD. New health department regulations along with household sewage treatment system upgrades will reduce amounts of these pollutants and e-coli & fecal coliform from entering in the stream.

Cattle feedlot near a small tributary

There are 13 livestock operations in this subwatershed with 11 of these operations needing improvements. There are 2,702 acres of pastureland with approximately 752 beef cows in the subwatershed. By improving these operations there will be a reduction in nutrient loadings, pathogens and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, and reducing (nutrient, sediment, & manure) runoff from feeding sites *(goals for the bmp's are listed in the previous impairment section).*

Goals

4. Complete and obtain approval of Brown & Highland countywide HSTS plans to identify needed sewage treatment upgrades and there locations.
5. Upgrade 50% of those identified 58 failing HSTS systems in the North Fork Subwatershed.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	4. Work with the local Health Departments to complete the HSTS inventory, which identifies the failing systems in the watershed. The plan will also identify the needs and types of systems necessary to correct the problem sites in the subwatershed. Lastly, the countywide plan will include an operation and maintenance program for the counties.	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	Approved County-wide HSTS plan by OEPA & local Health Boards.
Pathogens / bacteria	5. Replace or upgrade 50% of the 58 identified (through the HSTS plan) failing HSTS systems reducing the	Replace approx. 29 systems with grant cost share, DEFA low interest loan funds and	WOC watershed group along with HSTS homeowners will work with the Division of Financial	Jan. 2004 to Jan 2014	System upgrades will reduce the amounts of e. coli and fecal coliform present in the stream.

	amount of fecal coliform and e. coli present in the stream.	homeowner contribution. Repair 29 HSTS @ $5,000 per system totals $ 145,000.	Assistance and OEPA to obtain funds for replacements.		Amounts reduced will be calculated in the STEPL program.

Impairment: Flow / Habitat Alterations

Background

According to OEPA monitoring (1997) flow alterations are a cause of impairment in the North Fork Subwatershed. One site sampled in this segment had an exceptional macro invertebrate community and a marginally good fish community. Sediment, lack of cover and lack of fast current were limiting factors for the fish community. There are 14.66 miles of stream channelized in the North Fork Subwatershed. Sources that contribute to flow alterations are channelization, entrenchment, levied areas, lack of riparian habitat and livestock degradation areas. These flow/habitat alteration areas inhibit the stream from reaching its full potential.

Stream not meeting its full potential, low QHEI

Problem Statement

Several subwatershed tributaries in the North Fork Subwatershed are in need of some type of habitat improvements. According to the "Inventory Table" of North Fork Subwatershed is in need of 17.29 miles of riparian habitat. Studies of this subwatershed also show that as a whole there is 14.66 miles of stream that has been channelized and 1,100 feet levied. Studies also show approximately 73,700 feet (13.96 miles) as unmaintained petition ditches. The North Fork tributaries are in desperate need of riparian habitat (buffer) to raise QHEI scores along with water quality attainment. The only area monitored by OEPA is RM 6.9, most recent scores in 1997 show an IBI of 43 and a

Channelized stream running through a cropland field

QHEI of 52.5 (generally a value above 60 is needed to achieve Warmwater habitat). However, site specific calculations includes the establishment of 17.29 miles of riparian corridor with an average buffer width of 50 ft (25 feet each side). This will equal the revitalization of 104.78 acres of newly functioning riparian buffer habitat. With the establishment of new riparian habitat in the channelized areas, the stream corridor will begin to revitalize itself creating new habitat, while reducing the amounts of other pollutants entering the stream. Most of the tributaries in the subwatershed are very small therefore the average buffer width of 50 ft (25ft on each side) should be adequate in most cases to repair the riparian area. A direct marketing approach will be taken to target individual landowners where flow/habitat alteration solutions are needed.

Goals

6. Reestablish 104.78 acres (17.29 miles) of streamside riparian corridor to improve the QHEI scores and reduce pollution runoff.
7. Reduce channelization in small headwater streams through installing a demo site to demonstrate the channel morphology concept on approximately 5,000ft. This project will aid in watershed resident education and outreach.
8. Establish a riparian habitat protection program to protect the 30.13 miles of habitat that is currently in place.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Nutrients, Pesticides & Sediment	6. Establish 104.78 acres (17.29 miles) of streamside buffer habitat to reduce the amount of nutrients and pesticides and increase QHEI scores.	$9,430.2 for CRP (average CRP is $90 per soil) to set aside 104.78 acres of cropland to establish a buffer area (average buffer 50 foot minimum). * 17.29 miles (of riparian area needed)	Work with the Division of Forestry to obtain trees and plan tree plantings utilizing Forest Land Enhancement Program (FLEP). Work in conjunction with USDA NRCS to	2004 thru 2014 <u>YEARS</u> 2004-06 establish 5.76 miles 2007 – 10 establish 5.76 miles 2010 – 14 establish 5.77 miles	104.78 acres established and put aside in the CRP program to protect that land and stream. Improved QHEI scores in targeted stream segments.

		*5,280 ft. = 91,291.2 ft * 50 ft buffer = 4,564,569 ft2/ 43,560 = 104.78 acres.	establish Riparian Buffers through CRP and other USDA programs. Work with Division of Wildlife to promote warm season grasses.		
Habitat Alterations	7. Use education & outreach programs to save headwater streams from continuous channelization from streamside residents. Install a demo site to demonstrate the channel morphology concept on approximately 5,000 ft. of streambank. This will help landowners seek alternative ways to improve drainage in the North Fork subwatershed.	Work with all local landowners and farmers to education them on the harm of channelizing and entrenching the small streams. Hold citizen outreach programs to educate the community members about channelization and habitat alterations and why these effect streambank erosion and water quality. Install a demo site to demonstrate the channel morphology	SWCD & NRCS information and assistance. Use funds from Brown or Highland SWCD or grant dollars.	2004 – 2014 or until it is widely accepted to allow natural drainage to occur rather than channel-ization practices.	Higher QHEI scores and continual growth of the riparian habitat. Citizen education influencing there farming practices.

		concept on approximately 5,000 ft. of streambank.			
Habitat Alterations	8. Establish a protection program to save the current 30.13 miles of riparian habitat that is currently in place in the North Fork Subwatershed.	Work with state agencies to set up a riparian easement program. Partner with the Brown & Highland SWCD to hold easements to protect the riparian habitat. Set up guidelines and funding objectives to start a easement purchase program to protect the habitat.	Partner with all persons involved to get the program up and running. Use ODNR & OEPA to set up the program. Obtain grants and other funding. Use Brown & Highland SWCD's and County Commissioners to obtain public funds.	2004 - Start researching the program and funding options. 2005 – Partner with all appropriate agencies to obtain and hold the easements. Set up all legal logistics and target riparian areas. 2006 – Start program.	Easements purchased and riparian habitat protected from degradation.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 090 030
Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 69
Stream or Tributary	North Fork White Oak Creek
Segment Length (miles)	21
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Crop production, on-site wastewater systems
Source of Impairment	Nonirrigated crop production
Cause of Impairment	Siltation

Waterbody ID	OH 49 70
Stream or Tributary	Flat Run
Segment Length (miles)	5
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 71
Stream or Tributary	Brush Run
Segment Length (miles)	2
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 72
Stream or Tributary	Yellow Run
Segment Length (miles)	0
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, on-site wastewater systems
Cause of Impairment	

Waterbody ID	OH 49 73
Stream or Tributary	Ruble Run
Segment Length (miles)	0
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 74
Stream or Tributary	Indian Run
Segment Length (miles)	1
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

White Oak Creek Watershed Inventory
North Fork Subwatershed
HUC 05090201 090 030

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access to stream	Livestock oper. needing improvements	Livestock oper. complying	Number of New Homes	Percent of failing septics	Expected Development	Bridges/Culverts
Indian Run	9.1	23,800	5,000			5,000	2,000	21,800	no			10		yes	3
North Fork White Oak Creek	9.1 - 8.61	2,600	0				2,600	0	no			0		no	0
North Fork Trib 6	8.61	6,100	0			0	1,800	4,300	no			3		no	1
North Fork	8.61 - 7.93	3,300	0				3,300	0	no						1
Ruble Run	7.93	38,310	13,330			13,300	5,100	13,300	yes	1		10		yes	6
North Fork	7.93 - 7.09	4,700	0			0	4,700	0	no			10		yes	0
North Fork Trib 5	7.09	11,200	5,800			5,800	1,000	1,000	no			14		no	2
North Fork	7.09 - 6.53	3,300	0			0	3,300	0	no			0		no	1
North Fork Trib 4	7	5,800	4,100			4,100	0	4,100	no			5		no	2
North Fork Trib 3	6.53	12,200	2,500			2,500	9,700	2,500	no			1		no	3
North Fork	6.53 - 5.3	6,600	0			0	6,600	0	no		1	5		yes	2
North Fork Trib 2	5.3	7,900	4,000			4,000	3,000	4,000	no			15		yes	3
North Fork	5.3 - 3.83	7,450	1,100	1,100		0	5,000	1,100	no			4		yes	0
Yellow Run	3.83	8,700	2,600			0	5,900	0	no			15		yes	3
North Fork	3.83-1.32	13,300				0	13,300		yes	2		4		yes	3
Flat Run	1.32	105,000	36,500			36,500	68,500	36,500	yes	5	1	5		possible	13
Brush Run	1.32	11,000	2,500			2,500	8,300	2,700	no	1		0		no	3
North Fork	1.32-1.07	1,800					1,800	0	yes	1	0	0		no	0
North Fork Trib 1	1.07	7,600					7,600	0	no			2		yes	2
North Fork	1.07-0.0	5,600					5,600	0	yes	1		3			0
Total (measured in feet)		**286,260**	**77,430**	**1,100**		**73,700**	**159,100**	**91,300**		**11**	**2**	**106**			**48**
	Miles =	**54.22**	**14.66**	**0.21**		**13.96**	**30.13**	**17.29**							

* Petition ditch defined as a old township ditch

Livestock Inventory	Beef	Goat	Sheep
Totals	752		

** Totals gathered from Farm Service Agency's Livestock Compensation Program (LCP) applications filled out by the livestock owners.*

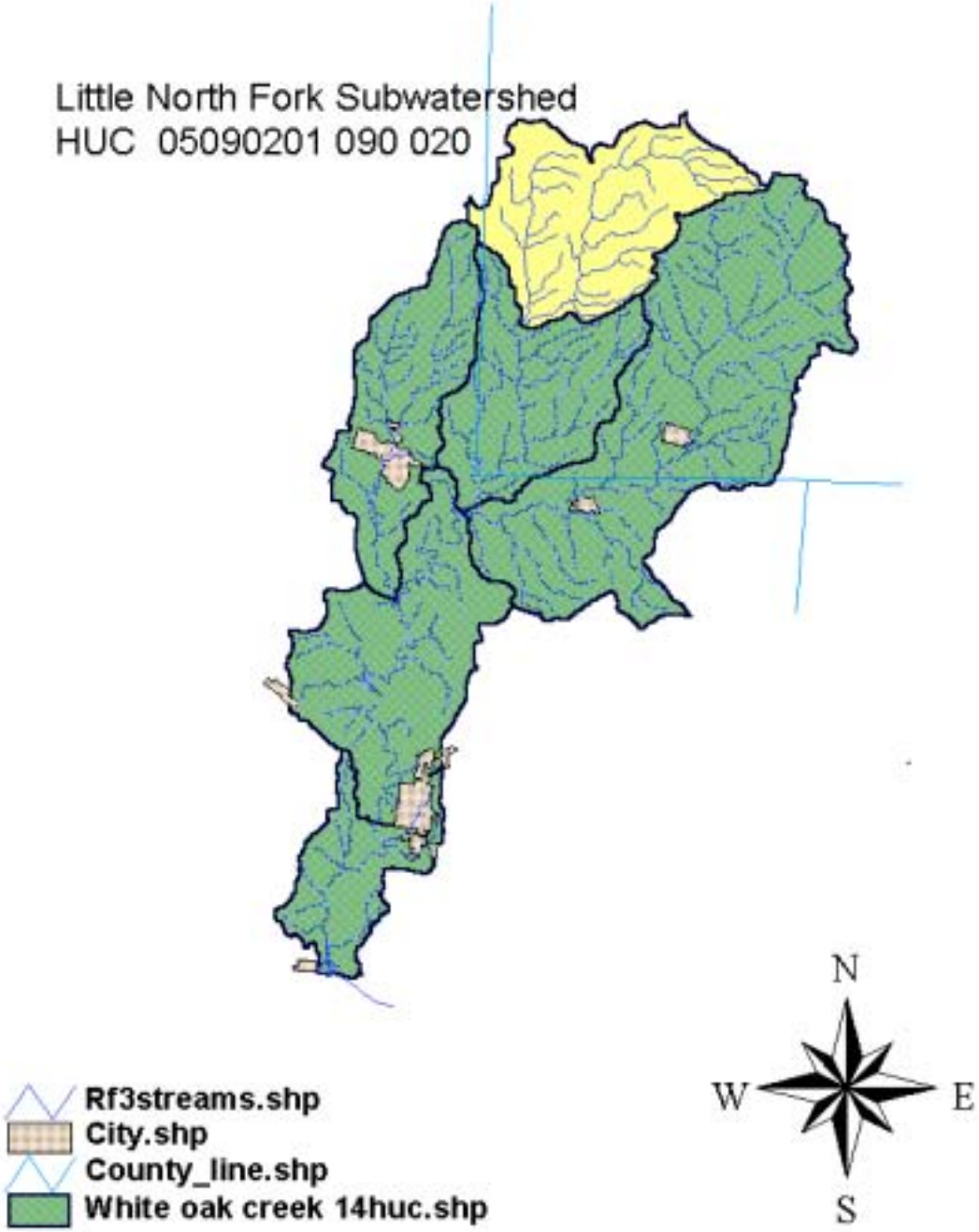
Subwatershed Total Acres
19,300.90

Water Quality Assessment

**All Data from OEPA*

Stream Name	Use Designation	Attainment Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
Flat Run	EWH	Untested						
Brush Run	EWH	Untested						
Yellow Run	EWH	Untested						
Ruble Run	EWH	Untested						
Indian Run	EWH	Untested						
RM 6.9	EWH	PARTIAL	43	7.9	46	52.5	Recommended change WWH	WONF 310

Little North Fork Subwatershed



Little North Fork Subwatershed

HUC 05090201 090 020
Physical Description:

Little North Fork Tributary that intersects an agricultural field

The Little North Fork area encompasses 23,788.4 acres. No EPA monitoring has been conducted on the main channel of Little North Fork. Stony Branch tributary is the only area that has been monitored. Results show the areas aquatic life designated uses as EWH but no other cumulative data from this area. Land use in this watershed is mainly agricultural with an emphasis on row cropping. Soy beans and corn are the major crops produced.

Barr Run, Stony Branch, and Lick Run are the three larger named tributaries in the subwatershed. The majority of small unnamed tributaries are channelized with little to no riparian buffer areas.

Rt. 131, 134 and 138 run through the Little North Fork subwatershed with the small town Danville situated on the divide of Little North Fork and East Fork subwatersheds.

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	3%	714 acres
Forest	10%	2,379 acres
Pasture	15%	3,568 acres
Cropland	72%	17,127 acres

Total Acres = 23,788.4

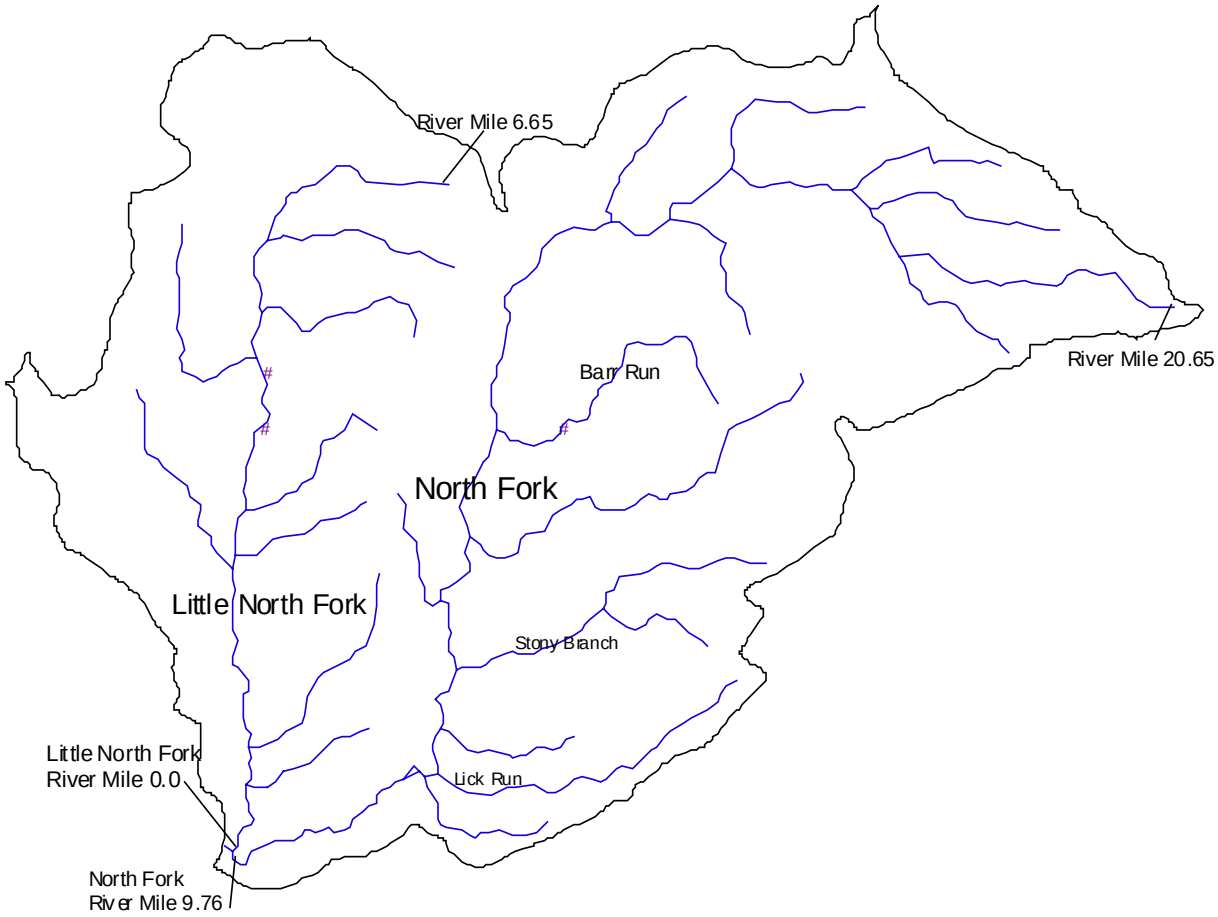
** Data provide by 1994 land use maps from Ohio Department of Natural Resources*

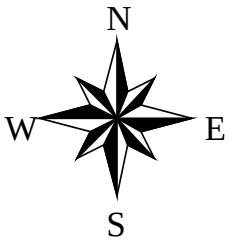
Little North Fork Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
** No Data Available*					

Little North Fork stream segment

Little North Fork Subwatershed
HUC 05090201 090 020





020streams.shp
020highschoolsites.shp
Little_north_fork_020.shp

Little North Fork Watershed
HUC 05090201 090 020

IMPAIRMENT: NUTRIENTS & SEDIMENTS

Background

Little water quality data is available for the Little North Fork Subwatershed; however, it is documented that similar sources impact the Little North Fork as those in North Fork and Sterling Run. This subwatershed is the main headwater section of the watershed, and the primary land use is agriculture. Therefore, leading local officials to believe that agriculture and HSTS systems are the main contributors to sedimentation, nutrients and pathogens in the stream.

Problem Statement

According to land use calculations cropland makes of 72% or 17,127 acres of the total land use. Pasture land makes up 15% or 3,568 acres of land use. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program there is an estimated sediment loss of 155,652.2 tons/year from cropland, pasture and forest; with a delivery ratio of 20,126.2 tons per year. This is the 2nd highest sediment producing subwatershed in the White Oak Creek drainage area. The sediment amount in tons/year makes of 23% of all the sediment impairing the entire White Oak Creek Watershed.

Tribuary stream that is severely impacted by livestock

The highest source of sediment and nutrients come from nonirrigated crop production, 72% of the land use being agriculture. A slight to moderate amount come from pasture land. There are 20 livestock operations totaling approximately 940 animal units that exist in this segment of stream with 6 of these operations needing improvements, mainly to

restrict livestock access to the stream or tributaries. Restricting the animals from the stream through a livestock fencing program will help reduce nutrients, pathogens and sedimentation from impacting the stream. Cropland rotation is also a fundamental idea that needs to be exercised in this subwatershed. Continuous soybeans are depleting the soil of its sustainability and productivity.

Channelized tributary running through a farm field, build up of sediment and nutrients (no buffer area exists)

Cropland contributes nutrients and pesticides to the stream through improper application of fertilizers and pesticides. If over application of fertilizers and pesticides has occurred, nutrients can enter the stream through several different ways, the first being a runoff event. This removes the soil particles from the soil surface, nutrients and pesticides can be or are attached to the soil particles and enter the stream. The second way is leaching through the soil, this allows nutrients and pesticides to enter ground water then carry the nutrients to the stream. The next way for nutrients to enter the stream would be improper manure application to cropland. Lastly, increased rainfall frequency and intensity over the past 7 years have shown incidents of runoff; even if fertilizers, pesticides, and manure are applied properly.

The subwatershed currently has 26.95 miles of protected riparian buffers. The QHEI score is estimated to be low (below 60). That riparian buffer is in need of protection from further degradation. The remaining 27.33 miles is in need of riparian corridor establishment to increase QHEI scores and reduce sedimentation and nutrient loadings. Riparian buffer establishment and cropland setbacks are a priority.

Known pollutant loads within this segment of stream includes 131,707.6 lbs. of nitrogen (N) per year, 37,572.3 lbs. of phosphorus (P) per year and 274,569.6 lbs. biological oxygen demand (BOD) per year.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland Pasture Forest **TOTAL EROSION**	149,501.6 6,051 99.66 **155,652.26**
Amount of sediment from erosion that is entering the stream	***20,126.2 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

1. Protect approximately 2 miles of stream from livestock access to reduce nutrient and sediment loadings (all fence will include a 10-15 year riparian forest protection area).
2. Reduce runoff from feeding sites by helping livestock owners relocate their feeding operations.
3. Reduce sedimentation and nutrient runoff by 50% from cropland areas.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sediment, Nutrients, & Habitat Alterations	1. Target livestock producers in the subwatershed where livestock has been identified to have access to the stream. Work with landowners to install 2 miles of streambank fencing and needed auxiliary practices to	$36,680 dollars for the fence and auxiliary practices. ** $31,680 (10,560 ft * $3.00 per/ft). for fencing + $5,000 ($2,500 per watering system * 2 systems) = $36,680 total*	Division of Wildlife, US Fish and Wildlife, US Forest Service, SOACDF, and USDA CRP, Farm Bill Funds.	Jan. 2006 to Jan. 2008	Document miles of streambank fencing installed along with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.

	protect at least 10,560 feet of streambank.	*cost*			
Nutrients, Sediments and Pathogens	2. Reduce runoff from feeding sites by installing 2 structures to reduce winter feeding concentrations that cause erosion and water quality degradation. Each structure will consist of a feed pad under roof and manure storage under roof. First priority being those pasture feeding sites that are split or adjacent to perennial or intermittent streams.	$ 52,000 Structure cost is $26,000 each. Cost Share rate equals 75% (19,500 each).	Environment Quality Incentive Program (EQIP) USDA, 319 grant funds or special project money.	Mar. 2004 to June 2007.	Direct reduction in sediment and pathogens. All livestock animals will be moved back away from the streambank. STEPL program will be used to calculate nutrient and sediment reductions.
Sedimentation	3. Reduce sedimentation by 50% (10,063.1 tons) from agricultural fields through conservation tillage, crop rotation, establishment of filter strips, riparian buffer strips and hayland.	$310,000 to establish those tasks.	Conservation Reserve Program, EQIP, apply for 319 funding.	Jan. 2005 to Jan. 2014	Sediment reduction of approximately 10,063.1 tons calculated by the STEPL program.

Impairment: Pathogens

Background

In the Little North Fork Subwatershed malfunctioning household sewage treatment systems contribute to the stream not meeting full warmwater habitat use designation status. The streams and tributaries are impacted by pathogens. Several sites monitored show severely elevated levels of bacteria. Elevated levels of pathogens have been connected to livestock having uncontrolled accesses to the stream, a large number of pasture acres, and the failure of household sewage treatment systems (HSTS).

Septic systems are known to fail in this subwatershed because of a seasonally high water table, slow permeability, slope and high clay content in the soil. Elevated levels of e-coli and fecal coliform has been found though student and volunteer monitoring. At the time of system repair, pollution reductions will be calculated in the STEPL program. Septic system upgrades along with the livestock exclusion fencing practices should prove to have a direct impact in water quality, raising the stream attainment status to full attainment of Warmwater Habitat (WWH).

Problem Statement

The Highland County Health Department estimates there are approximately 305 total systems in the area, with 25% of all septic systems in North Fork subwatershed failing. Therefore, there are 76 systems targeted for repair. From year 2004 to 2014 the goal is to repair 50% (approximately 38) of the malfunctioning systems in this subwatershed. The repair of 38 systems will result in 13,680 gallons per day adequately treated. This will also show a direct reduction in TSS, BOD, Phosphorus, Nitrogen and Ammonia. According to the STEPL Load Reduction Program there is 2,536.3 lbs/yr. nutrient load, 993.4 lbs/yr phosphorus load, and 10,356.6 lbs/yr of BOD. New health department regulations along with household sewage treatment system upgrades will reduce amounts of these pollutants and e-coli & fecal coliform from entering in the stream.

Cattle lot next to the stream

There are 20 livestock operations in this subwatershed with 6 of these operations needing improvements. There are 3,568 acres of pastureland with approximately 790 beef cows in the subwatershed. By improving these operations there will be a reduction in nutrient loadings, pathogens and

sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, and reducing (nutrient, sediment, & manure) runoff from feeding sites *(goals for the bmp's are listed in the previous impairment section).*

Goals

4. Complete and obtain approval of Brown & Highland countywide HSTS plans to identify needed sewage treatment upgrades and there locations.
5. Upgrade 50% of those identified 58 failing HSTS systems in the North Fork Subwatershed.
6. Livestock pathogen reductions (see previous section goals).

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	4. Work with the local Health Departments to complete the HSTS inventory, which identifies the failing systems in the watershed. The plan will also identify the needs and types of systems necessary to correct the problem sites in the subwatershed. Lastly, the countywide plan will include an operation and maintenance program for the counties.	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	Approved County-wide HSTS plan by OEPA & local Health Boards.

Pathogens / bacteria	5. Replace or upgrade 50% of the 76 identified (through the HSTS plan) failing HSTS systems reducing the amount of fecal coliform and e. coli present in the stream.	Replace approx. 38 systems with grant cost share, DEFA low interest loan funds and homeowner contribution. Repair 29 HSTS @ $5,000 per system totals **$ 190,000.**	WOC watershed group along with HSTS homeowners will work with the Division of Financial Assistance and OEPA to obtain funds for replacements.	Jan. 2004 to Jan 2014	System upgrades will reduce the amounts of e. coli and fecal coliform present in the stream. Amounts reduced will be calculated in the STEPL program.
Pathogens, Sediment & nutrients	6. See "Sediment & nutrient goals" ***Livestock fencing goal*** ***Livestock feed site goal***				

Impairment: Flow / Habitat Alterations

Background

Stream not meeting its full potential, low QHEI score

According to monitoring, flow alterations are a cause of impairment in the Little North Fork Subwatershed. Sediment, lack of cover and lack of fast current are limiting factors for fish and macroinvertebrate communities. There are 26.63 miles of stream channelized in the Little North Fork Subwatershed. Sources that contribute to flow alterations are channelization, entrenchment, levied areas, lack of riparian habitat and livestock degradation areas. These flow/habitat alteration areas inhibit the stream from reaching its full potential.

Problem Statement

Tributary stream that has been channelized through an agricultural field

Several subwatershed tributaries in the Little North Fork Subwatershed are in need of some type of habitat improvements. According to the "Inventory Table" of Little North Fork Subwatershed is in need of 27.33 miles of riparian habitat. Studies of this subwatershed also show that as a whole there is 26.63 miles of stream that has been channelized and 3,000 feet levied. Studies also show approximately 109,500 feet (20.74 miles) as unmaintained petition ditches. The North Fork tributaries are in desperate

need of riparian habitat (buffer) to raise QHEI scores along with water quality attainment. However, site specific calculations includes the establishment of 27.33 miles of riparian corridor with an average buffer width of 50 ft (25 feet each side). This will equal the revitalization of 165.6 acres of newly functioning riparian buffer habitat. With the establishment of new riparian habitat in the channelized areas, the stream corridor will begin to revitalize itself creating new habitat, while reducing the amounts of other pollutants entering the stream. Most of the tributaries in the subwatershed are very small therefore the average buffer width of 50 ft (25ft on each side) should be adequate in most cases to repair the riparian area. A direct marketing approach will be taken to target individual landowners where flow/habitat alteration solutions are needed.

Goals

7. Reestablish 165.6 acres (27.33 miles) of streamside riparian corridor to improve the QHEI scores and reduce pollution runoff.
8. Reduce channelization in small headwater streams through installing a demo site to demonstrate the channel morphology concept on approximately 5,000ft. This project will aid in watershed resident education and outreach.
9. Establish a riparian habitat protection program to protect the 26.95 miles of habitat that is currently in place.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Nutrients, Pesticides & Sediment	7. Establish 165.6 acres (27.33 miles) of streamside buffer habitat to reduce the amount of nutrients and pesticides and increase QHEI scores.	$14,904 for CRP (average CRP is $90 per soil) to set aside 165.6 acres of cropland to establish a buffer area (average buffer 50 foot minimum). * 27.33 miles (of riparian area needed)	Work with the Division of Forestry to obtain trees and plan tree plantings utilizing Forest Land Enhancement Program (FLEP). Work in conjunction with USDA NRCS to	2004 thru 2014 <u>YEARS</u> 2004-06 establish 9.1 miles 2007 – 10 establish 9.1 miles 2010 – 14 establish 9.13 miles	165.6 acres established and put aside in the CRP program to protect that land and stream. Improved QHEI scores in targeted stream segments.

		*5,280 ft. = 144,302.4 ft * 50 ft buffer = 7,215,120 ft2/ 43,560 = 165.6 acres.	establish Riparian Buffers through CRP and other USDA programs. Work with Division of Wildlife to promote warm season grasses.		
Habitat Alterations	8. Use education & outreach programs to save headwater streams from continuous channelization from streamside residents. Install a demo site to demonstrate the channel morphology concept on approximately 5,000 ft. of streambank. This will help landowners seek alternative ways to improve drainage in the Little North Fork subwatershed.	Work with all local landowners and farmers to education them on the harm of channelizing and entrenching the small streams. Hold citizen outreach programs to educate the community members about channelization and habitat alterations and why these effect streambank erosion and water quality. Install a demo site to demonstrate the channel morphology	SWCD & NRCS information and assistance. Use funds from Brown or Highland SWCD or grant dollars.	2004 – 2014 or until it is widely accepted to allow natural drainage to occur rather than channel-ization practices.	Higher QHEI scores and continual growth of the riparian habitat. Citizen education influencing there farming practices.

		concept on approximately 5,000 ft. of streambank.			
Habitat Alterations	9. Establish a protection program to save the current 26.95 miles of riparian habitat that is currently in place in the Little North Fork Subwatershed.	Work with state agencies to set up a riparian easement program. Partner with the Brown & Highland SWCD to hold easements to protect the riparian habitat. Set up guidelines and funding objectives to start a easement purchase program to protect the habitat.	Partner with all persons involved to get the program up and running. Use ODNR & OEPA to set up the program. Obtain grants and other funding. Use Brown & Highland SWCD's and County Commissioners to obtain public funds.	2004 - Start researching the program and funding options. 2005 – Partner with all appropriate agencies to obtain and hold the easements. Set up all legal logistics and target riparian areas. 2006 – Start program.	Easements purchased and riparian habitat protected from degradation.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 090 020
Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 75
Stream or Tributary	Little North Fork
Segment Length (miles)	5
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 76
Stream or Tributary	Lick Run
Segment Length (miles)	3
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 77
Stream or Tributary	Stony Branch
Segment Length (miles)	3
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 78
Stream or Tributary	Barr Run
Segment Length (miles)	2
Stream Assessment Status	No info
Aquatic Life Designated Use	EWH
Source of Impact	
Cause of Impairment	

White Oak Creek Watershed Inventory
Little North Fork Subwatershed
HUC 05090201 090 020

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access to stream	Livestock oper. needing improvements	Livestock oper. complying	Number of New Homes	Expected Development	Bridges/ Culverts
Little North Fork	6.65 - 5.4	10,200	7,200			7,200	3,000	7,200	no			3	no	2
Little North Fork Trib 1	5.4	8,600	8,600			5,000	0	8,600	no		1	1	yes	3
Little North Fork	5.4 - 4.8	3,460	1,900			1,900	1,560	1,900	yes	1	1	0	no	2
Little North Fork Trib 2	4.8	8,900	5,300			5,300	3,600	5,300	yes		1	0	no	1
Little North Fork	4.8 - 4.38	2,200	0			0	2,200	0	no			0	no	0
Little North Fork Trib 3	4.38	10,000	8,000			8,000	2,000	8,000	no		1	0	no	1
Little North Fork	4.38-3.05	7,000					7,000		no	1		3	no	2
Little North Fork Trib 4	3.05	8,200	3,200				5,000	3,200					no	2
Little North Fork	3.05-2.67	2,100	0				0	2,100	no			5		1
Little North Fork Trib 5	2.67	6,400	3,200				3,600	2,800	no			0	no	2
Little North Fork	2.67 - 2.58	450	0			0	450	0	no			0	no	0
Little North Fork Trib 6	2.58	9,200	5,000			5,000	1,000	5,000	no			5	yes	2
Little North Fork	2.58 - 1.03	8,100	3,000	3,000			5,000	3,000	no			10	yes	2
Little North Fork Trib 7	1.03	10,300					10,300	0	no			2	no	2
Little North Fork	1.03 - .7	1,700	0			0	1,700	0	no			2	no	1
Little North Fork Trib 8	0.7	6,000	1,500		700	1,500	5,200	800	no			0	no	1
Little North Fork	.7 - 0	3,500	0			0	3,500	0	no			4	no	1
North Fork Main Stem														
North Fork	9.76 - 12.0	12,000	0					2,500	no			0	no	1
North Fork Trib 7	12	7,200	5,400			5,400	1,800	5,400	no			0	no	2
North Fork	12 - 12.1	675	0			0	675	0	no			0	no	0
Lick Run	12.1	15,200	6,700				4,800	10,400	no	1 Dairy		0	no	6
North Fork	12.1 - 12.47	2,100	0				2,100	0	no			0	no	
North Fork Trib 8	12.47	6,500	1,600				4,900	0	no			0	no	1
North Fork	12.47 - 13.07	3,000	0				3,000	0				0	no	1
Stony Branch	13.07	19,600	8,800			8,800	10,800	8,800	yes	1	1	0	no	6
North Fork	13.07 - 13.72	3,400	0				3,400	0	yes	1		0	no	0
North Fork Trib 9	13.72	6,000	0				4,000	2,000	no		1	0	no	1
North Fork	13.72 - 14.3	3,500	0				3,500	0	no			1	no	0
North Fork Trib 10	14.3	19,000	4,800				14,200	4,800	no	1	3	1	no	0
North Fork	14.3 - 15.3	5,000	0				5,000	0	no			2	no	2
Barr Run	15.3	14,600	10,000			10,000	4,600	2,000	no		1	1	no	3
North Fork	15.3 - 17.65	12,300	3,000			3,000	9,300	3,000	no			3	yes	3
North Fork Trib 11	17.65	6,400	6,400			6,400	0	6,400	no			1	no	2
North Fork	17.65 - 18.22	3,000	0				3,000	0	no			0	no	1
North Fork Trib 12	18.22	7,000	7,000			7,000	0	7,000	no			0	no	1
North Fork	18.22 - 18.91	3,600	1,500			1,500	2,100	1,500	no			0	no	1
North Fork Trib 13	18.91	8,000	8,000			8,000	0	8,000	no			0	no	2
North Fork	18.91 - 20.04	5,600	3,600			3,600	2,000	3,600	no			0	no	1
North Fork	20.04 - 22.0	10,500	10,500			5,500	600	9,900	no		2	0	no	4
North Fork Trib 14	20.04	7,300	5,900			5,900	1,400	5,900	yes	1		0	no	2
North Fork Trib 15	20.29	8,700	0			0	4,000	4,700	no		1	0	no	1
North Fork Trib 16	20.65	12500	10500			10500	2000	10500	no		1	0	no	1
Total		**308,985**	**140,600**	**3,000**	**700**	**109,500**	**142,285**	**144,300**		**6**	**14**	**44**		**67**
	Miles =	**58.52**	**26.63**	**0.57**	**0.13**	**20.74**	**26.95**	**27.33**						

* Petition ditch defined as a old township ditch

Livestock Inventory	Beef	Goat	Hogs
Totals	790		150

** Totals gathered from Farm Service Agency's Livestock Compensation Program (LCP) applications filled out by the livestock owners.*

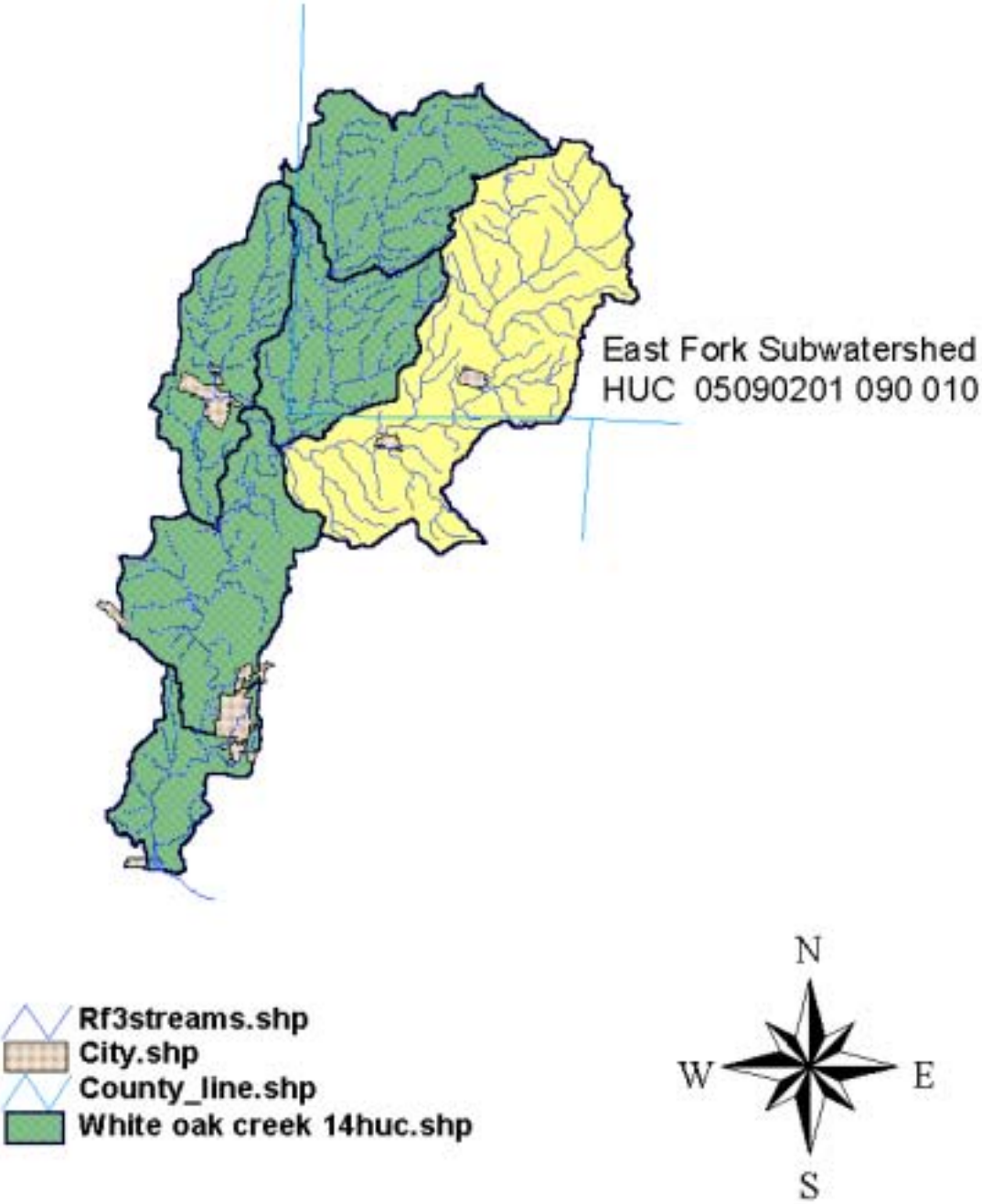
Subwatershed Total Acres
23,788.40

Water Quality Assessment

**All Data from OEPA*

Stream Name	Designation	Attainment Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
Little North Fork	EWH	Untested						
Lick Run	EWH	Untested						
Stony Branch	EWH	Untested						
Barr Run	EWH	Untestec						

East Fork Subwatershed



East Fork Subwatershed

HUC 05090201 090 010
Physical Description:

Eastern Junior High School students monitoring for macroinvertebrates

The East Fork Subwatershed is the ***largest*** subwatershed in the White Oak Creek Watershed area. It encompasses over 51,254 acres. The majority of East Fork is in full attainment of WWH based on 1997 OEPA monitoring data. The Villages of Sardinia and Mowrystown are located within the East Fork Subwatershed boundaries. Major tributaries include Sugar Run, Plum Run, Twin Run, Slabcamp Run, Middle Run, Browns Run Turkeyhole Run and Bells Run.

There are approximately 132.6 miles of streams (including all tributaries) in the East Fork Subwatershed. Most of the main stem of the East Fork is in good to excellent habitat condition. However, the tributaries are in danger if degradation due to very high numbers of livestock and farming operations. Agriculture and pasture land is the main land use in the East Fork Subwatershed. There are approximately 3,130 head of cattle in this area. Efforts to focus on livestock exclusion and fencing practices are top priorities.

The ultimate goal in the East Fork Subwatershed is to keep it in full attainment of Warmwater Habitat. Some section may even be brought into Exceptional Warmwater Habitat.

Reservoir

There is one reservoir located in the East Fork Watershed. The reservoir was previously used for surface water in the Village of Sardinia. However, the village now purchases ground water from Brown County Rural Water and the reservoir is owned by Sardinia. Recent local newspaper articles state that the village will auction the reservoir off to the highest bidder (2002). The reservoir will then be a privately owned area.

Protected Areas

There is only one farm in the White Oak Creek Watershed area that has been set aside as a permanent Farm Land Preservation Farm. The farm is 36 acres and runs adjacent to Turkey Hole Run in the East Fork subwatershed. The permanent easement is held by the Ohio Department of Agriculture and set up through the Southern Ohio Agricultural Community Development Foundation.

Land Use

Land use statistics are broken down by using the watershed land use map.

Land Use	Percent	Acres
Urban	8%	4,100 acres
Forest	17%	8,713 acres
Pasture	25%	12,814 acres
Cropland	50%	25,627 acres

Total Acres = 51,254.2

** Data provide by 1994 land use maps from Ohio Department of Natural Resources*

Point Source Pollution Sources			
*Permitted Discharge Loadings (30 day average-Kg/day)			
Facility	**suspended solids**	**nitrogen-ammonia**	**CBOD5**
Sardinia Wastewater Treatment Plant	6.8	0.9	5.7
White Oak High School Wastewater Treatment Plant	0.27	0.023	0.23
The Sardinia Wastewater Treatment Plant is located at Slabcamp Run River Mile 1.0			

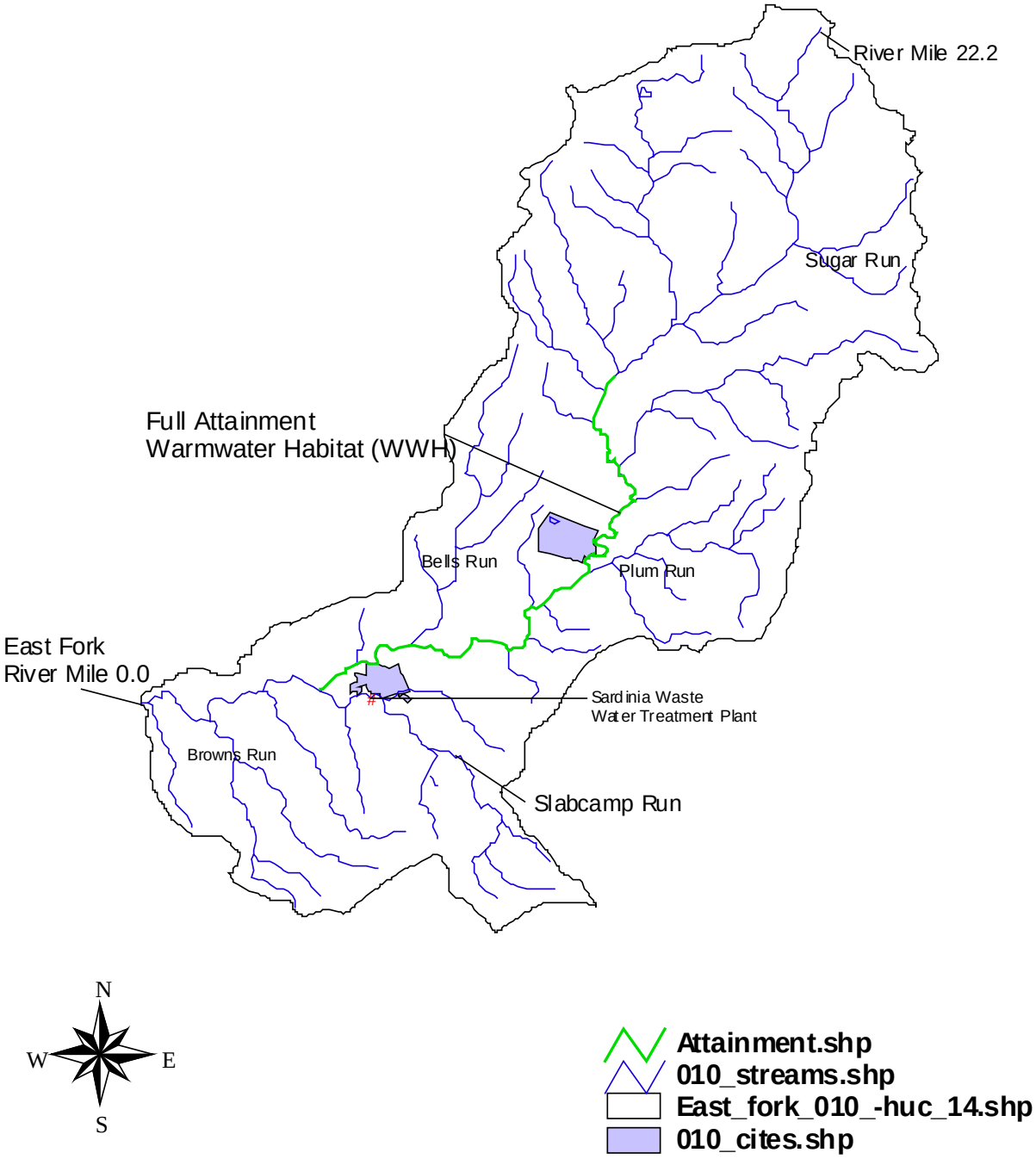
NonPoint Source Pollution	* H = High * M = Moderate	* S = Small * T = Threat
Causes:	**Sources:**	
Siltation – H	Nonirrigated crop production - H	
Pathogens – S	Pasture Land – S	
Slabcamp Run		
Flow Alteration - H	Natural - H	
Organic enrichment/DO - H	Minor Municipal Point Source - H	
Nutrients - M	Pasture land - S	
Pathogens - M	Nonirrigated crop production - S	
Siltation - S		
Pathogens - S		
Unionized Ammonia - S		

East Fork Subwatershed Water Quality Results

River Mile	Date	IBI	ICI	MiWB	QHEI
3.2	1987	52		105	**69.5**
3.2	1997	42		8	**66**
3.2	1997	42		7.1	**66**
5.8	1997	44	52	8.8	**65**
5.8	1997	50	52	8.8	**65**
14.2	1997	44	54	8.9	**64**
14.2	1997	40	54	8.9	**64**
Slabcamp Run					
0.9	1997	38			**62**
0.9	1997	28			**62**
1.1	1997	28			**41.5**
1.1	1997	24			**41.5**

View of the East Fork at River Mile 1.5

East Fork Subwatershed
HUC 05090201 090 010



East Fork Subwatershed
HUC 05090201 090 010

Impairment: Pathogens

Background

Three stations sampled within the East Fork stream segment from river mile (RM) 0 to 20.8 supported good fish communities, and good to exceptional macro invertebrate communities. Evidence of e. coli and total phosphorus suggests the possibility of a mild impact from agriculture and livestock runoff. Downstream from the confluence of Slabcamp Run (Sardinia WWTP) higher levels of phosphorus, E. coli and fecal coliforms are recorded, along with low level D.O. The lower 2.8 miles of the East Fork of White Oak Creek, which are designated EWH, have not been sampled.

The Sardinia Wastewater Treatment Plant is located on Slabcamp Run at RM 1.0. The 1997 OEPA data states that biological communities upstream from the Sardinia WWTP appeared to be limited by low flow conditions, with possible influence from animal waste runoff as evidenced by exceedences of E. coli and Fecal Coliforms. Downstream from the Sardinia WWTP there was low DO and elevated phosphorus, nitrates, ammonia, BOD, E. coli and Fecal Coliforms.

Problem Statement

The Brown County Health Department estimates there are approximately 720 total systems in the East Fork Subwatershed, with 25% of all septic systems in the subwatershed are failing. Therefore, there are 180 systems targeted for repair. From year 2004 to 2014 the goal is to repair 50% (approximately 90) of the malfunctioning systems. The repair of 90 systems will result in 32,400 gallons per day adequately treated. This will also show a direct reduction in TSS, BOD, Phosphorus, Nitrogen, and Ammonia. According to the STEPL load reduction program there is 5,987.36 lbs/yr. nutrient load, 2,345.1 lbs/year phosphorus load, and 24,448.4 lb/yr of BOD load from malfunctioning septic systems.

New health department regulations along with household sewage treatment system upgrades will reduce amounts of these pollutants and e-coli and fecal coliform form entering in the stream.

Excessive sedimentation and pathogens exist in this segment of stream because of animal

A livestock operation NOT using exclusion fencing as a BMP

Livestock operation that would benefit from a winter feeding site located away from the stream

operations needing improvements. There are 85 livestock operations in this segment of stream with 48 of these operations needing improvements. Pasture land makes 12,814 acres (25%) of the land use while cropland agriculture makes of 25,627 acres (50%) of the land use. There are approximately 3,640 cows, 66 goats and 29 sheep that exist in the East Fork Subwatershed. By improving these operations there will be a reduction in nutrient loadings, pathogens, and sediment runoff. This will be accomplished by restricting livestock access to the stream, improving pasture management, and reducing (nutrient, sediment, and manure) runoff from livestock feeding sites. *(Please see these goal statements under the "Nutrients & Sediments" Impairment Section.)*

Goals

1. Complete and obtain approval of Brown & Highland countywide HSTS plans to identify needed sewage treatment upgrades and there locations.
2. Upgrade 50% of those identified 180 failing HSTS systems in the East Fork Subwatershed.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Pathogens / bacteria	1. Work with the local Health Departments to complete the HSTS inventory,	$10,000 for data gathering and completing plan.	Local health department will complete HSTS plan.	Jan. 2004 to Jan. 2005 * Allow	Approved County-wide HSTS plan by OEPA & local Health Boards.

	which identifies the failing systems in the watershed. The plan will also identify the needs and types of systems necessary to correct the problem sites in the subwatershed. Lastly, the countywide plan will include an operation and maintenance program for the counties.			for 6 months for the plan to be prepared in draft form and an additional 6 months for plan approval.	
Pathogens / bacteria	2. Replace or upgrade 50% of the identified (through the HSTS plan) failing HSTS systems reducing the amount of fecal coliform and e. coli present in the stream.	Replace approx. 90 systems with grant cost share, DEFA low interest loan funds and homeowner contribution. Repair 90 HSTS @ $5,000 per system totals $450,000.	WOC watershed group along with HSTS homeowners will work with the Division of Financial Assistance and OEPA to obtain funds for replacements.	Jan. 2004 to Jan 2014	System upgrades will reduce the amounts of e. coli and fecal coliform present in the stream. Amounts reduced will be calculated in the STEPL program.

IMPAIRMENT: NUTRIENTS & SEDIMENTS

Background

Tribuary stream that is severely impacted by sediment

According to OEPA 1997 data the East Fork of White Oak Creek is fully meeting warmwater habitat from RM 3.2 to 14.2. However, the data also explains that impact from agriculture and livestock runoff is a problem. Causes include flow alterations, nutrients, pathogens, and sedimentation. The sources include natural, pasture land and nonirrigated crop production. The subwatershed has changed since the 1997 monitoring took place. The White Oak Creek Watershed Partners have observed further degradation taking place in the East Fork Subwatershed.

Problem Statement

Pasture field in need of Prescribed Grazing and Livestock Exclusion Fencing

According to land use calculations cropland makes of 50% or 25,627 acres of the total land use. Pasture land makes up 25% or 12,814 acres of land use. The source of sediment is land runoff and streambank erosion. According to the STEPL loading program there is an estimated sediment loss of 276,539.5 tons/year from cropland, pasture and forest;

with a delivery ratio of 28,779.5 tons per year. This is the **largest** sediment producing subwatershed in the White Oak Creek drainage area. The sediment amount in tons/year makes up 33% of all the sediment impairing the entire White Oak Creek Watershed.

Channelized tributary running through a farm field, build up of sediment and nutrients (no buffer area exists)

One of the highest sources of sediment and nutrients come from nonirrigated crop production with 50% of the land use being agriculture. A moderate amount of sediment, nutrients and pathogens come from pasture land. There are an extremely high number of livestock operations in the East Fork Subwatershed. Out of the 85 total livestock operations 48 of those are in need of some type of upgrading. There are 3,735 total animal in the subwatershed, priority goals include; restriction of livestock access to the stream or tributaries, upgrading feeding site, and pasture management. Restricting the animals from the stream through a livestock fencing program will help reduce nutrients, pathogens and sedimentation from impacting the stream. Pasture management or prescribed grazing system plans promote better utilization of forage available, which in turn provides more cover to reduce sediment and nutrient runoff.

Feedlot in the East Fork Subwatershed

Large areas of cropland contribute nutrients and pesticides to the stream through improper application of fertilizers and pesticides. If over application of fertilizers and pesticides has occurred, nutrients can enter the stream through several different ways, the first being a runoff event. This removes the soil particles from the soil

surface, nutrients and pesticides can be or are attached to the soil particles and enter the stream. The second way is leaching through the soil, this allows nutrients and pesticides to enter ground water then carry the nutrients to the stream. The next way for nutrients to enter the stream would be improper manure application to cropland. Lastly, increased rainfall frequency and intensity over the past 7 years have shown incidents of runoff; even if fertilizers, pesticides, and manure are applied properly.

The subwatershed currently has 75.57 miles of riparian buffers present. The QHEI scores are 69.5, 66, 65, 64, 62, and 41.5 (generally a score of 60 or above is needed to achieve warmwater biological criteria, the higher the better). The riparian buffer present is in need of protection from further degradation. The remaining 57.32 miles is in need of riparian corridor establishment to increase QHEI scores and reduce sedimentation and nutrient loadings. Riparian buffer establishment and cropland setbacks are a priority.

Known pollutant loads within this segment of stream includes 205,294 lbs. of nitrogen (N) per year, 56,038.1 lbs. of phosphorus (P) per year and 451,981 lbs. biological oxygen demand (BOD) per year.

Erosion & Sediment Delivery (ton/year)

LAND USE	EROSION
Cropland	251,247.1
Pasture	24,927.3
Forest	364.8
TOTAL EROSION	**276,539.2**
Amount of sediment from erosion that is entering the stream	***28,779.5 ton/yr.***

** Calculations based on the STEPL load reduction program.*

Goals

3. Improve pasture management by getting 70% of all pasture land following an approved "Prescribed Grazing System" to reduce sedimentation and manure runoff.
4. Reduce sedimentation and nutrient runoff by 50% from cropland areas.
5. Protect approximately 10 miles of stream from livestock access by using the Livestock Exclusion Fencing program to reduce nutrient and

sediment loading and improve QHEI scores (all fence will include a 10-15 year riparian forest protection area).

6. Use education as a protective measure in cropland pesticide set back requirements, proper application methods, and improving cropland management.
7. Reduce runoff by 100% by helping livestock owners relocate their feeding operations away from the stream or tributaries.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Sediment, Nutrients, & Habitat Alterations	3. Establish "Prescribed Grazing Systems" on 8,969.8 acres of pasture land. First priority being pastures that are split or adjacent to perennial or intermittent streams.	$134,547 for establishment of planned grazing systems. $15 per acre.	Environment Quality Incentive Program (EQIP) USDA, 319 Grant Funds or special project money.	Mar. 2004 to June 2007	Documentation of the number of pasture land that participate in the program. STEPL program will be used to calculate nutrient and sediment reduction.
Sedimentation	4. Reduce sedimentation by 50% (14,389.75 tons) from agricultural fields through conservation tillage, crop rotation, establishment of filter strips, riparian buffer strips and hayland.	$430,000 to establish those tasks.	Conservation Reserve Program, EQIP, apply for 319 funding.	Jan. 2005 to Jan. 2014	Sediment reduction of approximately 14,389.75 tons calculated by the STEPL program.
Sediment, Nutrients, & Habitat Alterations	5. Target 10 livestock producers in the subwatershed where livestock	$ 183,400 dollars for the fence and auxiliary practices.	Division of Wildlife, US Fish and Wildlife, US Forest Service,	Jan. 2006 to Jan. 2008	Document miles of streambank fencing installed along

	has been identified to have access to the stream. Work with landowners to install 10 miles of streambank fencing and needed auxiliary practices to protect at least 52,800 feet of streambank.	*52,800 ft * $3.00 /foot = $158,400 * $2,500 * 10 practices = $25,000 Total $183,400	USDA CRP, SOACDF, 319 grant funds.		with acreage of riparian area protected. Load reductions will be calculated using the Region 5 Model. Improved QHEI scores.
Sedimentation & Nutrients	6. Educate cropland producers on set back requirements for pesticide application. * Educate landowners on proper application method. *Improve cropland management.	$8,000 in education to inform cropland owners & farmers about pesticide application and runoff. * Have agriculture workshops to reach all watershed crop growers and landowners.	Education grants, SWCD donations, or 319 grant funds	April 2005 to Jan. 2008	Document the number of landowners and crop producers that have been educated through the educational workshops. Calculate reductions through landowner surveys after the workshop.
Nutrients, Sediments and Pathogens	7. Reduce runoff from feeding sites by installing 4 structures to reduce winter feeding concentrations that cause erosion and water quality degradation. Each structure	$ 104,000 Structure cost is $26,000 each. Cost Share rate equals 75% (19,500 each).	Environment Quality Incentive Program (EQIP) USDA, 319 grant funds or special project money.	Mar. 2004 to June 2008.	Direct reduction in sediment and pathogens. All livestock animals will be moved back away from the streambank. STEPL program will be used to

	will consist of a feed pad under roof and manure storage under roof. First priority being those pasture feeding sites that are split or adjacent to perennial or intermittent streams.				calculate nutrient and sediment reductions.

Impairment: Flow / Habitat Alterations

Background

The East Fork Subwatershed of White Oak Creek is reaching Warmwater Habitat and according to OEPA 1997 monitoring, the stream segment from RM 3.2 to 14.3 is in Full Attainment. However, it is believed that since the OEPA 1997 data was collected that the water quality has slightly changed in some portions of the stream. There are 38.34 miles of channelized stream in the East Fork Subwatershed. Sources that contribute to flow alterations are channelization, entrenchment, levied areas, lack of riparian habitat and livestock degradation areas. These flow/habitat alteration areas inhibit the stream from reaching its Exceptional Warmwater Habitat potential.

Stream not meeting its full potential, low QHEI

Problem Statement

Several subwatershed tributaries in the East Fork Subwatershed are in need of some type of habitat improvements. According to the "East Fork Inventory Table" subwatershed is in need of 57.32 miles of riparian habitat. Studies of this subwatershed have shown that as a whole, there are 38.34 miles of stream that has been channelized and 6,200 feet levied. Studies also show approximately 141,020 feet (26.71 miles) are categorized as unmaintained petition ditches. The East Fork tributaries are in need of riparian habitat (buffer) to raise QHEI scores along with water quality attainment.

Channelized stream running through a cropland field

Areas monitored by OEPA

(Generally QHEI value above 60 is needed to achieve Warmwater Habitat)

Year	River Mile	QHEI Value
1987	3.2	69.5
1997	3.3	66
1997	5.8	65
1997	14.2	64
Slabcamp Run		
1997	0.9	62
1997	1.1	41.5

Research shows the establishment of 57.32 miles of riparian corridor with an average buffer width of 50 ft. (25 feet each side) will raise the QHEI scores and will revitalize 347.4 acres of newly functioning riparian buffer habitat. With the establishment of new riparian habitat in the channelized areas, the stream corridor will begin to revitalize itself creating new habitat, while reducing the amounts of other pollutants entering the stream. Most of the tributaries in the subwatershed are very small therefore the average buffer width of 50 ft (25ft on each side) should be adequate in most cases to repair the riparian area. A direct marketing approach will be taken to target individual landowners where flow/habitat alteration solutions are needed.

The White Oak Creek Watershed Advisory Board will also research starting a Riparian Easement Purchase Program. The group will partner with the Brown and Highland SWCD's to hold the easements to protect the already established riparian habitat. The watershed group will set up guidelines and funding objectives to start the easement purchase program beginning in 2004.

Goals

8. Reestablish 347.4 acres (57.32 miles) of streamside riparian corridor to improve the QHEI scores and reduce pollution runoff.
9. Reduce channelization in small headwater streams through installing a demo site to demonstrate the channel morphology concept on approximately 5,000ft. This project will aid in watershed resident education and outreach.
10. Establish a Riparian Easement Purchase Program to protect the 75.57 miles of habitat that is currently in place.

Pollutant (cause of impairment)	Task Description	Resources	How	Time Frame	Performance Indicator
Nutrients, Pesticides & Sediment	8. Establish 347.4 acres (57.32 miles) of streamside buffer habitat to reduce the amount of nutrients and pesticides and increase QHEI scores.	$32,308 for CRP (average CRP is $93 per soil rate) to set aside 347.4 acres of cropland to establish a buffer area (average buffer 50 foot minimum). * 57.32 miles (of riparian area needed) *5,280 ft. = 302,649.6 ft * 50 ft buffer = 15,132,480 ft2/ 43,560 = 347.4 acres.	Work with the Division of Forestry to obtain trees and plan tree plantings utilizing Forest Land Enhancement Program (FLEP). Work in conjunction with USDA NRCS to establish Riparian Buffers through CRP and other USDA programs. Work with Division of Wildlife to promote warm season grasses.	2004 thru 2014 <u>YEARS</u> 2004-06 establish 19.1 miles 2007 – 10 establish 19.1 miles 2010 – 14 establish 19.12 miles	347.4 acres established and put aside in the CRP program to protect that land and stream. Improved QHEI scores in targeted stream segments.
Habitat Alterations	9. Use education & outreach programs to save headwater streams from continuous channelization from streamside residents. Install a demo site to demonstrate the	Work with all local landowners and farmers to education them on the harm of channelizing and entrenching the small streams. Hold citizen	SWCD & NRCS information and assistance. Use funds from Brown or Highland SWCD or OEPA 319 grant dollars.	2004 – 2014 or until it is widely accepted to allow natural drainage to occur rather than channel-ization practices.	Higher QHEI scores and continual growth of the riparian habitat. Citizen education influencing there farming practices.

	channel morphology concept on approximately 5,000 ft. of streambank. This will help landowners seek alternative ways to improve drainage in the East Fork subwatershed. *(Possible 2 stage ditch design, contingent on ODNR recommendations)*	outreach programs to educate the community members about channelization and habitat alterations and why these effect streambank erosion and water quality. Install a demo site to demonstrate the channel morphology concept on approximately 5,000 ft. of streambank.			

Habitat Alterations	10. Establish a protection program to save the current 75.57 miles of riparian habitat that is currently in place in the East Fork Subwatershed.	Work with state agencies to set up a Riparian Easement Program. Partner with the Brown & Highland SWCD to hold the easements. Set up guidelines and funding objectives to start a easement purchase program to protect the already established habitat.	Partner with all persons involved to get the program up and running. Use ODNR & OEPA to set up the program. Obtain grants and other funding. Use Brown & Highland SWCD's and County Commissioners to obtain public funds.	2004 - Start researching the program and funding options. 2005 – Partner with all appropriate agencies to obtain and hold the easements. Set up all legal logistics and target riparian areas. 2006 – Start program.	Easements purchased and riparian habitat protected from degradation.

Water Quality Data by Tributary

Hydrologic Unit Water Quality Report – 05090201 090 010
Below is a description from the Ohio Nonpoint Source Assessment Status for each White Oak Creek tributary listed by the Ohio Environmental Protection Agency, Division of Surface Water, Nonpoint Source Program. The tables detail the water body ID, the tributary name, stream length, status, aquatic life designation, source and causes or impairments. The data is used to assess and identify critical areas.

Waterbody ID	OH 49 60
Stream or Tributary	East Fork White Oak Creek
Segment Length (miles)	21
Stream Assessment Status	Attaining Use
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 61
Stream or Tributary	Turkeyhole Run
Segment Length (miles)	0
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 62
Stream or Tributary	Browns Run
Segment Length (miles)	1
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 63
Stream or Tributary	Middle Run
Segment Length (miles)	1
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	EWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 64
Stream or Tributary	Slabcamp Run
Segment Length (miles)	3

Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 65
Stream or Tributary	Twin Run
Segment Length (miles)	3
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 66
Stream or Tributary	Bells Run
Segment Length (miles)	2
Stream Assessment Status	NPS impacted
Aquatic Life Designated Use	WWH
Source of Impact	Agriculture, sanitary sewers
Cause of Impairment	

Waterbody ID	OH 49 67
Stream or Tributary	Plum Run
Segment Length (miles)	2
Stream Assessment Status	No info
Aquatic Life Designated Use	WWH
Source of Impact	
Cause of Impairment	

Waterbody ID	OH 49 68
Stream or Tributary	Sugar Run
Segment Length (miles)	1
Stream Assessment Status	No info
Aquatic Life Designated Use	WWH
Source of Impact	
Cause of Impairment	

White Oak Creek Watershed Inventory
East Fork Subwatershed
HUC 05090201 090 010

Stream Segment	River Mile	Segment Length (ft)	Channelized (ft)	Levied (ft)	Dammed (ft)	Unmaintained Petition Ditch (ft)	Rip. Buffer Present (ft)	Rip. Buffer Needed (ft)	Unrestricted livestock access to stream	Livestock oper. needing improvements	Livestock oper. complying	Number of New Homes	Expected Development	Bridges/ Culverts
East Fork	22.2-20.8	5,600	2,600			2,600	3,000	2,600	no	1	0	0	n	1
East Fork Trib 1	20.8	7,200	0			0	3,000	4,200	no	0	2	3	n	1
East Fork	20.8-19.68	6,100	0			0	3,600	2,500	no	0		2	n	1
East Fork Trib 2	19.68	8,100	0			0	8,100		no		1	3	y	2
East Fork	19.68-19.21	4,500	0			0	4,500		no			0	n	
East Fork Trib 3	19.21	9,500	5,400			5,400	4,100	5,400	yes	1		2	n	3
East Fork	19.21-18.8	2,100	0			0	2,100		no	0		0	n	
East Fork Trib 4	18.8	5,700	1,500			1,500	4,200	1,500	no	0		0	n	1
East Fork	18.8-17.99	4,400	0			0	4,400	0	yes	1	0	0	n	1
Sugar Run	17.99	23,800	0			0	14,000	9,800	yes	2	2	2	n	5
East Fork	17.99-16.51	8,000	0			0	1,800	6,200	yes	2	0	2	n	1
East Fork Trib 5	16.51	8,600	0			0	4,000	4,600	yes	3	0	4	n	4
East Fork	16.51-15.69	4,300	0			0	4,300		no			3	n	1
East Fork Trib 6	15.69	13,000	500				8,000	5,000	no			0	n	3
East Fork	15.69-15.52	850	0			0	850		no	0		0	n	0
East Fork Trib 7	15.52	68,450	5,300		1,200		44,950	23,500	yes	2	4	2	n	12
East Fork	15.52-14.35	6,600	0				6,600	0	no			0	n	1
East Fork Trib 8	14.35	27,400	22,800			20,000	4,600	22,800	no			0	n	3
East Fork	14.35-14.0	1,900	1,900	1,900			1,900		no			0	n	1
East Fork Trib 9	14	24,500	9,600				13,100	11,400	yes	1		0	n	4
East Fork	14.0-13.4	2,800	2,800	2,800			2,800	0	no		1	0	n	0
East Fork Trib 10	13.4	8,300	3,800				5,300		yes		1	0	n	1
East Fork	13.4-12.38	5,400		1,500			5,400		no	1		0	n	0
East Fork Trib 11	12.38	54,700					16,400	38,300	no	1	1	5	n	5
East Fork	12.38-11.73	3,400					3,400		no			0	n	0
East Fork Trib 12	11.73	9,700	5,800				9,700		yes	1	0	2	y	1
East Fork	11.73 - 9.62	11,500			500		11,500	0	no		1	0	n	1
Plum Run	9.62	68,700	35,000			35,000	33,700	35,000	yes	2	1	15	y	5
East Fork	9.62 - 8.7	4,900	1,600				4,900		no	1	2	2	n	1
East Fork Trib 13	8.7	5,000					5,000	0	no		1	0	n	1
East Fork	8.7 - 8.54	960					960		no			0	n	0
East Fork Trib 14	8.54	9,800	4,200			4,200	5,600	4,200	yes	2		6	y	3
East Fork	8.54 - 7.9	3,045					3,045		no		1	0	n	0
East Fork Trib 15	7.9	6,700	1,700			1,700	4,400	2,300	no		2	1	n	2
East Fork	7.9 - 7.55	2,000					2,000		no			0	n	0
East Fork Trib 16	7.55	6,500	2,600			2,600	4,500	2,000	yes	1	1	3	n	1
East Fork	7.55 - 5.7	9,700	6,600		1,000		9,700		yes	2		0	n	0
Bells Run	5.7	53,900					29,100	29,200	yes	10	2	3	y	20
East Fork	5.7 - 4.55	6,100	2,800				4,600	1,500	no	1	0	0	n	2
East Fork Trib 17	4.55	5,300	5,300			5,300		5,300	no	0	0	0	n	3
East Fork	4.55 - 3.8	4,200	2,000				2,200	2,000	no	1	0	0	n	2
Slabcamp Run	3.8	65,800	27,200			27,200	38,500	27,200	yes	4	6	50	y	14
Twin Run	1.38 Slabcamp Ru	13,100	6,100			6,100	7,000	6,100	yes	1	2	5	n	4
East Fork	3.8 - 2.7	6,300					6,300	0	no	0	2	7	n	0
Middle Run	2.7	20,300	15,225			11,420	5,075	15,225	yes	1	1	8	y	5
East Fork	2.7 - 1.44	7,000					2,300	4,700	no	0	1	0	n	0
Browns Run	1.44	45,400	24,100			12,000	21,300	24,100	yes	4	2	3	n	8
East Fork	1.44 - .15	6,800					6,800	0	no	0	0	1	n	0
Turkey Hole Run	0.15	11,800	6,000			6,000	5,800	6,000	yes	2	0	3	y	2
East Fork	.15 - 0	608					608		no	0	0	0	n	0
Total		**700,313**	**202,425**	**6,200**	**2,700**	**141,020**	**398,988**	**302,625**		**48**	**37**	**137**		**126**
	Miles	**132.64**	**38.34**	**1.17**	**0.51**	**26.71**	**75.57**	**57.32**						

* Petition ditch defined as a old township ditch

Livestock Inventory	Beef	Goat	Sheep
Totals	3640	66	29

** Totals gathered from Farm Service Agency's Livestock Compensation Program (LCP) applications filled out by the*

Subwatershed Total Acres
51,254.20

Water Quality Assessment

**All Data from OEPA*

Stream Name	Use Designation	t Status	IBI	Miwb	ICI	QHEI	Comment	Test Site name
East Fork (RM 14.2)	WWH	FULL	42	8.9	54	64		WOEF 600
East Fork (RM 5.8)	WWH	FULL	47	8.8	52	65	upstream of Slabcamp Run	WOEF 400
East Fork (RM 3.2)	WWH	FULL	42	7.6		66	downstream of Slabcamp Run	WOEF 200
Turkeyhole Run	EWH	Untested						
Browns Run	EWH	Untested						
Middle Run	EWH	Untested						
Slabcamp Run (RM 1.1)	EWH	Untested						
Slabcamp Run (RM .9)	EWH	Untested						
Twin Run	EWH	Untested						
Bells Run	EWH	Untested						
Plum Run	EWH	Untested						
Sugar Run	EWH	Untested						

Point Source Pollution Sources

*Permitted Discharge Loadings (30 day average-Kg/day)

Facility	suspended solids	nitrogen-ammonia	CBOD5
Sardinia Wastewater Treatment Plant	6.8	0.9	5.7
White Oak High School Wastewater Treatment Plant	0.27	0.023	0.23

NonPoint Source Pollution

* H = High * S = Small
* M = Moderate * T = Threat

Causes:	Sources:
Slabcamp Run	
Flow Alteration - H	Natural - H
Organic enrichment/DO - H	Minor Municipal Point Source - H
Nutrients - M	Pasture land - S
Pathogens - M	Nonirrigated crop production - S
Siltation - S	
Pathogens - S	
Unionized Ammonia -	

Section VII. Watershed Programs

Previous & Active Programs

See BMP map

- ***Riparian Buffers***
  - The installation of 31.5 acres of riparian buffers using 319 grant funds has helped reestablish a riparian corridor on the headwaters of Little North Fork and Flat Run. (see map BMP map for locations) The landowners agree to set aside their land as natural buffers for 15 years.

- ***Grassed Waterways***
  - The installation of 4 acres of grass waterways has help reduce the field runoff from reaching the stream.

- ***Household Sewage Treatment System upgrades***
  - The repair of 34 HSTS reduced the amount of effluent reaching the stream.

- ***Stream Clean-up Events***
  - Annual stream clean-up events have helped clean up over 4 miles of streambank. The White Oak Creek Watershed Group has also set aside four times per year to clean up a 2 mile stretch of Rt. 32 that covers 2 stream crossings.

- ***Grass Filter Strips***
  - The installation of 200.7 acres of grass filter strips has reduced the amount of pollutants by the natural filtration process.

- ***Log Jam Debris Removal Program***
  - The log jam removal program funds were received from Ohio General Assembly in 2000 to correct problems due to the 1997-98 floods. Total grant was for $142,857. A large portion of that was spent on 11 logjam sites in the Brown County portion of White Oak Creek.

- ***Water Monitoring Program***

A water monitoring program was set up with 8 local school districts in Brown and Highland County. Each school was equipped with $5,000 worth of state-of-the-art equipment. The school water monitoring teams monitored for 10 different physical, chemical, and biological parameters. This monitoring data has been used for baseline data. More information is included in this document under the water quality monitoring section.

- ***Livestock Exclusion Project***

The livestock exclusion project has received funding through the Division of Wildlife to install livestock exclusion fencing. There has been $67,235.51 spent in the White Oak Creek Watershed area. Thanks to the Division of Wildlife over 5.8 miles of fencing has been installed to protect 43.82 acres of riparian habitat for a minimum of 10 years. There is still a need for the reestablishment of 1,610 acres of riparian buffer habitat or 147.61 miles. There are a total of 9,727 total livestock (6,967 cattle) in the watershed and approximately 280 head has been protected through the first round of funding. Additional landowners are on the waiting list for more fencing funds.

White Oak Creek Watershed
Livestock Fencing Program
FY 2003

	Cost Share	Footage of Fence Streambank Protected	Riparian Buffer *(acres)*	Subwatershed	Livestock Excluded
Carl Beck	$6,630.00	2,400	1.92	Main Stem	9
Dan Henson	$10,000.00	12,600	10.2	Lower Main	100
Grover Shepard	$6,680.00	1,900	1.52	Main Stem	8
J & T Loudon	$10,000.00	3,000	2.41	Lower Main	10
Lisa Watson	$6,546.26	1,900	4.36	Main Stem	10
Lori Carter	$6,600.00	2,000	4.59	Main Stem	5
Charles Pursley	$5,939.25	2,100	4.82	Sterling Run	28
Bob McElroy	$4,840.00	2,200	14	Lower Main	60
Barb Casper	$10,000.00	2,500	5.75	East Fork	50
Miles		**5.80**			
Totals	**$67,235.51**	**30,600**	**43.82**		**280**

Education & Community Outreach Programs

** Same as page 26 - 30*

The White Oak Creek Watershed Project has been involved with a variety of educational activities since the project started in 2000. Through the education and outreach, the project has gained insight to stakeholder concerns in the watershed. These concerns have been used to guide this plan. There has been an excellent response by stakeholders at education and outreach events. The following is a partial listing of education and community outreach activities that have been conducted.

- **White Oak Creek Public Meeting** – On March 27, 2001, approximately 75 watershed stakeholders attended the first White Oak Creek public meeting. It was held in Mt. Orab in the Sterling Run Watershed. Stakeholder concerns were recorded and prioritized as follows:
  1. Littering & illegal trash dumping
  2. Sedimentation & erosion
  3. Poor sewage treatment
  4. Drinking water concerns

- **White Oak Creek Public Meeting** – The second meeting on August 30, 2001, was held in the headwaters of White Oak Creek at Hopewell Education Center. Over 60 watershed stakeholders attended. Concerns were recorded and prioritized as follows:
  1. Poor sewage treatment
  2. Sedimentation & erosion
  3. Drinking water
  4. Littering & trash dumping

- **Two Stream Clean-ups**
  1. April 7, 2001 – 10 local 4-H members helped clean up a 2 mile stretch of East Fork Subwatershed.
  2. May 18, 2002 – 22 community members cleaned appox. 2 miles of Sterling Run and filled over 30 bags of garbage.

- **Teachers Workshop**

August 14, 2001 – The White Oak Creek Watershed Group and the Brown SWCD sponsored the second water monitoring teacher workshop. This workshop enabled teacher volunteers to collect reliable water quality data when the water monitoring groups test the designated 20 sites within the White Oak Creek Watershed. Eight high school science teachers participated.

- **Storm water Stenciling**

Student volunteers participate in the watershed storm water stenciling projects throughout the year. This event helps educate the community against dumping chemical pollutants into the storm sewer.

- **AWARE Water Quality Training**

August 6, 2002 & October 5, 2003 – The White Oak Creek Watershed Partners along with Brown SWCD, Ohio Farm Bureau and Brown County Farm Bureau hosted an exciting hands on water monitoring training at a farm along White Oak Creek. Participants were introduced to the AWARE (Agricultural Watershed Awareness Resource Evaluation) Program; this is a volunteer member-based program for watershed residents to determine the quality and health of their watershed's physical, chemical and biological features.

- **Homeowners Guide**

The purpose of the Homeowners Guide is to help the individuals interested in building or buying a home sort out the broad range of considerations that need to be addressed before purchasing. The brochure will also assist prospective home buyers and home builders by providing a list of items to consider when evaluating a lot or building site, or selecting land for development. The information in the guide educates watershed residents about the facts and dangers to watch for when choosing a home site.

- **Watershed Brochure**

  The White Oak Creek Watershed Brochure was produced to educate Brown and Highland County residents about the activities and purpose of the watershed group. The brochure identifies the facts, activities and partners associated with the watershed project. The brochure is a trifold color pamphlet with the purpose of getting more volunteers educated and involved in the watershed.

- **Educational Field Days**

  The White Oak Creek Watershed conducts and presents at many different field day events throughout the year. These field days mainly focus on the education of students in the local school districts. Each field day is jam packed with educational stops that focus on agriculture, conservation and water quality.

- **Conservation Field Day**

  October 12, 2002 – The Brown SWCD hosted an adult conservation field day that focused on best management practices. The event was and will continue to be held at a local working farm where conservation practices have been implemented. This gives many farmers and watershed residents a chance to view the benefits of conservation practices. This provides opportunities for landowners to see and begin implementing best management practices to reduce nonpoint source pollution.

- **Highland County Farmers Club**

  The watershed coordinator spoke with the Highland County Farmers Club to inform them about the implementation opportunity for best management practices. The members viewed a working (319) funded buffer strip. This nonpoint source pollution reduction practice showed the benefit of installing these types of practices.

- **Ripley Farmers Club**

  The watershed coordinator showed a presentation about the water quality efforts taking place in the White Oak Creek Watershed. This was an educational opportunity for farmers and landowners to be educated about the local water quality efforts happening in the area.

- **Quarterly Watershed Newsletters**

  Each quarter (4 times per year) a watershed wide newsletter is produced. The newsletter is a great opportunity to inform and educate the entire watershed. Every watershed resident receives a newsletter with quarterly happenings published. The newsletter invites everyone to participate in watershed activities and updates them about upcoming events.

- **Adopt – a – Highway**

  The White Oak Creek Watershed Project and Brown SWCD co-sponsors a 2 miles section of St. Rt. 32 encompassing both sections of Highland and Brown County. The sections are cleaned 4 times per year by volunteers.

- **Local Water Quality Concerns Survey**

  Approximately 1,800 surveys were sent out enclosed in the watershed newsletter. The survey was accompanied by an article in the newsletter explaining the watershed action plan and how the information from the survey cards would be used in the identification of pollution concerns in the watershed. Approximately 100 surveys were returned with their issues ranked from highest to lowest concern. #1 was illegal dumpsites, #2 was failing septic systems and # 3 was erosion and sedimentation. These concerns are very similar to the direct impacts to which OEPA refers in the 305 (b) report as stream impairments. These concerns will be addressed in this plan.

- **Brown County Water Festival**

  The Water Festival is sponsored by the Brown County Rural Water Association. There are many educational and informative booths and exhibits with which the public can interact to learn about water quality and resources.

- **Brown & Highland County Fair Booth**

  Each year the White Oak Creek Watershed Group is represented at the local county fairs. The SWCD offices set up informational booths. Watershed information along with maps are displayed and distributed to local residents.

- **High School Water Monitoring Program**

A water monitoring program was set up with 8 local school districts in Brown and Highland County. Each school was equipped with $5,000 worth of state-of-the-art equipment. The school water monitoring teams monitor for 10 different physical, chemical, and biological parameters. This monitoring data has been used for baseline data. There has been little monitoring done in this watershed so the student monitoring data is a great baseline to begin with. The student data is included in this document under the water quality monitoring section.

- **Junior High Macroinvertebrate Monitoring Program**

  Students and teachers participate in the macroinvertebrate monitoring program. Activities include collecting, identifying and documenting the invertebrate life forms that inhabit the streams of White Oak Creek. Students have collected many invertebrates including crayfish, water penny beetles, mayfly nymphs, aquatic worms, caddisfly larvae, hellgrammites, and many others.

Education and Outreach Activities

Activity	Timeframe
White Oak Creek Watershed Calendar	November 2004
Field Day Presentations	Spring & Summer 2001 – 2013
Steam walks & Canoe floats	Summer 2004 – 2013
Annual Stream Clean-up	May 2002 – 2013
Commissioner's Tour	July 16, 2003
Local Work Group participation	On going effort
Wellhead protection committee participation	Quarterly
Brown County GIS Policy Board	On going effort
Planning Commission Meetings	Quarterly
Watershed Advisory Board Meetings	Quarterly
Watershed Community Involvement Meetings	Bi-yearly 2001 – 20013
AWARE water quality workshops	August 2002 – 2013
School Water Monitoring Project	Fall & Spring 2000 – 2013
Recycling Events	On going
Conservation Field Days	Yearly 2002 – 2013
Distribution of educational materials	On going
Set up displays at fairs and festivals	On going
Produce and distribute watershed newsletters	Quarterly 2000 – 2013
Nonpoint Source Pollution school programs	On going
Educational programs using the Streamulator and Enviroscape.	On going

Active or Proposed Program Goals

** Similar to page 13-15*

Activity	How	Timeframe	Accomplished
Education & Outreach	• Continue and enhance all ongoing educational events and organize new efforts. • Continue Nonpoint Source Pollution Education in local elementary and middle schools. • Continue all 8 watershed high schools' participation in water quality monitoring efforts. • Continue annual Stream Clean-Up. • Participate in county commissioner meetings. • Conduct water quality monitoring workshops with the public partnering with Ohio Farm Bureau. • Set up informational displays at community events (such as fairs and festivals). • Distribute the informational watershed brochure and homeowners guide for better water quality.	Continuous Efforts	
	• Gather all previously involved and new community members to set up the "formal" Friends of White Oak Creek Group. • Organize and conduct quarterly watershed group meetings, workshops and demonstrations. • Participate in the OEPA TMDL process in the years of 2006 - 2008. • Distribute watershed wide newsletters to approx. 3000 residents quarterly.	2004	

	• Produce a yearly calendar of upcoming watershed events with scenes of White Oak Creek and fun educational facts about the stream. • Educate students about the stream and ways to stop pollution at local SWCD Field Day events. • Participate in a day long County Commissions Day Tour. With stops at White Oak Creek to inform the commissions of local efforts and funding needs. • Hold stream walk and canoeing events on the stream. • Have the watershed coordinator participate in county planning efforts to set up local adoption of set back requirements. • Work closely with the local high schools science clubs to conduct more baseline water monitoring data for the stream.		
Watershed wide floodplain and erosion assessment. Measuring miles of streambank erosion sites and floodplain condition.	• Obtain funding for a formal floodplain analysis, along with a sinuosity study and an eroding banks assessment. • Assess and monitor the watershed's floodplains and streambank erosion sites through the proper training and funding.	March 2005 – September 2006	
Illegal Trash Dumping & Littering	• Remove trash from creek and streambanks through the annual stream clean-up. • Educate students and adults and encourage them to report trash dumpers. • Partner with the Adams-	Continuous	

	Brown Recycling Center and Solid Waste Authority to hold more public clean-up events and hazardous material collection days.		
Improperly Treated Wastewater	• Work with the local homeowners and county health departments to upgrade failing household sewage treatment systems (HSTS). • Monitor the amount of e-coli and fecal coliform in the stream at target areas. • Educate the homeowner of health concerns of pathogens in the stream and teach them the proper maintenance for their system. • Work with the local health department to create a countywide plan to address these problems and acquire funding to assist landowners. Through the Department of Environmental Financial Assistance (DEFA) and 319 grant programs.	March 2000 – December 2014	34 systems repaired (as of Dec. 2003)
Sedimentation, Habitat Alteration, and Nutrient Loading	• Set up a tree planting program to repair the loss of riparian buffer along the stream corridor. • Educate landowners of the importance of a good riparian habitat. • Protect the streambank from livestock access to reduce nutrient loading, sedimentation and habitat degradation; while increasing QHEI scores, using livestock fencing. • Research the removal options of the Old Georgetown Waste Water Treatment Plant Dam at RM	On going effort 2003 - 2014 Study 2005-2006	**5.8 miles** of fencing has been installed to protect **43.82 acres (as of Jan. 2004)**

	7.6 to restore natural stream flow. • Improve pasture management of all pasture land by providing the landowner with an approved "Prescribed Grazing System" to reduce sedimentation and nutrient runoff. • Reduce channelization in small headwater streams through installing a demo sites to demonstrate the channel morphology concepts. This project will aid in watershed resident education and outreach.	2004 - 2008 2004 - 2014	
Monitoring	• Work with OEPA and volunteers to fill in missing data gaps. Limited water quality data is available in the headwaters and tributaries of White Oak Creek. A goal to collect and analyze more data in these areas is a necessity. A Lab Monitoring Proposal has been submitted (2003) and is in the set-up process to begin water quality monitoring utilizing OEPA's lab.	January 2004 – December 2008	
Habitat Protection	• The White Oak Creek Watershed Advisory Board and Partners will research the opportunity of developing a Riparian Easement Purchase Program. The watershed group will partner with the Brown & Highland Soil & Water Conservation Districts and county commissioners to hold the conservation easements to protect the already established riparian habitat. The watershed	2004 – 2014	

	group will set up guidelines and funding objectives to start the easement purchase program beginning in 2004. • Improve timber management in the forested areas with a Forestry Stewardship Plan to protect approximately 2,800 acres.	2004 - 2010	
Soil Quality	• The White Oak Creek Technical Focus Group will partner with the Ohio Division of Natural Resources to conduct a Soil Quality Pilot Project to survey the current soil quality in continuous soy bean agricultural areas. The program is a pilot project for the state and will be used to determine future implementation practices. The results will be added to this plan.	2004 - 2005	

Most subwatershed goals are included in this chart and there accomplishments will be tracked.

VIII. Water Quality Monitoring Program & Data

Introduction

The White Oak Creek Water Quality Monitoring Program is one objective of the White Oak Creek Watershed 319(h) program. The focus of the water quality monitoring serves two purposes. The first is to educate the citizens in the White Oak Creek Watershed to reduce the amount of pollutants entering the creek by monitoring for selected physical, chemical and bacteriological parameters. This is achieved by the methods and controls described and outlined in the approved Quality Assurance Project Plan (QAPP). A water monitoring program was set up with 8 local school districts in Brown and Highland County. Each school was equipped with $5,000 worth of state-of-the-art equipment. The school water monitoring teams monitor for 10 different physical, chemical, and biological parameters. This monitoring data has been used for baseline data. There has been little monitoring done in this watershed so the student monitoring data is a great baseline to begin with. The student data is included in this document under the water quality monitoring section. The second phase of the water quality monitoring is to serve as a foundation of information to be correlated with certain land-use activities that are identified under objective (2) two and objective (3) of the White Oak Creek EPA 319 (h) grant proposal. These correlations will lead to the documented closure of the planning phase for this project.

Program Agency Partners: Ohio Valley Resource Conservation & Development, ODNR (Division of Wildlife), ODNR (Division of Forestry), Brown County Health Department, Highland County Health Department, USDA (NRCS) Georgetown Field Office, USDA (NRCS) Hillsboro Field Office, OSU Extension Brown County, OSU Extension Highland County, Brown County Litter Control, Ohio Environmental Protection Agency, Brown SWCD, Highland SWCD.

Program Affiliates: ODOT (Adopt-A-Highway Program), Ohio Farm Bureau, 8 Local High Schools, AgriCountry Television Program.

Purpose of Program: To accomplish all water quality monitoring objectives in the White Oak Creek Watershed Project.

Area being monitored: The area being monitored is the White Oak Creek Watershed which encompasses approximately 235 square miles in Highland and Brown Counties. There are 16 active water quality monitoring sites and 4 alternate sites within the White Oak Creek Watershed. The 4 alternate sites are 9 (Western Brown), 12 (Fayetteville), 14 (Hillsboro), and 19 (Lynchburg) These sites are listed and described below:

Site	County	Township	School	Description
1	Brown	Pleasant	Ripley	Old iron bridge E. of 221,.5 miles N. of 221&52
2	Brown	Lewis	Ripley	2.8 miles N. of 221&52, on E. side of 221
3	Brown	Pleasant	Georgetown	S.R. 221 S. of Georgetown across from old H2O plant
4	Brown	Scott	Georgetown	Iron Bridge 1.5 miles W of Wahlsburg, park at Lowry Ln.
5	Brown	Sardinia	Eastern	S.R. 134 N. of Sardinia, S. of 32 across from Supervalue
6	Brown	Washington	Eastern	Dead end of Sicily Road at bridge, use riffle area,
7	Brown	Scott	Western	Abandoned Bridge on Sterling East Road
8	Brown	Scott	Western	1st Crossing at creek on Sterling West Rd., .4 W. of 68 & Sterling
9	Brown	Green	Western	City building at 409 N. High Street
10	Brown	Green	Fayetteville	Bridge at 3809 Bardwell West
11	Brown	Green	Fayetteville	1.6 miles E. of Greenbush at 15671 Crawford Day Rd
12	Brown	Green	Fayetteville	S.R. 286 E. of Moon Road at bridge, W. of Ditrick Rd.
13	Highland	New Market	Hillsboro	Bridge at entrance to Hopewell Spec.Ed.,5350W. New Market
14	Highland	New Market	Hillsboro	Culvert next to cornfield at 4360 Custer Road
15	Highland	White Oak	White Oak	Bridge w/guardrails, riprap W. of Taylorsville under bridge
16	Highland	White Oak	White Oak	Diehl Park Damn at end of parking lot, use same side of damn.
17	Highland	Salem	Lynchburg	Culvert at 2262 S.R.131, S.E.of Bridge, use driveway
18	Highland	Salem	Lynchburg	Little North Fork at bridge, 1011 E. Barker
19	Highland	Salem	Lynchburg	5016 S.R. 134 Watch Dog
20	Highland	Hamer	Hillsboro	Culvert at speed sign. Park at cemetary. E. Danville Rd.

Parameters being monitored:

Water Temperature (Celsius)
Variables that affect a waterway's temperature include:

1.The color of the water. Most heat warming surface waters comes from the sun, so waterways with dark-colored water, or those with dark muddy bottoms, absorb heat best.

2. The depth of the water. Deep waters usually are colder than shallow waters simply because they require more time to warm up.

3.The amount of shade received from shoreline vegetation. Trees overhanging a lake shore or river bank shade the water from sunlight. Some narrow creeks and streams are almost completely covered with overhanging vegetation during certain times of the year. The shade prevents water temperatures from rising too fast on bright sunny days.

4. The latitude of the waterway. Lakes and rivers in cold climates are naturally colder than those in warm climates.

5. The time of year. The temperature of waterways varies with the seasons.

6. The temperature of the water supplying the waterways. Some lakes and rivers are fed by cold mountain streams or underground springs. Others are supplied by rain and/or surface run-off. The temperature of the water flowing into a lake, river or stream helps determine its temperature.

7. The volume of the water. The more water there is, the longer it takes to heat up or cool down.

8.The temperature of effluents dumped into the water. When people dump heated effluents into waterways, the effluents raise the temperature of the water.

Fish and most aquatic organisms are cold-blooded. Consequently, their metabolism increases as the water warms and decreases as it cools. Each species of aquatic organism has its own optimum (best) water temperature. If the water temperature shifts too far from the optimum, the organism suffers. Cold-blooded animals can not survive temperatures below 0 oC (32 oF), and only rough fish like carp can tolerate temperatures much warmer than about 36 oC (97 oF).

Dissolved Oxygen (mg/L)
Dissolved oxygen (DO, pronounced dee-oh) is oxygen that is dissolved in water. It gets there by diffusion from the surrounding air,aeration of water that has tumbled over falls and rapid, and as a waste product of Photosynthesis.

Fish and aquatic animals cannot split oxygen from water (H2O) or other oxygen containing compounds. Only green plants and some bacteria can do that through photosynthesis and similar processes. Virtually all the oxygen we breathe is manufactured by green plants. A total of three-fourths of the earth's oxygen supply is produced by phytoplankton in the oceans.

If water is too warm, there may not be enough oxygen in it. When there are too many bacteria or aquatic animal in the area, they may overpopulate, using DO in great amounts.

Oxygen levels also can be reduced through overfertilization of water plants by run-off from farm fields containing phosphates and nitrates (the ingredients in fertilizers). Under these conditions, the numbers and size of water plants increase a great deal. Then, if the weather becomes cloudy for several days, respiring plants will use much of the available DO. When these plants die, they become food for bacteria, which in turn multiply and use large amounts of oxygen.

How much DO an aquatic organism needs depends upon its species, its physical state, water temperature, pollutants present, and more. Consequently, it is impossible to accurately predict minimum DO levels for specific fish and aquatic animals. For example, at 5 oC (41 oF), trout use about 50-60 milligrams (mg) of oxygen per hour; at 25 oC (77 oF), they may need five or six times that amount. Fish are cold-blooded animals, so they use more oxygen at higher temperatures when their metabolic rate increases.

Numerous scientific studies suggest that 4-5 parts per million (ppm) of DO is the minimum amount that will support a large, diverse fish population. The DO level in good fishing waters generally averages about 9.0 parts per million (ppm). When DO levels drop below about 3.0 parts per million, even the rough fish die. The table in this section shows some representative comparisons.

*From Water Quality Criteria, the Resources Agency of California, State Water Quality Board, 1963. Publication No. 3-A.

How Dissolved Oxygen Affects Water Supplies:
A high DO level in a community water supply is good because it makes drinking water taste better. However, high DO levels speed up corrosion in water pipes. For this reason, industries use water with the least possible amount of dissolved oxygen. Water used in

very low pressure boilers have no more than 2.0 ppm of DO, but most boiler plant operators try to keep oxygen levels to 0.007 ppm or less.

pH (0-14)

The balance of positive hydrogen ions (H+) and negative hydroxide ions (OH-) in water determines how acidic or basic the water is. When analysts measure pH, they are determining the relative concentration (expressed in exponential, or "power" form) of hydrogen ions; the term "pH" comes from the power of Hydrogen. The pH scale ranges from 0 (high concentration of positive hydrogen ions, strongly acidic) to 14 (high concentration of negative hydroxide ions, strongly basic). In pure water, the concentration of positive hydrogen ions is in equilibrium with the concentration of negative hydroxide ions, and the pH measures exactly 7.

In a lake or pond, the water's pH is affected by its age and the chemicals discharged by communities and industries. Most lakes are basic (alkaline) when they are first formed and become more acidic with time due to the build-up of organic materials. As organic substances decay, carbon dioxide (CO2) forms and combines with water to produce a weak acid, called "carbonic" acid — the same stuff that is in carbonated soft drinks.
Large amounts of carbonic acid lower water's pH.

Synergistic Effects of pH

Synergy is the process whereby two or more substances combine and produce effects greater than their sum. For example, 2 + 2 = 4 (mathematically). But synergistically, 2 + 2 = much more than 4! Synergy is a mathematical impossibility, but it is a chemical reality. Here is how it works:

When acid waters (waters with low pH values) come into contact with certain chemicals and metals, they often make them more toxic than normal. As an example, fish that usually withstand pH values as low as 4.8 will die at pH 5.5 if the water contains 0.9 mg/L of iron. Mix an acid water environment with small amounts of aluminum, lead or mercury, and you have a similar problem—one far exceeding the usual dangers of these substances.

The pH of sea (salt) water is not as vulnerable as fresh water's pH to acid wastes. This is because the different salts in sea water tend to buffer the water with Alka-Seltzer-like ingredients. Normal pH values in sea water are about 8.1 at the surface and decrease to about 7.7 in deep water. Many shellfish and algae are more sensitive than fish to large changes in pH, so they need the sea's relatively stable pH environment to survive.

Most fish can tolerate pH values of about 5.0 to 9.0, but serious anglers look for waters between pH 6.5 and 8.2. The vast majority of American rivers, lakes and streams fall within this range, though acid rain has compromised many bodies of water in our environment.

* Water Quality Criteria, California Water Quality control Board, 1963.

Turbidity (NTU)

The American Public Health Association (APHA) defines turbidity as "the optical property of a water sample that causes light to be scattered and absorbed rather than transmitted in straight lines through the sample." In simple terms, turbidity answers the question, "How cloudy is the water?"

Light's ability to pass through water depends on how much suspended material is present. Turbidity may be caused when light is blocked by large amounts of silt, microorganisms, plant fibers, sawdust, wood ashes, chemicals and coal dust. Any substance that makes water cloudy will cause turbidity. The most frequent causes of turbidity in lakes and rivers are plankton and soil erosion from logging, mining, and dredging operations.

Measuring Turbidity

The most accurate way to determine water's turbidity is with an electronic turbidimeter . The turbidimeter has a light source and a photoelectric cell that accurately measures the light scattered by suspended particles in a water sample. The results are reported in units called Nephelometric Turbidity Units or NTUs.T

Drinking Water Standards

The APHA specifies drinking water turbidity shall not exceed 0.5 NTUs. However, some scientists think this standard is too generous. They want to see the value reduced to 0.1 NTUs.

Turbidity Effects on Fish and Aquatic Life

Turbidity affects fish and aquatic life by:

Interference with sunlight penetration. Water plants need light for photosynthesis. If suspended particles block out light, photosynthesis—and the production of oxygen for fish and aquatic life—will be reduced. If light levels get too low, photosynthesis may stop altogether and algae will die. It is important to realize conditions that reduce photosynthesis in plants result in lower oxygen concentrations and large carbon dioxide concentrations. Respiration is the opposite of photosynthesis. Large amounts of suspended matter may clog the gills of fish and shellfish and kill them directly. Suspended particles may provide a place for harmful microorganisms to lodge. Some suspended particles may provide a breeding ground for bacteria.

Fish can not see very well in turbid water and so may have difficulty finding food. On the other hand, turbid water may make it easier for fish to hide from predators.

Reactive Phosphates and Total Phosphates (mg/L)
The element phosphorus is necessary for plant and animal growth. Nearly all fertilizers contain phosphates (chemical compounds containing the element, phosphorous). When it rains, varying amounts of phosphates wash from farm soils into nearby waterways. Phosphates stimulate the growth of plankton and water plants that provide food for fish. This may increase the fish population and improve the waterway's quality of life. If too much phosphate is present, algae and water weeds grow wildly, choke the waterway, and use up large amounts of oxygen. Many fish and aquatic organisms may die.

The Phosphorus Cycle is said to be "imperfect" because not all phosphates are recycled. Some simply drain off into lakes and oceans and become lost in sediments. Phosphate loss is not serious because new phosphates continually enter the environment from other sources.

The Phosphorus Cycle
Phosphates come from fertilizers, pesticides, industry, and cleaning compounds. Natural sources include phosphate-containing rocks and solid or liquid wastes.

Phosphates enter waterways from human and animal wastes (the human body releases about a pound of phosphorus per year), phosphate-rich rocks, wastes from laundries, cleaning and industrial processes, and farm fertilizers. Phosphates also are used widely in power plant boilers to prevent corrosion and the formation of scale.

Effects on Humans
Phosphates will not hurt people or animals unless they are present in very high concentrations. Even then, they will probably do little more than interfere with digestion. It is doubtful that humans or animals will encounter enough phosphate in natural waters to cause any health problems.

Forms of Phosphate
Phosphates exist in three forms: orthophosphate, metaphosphate (or polyphosphate) and organically bound phosphate. Each compound contains phosphorus in a different chemical formula. Ortho forms are produced by natural processes and are found in wastewater. Poly forms are used for treating boiler waters and in detergents; they can change to the ortho form in water. Organic phosphates are important in nature and also may result from the breakdown of organic pesticides which contain phosphates.

Hach Company makes kits to test for the presence of phosphate. You willl probably use the cube kit that measures the most common form—orthophosphate—or the color disk that determines orthophosphate and metaphosphate. A total phosphate kit measures all three types of phosphates. Some values for total phosphate-phosphorus are given below.

Phosphate-phosphorus levels and effects

Amount of total phosphate-phosphorus	Effects
0.01-0.03 mg/L	Amount of phosphate-phosphorus in most uncontaminated lakes
0.025 mg/L	Accelerates the Eutrophication process
0.1 mg/L	Recommended maximum for streams

Alkalinity (mg/L)

Alkalinity is not a pollutant. It is a total measure of the substances in water that have "acid-neutralizing" ability. Do not confuse alkalinity with pH. PH measures the strength of an acid or base; alkalinity indicates a solution's power to react with acid and "buffer" its pH— that is, the power to keep its pH from changing. To illustrate, we will compare two samples of pure water and buffered water. Absolutely pure water has a pH of exactly 7.0. It contains no acids, no bases, and no (zero) alkalinity. The buffered water, with a pH of 6.0, can have high alkalinity. If you add a small amount of weak acid to both water samples, the pH of the pure water will change instantly (become more acid). But the buffered water's pH will not change easily because the Alka-Seltzer-like buffers absorb the acid and keep it from "expressing itself." Alkalinity is important for fish and aquatic life because it protects or buffers against pH changes (keeps the pH fairly constant) and makes water less vulnerable to acid rain. The main sources of natural alkalinity are rocks, which contain carbonate, bicarbonate, and hydroxide compounds. Borates, silicates, and phosphates may also contribute to alkalinity. Limestone is rich in carbonates, so waters flowing through limestone regions generally high alkalinity— hence its good buffering capacity.

Nitrates (mg/L)

Nitrite and Nitrate are forms of the element Nitrogen, which makes up about 80 percent of the air we breathe. As an essential component of life, nitrogen is recycled continually by plants and animals, and is found in the cells of all living things. Organic nitrogen (nitrogen combined with carbon) is found in proteins and other compounds. Inorganic nitrogen may exist in the free state as a gas, as ammonia (when combined with hydrogen), or as nitrite or nitrate (when combined with oxygen). Nitrites and nitrates are produced naturally as part of the nitrogen cycle, when a bacteria 'production line' breaks down toxic ammonia wastes first into nitrite, and then into nitrate.

Sources of nitrites and nitrates

Nitrate is a major ingredient of farm fertilizer and is necessary for crop production. When it rains, varying nitrate amounts wash from farmland into nearby waterways. Nitrates also get into waterways from lawn fertilizer run-off, leaking septic tanks and cesspools, manure from farm livestock, animal wastes (including fish and birds), and discharges from car exhausts. Nitrates stimulate the growth of plankton and water weeds that provide food for fish. This may increase the fish population. However, if algae grow too wildly, oxygen levels will be reduced and fish will die. Nitrates can be reduced to toxic nitrites in the human intestine, and many babies have been seriously poisoned by well water containing high levels of nitrate-nitrogen. The U.S. Public Health Service has established 10 mg/L of nitrate-nitrogen as the maximum contamination level allowed in public drinking water. Effects of nitrates and nitrites on fish and aquatic life Nitrate-nitrogen levels below 90 mg/L and nitrite levels below 0.5 mg/L seem to have no effect on warm-water fish.

E. coli (colonies per 100 ml)

Total Coliform (colonies per 100 ml)

Also being documented are stream site physical conditions and air temperature.

Monitoring performed by: Highland SWCD Staff, Brown SWCD Staff, High School Student Volunteers and High School Teacher Sponsors/Advisors. Participating school districts (8) are listed below:

Western Brown, Fayetteville-Perry, Ripley-Union-Lewis, Eastern Brown, Georgetown Exempted, White Oak, Hillsboro and Lynchburg High Schools.

Procedures followed: All water monitoring procedures were adapted by each collection team according to the Hach Company "water analysis handbook, third edition" made available in the Q.A.P.P. Document. This involves some freedom to analyze samples at stream site or in classroom/lab setting.

Monitoring Schedule: The water monitoring activities performed by student and teacher volunteers began with teacher training in August/2000. The monitoring was performed during the school year as weather permitted. This monitoring was primarily performed in the spring and fall months. This includes the fall of 2000 and was concluded in the spring of 2002.

Data Collected: All data collected from August 2000 till June 2002 and was recorded onto data sheets and reviewed by teacher advisors. These data sheets are photocopied and sent to the Brown SWCD. These data sheets were then reviewed by district staff and saved in digital form on district computer's hard drive and floppy disks. The disks are stored in fire-proof safe. All data has been made available to the White Oak Creek Watershed Project Advisory Board, Watershed Coordinator, and the Ohio EPA.

Quality Control Issues and Corrections

All field and laboratory quality controls checks (Q.A.P.P. march 2000) were utilized in order to minimize errors. The parameters measured are listed below. Additional monitoring of sites in needed in order to record a more complete account of water quality. The following parameters were not tested or measured in this project: BOD, Total Hardness and Conductivity. Equipment and procedures for these parameters were not made available to the project or volunteers.

Project Status

The White Oak Creek Water Monitoring Project has completed the objectives found in the Quality Assurance Project Plan. The data collected from this project will be utilized in the current Watershed Action Plan and made available to all stakeholders. Future monitoring will include volunteer teacher and student data that is made possible by all equipment donated to the participating school districts as part of this project. In addition, the Brown and SWCD's have aquired a YSI 650 Sonde that will be used to update water quality data within the watershed. The Brown and Highland SWCD's will also continue to monitor aquatic macroinvertebrate populations within the White Oak Creek watershed with the help of volunteer student, teacher and resident monitors.

Parameters Measured	Stream Averages
Air Temperature (°C)	15.88
Water Temp. (°C)	12.56
pH	8.06
Alkalinity (mg/L CaCO3)	188.37
Turbidity (NTU)	19.80
Reactive Phosphates (mg/L)	0.54
Total Phosphates (mg/L)	0.90
Total Nitrates (mg/L)	0.74
Total Coliform (colonies/100mL)	28816.35
E-Coli (colonies/100mL)	3543.16
Dissolved Oxygen (mg/L)	9.93

Conclusions of Water Quality

The water quality of White Oak Creek seems to be fairly consistent from site to site and season to season. However, there were limited samples taken from several of our monitoring sites. The parameters that show some need for concern include the levels of E.coli and Total Coliform. The Nitrate and Phosphate levels seem to fluctuate with season and by site. The turbidity levels fluctuate greatly after rain events and are in need of further monitoring. The data collected as part of this project should serve as a baseline for future monitoring and water quality/conservation efforts.

Invertebrate Monitoring

The White Oak Creek and its tributaries routinely reveal diverse and abundant populations of aquatic invertebrates. A list of organisms collected by the Ohio Department of Transportation, Office of Environmental Services is listed below. These invertebrates were collected in the spring of 2001 in the main stream of White Oak Creek at the White Oak Valley intersection. This information is available in an Ecological Survey Report BRO-CR-21-4.989/5.134(PIDs 18811/18812).

Flatworms (Planaridae), Aquatic Sow Bugs (Asellidae), Scud (Gammaradae), Mayfly (Baetidae, Heptageniidae, Isonychiidae), Damselfly (Coenagrionidae), Stonefly (Perlidae), Dobsonfly and Fishfly (Dorydalidae), Caddisfly (Hydropsychidae), Water Penny Beetle (Psephenidae), Riffle Beetle (Elmidae), Midge (Chironomidae), Ram Horns (Planorbidae), Asian Clams (Corbiculidae), Fingernail Clams (Sphaeriidae).

Aquatic Macro-invertebrates will continue to be monitored throughout the watershed as part of an ongoing educational outreach project conducted by the Brown SWCD. This is made possible through a W.A.W.A. Grant from the ODNR, Division of Soil and Water Conservation.

Future Monitoring Activities

The anticipated water quality monitoring activities include web based access to all data, additional water monitoring and data collection performed by SWCD staff, student/teacher volunteers, public outreach events/monitoring, invertebrate monitoring within watershed, rain event monitoring with the use of a YSI Sonde and utilization of weather monitoring equipment within the watershed. Future plans also include Pre and Post implementation project monitoring, long term monitoring stations to determine load reductions. A yearly "State of the Watershed Report" will also be produced. The report will include all new monitoring data and describe what shape the watershed is in.

Monitoring Goal

1. Work with OEPA and volunteers to fill in missing data gaps. Limited water quality data is available in the headwaters and tributaries of White Oak Creek. A goal to collect and analyze more data in these areas is a necessity. A Lab Monitoring Proposal has been submitted (2003) and is in the set-up process to begin water quality monitoring utilizing OEPA's lab.
   Lab Proposal is located on in the Appendix

   Time Frame: January 2004 – ongoing
   Funding: OEPA & Brown and Highland Soil & Water Conservation Districts

2. **FISH Monitoring** - Conduct a baseline study to evaluate fish population. Subcontract with a local university for a stream fish population study to develop baseline data for White Oak Creek.

Time Frame: March 2004 through 2005
Funding: OEPA 319 grant program

Watershed landowners at the creek learning about current water quality

Simple water quality monitoring being conducted

Section IX. Funding Strategies

A list of possible funding sources has been put together as a guideline for implementation practices. Many of these sources are already are currently providing assistance for programs and practices. The list will grow as other sources become available.

- **319 Grant Funds**
  - To Date $445,000 spent on education, implementation and planning.
  - Fiscal Year 2004 - $230,254
  - Future grants will be written to address water quality impairments and target critical areas.
- **Federal Farm Bill Funds**
  - Conservation Reserve Program
  - Environmental Quality Incentives Program
  - Wildlife Habitat Incentives Program
  - Forest Land Enhancement Program
  - Grassland Reserve Program
  - Wetland Reserve Program
  - Conservation Security Program
  - Special Pilot Project Funds
- **Division of Forestry & US Fish and Wildlife**
  - Funding for livestock exclusion projects (5.8 miles funded to date (3/04)
  - Approximately 31 more miles are in need of fencing dollars ($982,080)
- **ODNR/EPA**
  - Watershed Coordinator position
  - Special Project Funding
- **Ohio Department of Natural Resources**
  - Cost Share
  - Special Pilot Project funding
  - Operational Grants
  - Dam Removal
- **County Commissioners**
  - Brown County provides all match for the watershed coordinator grant

  - Highland County may contribute with Best Management Practice or salary
- **Southern Ohio Tobacco Foundation**
  - Conservation and implementation programs
- **DEFA**
  - Revolving loan funds
- **Ohio Environmental Education Funds**
  - Small educational grants
- **Donations**
  - Private and Public
- **Private Foundations and/or Corporations**
- **Rumpke Landfill**
  - **Donations**
  - **Grants**
- **Membership Dues** (Future development of established group)
- **Clean Ohio Grant Funds**
- **Ohio Farm Bureau**
  - Grants
  - Cost Share
  - Donations
  - Volunteers
- **Ohio State University Extension**
  - Program assistance
  - Volunteers
  - Facilities
- **ODNR Division of Wildlife**
  - Grants
  - Fencing Funds
  - Program Assistance
- **Watershed Villages**
  - Mt. Orab
  - Georgetown

- Buford
- Mowrystown
- Sardinia
  - Cost Share
  - Donations
  - Policy
  - Fees

- **County Appropriations**
  - Brown County
    - General Fund
    - Solid Waste Authority
    - Emergency Management Association
    - GIS Policy Board
    - And others
  - Highland County
    - General Fund
    - GIS
    - And others
- **Partnership Associations Donations**
  - Ohio Corn Growers Association
  - Ohio Soybean Association
  - Farm Bureau AWARE Program
  - Cattlemen Association
  - Pork Producers Association
  - State Dairy Association
  - Brown County Rural Water Association
  - Ohio State University Research Farm (Brown County)

** This is a partial list of funding sources that will be utilized in pursuing additional money for the White Oak Creek Watershed Project. Some of these possible funding*

sources have already been utilized and may be utilized in the future. As the watershed program grows many other funding sources will be added to this list.

Pictured above are some current project funding sources: Brown SWCD Employees & Board Members, NRCS, and County Commissioners

Evaluation

The ultimate goal for evaluation of the White Oak Creek Watershed Project will be if the non or partial attaining stream segments move into full attainment as a result of White Oak Creek Watershed implementation strategies.

The following table has been created to set up evaluation activities that will track the success of the White Oak Creek Watershed Action Plan. Evaluation of the goals and implementation phases will be carried out by the following activities. The ultimate evaluation tool will be if non-attaining or partial attaining streams will move into full attainment. However, other efforts such as education and stakeholder participation will also be evaluated to determine the overall effectiveness and success of the watershed project. Load reductions are the most critical area of evaluation and will be focused on as implementation practices are set into place. The Load Reduction Program will be used to determine effectiveness. However, the timeframe for noticeable water quality improvements may be over a longer period of time.

Evaluation Activity	Who	How	Timeframe
Load reduction calculations for all BMP installed	Resource Management Specialist, watershed coordinator & Advisory board	Set load reduction criteria by using the STEPL program.	Pre and post implementation project
Pre and Post implementation project monitoring component to evaluate the effectiveness of the implementation efforts	Watershed coordinator & volunteers	Establish baseline conditions and post project monitoring to determine if the implementation practice has been effective in reducing the amount of pollutant entering the stream segment.	Pre and post implementation projects
Mid-Course Evaluation Criteria & Strategies	Watershed coordinator, volunteers, student interns, contracted expert, and/or	Set up a short term water quality monitoring program midway through the life of the Watershed Action Plan to evaluate	2007/2008

	OEPA	the effectiveness of installed Best Management Programs and any other implementation projects that have been implemented to date.	
Progress toward attaining water quality standards	White Oak Creek Watershed Group (Agency and Volunteers)	Use monitoring to determine if substantial progress is being made towards attaining water quality standards. If this is not happening, then consider reevaluating the implementations practices set forth in this watershed action plan.	Throughout the watershed plans lifetime. 2003 - 2014
Establish long term monitoring stations to determine load reductions and water quality improvements	Watershed volunteers, watershed coordinator and watershed group	Collect lab samples to have analysed by the OEPA lab. Also set up a new permanent USGS gauging station on the upper river miles of White Oak Creek to monitor several different parameters (including flow).	Quarterly lab monitoring Daily monitoring with USGS station
Evaluate education outreach activities and meetings by tracking number of participants	Watershed coordinator & Advisory board	Use sign in sheets and public participation documents to evaluate the effectiveness of education programs	At each activity-Yearly totals

Evaluate stakeholder attitudes and education through surveys	Watershed coordinator & Advisory board	Mail and handout surveys at educational activities to determine the watershed citizens ideas, concerns and attitudes toward the watershed program	Throughout the project
Hold citizens meetings to evaluate and publicize project success	Watershed coordinator, Ohio State University Extention	* Hold citizen meeting to gather data from watershed residents * Use local media to publicize project activities * Give reports to county/township and civic organizations	Throughout the project
Produce a yearly "State of the Watershed" Report to promote highlights of the watershed project yearly	Watershed Coordinator & OSU Extension	Produce a document with updated data, tracking the progress of the watershed group each year to inform citizens and project partners about the past years water quality efforts and accomplishments. All volunteers, partners and funding entities will get a copy of the report, along with most watershed residents	Annually
Track progress of the watershed plan and water quality results	Watershed coordinator, focus groups, advisory board and Citizen Watershed Group	Evaluate the effectiveness of all watershed activities and determine when unsatisfactory progress will lead to plan revisions.	Every 2 years

Evaluate funding	Watershed Group, Advisory Board and coordinator	Evaluate current and future funding and what will be available in the future. Use the watershed funding section to evaluate future opportunities.	Yearly or more on an as needed basis

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Experts Consulted

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OEPA Experts
ODNR Experts

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This is only a partial list more areas may be added in the future

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Ohio Environmental Protection Agency
Water Quality Lab Analysis Proposal

Project Summary:

The White Oak Creek Watershed Project's mission is to bring together local communities to enhance water quality and encourage natural resource protection. The White Oak Creek Watershed Partners have produced a Comprehensive Action Plan, which was endorsed by OEPA in April 2004. One of the goals of the action plan is the need of more water quality monitoring data. The lack of monitoring data is a major hindrance in the advancement of the watershed group's improvement efforts. Without this critical data, an accurate depiction cannot be made about each stream segment's health. All of the collected data received from the OEPA monitoring will be used in the Watershed Action Plan.

To date the White Oak Creek Watershed Partners have implemented many new programs to reduce pollution loadings into the stream. Known causes of impairments are Nutrients, Pathogens, Sedimentation, Flow Alterations and Habitat Alterations. The project has spent an estimated total of $450,000 dollars to implement local pollution reduction best management practices. The money has come from OEPA 319 grant funds and other local entities. Local interests has triggered these water quality improvement efforts and with the additional monitoring data needed the project partners can make a more accurate diagnosis of the stream and where implementation effort should be focused. Pollution load reductions, in accordance with the action plan, are the priority of the watershed group and without accurate and up-to-date monitoring data, pollution source areas are harder to find and evaluate.

Lab Analysis Needs:

To accurately determine water quality critical areas more monitoring needs to be completed. The watershed coordinator in conjunction with the education coordinator or (properly trained volunteers) will collect water samples from designated sites, in accordance with OEPA standards, and deliver then to the Division of Environmental Services in Columbus, Ohio for lab analysis. Ohio EPA Division of Environmental Services Chain of Custody will be used. All Ohio EPA lab sheets and containers will be used to follow all standards and handling standards. The White Oak Creek Watershed Coordinator has been through OEPA monitoring training.

The chemical tests that are most desperately needed are Nitrates, Phosphates, Suspended Solids and Bacterial (e-coli & fecal coliform). With the addition of this valuable data more detailed targeting of water quality impairments can be used for the assessment of implementation practices.

Chemical Tests Requested
Nitrates
Phosphates
E-coli
Fecal Coliform
Suspended Solids

Proposed Sites to be monitored

- Slabcamp Run
- Bells Run
- East Fork of White Oak Creek
- North Fork of White Oak Creek
- Little North Fork of White Oak Creek
- Flat Run
- Mouth of Unity Creek
- Mouth of Sterling Run
- Town Run near mouth
- Town Run in Georgetown
- Upper Sterling Run
- Miranda Run
- White Oak Creek Main Stem - Lower
- White Oak Creek Main Stem – Mid
- Sterling Run at Lake Grant
- Sterling Run above Mt. Orab

**** Only 8 sites will be monitored during one collection session.***
All sites will be entered into the STORET database.

When samples will be collected:

Each site will be sampled 6 times per sampling season. The samples will be preserved and immediately driven to the Division of Environmental Services facility in Columbus for analysis. The sampler will follow all protocol set forth by OEPA and their monitoring needs. Samples will be collected during the sampling season (June through October), unless changed by OEPA or the watershed coordinator. In most cases water samples will collected all sites. Except when e-coli and fecal coliform is tested. All bacterial samples (e-coli, ect.) will be collected as quickly as possible with immediate delivery to the lab. The holding time for these samples is only 6 total hours. When non-bacterial samples are taken, flow may also be measured to give a more accurate account of what the stream is like at that point in time. Other test may be preformed at the time of water collection. A YSI sonde will be used to measure temperature, Dissolved Oxygen (DO), pH, and Turbidity. Visual observations, along with QHEI data may also be collected at each site.

Budget

Parameter	Number of sites	Cost	Total Cost (6 tests per site)
Solids, Suspended	8	$11.25	$540.00
E Coli	8	$22.50	$1,080.00
Fecal Coliform	8	$19.00	$912.00
Ammonia/Nitrate-Nitrite	8	$21.50	$1,032.00
TKN/Total Phosphorus	8	$29.75	$1,428.00
TOTAL			***$4,992.00***
Possible – Herbicides (atrazine)	*1*	*270.00*	*$270.00*
Possible Total			***$5,262.00***

White Oak Creek Watershed Water Monitoring Data

Collected by
High School Water Monitoring Teams

2000 – 2002

Ripley 1	9/13/2000	9/22/2000	10/19/2000	10/25/2000	11/2/2000	11/16/2000	12/15/2000
Air Temperature (°C)	25	15.5	15.5	24.4	22.8	7.3	4.4
Water Temp. (°C)	26.4	21.7	13.7	18.4	15	11.7	5
pH	8.2	9.1	8.1	8.3	8.2	8.3	8.5
Alkalinity (mg/L CaCO3)	301	142		189	370	188	294
Turbidity (NTU)	11	10	6	15.5	12	8	13
Reactive Phosphates (mg/L)					0.25	0.33	over range
Total Phosphates (mg/L)						0.94	
Total Nitrates (mg/L)	0.4	0.8				0.7	0.9
Total Coliform (colonies/100mL)				10	20	168	
E-Coli (colonies/100mL)				317	23	96	
Dissolved Oxygen (mg/L)		11.6		9.8			

9/28/2001	10/12/2001	10/31/2001	11/16/2001	11/20/2001	Averages
17	24	22	22	9.5	17.45
19.8	19.1	11.2	12	10.8	15.40
8.7	8.6	8.6	8.5	8.6	8.48
104	150	190	176	199	209.36
14	17	8	10	11	11.29
				0.24	0.27
					0.94
	0.4		0.4	0.5	0.59
					66.00
					145.33
10.3			10.7	8.3	10.14

Ripley 2	9/13/2000	9/22/2000	10/19/2000	10/25/2000	11/2/2000	11/16/2000	12/15/2000
Air Temperature (°C)	25	13.9	15.5	24.4	22.8	7.3	4.4
Water Temp. (°C)	24	20.6	11	18.4	15	8.9	2.9
pH	8.3	8.4	8.4	8.3	8.4	8.5	8.5
Alkalinity (mg/L CaCO3)	486	127		244	229	180	301
Turbidity (NTU)	6.1	4	5	1.6	2	5	14.6
Reactive Phosphates (mg/L)					2.12	0.4	over range
Total Phosphates (mg/L)						1.11	
Total Nitrates (mg/L)	0.4	over range				0.7	0.9
Total Coliform (colonies/100mL)				8	153	193	
E-Coli (colonies/100mL)					8	104	
Dissolved Oxygen (mg/L)		11.8		10.4			

6/4/2001	9/19/2001	9/28/2001	10/12/2001	10/31/2001	11/16/2001	11/20/2001	Averages
21	22	20	23	22	28	8.5	18.41
17.3	19.5	15.7	16.8	13.7	10	8.6	14.46
8.5	8.5	8.9	8.5	8.2	8.6	8.7	8.48
	170	96	190	150	225	245	220.25
330	4.3	4	9	16	1	2	28.90
					0.4	0.19	0.78
							1.11
						0.5	0.63
							118.00
							56.00
		10.5			14	8.8	11.10

Georgetown 3	11/6/2000	11/29/2000	12/8/2000	12/19/2000	6/4/2001	9/19/2001	Averages
Air Temperature (°C)	19	1.7			20.3	24	16.25
Water Temp. (°C)	9.8	6	0.9	1.3	17.6	20.3	9.32
pH	8.4	8.4	8.4	8.2	8.57	8.4	8.40
Alkalinity (mg/L CaCO3)	240	187	205	94	15	196	156.17
Turbidity (NTU)	0.95	3.96	2.29	64.7		1.8	14.74
Reactive Phosphates (mg/L)	0.15	0.49					0.32
Total Phosphates (mg/L)			0.04	1.15			0.60
Total Nitrates (mg/L)	0.4	0.4	0.3	0.7			0.45
Total Coliform (colonies/100mL)	860		285	89,000			30048.33
E-Coli (colonies/100mL)	230		0	3,000			1076.67
Dissolved Oxygen (mg/L)	13.1	12.8	13.7	13.3			13.23

Georgetown 4	11/6/2000	11/29/2000	12/8/2000	12/19/2000	Averages
Air Temperature (°C)	20	1.7			10.85
Water Temp. (°C)	11.1	5.3	0.9	1.1	4.60
pH	8.69	8.6	8.7	7.7	8.42
Alkalinity (mg/L CaCO3)	293	181	205	186	216.25
Turbidity (NTU)	1.13	4.73	1.96	42.5	12.58
Reactive Phosphates (mg/L)	0.17	0.72			0.45
Total Phosphates (mg/L)			0.04	1.03	0.54
Total Nitrates (mg/L)	0.3	0.4	0.3	0.7	0.43
Total Coliform (colonies/100mL)			245	490,000	245122.50
E-Coli (colonies/100mL)			0	96,000	48000.00
Dissolved Oxygen (mg/L)	11.4	14.1	14.3	over range	13.27

Eastern 5	9/20/2000	10/3/2000	10/25/2000	11/13/2000	12/4/2000	12/12/2000	3/20/2001	4/2/2001	4/18/2001
Air Temperature (°C)	27	26.5	24	15	2	3	11	19	18
Water Temp. (°C)	19.9	20.8	17.9	8.9	1.2	1.7	7.5	9.7	12.5
pH	8.1	5.6	7.8	7.8	8.2	8.04	8.6	8.2	8.4
Alkalinity (mg/L CaCO3)	220	257	257	179	234	242	195	120	215
Turbidity (NTU)	21	5	4	16	3	3	7	53	3
Reactive Phosphates (mg/L)	0.26	1.54	0.01	0.64	2.21	0	0.06	0.66	0.02
Total Phosphates (mg/L)			0.22	0.62	0.05	0.21	0.17	0.82	0.06
Total Nitrates (mg/L)	0.3	1.3	0.2	0.6	0	0	0	1.3	0.2
Total Coliform (colonies/100mL)			687	5790	1.6	400	1000	413	110
E-Coli (colonies/100mL)			57	370	0	20	0	160	0
Dissolved Oxygen (mg/L)	9.8	8.8	8.9	9.3	over range	14.1	over range	11.4	13.3

4/30/2001	5/15/2001	9/18/2001	10/9/2001	10/23/2001	11/6/2001	11/19/2001	4/9/2002	4/23/2002	5/14/2002	Averages
32	28	21	22	24	17	13	16	18	22	18.87
21.4	21.5	18.3	13.1	17.2	15.1	10.7	14.7	13.7	14.6	13.71
8.3	8.33	8.37	8.2	8.9	7.5	8.5	8.2	7.7	7.8	8.03
197	202	231	211	191	228	211	195	137	102	201.26
7	7	7	4	5	4	6	6	38	49	13.05
0	0.14	0.16	0.32	0.25	0.13	2.45	0.05	0.67	0.59	0.53
0.33	0.04	0.27	0.36	0.79	0.2	0	0.06	0.39	0.59	0.30
0	0.4		0	0.1	0.1	0	0.3	0.7	0.2	0.32
50	645	5,247	980	372	736	2200	1450	372	over range	1278.35
50	20	97	47	6	10	240	0	6	over range	67.69
10	11	7	8.5	8.6	12.7	13.1	12.3	11.7	9.1	10.56

Eastern 6	9/20/2000	10/3/2000	10/25/2000	11/13/2000	12/4/2000	12/12/2000	3/20/2001	4/2/2001	4/18/2001
Air Temperature (°C)	28	27	23	19	8	5	15	21	13
Water Temp. (°C)	18.6	18	17.8	9.1	2.7	2.6	7.3	8.7	12.8
pH	7.9	7.63	7.6	7.6	7.9	7.8	8.3	7.9	8.3
Alkalinity (mg/L CaCO3)		206	257	146	202	221	142	85	187
Turbidity (NTU)	12	13	3	23	8	7	24	51	9
Reactive Phosphates (mg/L)	0.51	0.37	0.84	2.2	1.6	over range	0.77	0.48	0.16
Total Phosphates (mg/L)			0.86	2	0.18	0.47	0.35	0.72	0.24
Total Nitrates (mg/L)	0.3	0.8	0.2	0.3	0	0	0.1	1.6	0.4
Total Coliform (colonies/100mL)			717	6120	5.7	1150	1000	4,030	720
E-Coli (colonies/100mL)			10	160	0.36	40	0	325	90
Dissolved Oxygen (mg/L)	6.5	6.6	5.6	8.9	13.7	13.3	13.5	11.3	12.4

4/30/2001	5/15/2001	9/18/2001	10/9/2001	10/23/2001	11/6/2001	11/19/2001	4/9/2002	4/23/2002	5/14/2002	Averages
27	27	22	20	26	20	14	15	17	20	19.32
18.8	19.2	18.1	13.3	16.4	10.1	10	14.4	13.6	14.2	12.93
7.9	7.99	7.97	7.9	7.6	7.91	8	8.1	7.6	7.8	7.88
222	232	215	215	150	197	207	147	87	61	176.61
8	6	11	12	10	20	12	17	62	54	19.05
0.09	0.18	over range	0.36	1.12	0.5	2.58	0	0.3	0.49	0.74
0.28	0.27	0.52	0.56	0.54	0.65	0.3	0.1	0.55	0.74	0.55
0	0	0	0	0	0	0	0	0	0	0.19
2,933	405	6,213	433	308	3073	2420	1000	308	over range	1927.23
0	0	40	23	17	70	73	500	17	0	80.32
9.5	9.5	9.7	6.6	6.1	8.6	10.1	12.1	9.3	9.2	9.61

Western 7	9/6/2000	9/20/2000	10/4/2000	10/17/2000	11/20/2000	11/30/2000	4/20/2001
Air Temperature (°C)	25	25	31	21	9	9	20
Water Temp. (°C)	23.2	21.7	20.9	15.2	3.2	5.1	15.6
pH	8.4	8.5	8.21	8.25	8.43	8.7	8.9
Alkalinity (mg/L CaCO3)	132	162		248	240	215	235
Turbidity (NTU)	18	5	4.5	5	5	6.11	2.68
Reactive Phosphates (mg/L)	1.04	0.33	0.34	0.39	0.7	0.43	0.08
Total Phosphates (mg/L)					1.08	0.86	0.088
Total Nitrates (mg/L)	0.5	0.7	1.1	0.9	0.9	0.8	0.2
Total Coliform (colonies/100mL)						1,450	
E-Coli (colonies/100mL)						100	
Dissolved Oxygen (mg/L)	9.6	10.7	11.2	12.3	13.4	13.8	over range

4/30/2001	5/16/2001	5/29/2001	9/20/2001	10/18/2001	10/25/2001	11/8/2001	3/25/2002	4/9/2002	4/29/2002	Averages
23	30	22	25	12	15	24	8.5	13	8	18.85
19	23.2	19.6	20.3	11.1	14.6	10.4	7	13.5	13	15.09
8.9	8.7	8	8.5	8.1	7.7	8.3	7.97	8.2	7.96	8.34
	235	112	2.54	125	85	4.74	201	183	91	151.42
2.81	3.3	37.6	3.3	18.9	85.1	2.92	11	3	105	18.78
0.27	0.35	0.95	0.23	0.96	1.2	0.22	0.17	0.09	0.49	0.48
0.08	0.46	0.78		1.8	1.95	0.2		0.09		0.74
0.15	0.15	1.8	0.1	0.7	0.5	0.2	1.4	0.2	0.1	0.61
				5400	over range	5100			over range	3983.33
				300	over range	200			over range	200.00
	11.6	10.3	11.8	11.8	over range	over range	12.6	13.2	8.7	11.62

Western 8	9/6/2000	9/20/2000	10/4/2000	10/17/2000	11/20/2000	11/30/2000	4/20/2001	4/30/2001
Air Temperature (°C)	27	25	27	19	10	10	15	25
Water Temp. (°C)	21.9	18.8	19.8	14.4	3.1	5.1	15	20
pH	8.1	7.9	7.7	7.68	8.1	8.6	8.5	8.7
Alkalinity (mg/L CaCO3)	89	129	109	168	130	102	184	
Turbidity (NTU)	13	6	11.7	3.5	3.63	5.69	3.9	2.81
Reactive Phosphates (mg/L)	0.47	0.41	0.27	0.38	1.17	0.14	0.04	0.33
Total Phosphates (mg/L)					0.3	0.59	0.16	0.09
Total Nitrates (mg/L)	0.8	4.4	2.9	2.4	2.3	0.7	0.4	0.3
Total Coliform (colonies/100mL)						3,500		
E-Coli (colonies/100mL)								
Dissolved Oxygen (mg/L)	9.8	8.9	9.8	11		13	10.8	over range

5/16/2001	5/29/2001	9/20/2001	10/18/2001	10/25/2001	11/8/2001	3/25/2002	4/9/2002	4/29/2002	Averages
28	23	19	10	15	24	6.5	13	8.5	17.94
19.9	21	18.8	13.4	15.8	10.2	7.5	14.5	13	14.84
7.9	8.2	8.2	8.1	7.7	7.6	7.9	8.8	7.87	8.09
252	122	231	172	60	4.5	102	138	81	129.59
2.78	9.81	6.6	23.2	69.2	13.5	80	14	238	29.84
0.37		0.37	0.5	1.21	0.39	0.31	0.05	0.45	0.43
0.54	0.42		1.14	1.88	0.62		0.2		0.59
0.5	0.6	3.4	0.7	0.4	1.4	0.2	0.3		1.36
			2500	over range	1100			Over range	2366.67
			260	over range	100			over range	180.00
		9.2	over range	9.9	11.6	13.5	10.8		10.75

Fayetteville 10	9/20/2000	10/9/2000	10/27/2000	11/15/2000	11/29/2000	3/29/2001	4/18/2001	4/30/2001	5/15/2001
Air Temperature (°C)	22	6	15	2.5	4		3	15	15
Water Temp. (°C)	16.1	7.9	14.7	5	3	5.7	6	14	16
pH	7.8	7.9		7	7.46	7	6	6.5	7
Alkalinity (mg/L CaCO3)	134	117	226	171	101	275	249	199	277
Turbidity (NTU)	8	12.4	10.8	10.4	22	9.99	16	9.8	5.8
Reactive Phosphates (mg/L)	0.46	0.07	2.6	1.27	1.56	0.13	0.39	0.36	0.26
Total Phosphates (mg/L)				2.48	1.6			0.41	
Total Nitrates (mg/L)	0.2	0.8	1.4	0.6		0.2	1.1	1	0.4
Total Coliform (colonies/100mL)			12,100	7,400	over range	300		400	
E-Coli (colonies/100mL)			2,500	180	150	530		0	
Dissolved Oxygen (mg/L)	5.1	7.2	2.9	8.7	10.7	12.9	12.4	7.6	5.1

9/18/2001	10/11/2001	10/23/2001	11/8/2001	3/26/2002	4/15/2002	4/25/2002	5/7/2002	5/16/2002	Averages
19	20	20	10	5	20	9	20	18	13.15
18	17	14.5	7.2	3.3	15.6	12.7	17.5	14.4	11.59
7	8	8	8.1	7.2	7.4	7.8	7.44	7.6	7.36
156	232	171	185	33	58	118	58	92	158.44
7.52	81	10	6	304	9.99	72	142	28	42.54
0.56		0.67	0.27	0.38	1.93	0.46	0.74	6.8	1.11
0.87	0.11	0		1.96	1.4	1.09		1.13	1.11
0.4	1.1	0.3	0.3			0.2		0.1	0.58
	16,200	over range	1800	35,000		30,000	over range	10,000	12577.78
	4,800		1700	2000		5,000	over range	2,000	1886.00
6.2	3.1	6.5	9.8	12.1	8.4	10	8.6	10.1	8.19

Fayetteville 11	9/20/2000	10/9/2000	10/27/2000	11/15/2000	11/29/2000	3/29/2001	4/18/2001	4/30/2001	5/15/2001
Air Temperature (°C)	19	4	13	2	4		1	11	16
Water Temp. (°C)	16.8	7.2	14.2	4.2	4	5.9	5	13	18
pH	7.8	7.8		7	7.4	7.5	6	6	7
Alkalinity (mg/L CaCO3)	151	117	132	179	94	239	246	208	234
Turbidity (NTU)	2.7	13.9	20.7	8.7	17	9.99	12	3.7	3.9
Reactive Phosphates (mg/L)	0.58	0.63	over range	2.36		0.19	0.23	0.41	0.29
Total Phosphates (mg/L)				1.37	3.84			0.21	
Total Nitrates (mg/L)	0.2	1	1	0.6		0.3	0.9	0.7	0.4
Total Coliform (colonies/100mL)			37,000	310,000	over range	802	over range	2,800	
E-Coli (colonies/100mL)			7,000	31,987	1900	10	70	1,000	
Dissolved Oxygen (mg/L)	4.3	7.2	5	9.2	9.7	14.2	10.8	6.5	5.5

9/18/2001	10/11/2001	10/23/2001	11/8/2001	3/26/2002	4/15/2002	4/25/2002	5/7/2002	5/16/2002	Averages
19	20	20	9	5	17	8	23	16	12.18
18	15	14.5	6.1	3.3	15.6	12.7	17	14.7	11.40
7	7	8.03	8.3	7.2	7.56	7.7	7.42	7.58	7.31
192	220	191	236	30	56	108	36	98	153.72
2.13	3	7	4	302	9.99	46	126	30	34.60
0.92	1.63	1.04	0.3	1.56	1	0.37	0.9	0.6	0.81
1	0.05	0		2.62	2.5	0.89	0.08	1.13	1.24
0.3	0.4	0.2	0.4			0.2			0.51
	3400	13,020	1300	27,000		28,000	over range	9,000	43232.20
			700	0		0	over range	3,000	4566.70
6.2	4	4.8	9.1	over range	10.6	9	8.3	9.4	7.87

Hillsboro 13	9/29/2000	3/15/2001	8/30/2001	10/30/2001	11/13/2001	11/27/2001	3/18/2002	4/8/2002
Air Temperature (°C)		6	28	11	3	14	16	22
Water Temp. (°C)	18.3	6.3	24	9.6	4.5	10	10.3	12.6
pH	7.8	7.9		8.2	8.2	7.7	8.6	8.7
Alkalinity (mg/L CaCO3)	247.5	164				140		165
Turbidity (NTU)	8.97	5.91	8.1		2.49	219	13.5	3.1
Reactive Phosphates (mg/L)	0.9	over range				over range	0.8	0.12
Total Phosphates (mg/L)								
Total Nitrates (mg/L)	2.2	0.5				0.89	3.9	0.3
Total Coliform (colonies/100mL)		336						
E-Coli (colonies/100mL)		84						319
Dissolved Oxygen (mg/L)	9.2	7.6				over range	over range	over range

5/29/2002	10/16/2001	Averages
25	5	14.44
16.7	11.5	12.38
8.1	7.95	8.13
163		175.90
6.1		33.40
over range		0.61
0.6		1.40
301		318.50
3		135.33
over range		8.40

WhiteOak 15	10/12/2000	10/26/2000	11/10/2000	3/29/2001	4/17/2001	4/30/2001	5/30/2001	9/27/2001	10/12/2001
Air Temperature (°C)	17.2	30	27	7.8	16	26	17.2	13.7	
Water Temp. (°C)	11.3	17.1	15.7	8	9.5	20.8	19.6	14.5	
pH	8	7.77	7.5	8.2	8.4	8.6	8.4	8.43	8.23
Alkalinity (mg/L CaCO3)	250	337	267	204	271	263		260	244
Turbidity (NTU)	3.7	2.3	5.8	1.77	2.6	2.72	8.3	3.69	4.3
Reactive Phosphates (mg/L)	0.3	0.08	0.1	0.06	0.07	2.04	1.04	0.11	0.03
Total Phosphates (mg/L)									
Total Nitrates (mg/L)	0.1	0.3	0.5	0.09	0.2		0.1	4	0.6
Total Coliform (colonies/100mL)					64				25
E-Coli (colonies/100mL)					5				20
Dissolved Oxygen (mg/L)	11.9	5.9	8.3	13.7	8.2	14.2	3.8	10.2	11.4

10/23/2001	11/12/2001	12/4/2001	Averages
17.4	21		19.33
8.7	17		14.22
7.32			8.09
871	333	318	328.91
4	4.5	3.96	3.97
0	0.09	0.36	0.36
0.7	0.7	4.5	1.07
51	9	7	31.20
46	3	2	15.20
12.3	12.8	11.3	10.33

WhiteOak 16	10/12/2000	10/26/2000	11/10/2000	3/29/2001	4/17/2001	4/30/2001	5/30/2001	9/27/2001	10/12/2001
Air Temperature (°C)	17.8	34	29	6.8	16	30	18.1	14.9	
Water Temp. (°C)	10.5		14.2	8.6	10.2	17.6	18.9	14.2	
pH	7.23	7.63	7.9	7.1	8.2	8.3	8.1	8.51	7.67
Alkalinity (mg/L CaCO3)	263	280	287	274	191	237	303		277
Turbidity (NTU)	4.8	2.5	3	2.47	3.12	3.47	9.5	3.79	4.15
Reactive Phosphates (mg/L)	0.25	0.22	0.17	0.41	0.06	0.3	1.24	0.13	0.27
Total Phosphates (mg/L)									
Total Nitrates (mg/L)	0.3	0.4	0.4	0.5	0.7	0.4	1.8	0.6	0.3
Total Coliform (colonies/100mL)					42		200		12
E-Coli (colonies/100mL)					4		1		15
Dissolved Oxygen (mg/L)	10.7	3.7	8.9	12.3	9.4	9.5		11.1	10.2

10/23/2001	11/12/2001	12/4/2001	Averages
18.2	20		20.48
0.5	7		11.30
7.32			7.80
218	293	262	262.27
4.2	4.83	7.11	4.41
0.25	0.21	0.16	0.31
0.8	0.5	1.9	0.72
2	21	14	48.50
1	3	3	4.50
8.4	10.3	10.6	9.55

Lynchburg 17	10/16/2000	10/31/2000	11/15/2000	11/29/2000	3/27/2001	4/18/2001	4/25/2001	5/23/2001	9/12/2001
Air Temperature (°C)	21.1	1.7	1.1	1.1	10	1.7	5	10	21.1
Water Temp. (°C)	17.5	16.6	6	7.4	8.3	16.5	10	15.4	23
pH	8.7	7.8	7.9	8.1	8.8	8.8	7.8	7.3	8.01
Alkalinity (mg/L CaCO3)	204	209	215	228	175	152	167		195
Turbidity (NTU)	2.18	2.23	2.18	10.9	2.06	1.5	2.54		2.79
Reactive Phosphates (mg/L)					0.07	0.27			
Total Phosphates (mg/L)					0.24				0.67
Total Nitrates (mg/L)					1.5	0.25	0.2		3
Total Coliform (colonies/100mL)									610
E-Coli (colonies/100mL)									105
Dissolved Oxygen (mg/L)							8		4.1

10/3/2001	10/30/2001	11/27/2001	Averages
26.7	15.6	15.6	10.89
20.3	12.4	13.3	13.89
8.8	8.4	7.7	8.18
176	186	55	178.36
2.99	4.42	44.6	7.13
0.12	0.18	over range	0.16
0.33	1.1	5.15	1.50
2.9	2.3	0.4	1.51
	8985	314,500	108031.67
		160	132.50
11.7	12.3	8.55	8.93

Lynchburg 18	10/16/2000	10/31/2000	11/15/2000	11/29/2000	3/27/2001	4/18/2001	5/1/2001	5/23/2001	9/12/2001
Air Temperature (°C)	21.1	10	1.1	0	7.2	1.7	23.9	15.6	21.1
Water Temp. (°C)	18.1	9.8	7	6.8	8.5	12.2	21	18.4	20.4
pH	7.5	7.8	7.56	7.6	8.7	8.7	8.1	7.5	7.97
Alkalinity (mg/L CaCO3)	221	262	241	111	150	177	212		181
Turbidity (NTU)	2.97	3.01	2.99	12.9	3.88	4.13	5.04		1.53
Reactive Phosphates (mg/L)					0.08				
Total Phosphates (mg/L)					0.5				1.54
Total Nitrates (mg/L)					1.4	0.45	0.3		0.3
Total Coliform (colonies/100mL)									3025
E-Coli (colonies/100mL)									
Dissolved Oxygen (mg/L)						8.7	over range		7

10/3/2001	10/31/2001	11/27/2001	Averages
23.9	10	15.6	12.60
17.7	9.4	14.2	13.63
8	8.4	8	7.99
209	192	67	183.91
1.64	4.67	84.9	11.61
0	0.33	2.34	0.69
	0.98	3.15	1.54
0.3	0.95	0.45	0.59
678	13,400	29,100	11550.75
	0	210	105.00
3.6		over range	6.43

Hillsboro 20	9/29/2000	9/28/2001	3/15/2001	10/16/2001	10/30/2001	11/13/2001	11/27/2001	3/18/2002
Air Temperature (°C)			6.5	6	9	1	16.5	13
Water Temp. (°C)	18.9	18.9	5.9	12	10.1	4.4	11.3	9.4
pH	7.51	7.51	7.9	7.7	7.9	7.98	7.7	8.7
Alkalinity (mg/L CaCO3)	132	132	171			2.99	80	
Turbidity (NTU)	7.76	7.76	6.37				170	12.6
Reactive Phosphates (mg/L)	0.33	0.33	over range				1.64	0.5
Total Phosphates (mg/L)								
Total Nitrates (mg/L)	0.4	0.4	0				0.1	4.2
Total Coliform (colonies/100mL)			340					
E-Coli (colonies/100mL)			24					
Dissolved Oxygen (mg/L)	7.9	7.9					10.8	over range

4/15/2002	5/29/2002	Averages
27	25	13.00
14	16.7	12.16
8.5	8.2	7.96
80	182	111.43
5.6	5.8	30.84
0.14	over range	0.59
0.7	0.4	0.89
423	319	360.67
88	6	39.33
over range	over range	8.87

	Ripley 1	Ripley 2	Georgetown 3	Georgetown 4	Eastern 5	Eastern 6	Western 7	Western 8
Air Temperature (°C)	17.45	18.41	16.25	10.85	18.87	19.32	18.85	17.94
Water Temp. (°C)	15.40	14.46	9.32	4.60	13.71	12.93	15.09	14.84
pH	8.48	8.48	8.40	8.42	8.03	7.88	8.34	8.09
Alkalinity (mg/L CaCO3)	209.36	220.25	156.17	216.25	201.26	176.61	151.42	129.59
Turbidity (NTU)	11.29	28.90	14.74	12.58	13.05	19.05	18.78	29.84
Reactive Phosphates (mg/L)	0.27	0.78	0.32	0.45	0.53	0.74	0.48	0.43
Total Phosphates (mg/L)	0.94	1.11	0.60	0.54	0.30	0.55	0.74	0.59
Total Nitrates (mg/L)	0.59	0.63	0.45	0.43	0.32	0.19	0.61	1.36
Total Coliform (colonies/100mL)	66.00	118.00	30048.33	245122.50	1278.35	1927.23	3983.33	2366.67
E-Coli (colonies/100mL)	145.33	56.00	1076.67	48000.00	67.69	80.32	200.00	180.00
Dissolved Oxygen (mg/L)	10.14	11.10	13.23	13.27	10.56	9.61	11.62	10.75

Fayetteville 10	Fayetteville 11	Hillsboro 13	WhiteOak 15	WhiteOak 16	Lynchburg 17	Lynchburg 18	Hillsboro 20
13.15	12.18	14.44	19.33	20.48	10.89	12.60	13.00
11.59	11.40	12.38	14.22	11.30	13.89	13.63	12.16
7.36	7.31	8.13	8.09	7.80	8.18	7.99	7.96
158.44	153.72	175.90	328.91	262.27	178.36	183.91	111.43
42.54	34.60	33.40	3.97	4.41	7.13	11.61	30.84
1.11	0.81	0.61	0.36	0.31	0.16	0.69	0.59
1.11	1.24				1.50	1.54	
0.58	0.51	1.40	1.07	0.72	1.51	0.59	0.89
12577.78	43232.20	318.50	31.20	48.50	108031.67	11550.75	360.67
1886.00	4566.70	135.33	15.20	4.50	132.50	105.00	39.33
8.19	7.87	8.40	10.33	9.55	8.93	6.43	8.87

	Stream Averages
Air Temperature (°C)	15.88
Water Temp. (°C)	12.56
pH	8.06
Alkalinity (mg/L CaCO3)	188.37
Turbidity (NTU)	19.80
Reactive Phosphates (mg/L)	0.54
Total Phosphates (mg/L)	0.90
Total Nitrates (mg/L)	0.74
Total Coliform (colonies/100mL)	28816.35
E-Coli (colonies/100mL)	3543.16
Dissolved Oxygen (mg/L)	9.93

STUDENT WATER MONITORING AVERAGES

Site Averages	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 10	Site 11	Site 13	Site 15	Site 16	Site 17	Site 18	Site 20	Stream Averages
Air Temperature (°C)	17.45	18.41	16.25	10.85	18.87	19.32	18.85	17.94	13.15	12.18	14.44	19.33	20.48	10.89	12.60	13.00	15.88
Water Temp. (°C)	15.40	14.46	9.32	4.60	13.71	12.93	15.09	14.84	11.59	11.40	12.38	14.22	11.30	13.89	13.63	12.16	12.56
pH	8.48	8.48	8.40	8.42	8.03	7.88	8.34	8.09	7.36	7.31	8.13	8.09	7.80	8.18	7.99	7.96	8.06
Alkalinity (mg/L CaCO3)	209.36	220.25	156.17	216.25	201.26	176.61	151.42	129.59	158.44	153.72	175.90	328.91	262.27	178.36	183.91	111.43	188.37
Turbidity (NTU)	11.29	28.90	14.74	12.58	13.05	19.05	18.78	29.84	42.54	34.60	33.40	3.97	4.41	7.13	11.61	30.84	19.80
Reactive Phosphates (mg/L)	0.27	0.78	0.32	0.45	0.53	0.74	0.48	0.43	1.11	0.81	0.61	0.36	0.31	0.16	0.69	0.59	0.54
Total Phosphates (mg/L)	0.94	1.11	0.60	0.54	0.30	0.55	0.74	0.59	1.11	1.24				1.50	1.54		0.90
Total Nitrates (mg/L)	0.59	0.63	0.45	0.43	0.32	0.19	0.61	1.36	0.58	0.51	1.40	1.07	0.72	1.51	0.59	0.89	0.74
Total Coliform (colonies/100mL)	66.00	118.00	30048.33	245122.50	1278.35	1927.23	3983.33	2366.67	12577.78	43232.20	318.50	31.20	48.50	108031.67	11550.75	360.67	28816.35
E-Coli (colonies/100mL)	145.33	56.00	1076.67	48000.00	67.69	80.32	200.00	180.00	1886.00	4566.70	135.33	15.20	4.50	132.50	105.00	39.33	3543.16
Dissolved Oxygen (mg/L)	10.14	11.10	13.23	13.27	10.56	9.61	11.62	10.75	8.19	7.87	8.40	10.33	9.55	8.93	6.43	8.87	9.93

Threatened
And
Endangered
Species Maps

Ohio Department of Natural Resources

BOB TAFT, GOVERNOR SAMUEL W. SPECK, DIRECTOR

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Nancy Strayer, Acting Chief
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Phone: (614) 265-6453; Fax: (614) 267-3096

January 24, 2003

Heidi Devine
ODNR, Division of Wildlife
1076 Old Springfield Pike
Xenia, OH 45385

Dear Ms. Devine:

I have reviewed our Natural Heritage maps and files for the White Oak Creek Watershed Action Plan and Inventory project in Brown and Highland Counties. The locations for records of rare and endangered species and other natural features within this project area are indicated on the attached maps. On the maps, the thick blue lines indicate watershed boundaries, the thinner (and straight) blue lines indicate quadrangle boundaries. Also, the pink lines indicate township boundaries, and the red lines indicate county lines. The open red circles indicate the locations of rare species and natural features. Common name, scientific name and status are given for each species.

There are no existing or proposed state nature preserves or scenic rivers within the project area. We are also unaware of any geologic features, breeding or non-breeding animal concentrations, champion trees, or state parks, forests or wildlife areas in the project vicinity.

Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Please note that although we inventory all types of plant communities, we only maintain records on the highest quality areas. Also, we do not have data for all Ohio wetlands. For National Wetlands Inventory maps, please contact Madge Fitak in the Division of Geological Survey at 614-265-6576.

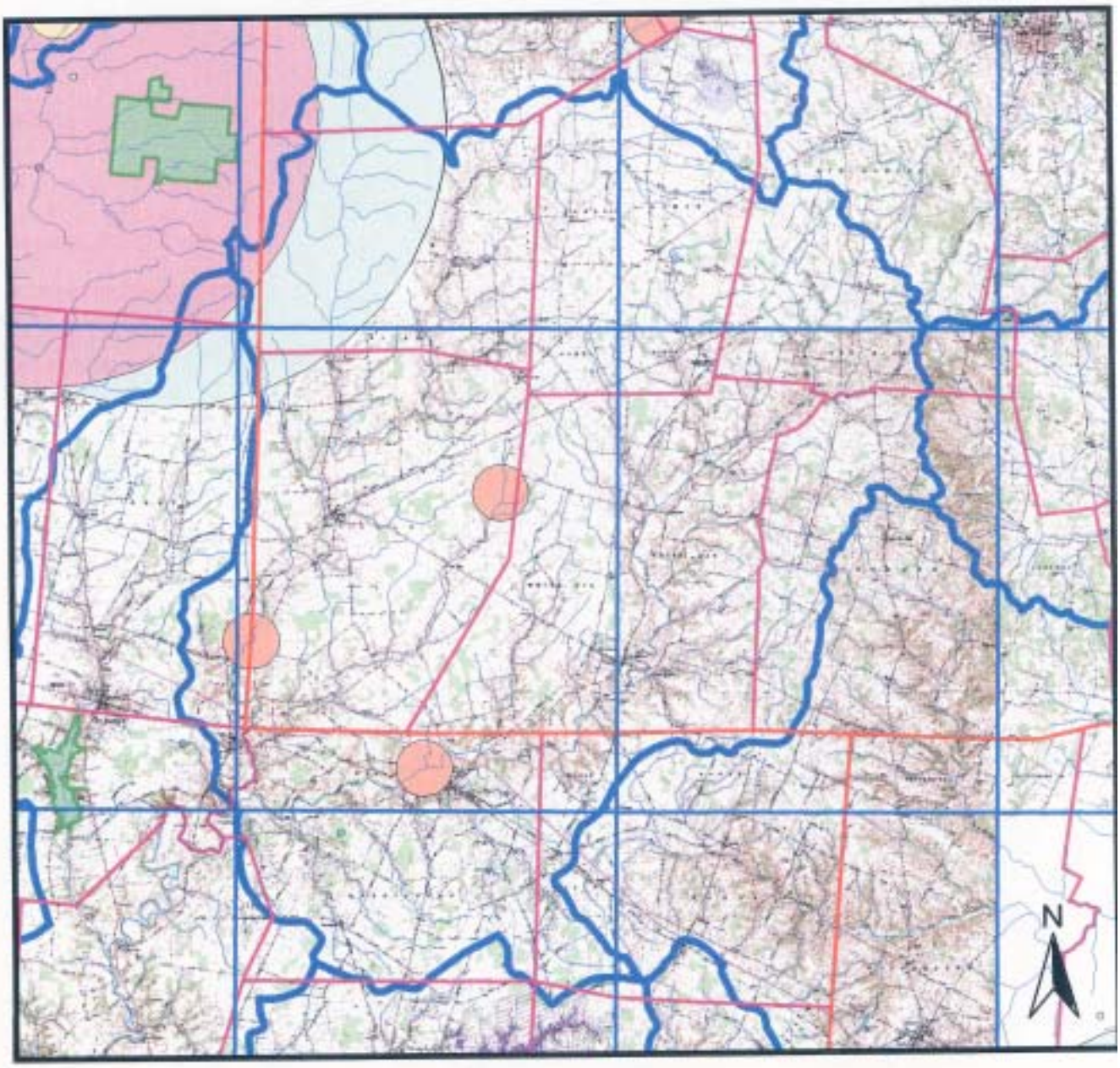
Please contact me at 614-265-6818 if I can be of further assistance.

Sincerely,

Debbie Woischke

Debbie Woischke, Data Specialist
Support Services Group

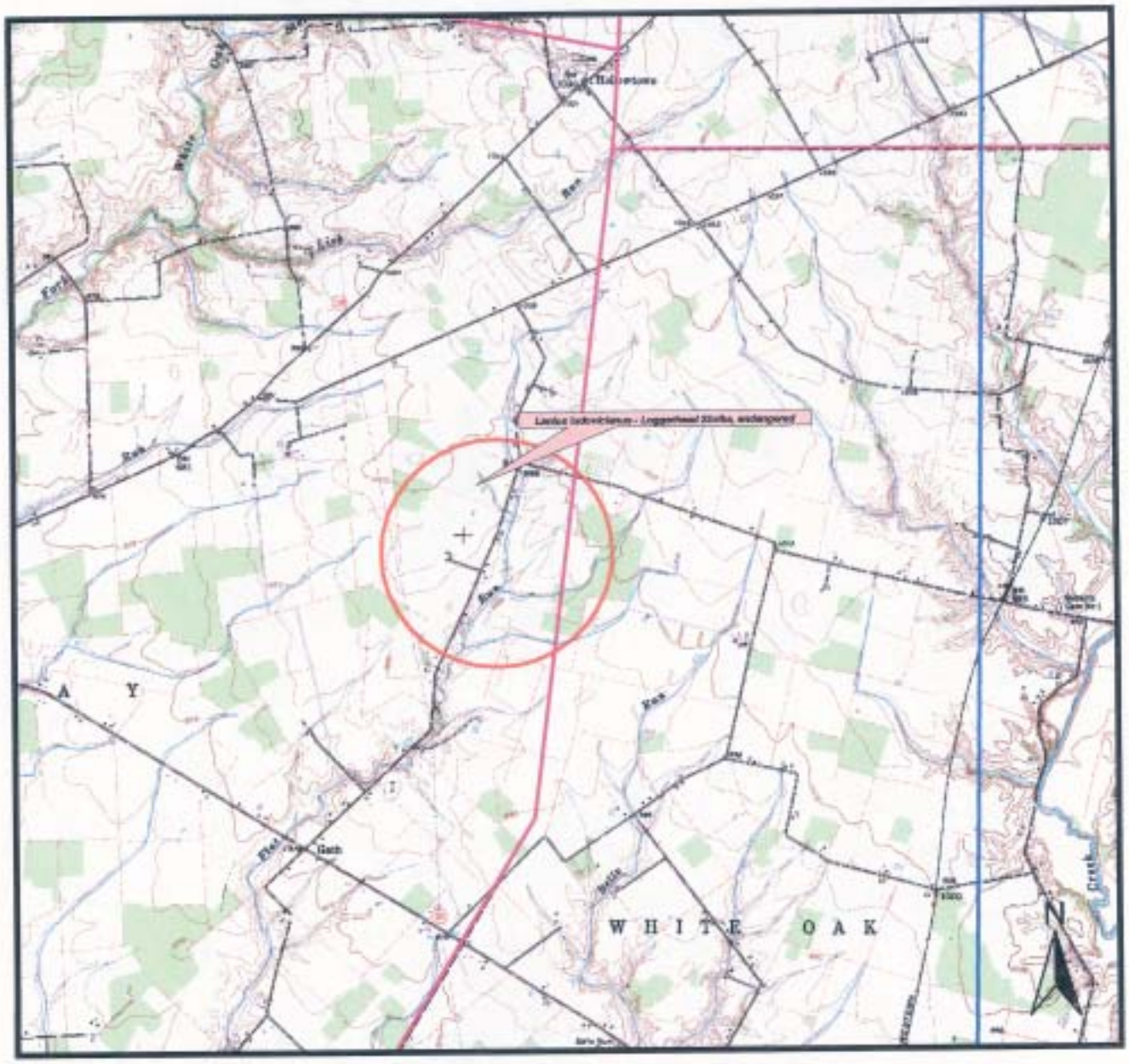
White Oak Creek Watershed Overview



2 0 2 4 Miles

January 24, 2003

Sardinia Quad



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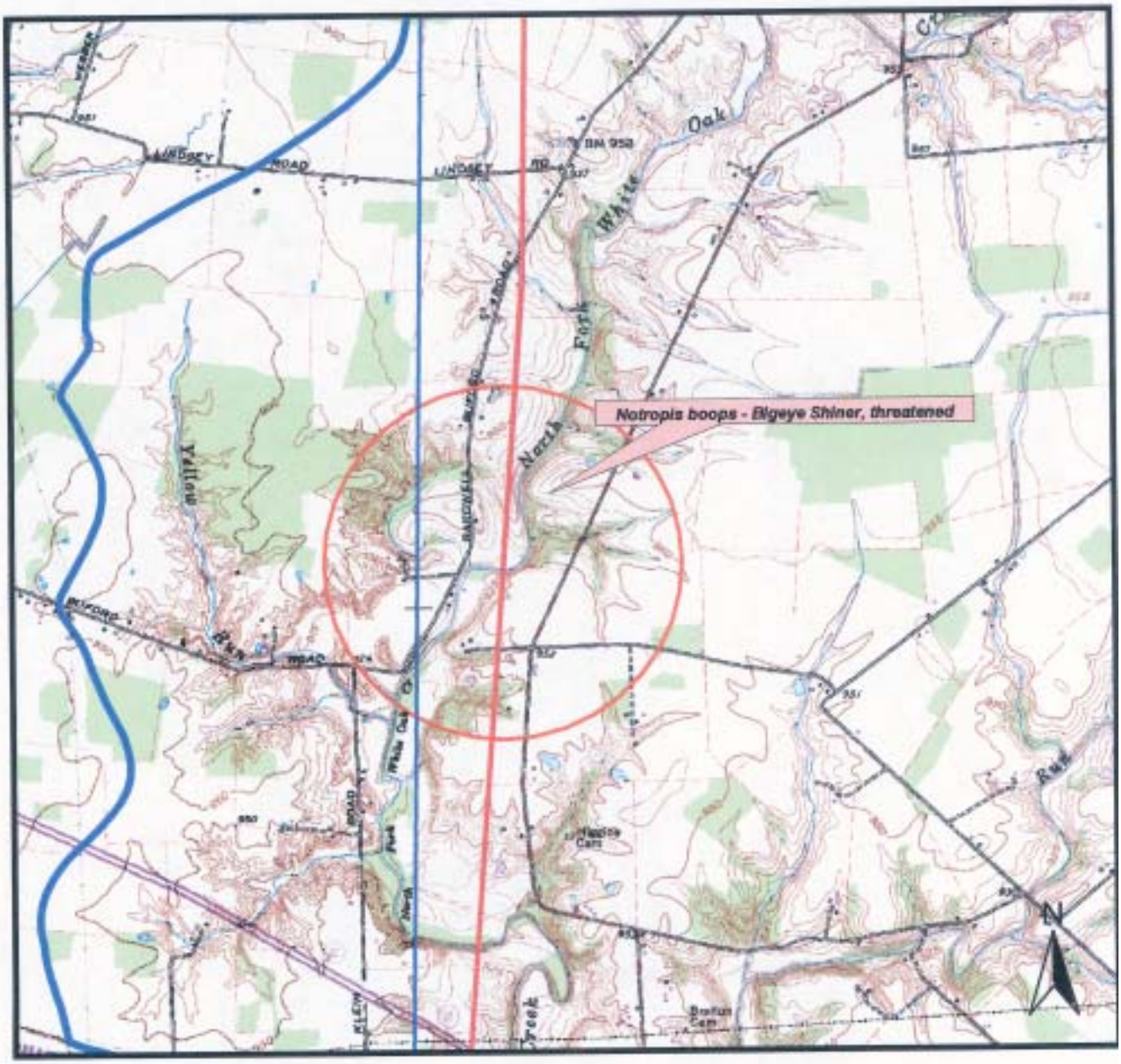
January 24, 2003

Mount Orab and Sardinia Quads



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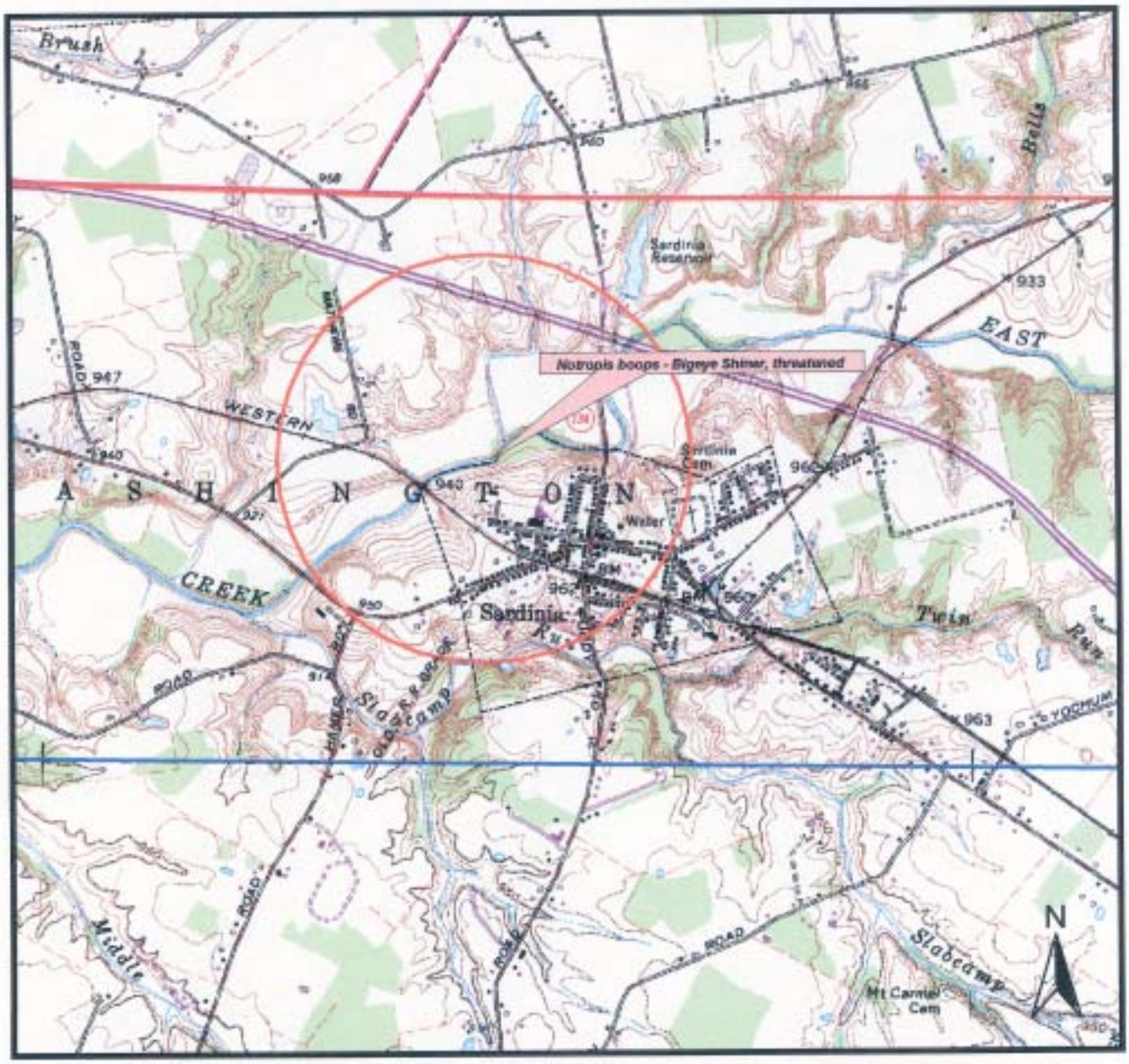
January 24, 2003

Sardinia Quad



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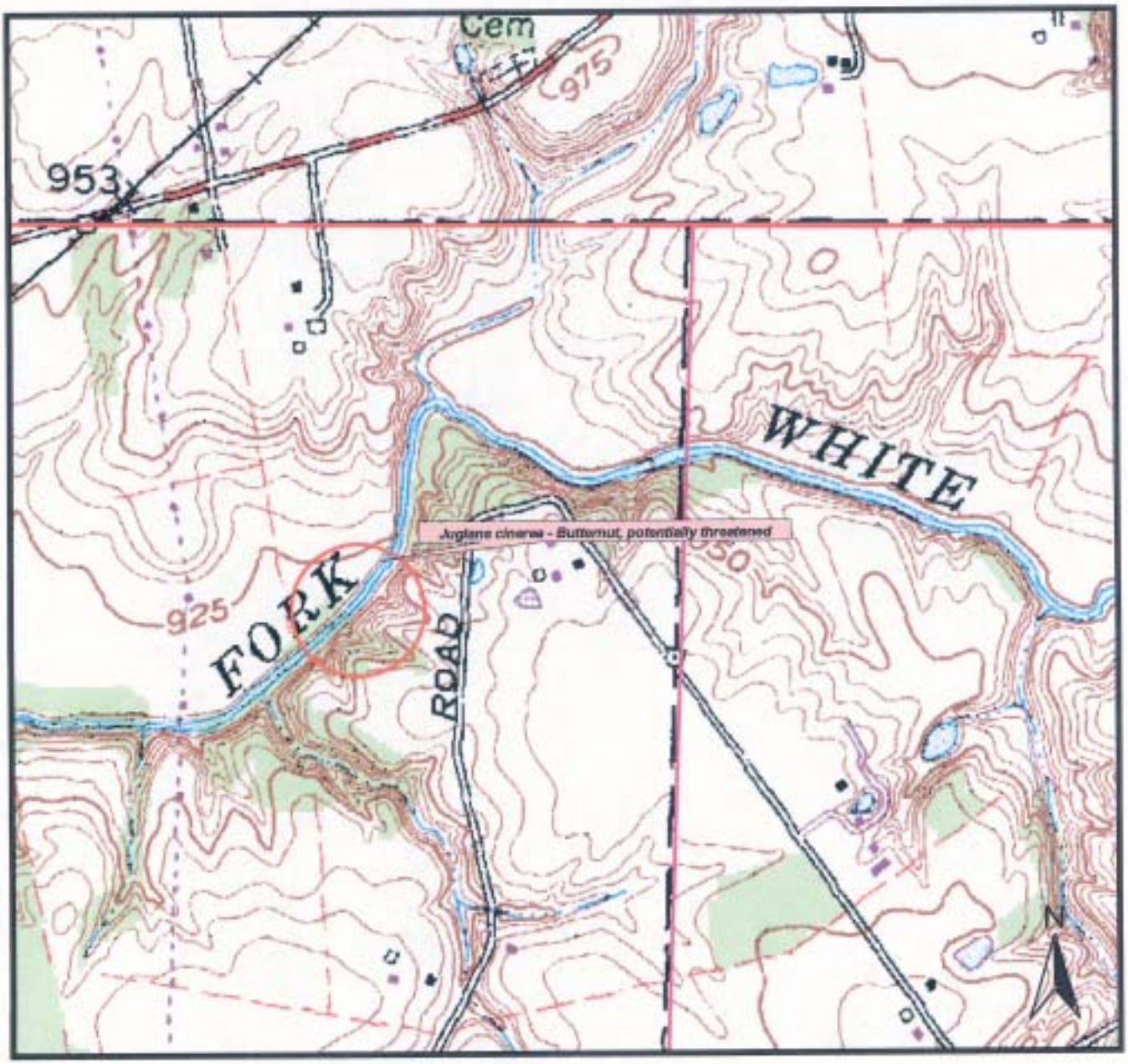
January 24, 2003

Sardinia Quad



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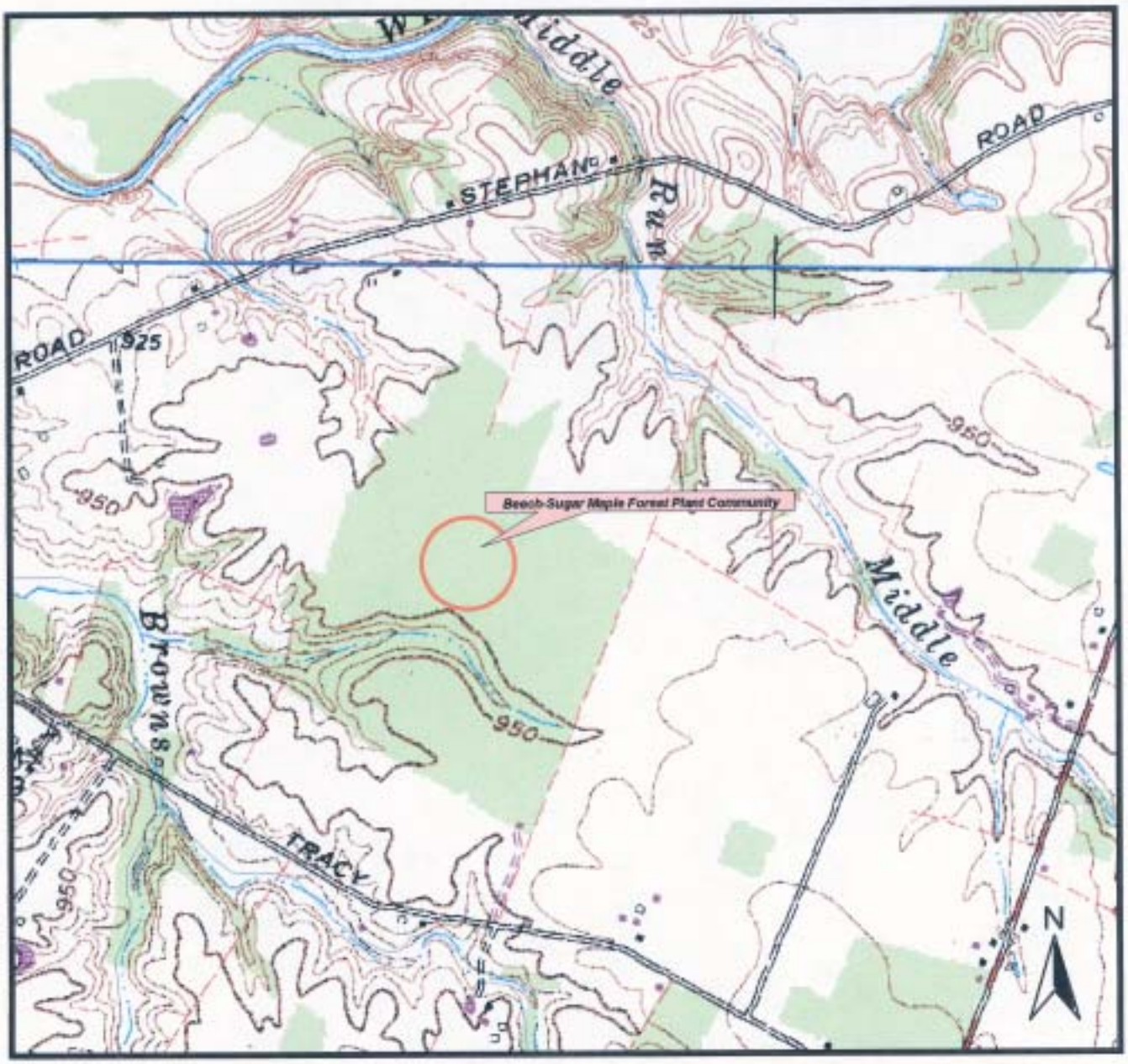
January 24, 2003

Ash Ridge Quad



0.1 0 0.1 0.2 Miles

January 24, 2003

Public Meeting Input
Citizens Concerns

March 27, 2001:

***voiced concerns**

- Mercury Concerns
- Mandatory Regulations
  - For fertilizers, ect…
- Rumpke Landfill Concerns
- Creek Obstructions
  - Log jams, ect…
- Public Access
  - Fishing, wading, or swimming
- State Route 221 – sanitary sewage disposal concerns
- Bank erosion

***written concerns**

#1 – Littering & illegal trash dumping
#2 – Sedimentation & erosion
#3 – Poor sewage treatment
#4 – Drinking Water concerns
#5 – Flooding
#6 – Lack or public access & lack of recreation on the stream
#7 – need for more picnic areas, wildlife habitat and dam concerns.

August 30, 2001

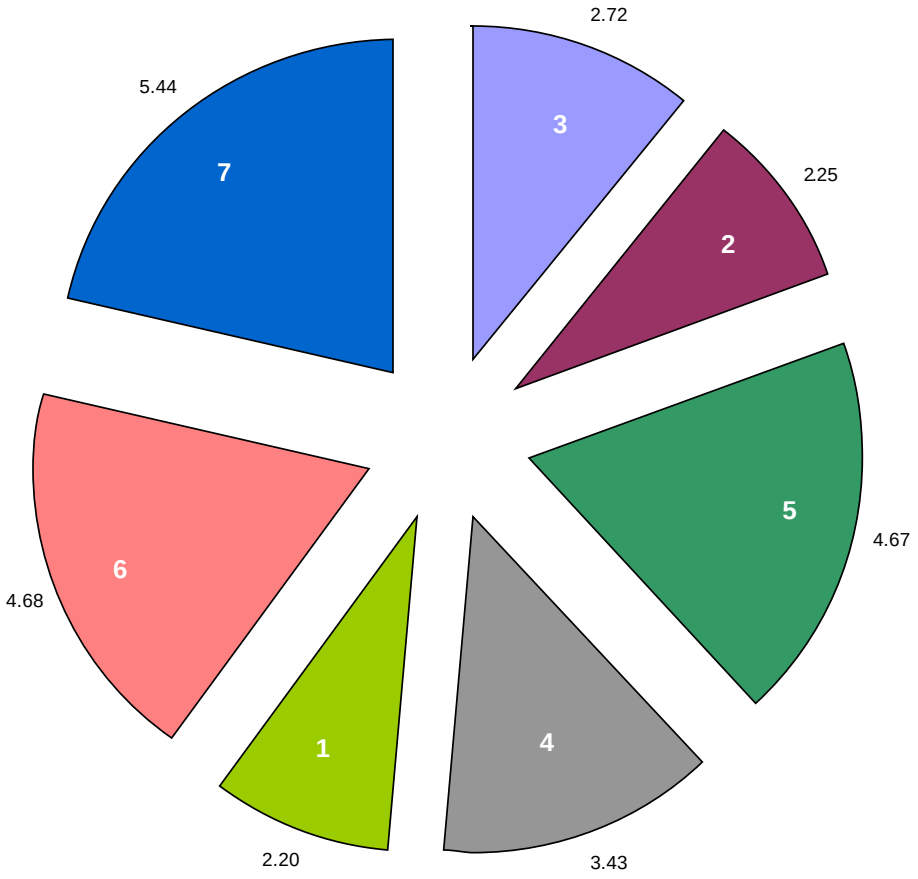
***Voiced concerns**

- Need for tree removal
- Beaver problems
- Non-existent or failing septic systems
- Need for more cost-share dollars for BMP's
- Fish community concerns – less game fish

*** written concerns**

#1 – Sewage treatment
#2 – Sedimentation & erosion
#3 – Drinking water
#4 – Litter
#5 – Flooding
#6 – lack of recreation on the stream
#7 – lack of public access

RESULTS OF THE WHITE OAK CREEK WATERSHED COMMUNITY PUBLIC SURVEY



- 3 — Erosion & Excess sediment
- 2 — Failing septic system
- 5 — Lack of stream-side forest
- 4 — Excess nutrient runoff & lawn fertilizer
- 1 — Illegal stream-side dumpsites
- 6 — Stream channelization & habitat alterations
- 7 — Lack of recreation opportunities

1 = higest concern

7 = lowest concern

* 1,800 surveys mailed & 95 returned

RESULTS OF THE WATERSHED COMMUNITY PUBLIC SURVEY

***1 is the highest concern through 10 the lowest concern.**

Erosion & Excess sediment	Failing septic system	Lack of stream-side forest	Excess nutrient runoff & lawn fertilizer	Illegal stream-side dumpsites	Stream channelization & habitat alterations	Lack of recreation opportunities	Other * see comments
4	2	5	3	1	6	7	
5	2		3	4			1 (a)
4	1	1	5	1	6	10	
1	2	5	1	2	3	4	
1	3	6	4	2	5	7	
1							(b)
2	6	5	1	4	7	8	3 ©
1	1	3	4	1	3	5	
2	1	1	2	1	1	2	
3	1	5	2	4	6	7	(d)
4	3	5	2	1	7	6	
	1						
3	2	6	4	1	5	7	
1	3	2	4	5	6	7	
2	3	4	5	1	6	7	
5	1	4	2	3	6	7	
4	1	6	2	3	5	7	
	1						
1	1	3	3	1	2	1	
3	1	6	5	2	4	7	
4	1	6	3	2	5	7	
	1	6	2	3	4	5	
3	2	6	4	1	5	7	
1	2	7	6	3	5	4	
6	1	4	2	3	5	7	8 (e)
1	3	5	4	2	6	7	
1	2	6	5	4	3	7	
2	3	6	4	1	5	7	
						1	2 (f)
4	2	5	1	2	6	7	
7	6	4	5	2	1	3	
1	5	6	4	2	7	3	
5	2	7	3	1	6	4	

Erosion & Excess sediment	Failing septic system	Lack of stream-side forest	Excess nutrient runoff & lawn fertilizer	Illegal stream-side dumpsites	Stream channelization & habitat alterations	Lack of recreation opportunities	Other * see comments
2	1	5	3	4	6	7	* (g)
3	1	5	7	2	4	6	
							1 (h)
1	2	3	6	5	7	8	4 (l)
3	2	6	1	4	5	7	(j)
5	4	7	3	2	6	8	1(k)
2	1		5	3	4	6	7
2	3			1			
1						1	
1			1			1	
4	2	5	1	3	6	7	
3	2	4	5	1	6	7	
4	1	5	2	3	6	7	
1	5	7	2	4	3	6	8 (l)
0	0	0	0	0	0	0	1(m)
4				1	3	2	
4	3	5	7	1	6	2	
			2	2			1(n)
3	1	6	5	4	2	7	
1					2		
				1			(o)
1	6	2	5	3	4	7	
				1			
4	2	6	3	1	5	7	
3	6	2	5	4	1	7	
2				1			3(p)
	1			1			
1	1	1	4	1	6	3	4 (q)
6	1	4	3	2	5	7	
3	2	1	4	5	6	7	
2	3			4	1		
4	1	6	3	2	5	7	3 ®
3	2		4	1			
2	3	5	4	1	7	6	
3	1	4	6	2	5	7	8 (s)
5	1	6	3	2	7	4	
						1	
1		2		3			(t)

	Erosion & Excess sediment	Failing septic system	Lack of stream-side forest	Excess nutrient runoff & lawn fertilizer	Illegal stream-side dumpsites	Stream channelization & habitat alterations	Lack of recreation opportunities	Other * see comments
								1(u)
	1	1	1	1	1	1	1	1(v)
	4	1	5	6	2	7	3	
	4	1	7	2	3	6	5	
	4	1	6	2	3	5	7	
	5	1	4	2	6	7	3	
	4	1	7	5	2	3	6	8
	1	1		1	1	1		
	1	3	2					
	2	3	6	4	1	5	8	7 (w)
	2	1	6	3	4	7	5	
	1	2	6	5	3	7	4	
					1			
	3	5	7	2	1	4	6	
	4	9	6	3	5	8	7	1 & 2 (x)
	2	3	6	4	1	5	7	
	2	1	6	5	3	7	4	
		2				1		(y)
	3	1	4	5	2	6	7	
	1	1	2	2	1	1	2	
	3	2	7	6	1	4	5	
	5	7	2	6	1	3	4	
				1	2			
	2				1			3
Total	220	171	322	254	183	342	397	
Average	2.72	2.25	4.67	3.43	2.20	4.68	5.44	
Rank	**3**	**2**	**5**	**4**	**1**	**6**	**7**	

Ohio EPA - Appendix D1 - 2000 305(b): Rivers and Streams

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 49	**10-407**	**3.00**	**0.00**	**05090201-**	**Interior Plateau**

WB Name: ***TOWN RUN***

Aquatic Life Use(s): **LRW** Segment Length: **3.00**

County: **BROWN CO**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full:**	**2.20**	**Full, But Threatened:**	**0.00**	**Partial:**	**0.80**	**None**	**0.00**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
						2.20	**0.80**

Comments: The biological communities were poor upstream from the Georgetown WWTP, apparently due to periodic intermittent flow conditions. Downstream from the WWTP the macroinvertebrate community was very poor due to high densities of tolerant taxa. High concentrations of nutrients appear to be the primary cause of the community decline. High numbers of E. Coli and Fecal Coliforms indicate the Georgetown WWTP needs to upgrade its treatment.

Causes of Impairment:

Nutrients - H
Pathogens - M
Pesticides - S
Zinc - S
Copper - S

Sources of Impairment:

Minor Municipal Point Source - H

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 55	**10-413**	**14.90**	**0.00**	**05090201-089**	**Interior Plateau**

WB Name: ***STERLING RUN***

Aquatic Life Use(s): **WWH** Segment Length: **14.90**

County: **BROWN CO**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full:**	**2.70**	**Full, But Threatened:**	**0.00**	**Partial:**	**0.00**	**None**	**8.60**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
			2.70			**8.60**	

Comments: Upstream from Lake Grant small stream size and possible intermittent flow conditions influence the biological communities. Possible impacts from row crop agriculture and livestock exist as exceedences of phosphorus and E. Coli were recorded. Downstream from Lake Grant and Snapping Turtle Run (Mount Orab WWTP) the macroinvertebrate community was exceptional (ICI=50), and the fish community was good (IBI=44, MIwb=8.4). Runoff from livestock pastures, and sediment embeddedness may be moderately impacting the fish community.

Causes of Impairment:

Flow alteration - H
Nutrients - S
Pathogens - S

Sources of Impairment:

Nonirrigated crop production - H
Natural - M
Pasture land - S

Ohio EPA - Appendix D1 - 2000 305(b): Rivers and Streams

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 56	**10-414**	**2.50**	**0.00**	**05090201-**	**Interior Plateau**

WB Name: ***SNAPPING TURTLE RUN***

County: **BROWN CO**

Aquatic Life Use(s): **WWH** Segment Length: **2.50**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full: 0.00**	**Full, But Threatened: 2.20**	**Partial: 0.00**	**None 0.30**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
			2.20			0.30	

Comments: The biological communities were only marginally attaining WWH criteria upstream from the Mount Orab WWTP. Habitat limitations included heavy siltation and lack of fast current. Exceedences of pesticides, E. Coli and Fecal Coliforms indicate runoff from row crop and livestock pastures may be impacting the stream. Downstream from the Mount Orab WWTP elevated nutrients (phosphorus and nitrates) and a continuation of upstream impacts were affecting the biological communities. This segment should be downgraded from EWH to WWH.

Causes of Impairment:	Sources of Impairment:
Nutrients - H	*Minor Municipal Point Source - H*
Siltation - M	*Nonirrigated crop production - M*
Pathogens - S	*Pasture land - M*
Pesticides - S	*Nonirrigated crop production - T*
Nutrients - T	
Siltation - T	

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 58	**10-400**	**29.30**	**20.75**	**05090201-**	**Interior Plateau**

WB Name: ***WHITEOAK CREEK (EAST FORK TO STERLING CREEK)***

County: **BROWN CO**

Aquatic Life Use(s): **WWH** Segment Length: **8.55**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full: 0.00**	**Full, But Threatened: 0.00**	**Partial: 8.55**	**None 0.00**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
			8.55				

Comments: The one biological station sampled in this segment had an exceptional macroinvertebrate community (ICI=46) and a marginally good fish community (IBI=37, MIwb=7.7). The fish community at this site was probably limited by siltation, lack of cover and no fast current. Exceedences of E. Coli and Fecal Coliforms indicate contamination from livestock runoff.

Causes of Impairment:	Sources of Impairment:
Siltation - H	*Nonirrigated crop production - H*
Pathogens - S	*Pasture land - S*

Ohio EPA - Appendix D1 - 2000 305(b): Rivers and Streams

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 60	**10-420**	**20.80**	**0.00**	**05090201-087**	**Interior Plateau**

WB Name: ***EAST FORK WHITEOAK CREEK***

County:

Aquatic Life Use(s): **WWH** Segment Length: **20.80**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full: 20.80**	**Full, But Threatened: 0.00**	**Partial: 0.00**	**None 0.00**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
			20.80				

Comments: Three stations sampled within this segment supported good fish communities, and good to exceptional macroinvertebrate communities. A few exceedences of E. Coli and total phosphorus suggest the possibility of a mild impact from agricultural and livestock runoff. Downstream from the confluence of Slabcamp Run (Sardinia WWTP) higher exceedences of phosphorus, E. Coli and Fecal Coliforms were recorded, along with low diel DO. The lower 2.8 miles of stream, which are designated EWH, were not sampled.

WBID #:	River Code:	Upper River Mile:	Lower River Mile:	USEPA Reach:	Ecoregion:
OH49 64	**10-424**	**2.50**	**0.00**	**05090201-**	**Interior Plateau**

WB Name: ***SLABCAMP RUN***

County: **BROWN CO**

Aquatic Life Use(s): **WWH** Segment Length: **2.50**

Assessment Cycle: **2000** Field Data Collected From: **199707 to 199709** Assessment Age: **Current**

Aquatic Life Use Attainment:	**Full: 0.00**	**Full, But Threatened: 0.00**	**Partial: 0.00**	**None 2.50**

Narrative Assessment:	Excellent	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
						2.50	

Comments: Biological communities upstream from the Sardinia WWTP appeared to be limited by low flow conditions, with possibile influence from animal waste runoff as evidenced by exceedences of E. Coli and Fecal Coliforms. Downstream from the Sardinia WWTP there was low DO and elevated phosphous, nitrates, ammonia, BOD, E. Coli and Fecal Coliforms.

Causes of Impairment:

Flow alteration - H
Organic enrichment/DO - H
Nutrients - M
Pathogens - M
Siltation - S
Pathogens - S
Unionized Ammonia - S

Sources of Impairment:

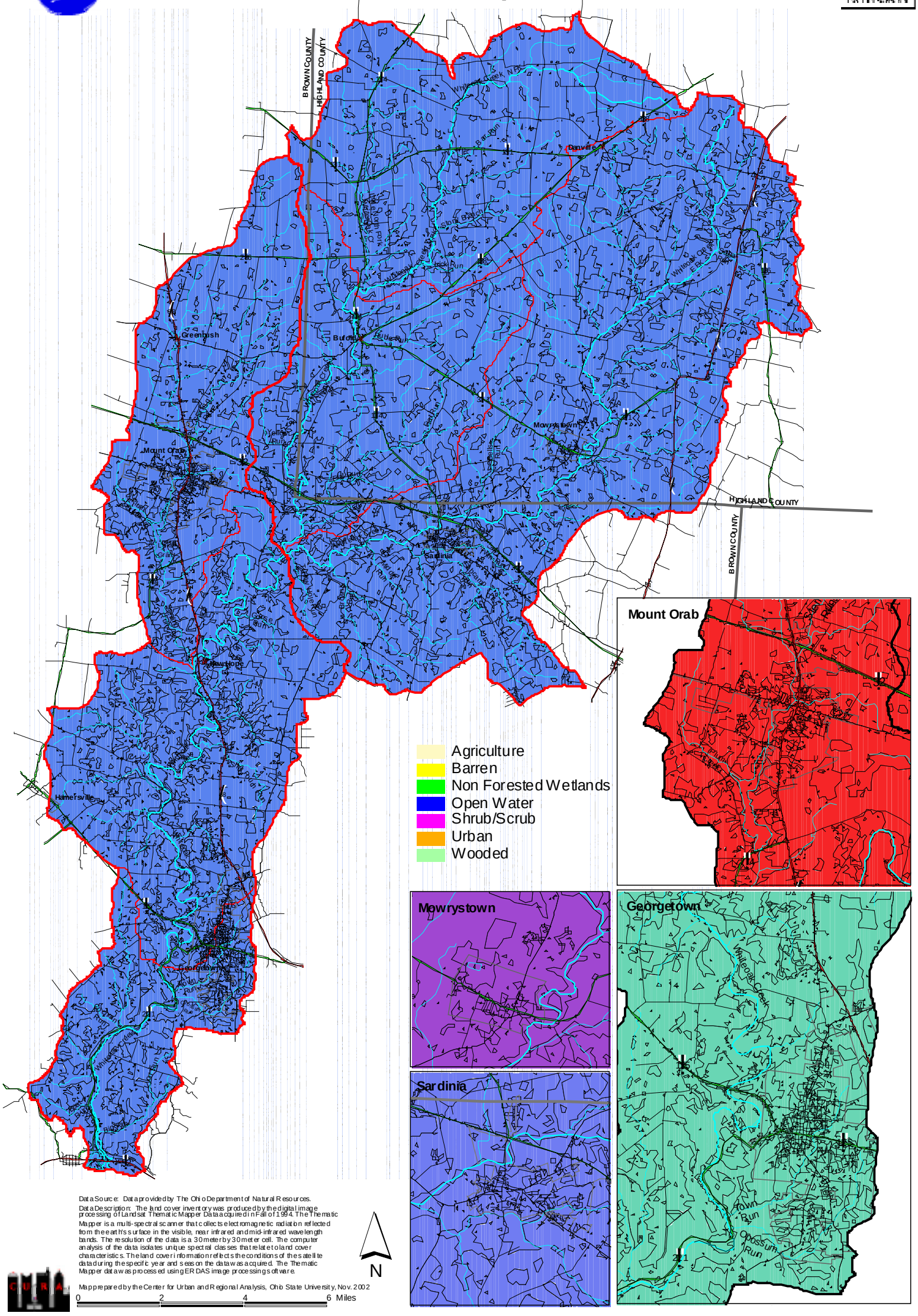
Natural - H
Minor Municipal Point Source - H
Pasture land - S
Nonirrigated crop production - S

Farmland Preservation - Farm
East Fork Subwatershed

SOIL MAP OF BROWN COUNTY, OHIO — SHEET NUMBER 18

WHITE OAK CREEK WATERSHED

1994 Land Use / Land Cover

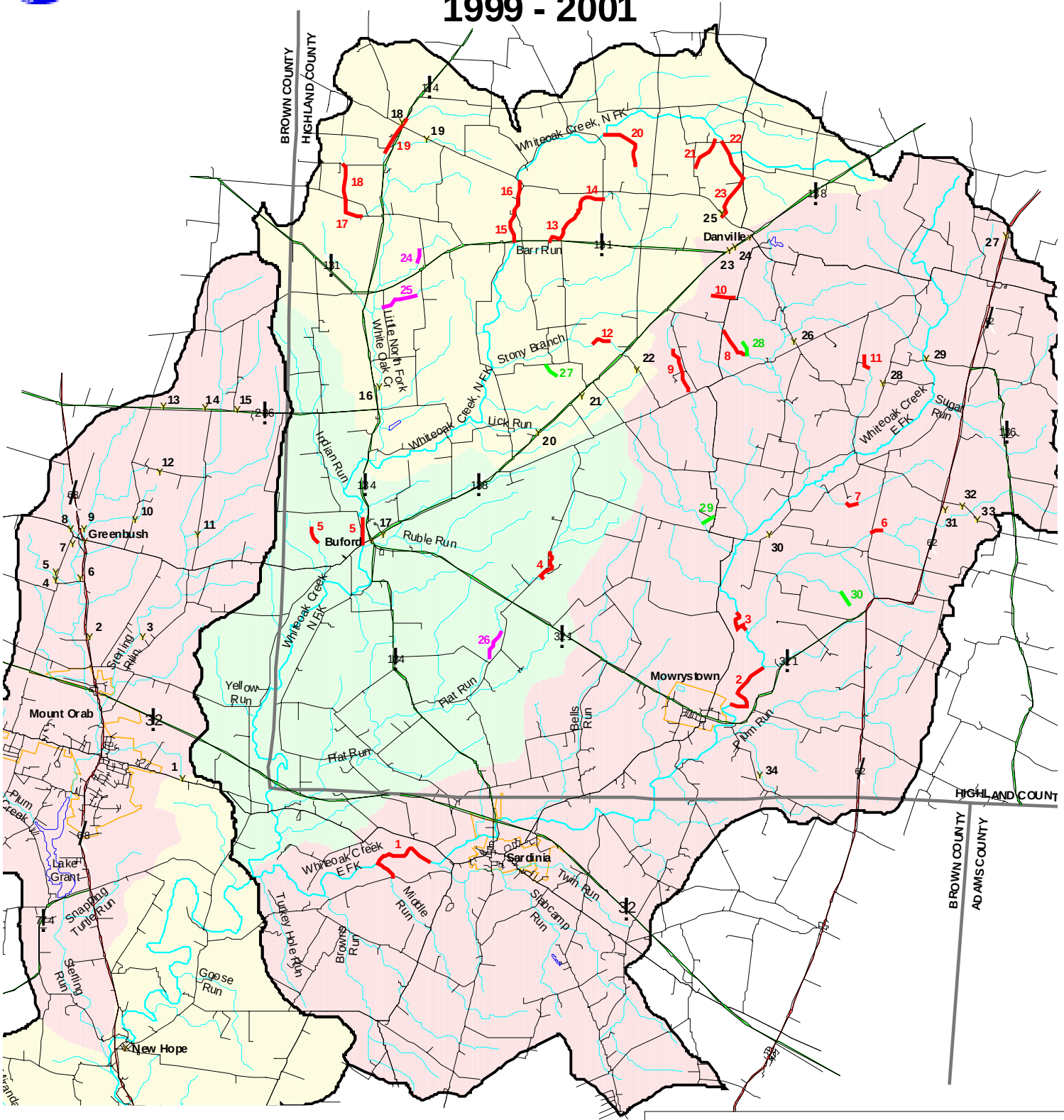


Data Source: Data provided by The Ohio Department of Natural Resources.

Data Description: The land cover inventory was produced by the digital image processing of Landsat Thematic Mapper Data acquired in Fall of 1994. The Thematic Mapper is a multi-spectral scanner that collects electromagnetic radiation reflected from the earth's surface in the visible, near infrared and mid-infrared wavelength bands. The resolution of the data is a 30 meter by 30 meter cell. The computer analysis of the data isolates unique spectral classes that relate to land cover characteristics. The land cover information reflects the conditions of the satellite data during the specific year and season the data was acquired. The Thematic Mapper data was processed using ERDAS image processing software.

Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

WHITE OAK CREEK WATERSHED
319 Grant Funded Best Management Practices
1999 - 2001



Towns
County Boundary
US Routes
State Routes
Major Streets
All Other Streets
White Oak Creek
Creeks/Streams
Cities/Villages
White Oak Creek Watershed

319 Grant Locations
Septic System Upgrade
Filter Strips
Grassed Waterway
Riparian Buffer

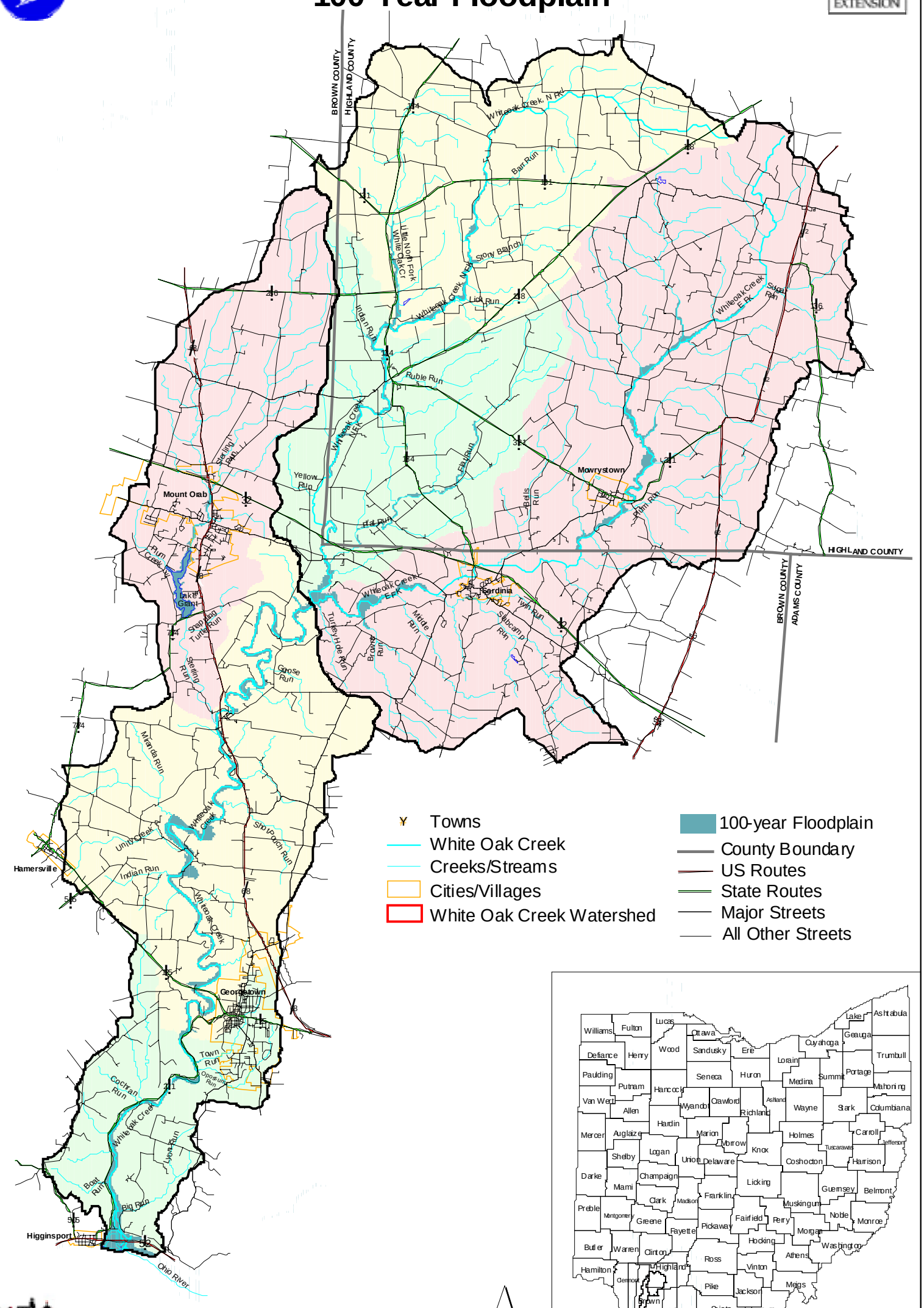
Data Source: Data provided by Brown SWCD obtained from USEPA and USGS
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

0 2 4 6 Miles

N

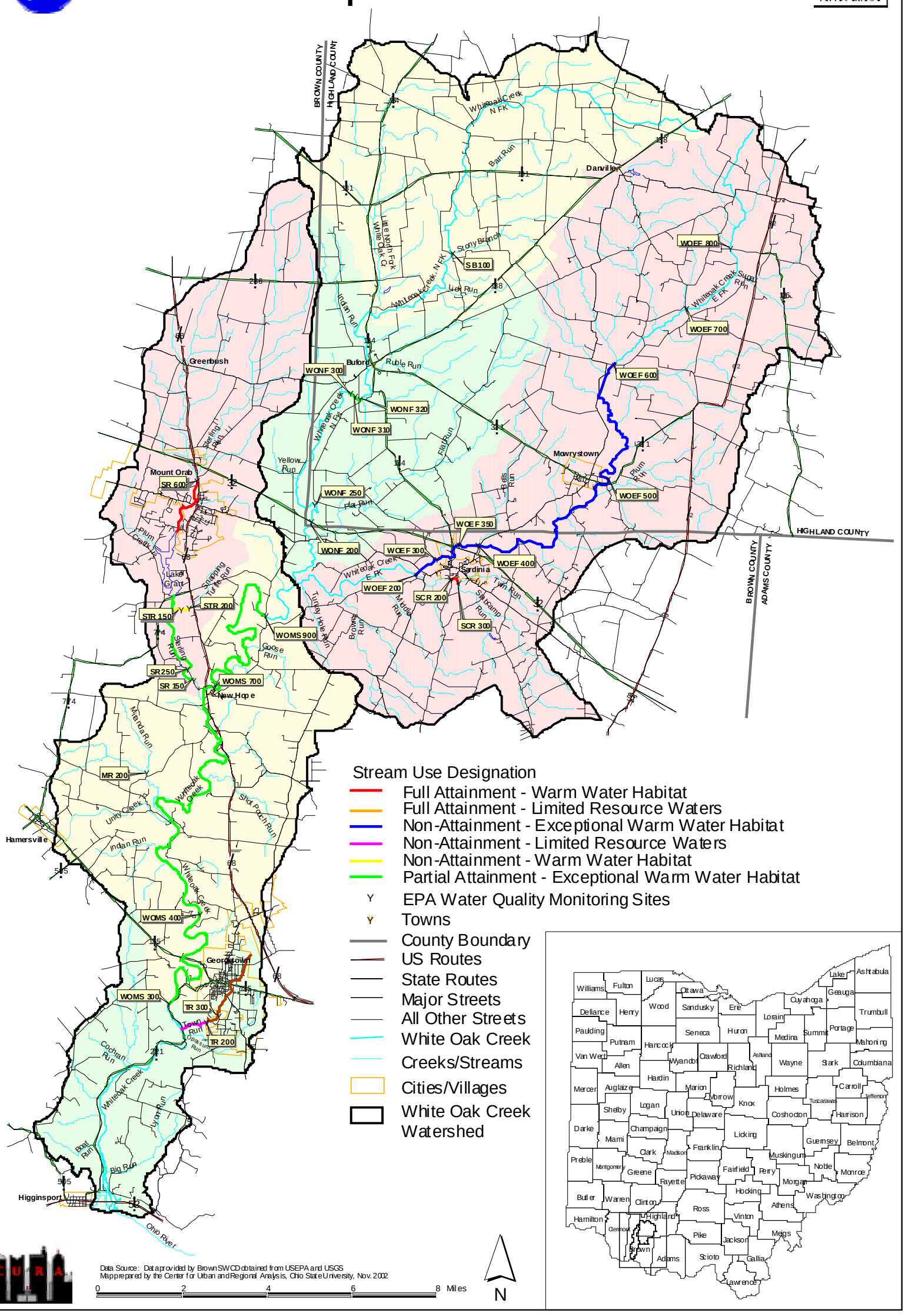
WHITE OAK CREEK WATERSHED

100-Year Floodplain

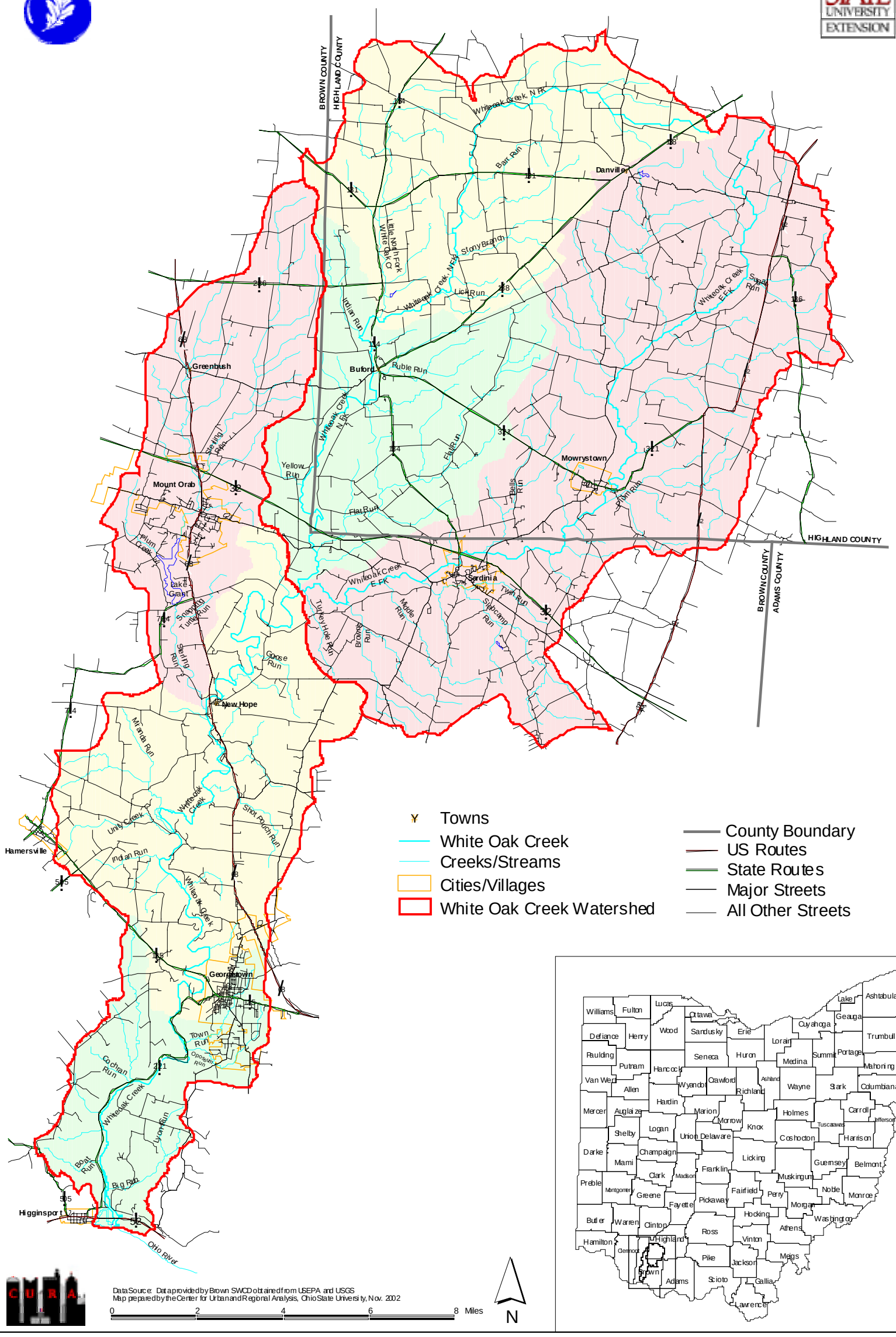


WHITE OAK CREEK WATERSHED

1997 OEPA Aquatic Use Attainment Status

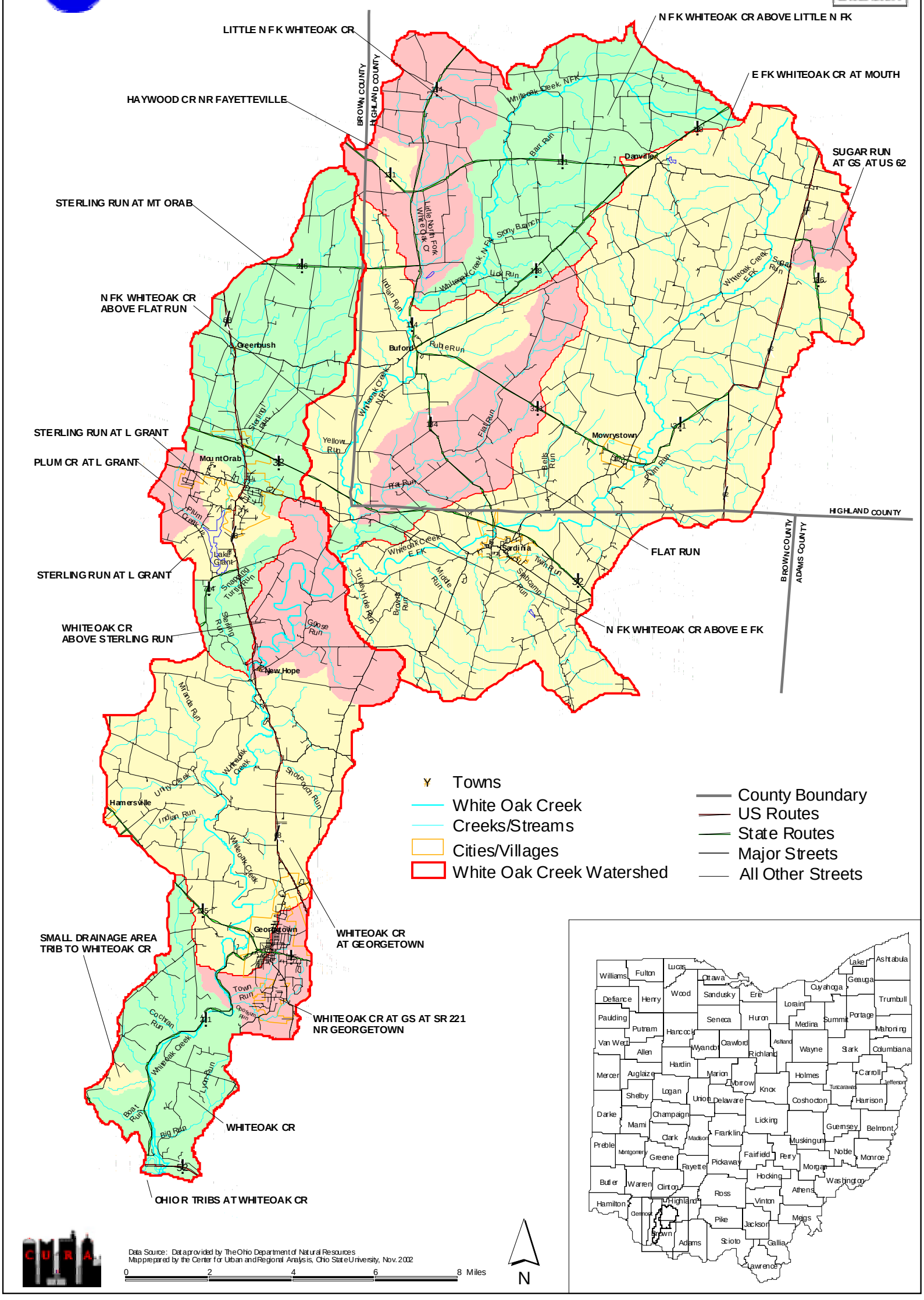


WHITE OAK CREEK WATERSHED



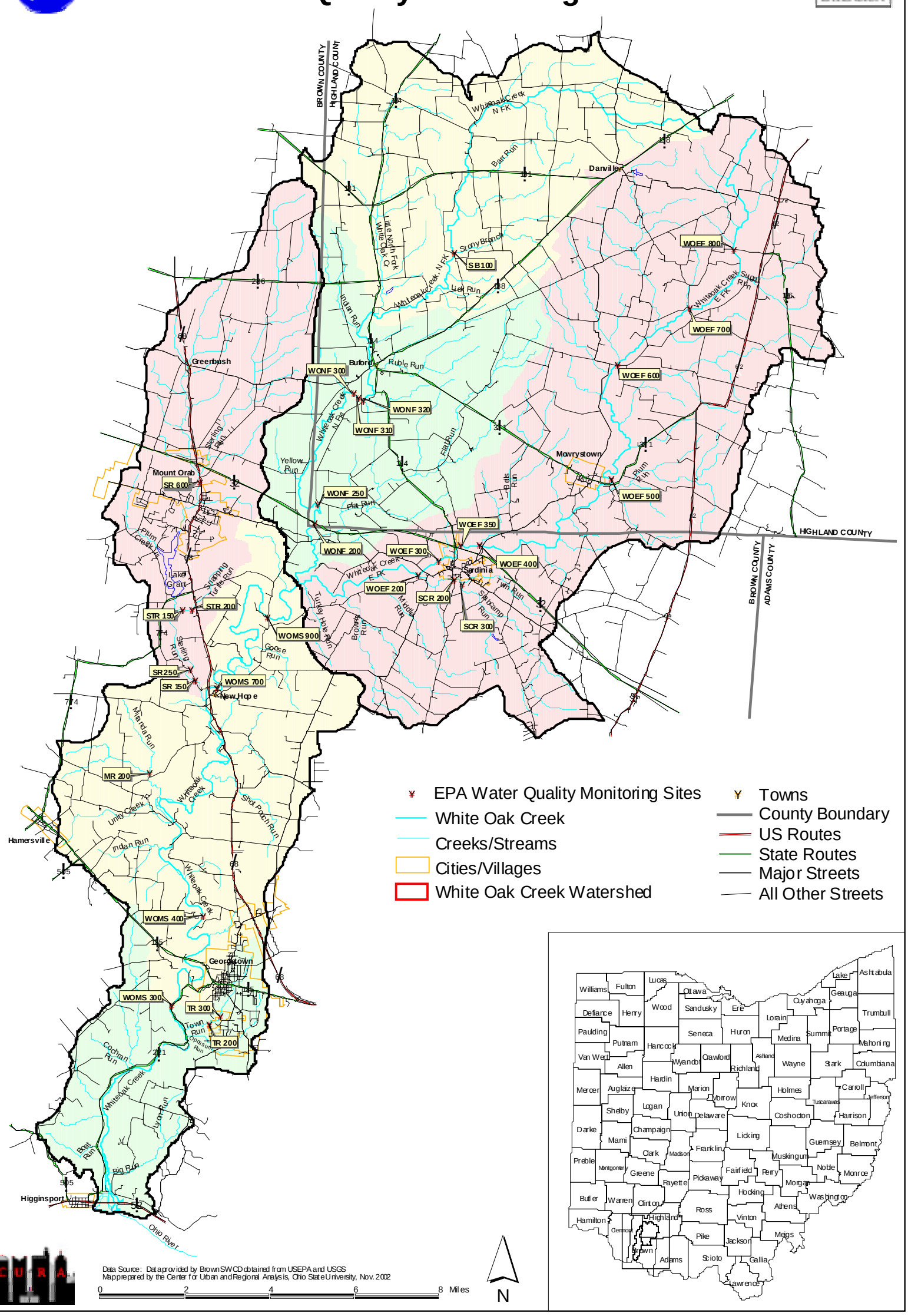
WHITE OAK CREEK WATERSHED

Detailed Watersheds



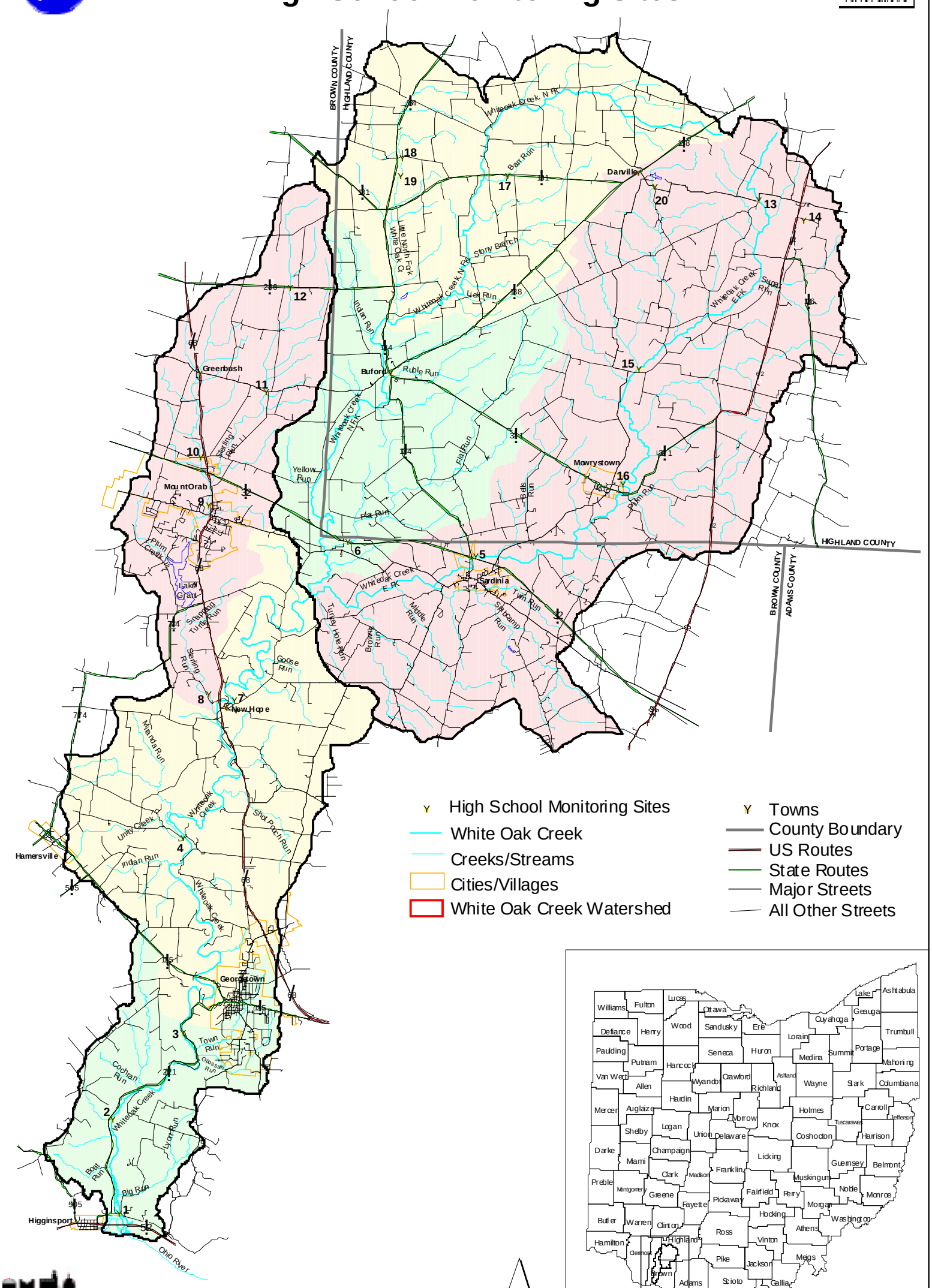
WHITE OAK CREEK WATERSHED

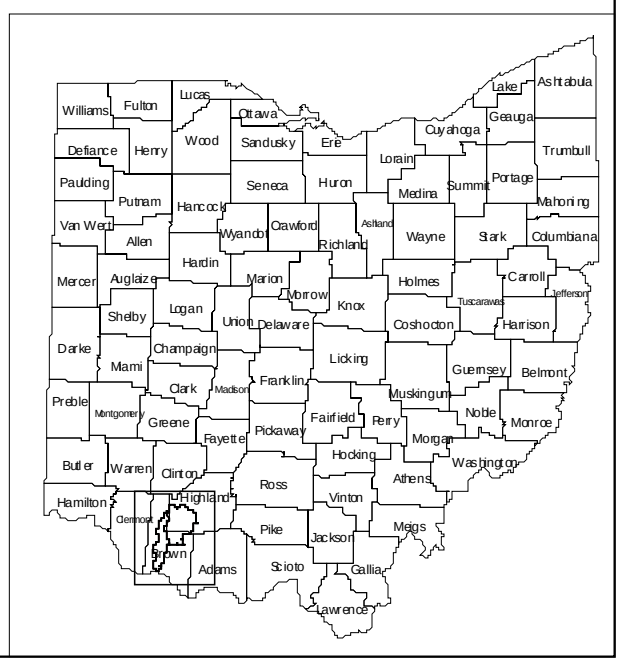
EPA Water Quality Monitoring Sites & Tribs



WHITE OAK CREEK WATERSHED

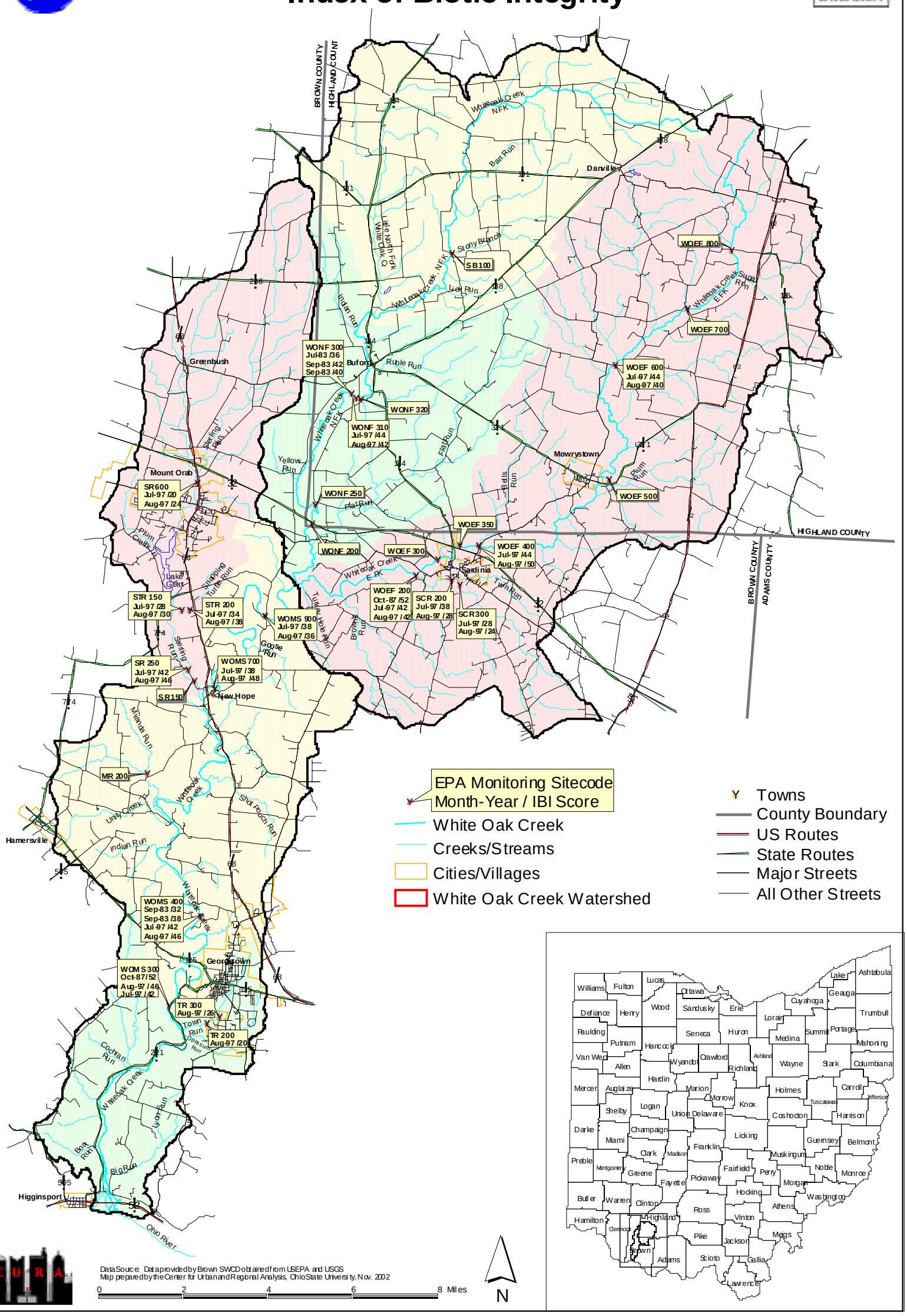
High School Monitoring Sites





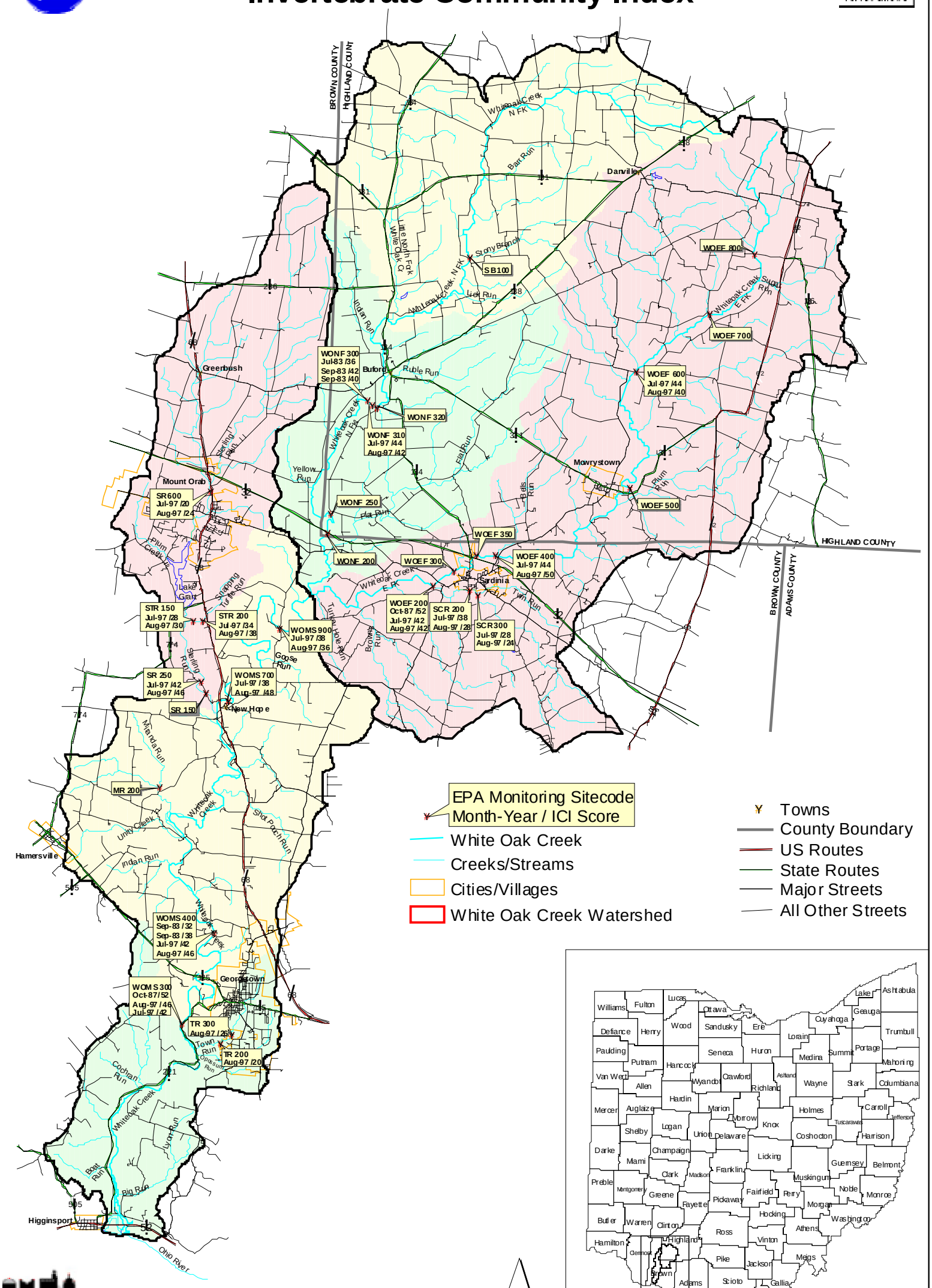
WHITE OAK CREEK WATERSHED

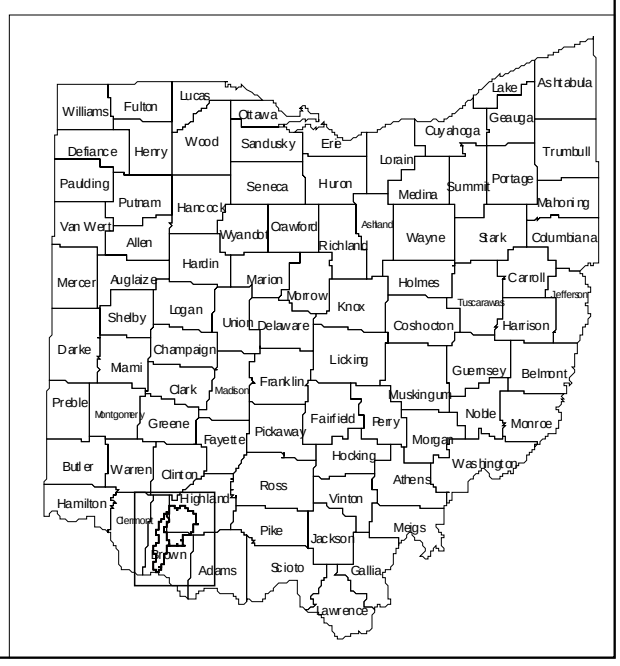
Index of Biotic Integrity



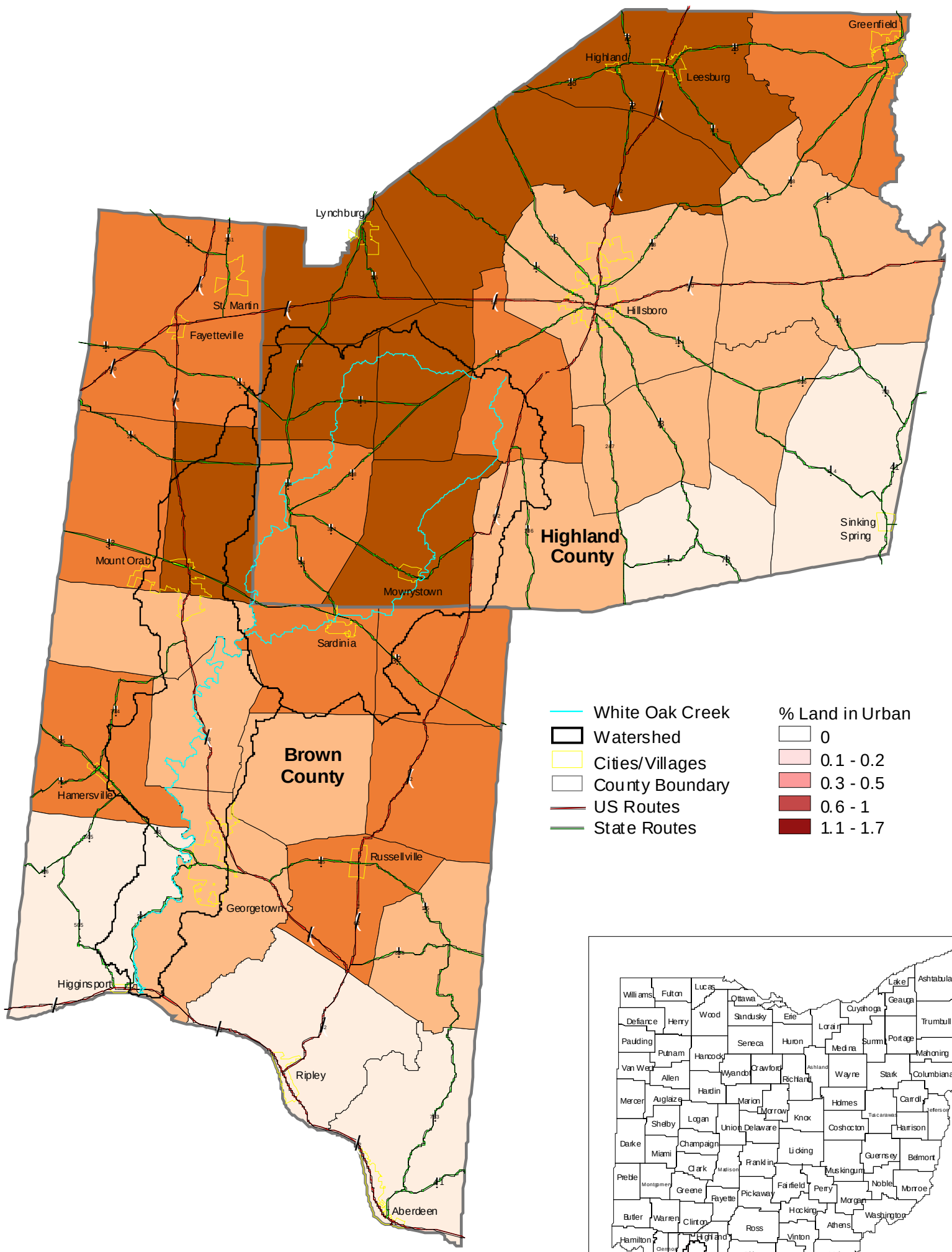
WHITE OAK CREEK WATERSHED

Invertebrate Community Index





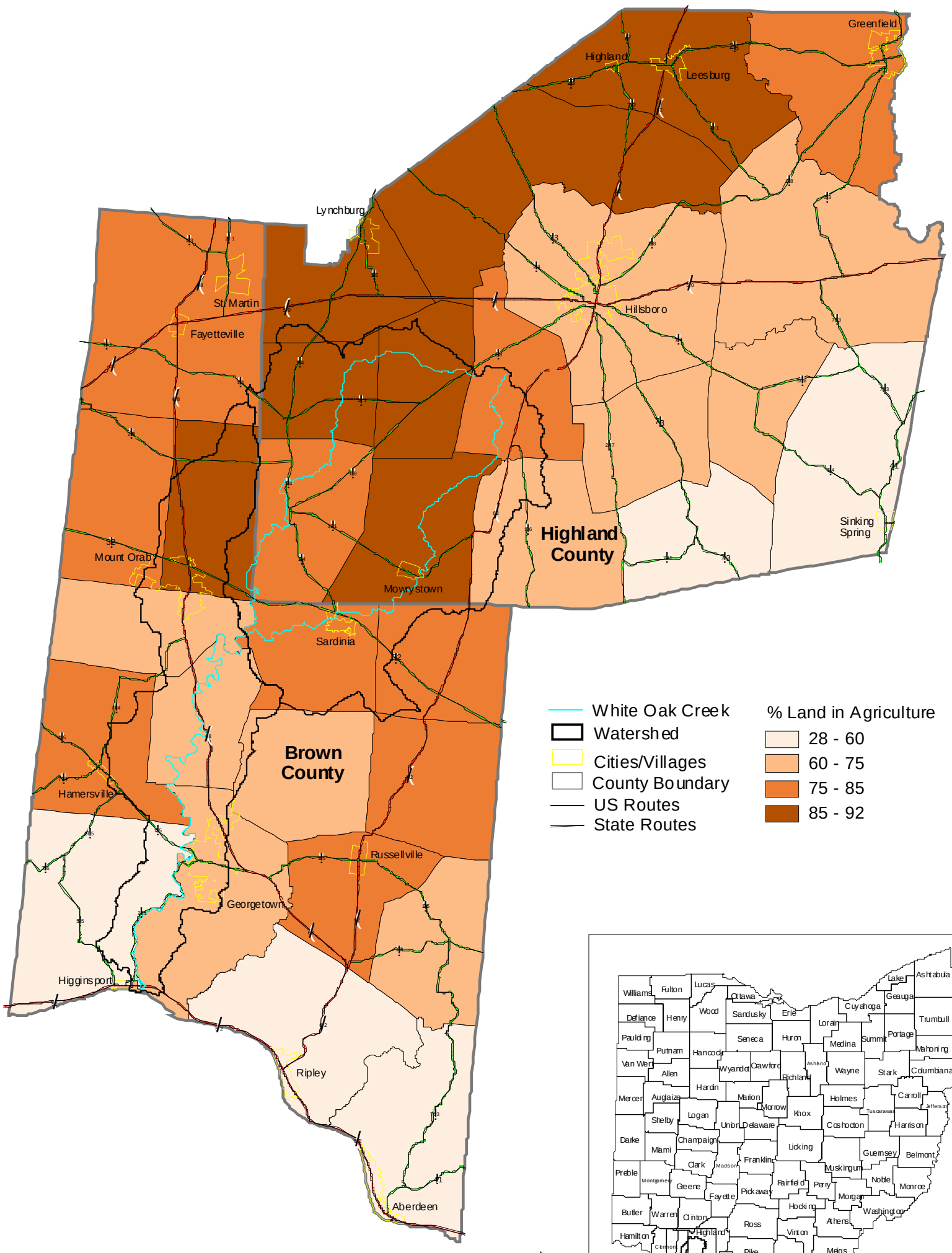
WHITE OAK CREEK WATERSHED
Percent Land in Urban (Early 1990's)



Data Source: Multi-Resolution Land Characteristics Consortium National Land Cover Data
prepared by the Exurban Change Project, OSU
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

0 4 8 12 Miles

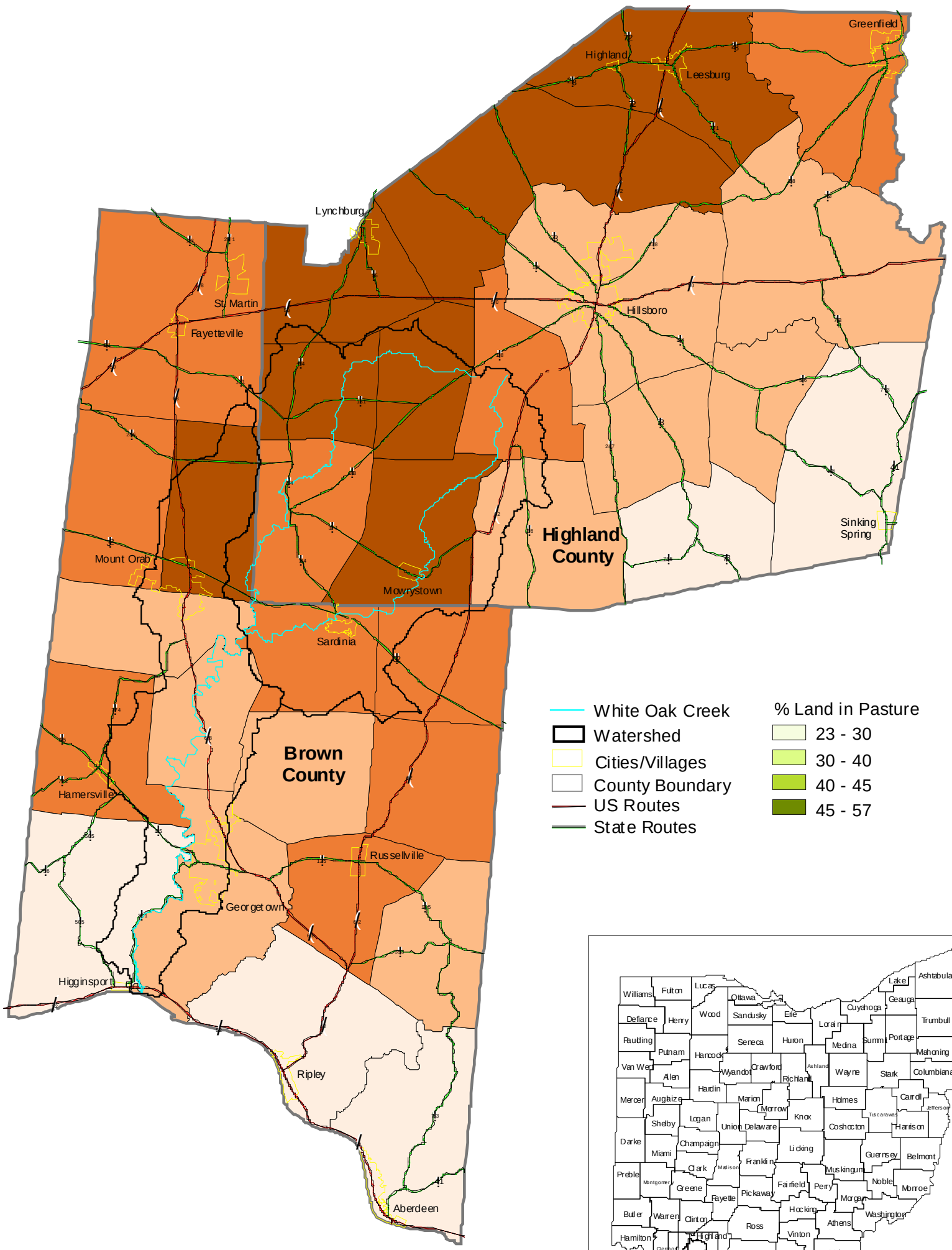
WHITE OAK CREEK WATERSHED
Percent Land in Agriculture (Early 1990's)



Data Source: Multi-Resolution Land Characteristics Consortium National Land Cover Data prepared by the Exurban Change Project, OSU
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

0 4 8 12 Miles

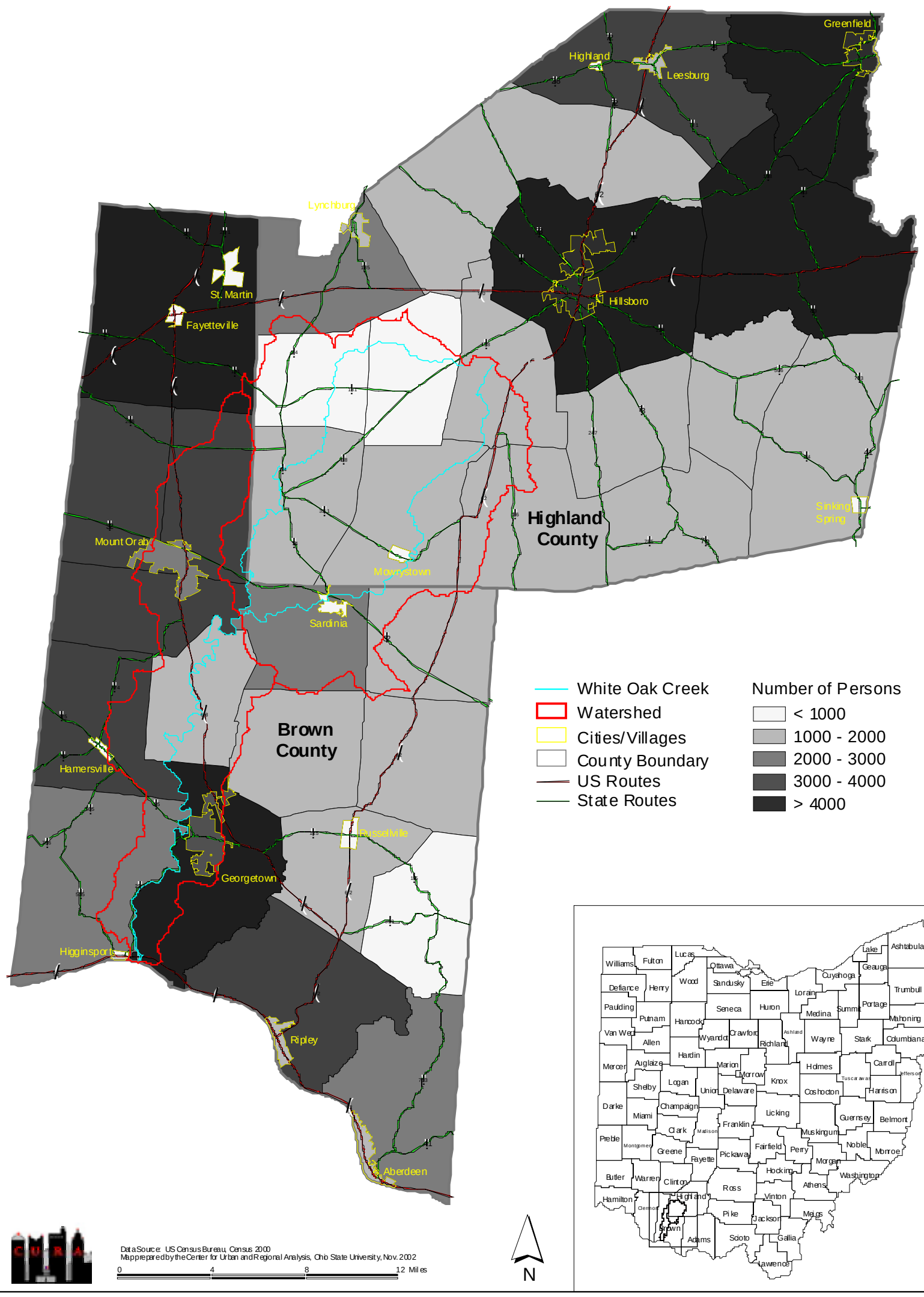
WHITE OAK CREEK WATERSHED
Percent Land in Pasture (Early 1990's)



Data Source: Multi-Resolution Land Characteristics Consortium National Land Cover Data
prepared by the Exurban Change Project, OSU
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

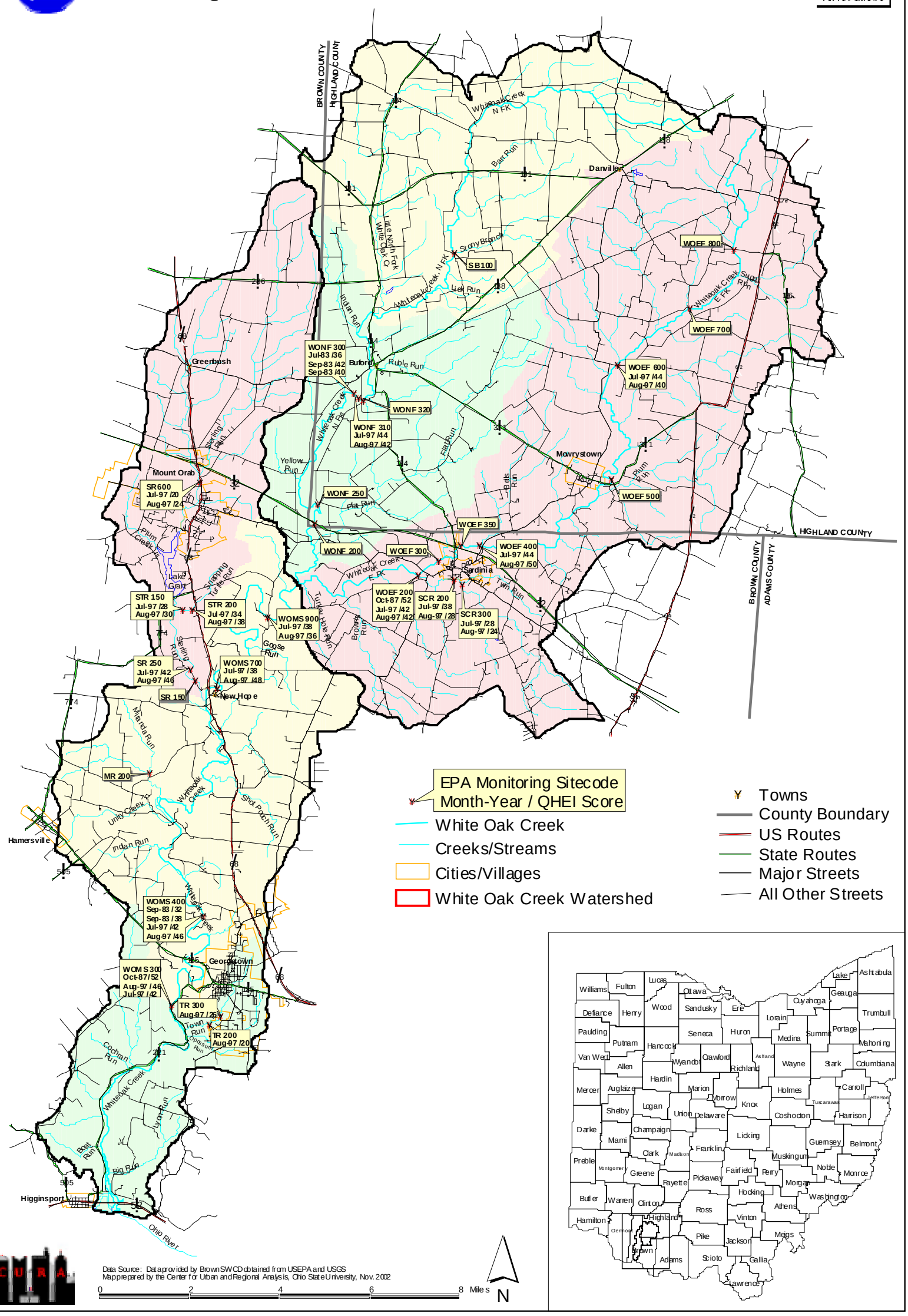
0 4 8 12 Miles

WHITE OAK CREEK WATERSHED
Population Distribution 2000



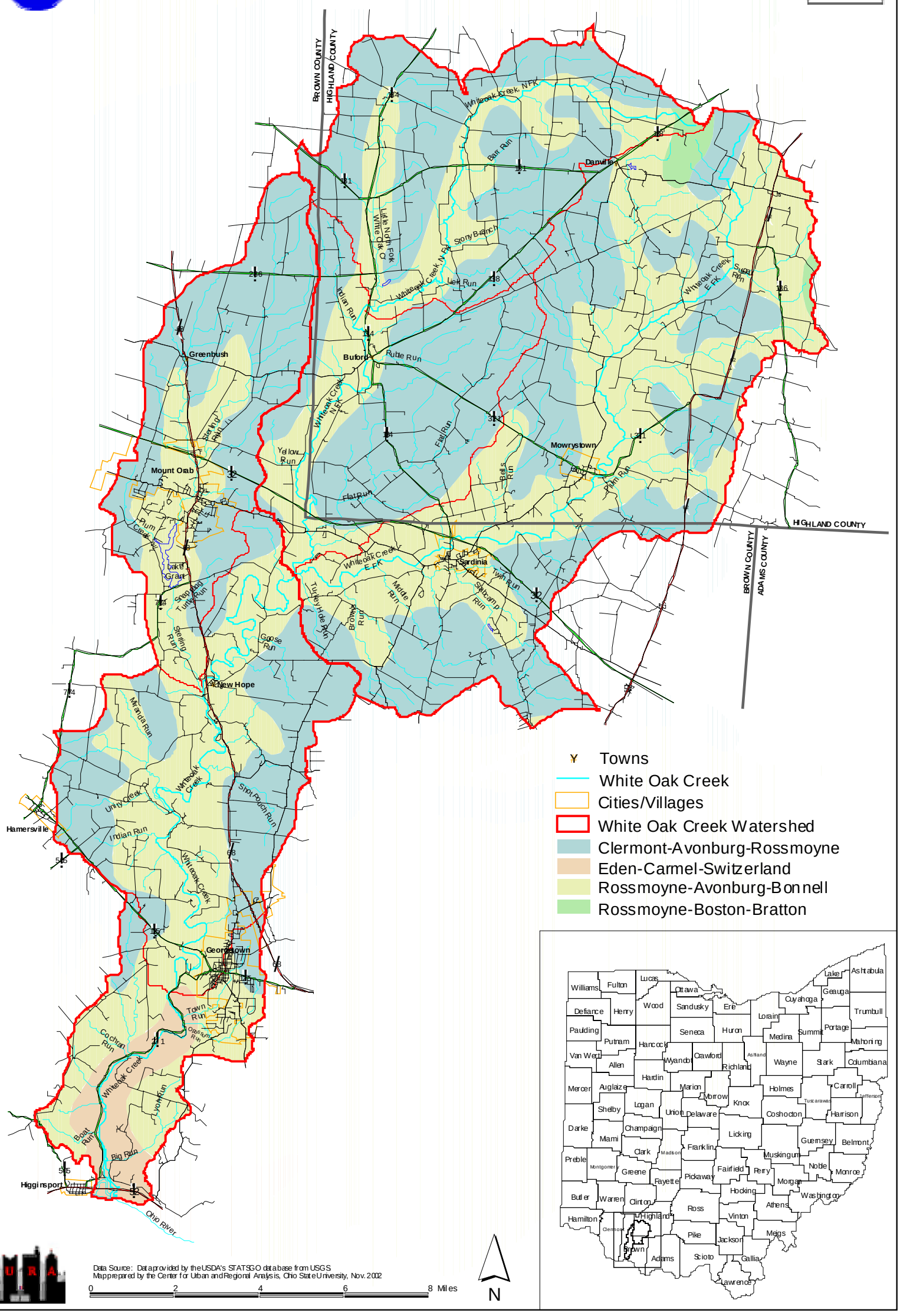
Data Source: US Census Bureau, Census 2000
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

WHITE OAK CREEK WATERSHED
Qualitative Habitat Evaluation Index



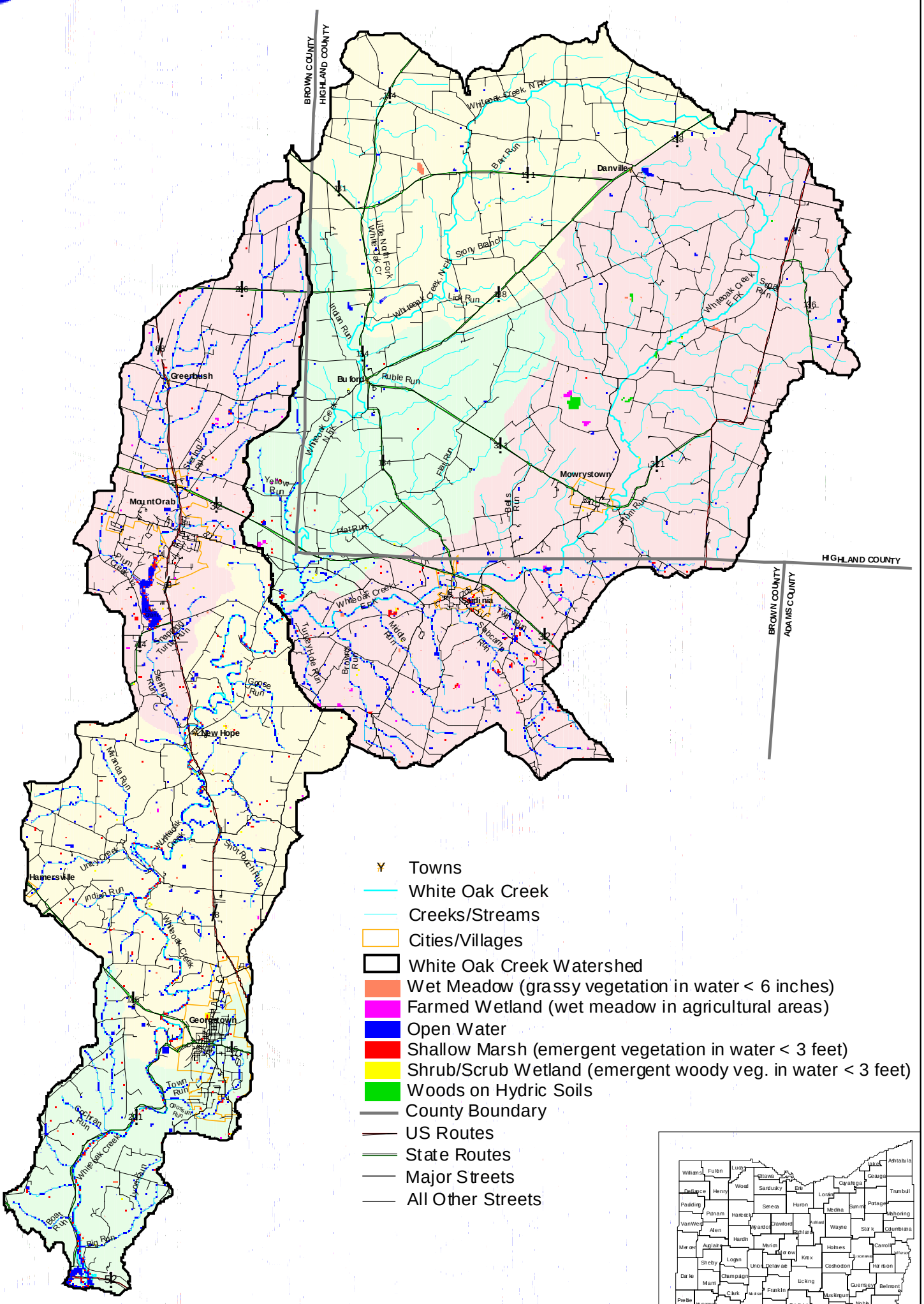
Data Source: Data provided by Brown SWCD obtained from USEPA and USGS
Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

WHITE OAK CREEK WATERSHED
STATESGO Soil



WHITE OAK CREEK WATERSHED

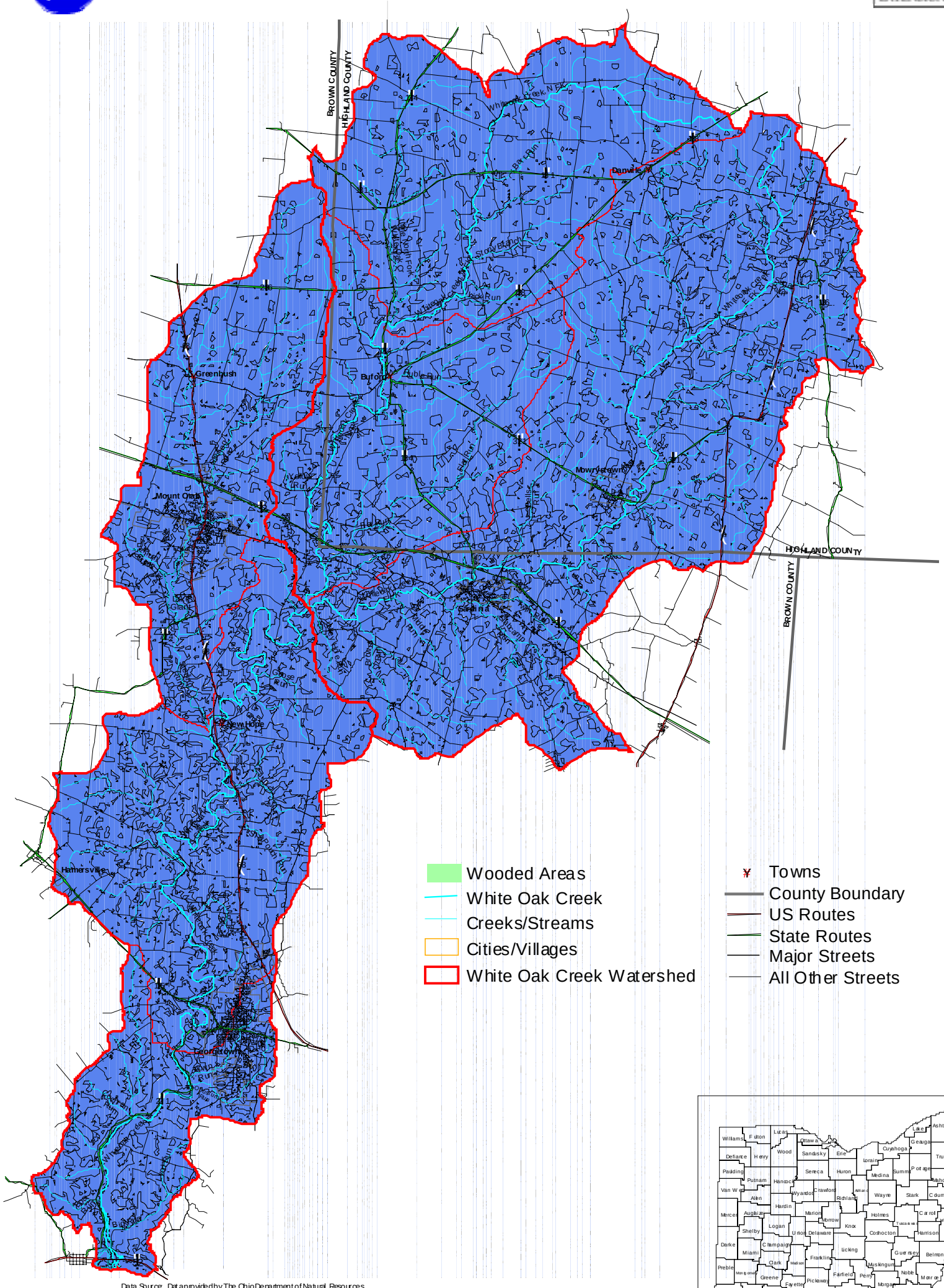
1985 / 1986 Wetlands Inventory



Data Source: Data provided by The Ohio Department of Natural Resources.
Data Description: The Wetlands Inventory is based on analysis of satellite data and is intended solely as an indicator of wetland sites for which field review should be conducted. The satellite data reflect conditions during the specific year and season the data was acquired and all wetlands may not be indicated. The Wetlands Inventory for Brown County was produced from May 1985 while Wetlands for Highland County was produced from April 1986. The resolution of Landsat Thematic mapper data is 30 meters by 30 meters using ERDAS Image processing software.

Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

WHITE OAK CREEK WATERSHED
Wooded Areas



Data Source: Data provided by The Ohio Department of Natural Resources.
Data Description: The wooded area is from land cover inventory produced by the digital image processing of Landsat Thematic Mapper Data acquired in Fall of 1994. The Thematic Mapper is a multi-spectral scanner that collects electromagnetic radiation reflected from the earth's surface in the visible, near infrared and mid-infrared wavelength bands. The resolution of the data is a 30 meter by 30 meter cell. The computer analysis of the data isolates unique spectral classes that relate to land cover characteristics. The land cover information reflects the conditions of the satellite data during the specific year and season the data was acquired. The Thematic Mapper data was processed using ERDAS image processing software.

Map prepared by the Center for Urban and Regional Analysis, Ohio State University, Nov. 2002

0 2 4 6 8 10 Miles

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