# SUGAR CREEK SOCIAL INDICATORS

## Tapping Subwatershed TMDL Potential in the Headwaters of the Ohio River

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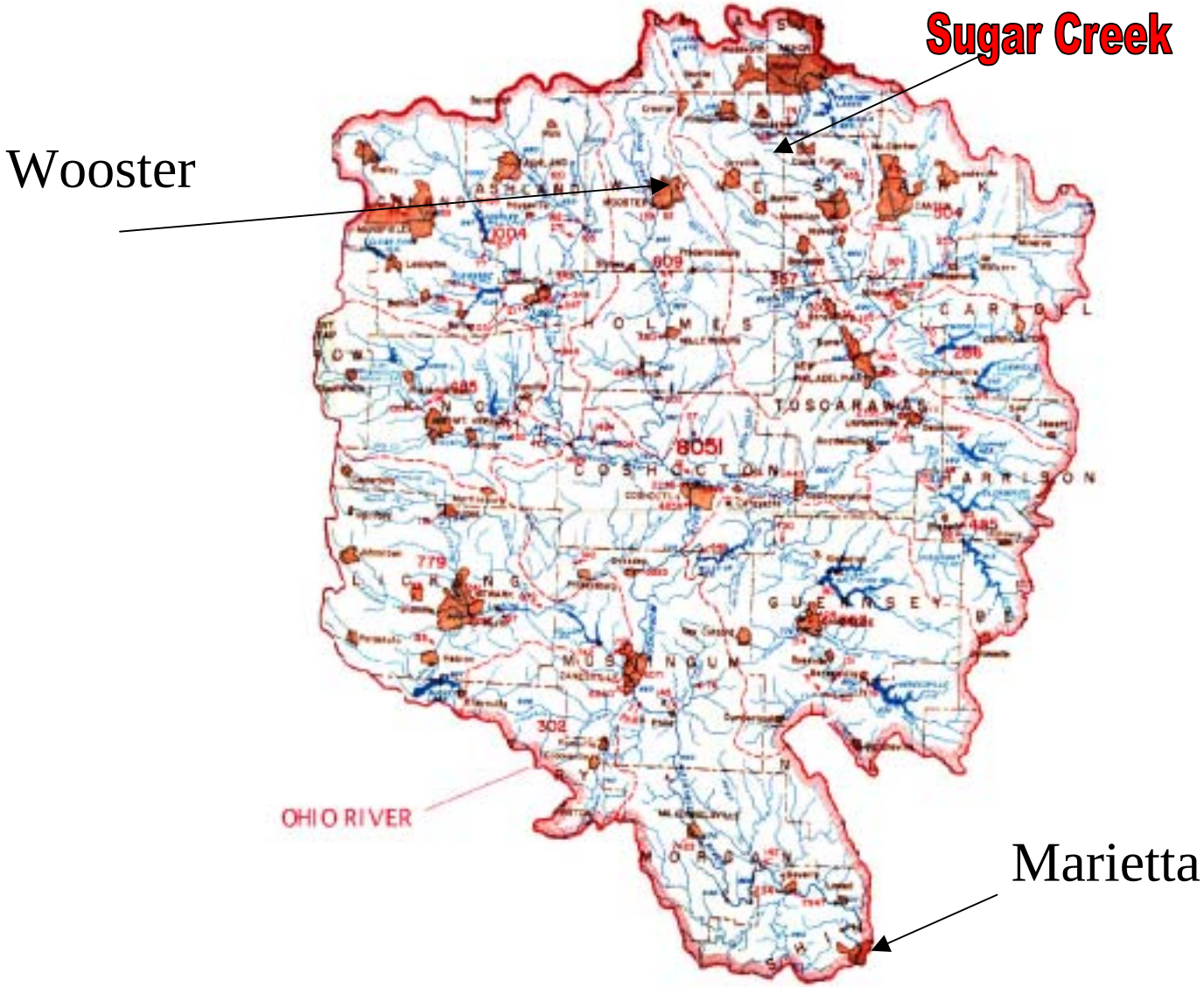
# THE MUSKINGUM WATERSHED IS THE SECOND LARGEST IN OHIO



# THE EXISTING SITUATION--
## Sugar Creek is one of the most impaired watersheds in the State of Ohio.

## SUGAR CREEK IMPAIRMENTS

- SEDIMENTATION
- HIGH LEVELS OF E.COLI BACTERIA
- HIGH LEVELS OF NITRATES
- HIGH LEVELS OF PHOSPHORUS

# SOCIAL INDICATORS
# --ACCORDING TO FARMER TEAM--

- Choosing neighbors for special purpose action and inquiry
- Going out to lunch together for the first time
- Distrust of EPA leads to joint recon mission by farmer rep and 2 researcher
- Distrust of EPA data leads to own data collection and farmer's own inquiry
- Farmers realize that their inquiries have scientific merit.
- Farmers request samples for specific inquiries
- Smithville town council cooperates in data collection
- Dreaming about a buffer hunting zone

# SOCIAL INDICATORS
# --ACCORDING TO FARMER TEAM--

- Decision to be good land/water stewards regardless of whether EPA's data was correct or not. (It was…).
- Letters to neighbors informing them of changes
- "Hot spot" approach to invite new team members

# SOCIAL INDICATORS ACCORDING TO RESEARCHERS (continued)

- Land use/land tenancy
- Range of rental rates
- Demographics
- Farm succession/inheritance—land fragmentation rates
- Trust in agencies
- Social institutions—school and church

# SOCIAL INDICATORS ACCORDING TO RESEARCHERS

- Coherence/hypercoherence—social networks
- Awareness of problem
- Spatial distribution/aggregation of locally defined concerns and goals (questionnaire referenced to GIS on parcel basis through Access database
- Congruity of Watershed and Community
- Symbolic value of Watershed BMP vis a vis community vision
- Measuring positive feedback loops related to lowering chemical inputs and economic gain.

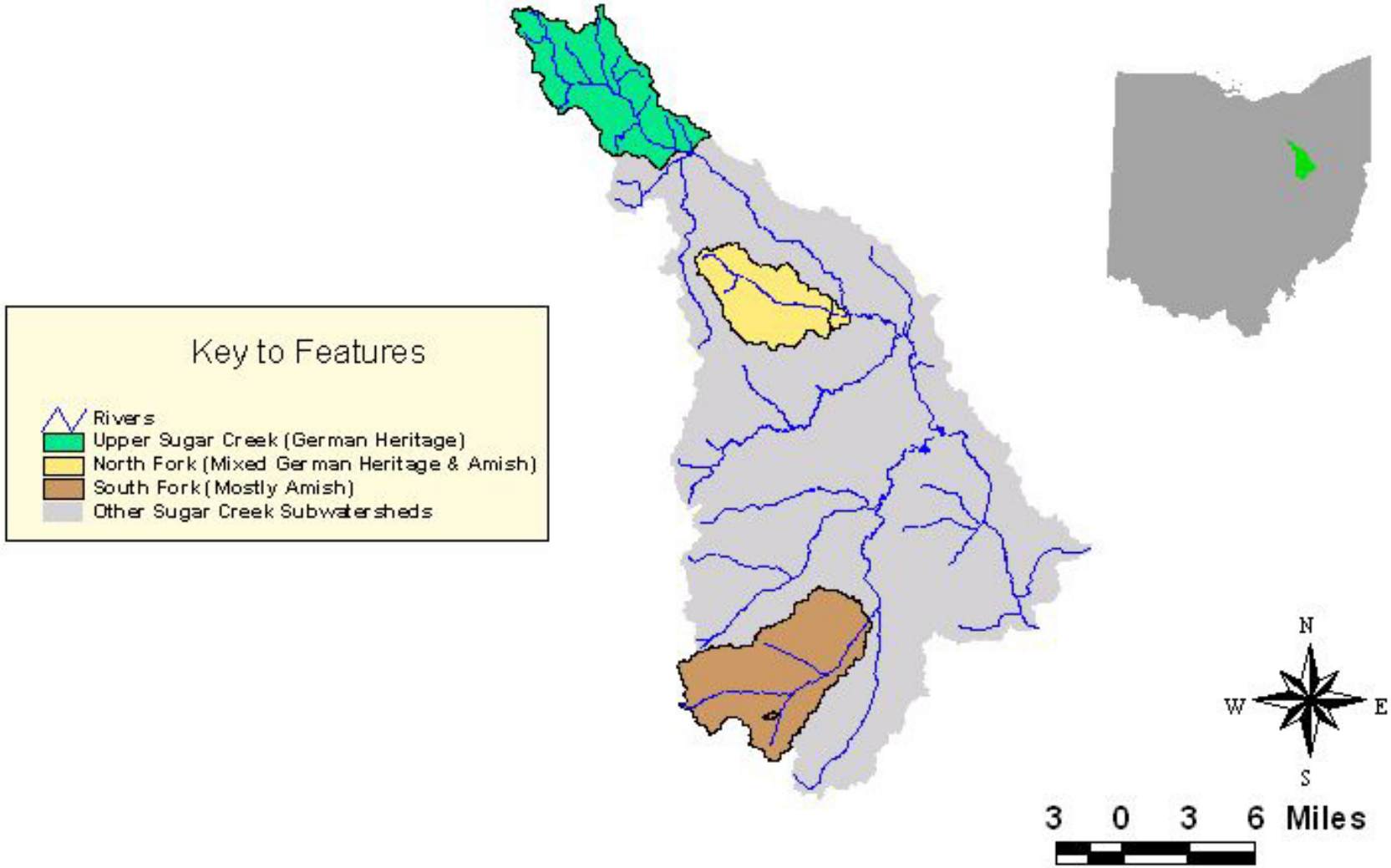
# THE SUGAR CREEK METHOD

- Treat each stream as unique physically, biologically, and socially;
- Focus on headwaters and benchmark socially through a survey and through water quality analysis.
- Catalyze local level participatory learning communities that seek their own subwatrserhed visions;
- Collaborate with downstream teams with the help of extension and soil and water quality agents;
- Build on the concept that a healthy environment leads to healthy people and profitable agriculture; and
- A holistic approach seeking to find more suitable agroecological methods at the family, farm, subwatershed, community, and watershed levels.

# THE SUGAR CREEK METHOD (1)

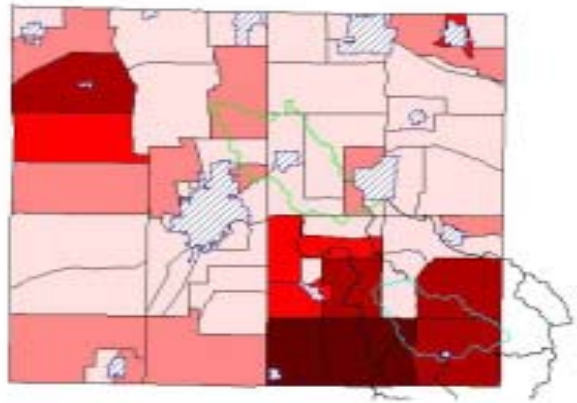
- Treat each stream (tributary) as unique physically, biologically, and socially.
  - Participatory approaches differ according to many cultural factors such as age, religion, and ethnicity.
  - Focus on headwaters first.

# Sugar Creek Subwatersheds

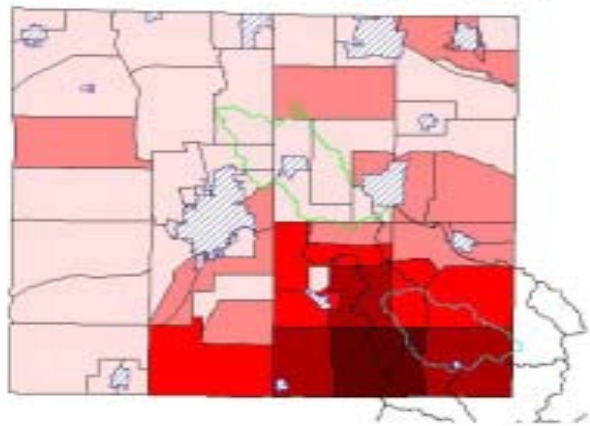


| Subwatershed | Participatory Team Type | Heritage Characteristics | Farming Characteristics | Pollution Problems |
|---|---|---|---|---|
| **Upper Sugar Creek (Smithville)** | Farmer led<br>Neighbors with land on stream<br>Works with AMP | German with some English and French | Dairy, hog, and grain farming (farm size 400+ acre average) | Sedimentation<br>Nitrates<br>phosphorus |
| **North Fork** | County SWCD led<br>Community leaders from diverse organizations | Mixed German, Swiss Mennonite, and ), Old Order Amish | Dairy, poultry, and Amish rotations (farm size about 200 or less) | Sedimentation<br>Fecal coliform<br>Nitrates<br>Phosphorus<br>Dissolved Oxygen |
| **South Fork** | Amish churches, parochial schools, oat threshing rings, and silo filling rings | Old Order Amish | Dairy and Amish rotations, cash vegetable crops (farm size of 75-200 acres) | Sedimentation<br>Phosphorus<br>Dissolved Oxygen<br>Poor Habitat Quality |

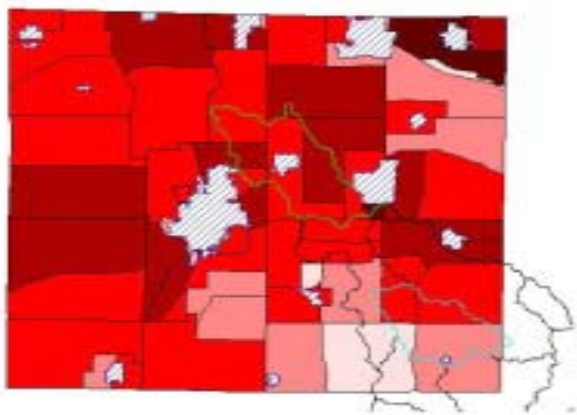
# English Language Literacy in Wayne County



**Not Able to Speak English**
- 0 - 5
- 6 - 15
- 16 - 40
- 41 - 130
- 131 - 313



Able to Speak/Second Language
- 0 - 43
- 44 - 131
- 132 - 266
- 267 - 622
- 623 - 1334

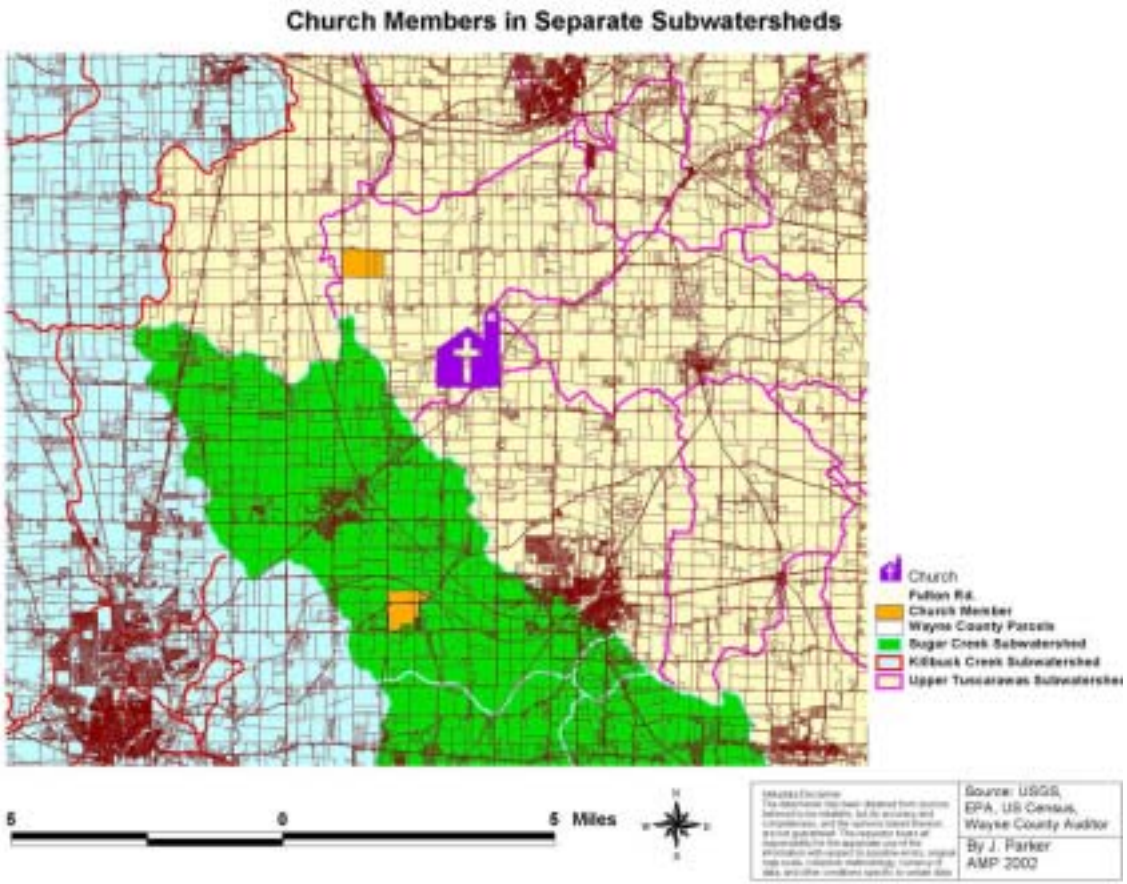


Only Speak English
- 179 - 365
- 366 - 835
- 836 - 1154
- 1155 - 1651
- 1652 - 2802

Source: U.S. Census, OEPA

AMP GIS, 2000

# Upper Sugar Creek –church members exchange low input farming information at their church outside of the watershed.



# THE AMISH CHURCH GROUPS

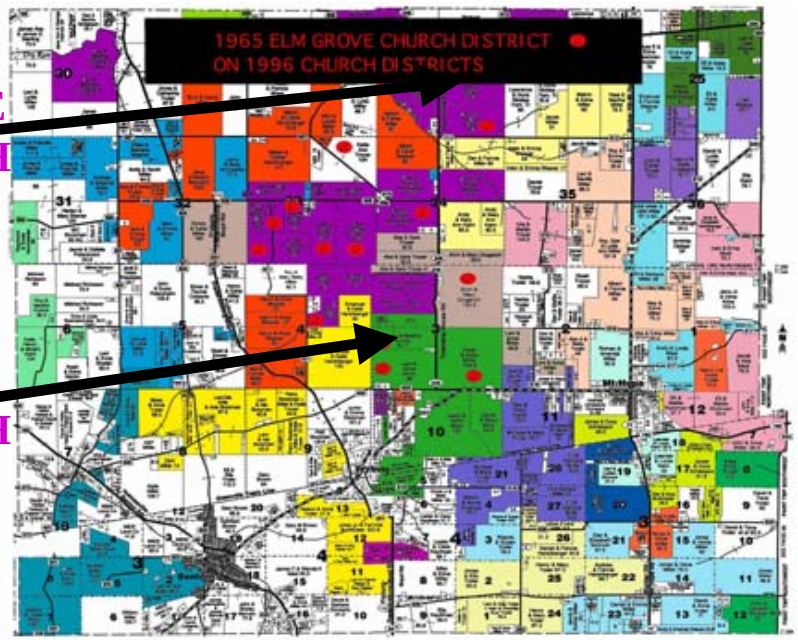
**The primary unit of Amish society is an extended family, which usually includes three generations. Groups of families are tightly connected as parts of Amish church communities or *Gemeinde*. Church services are held in homes and barns which limits size to 20-40 households, beyond which church fissioning occurs.**

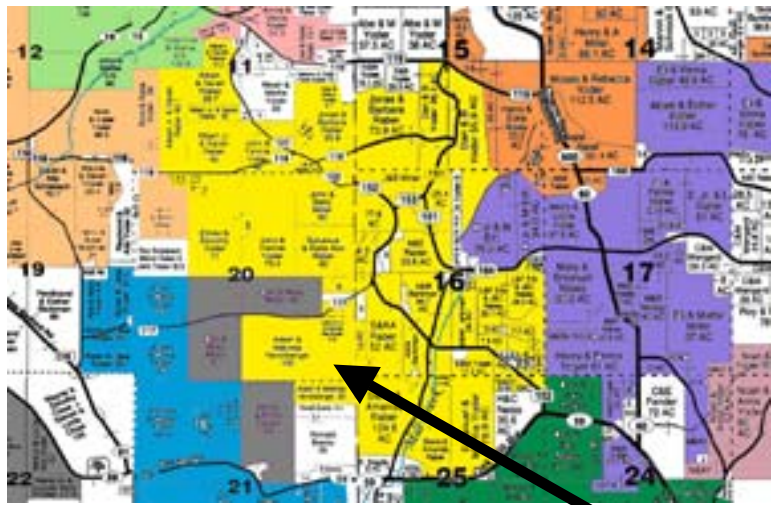
## ZONE 1: SPLINTERED

## ZONE 2: CONTIGUOUS

**FARM 1 (PURPLE CHURCH GROUP)**

**FARM 2 (GREEN CHURCH GROUP)**



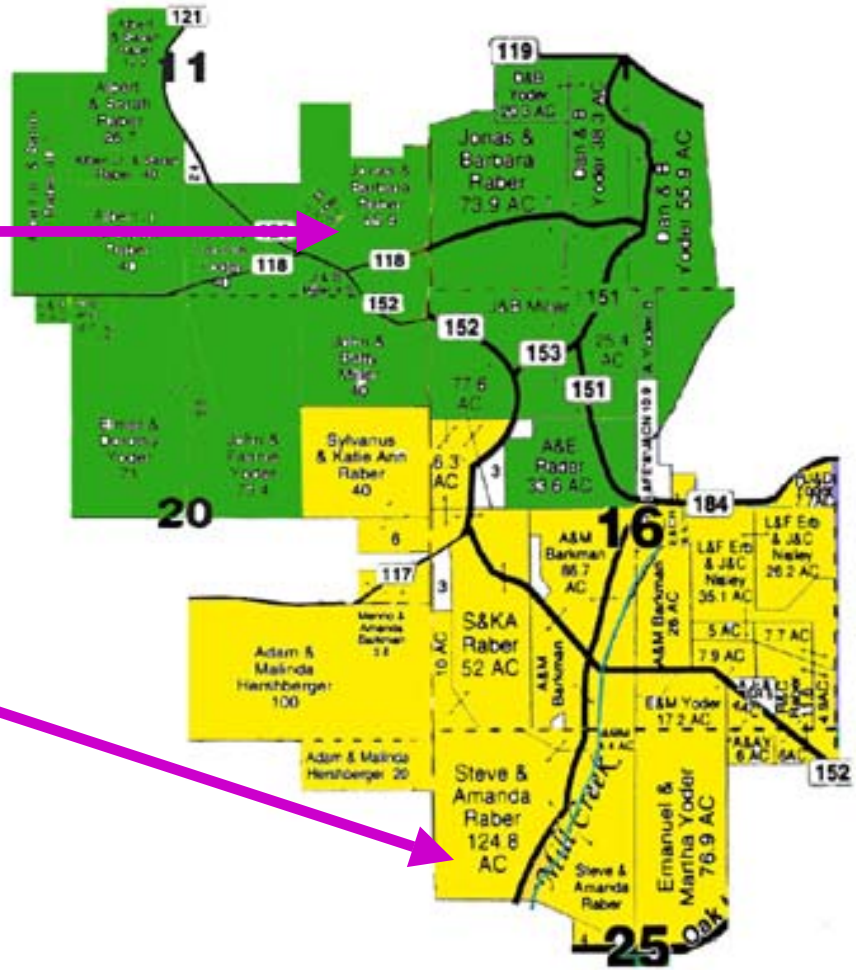



**FARM 3 (YELLOW CHURCH GROUP (BEFORE 1995 SPLIT)**

# OLD ORDER AMISH CHURCH THAT DIVIDED IN 1995

**OLD SCHOOL (TWINCREEK)**

**NEW SCHOOL BUILT IN 1994**

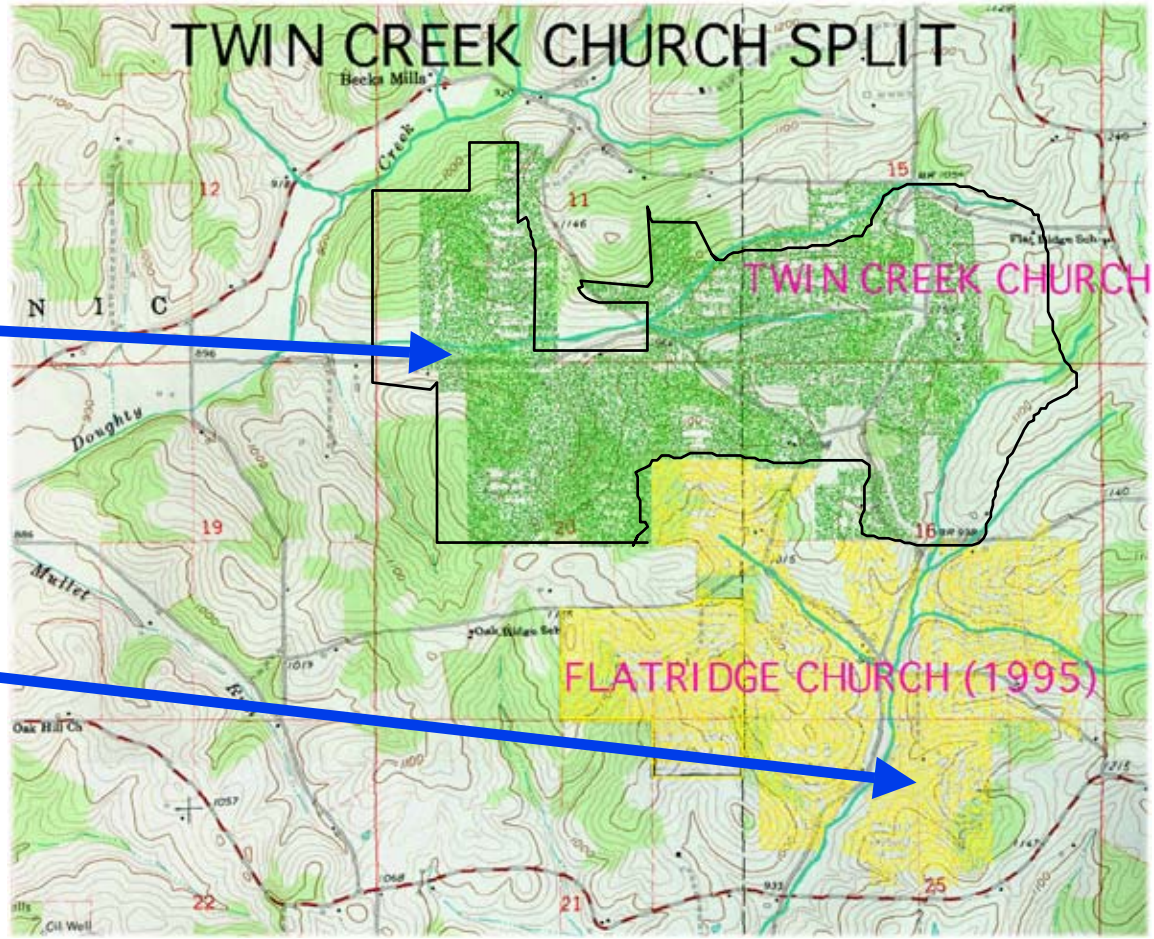



**SCHOOL OVER-CROWDING PRECEDED THE CHURCH DIVISION**

# OLD ORDER CHURCH SPLIT ALONG WATERSHED LINES

**DOUGHTY CREEK (KILLBUCK WATERSHED)**

**MILL RUN (TUSKARAWAS WATERSHED)**



# Upper Sugar Creek Farming Strategy

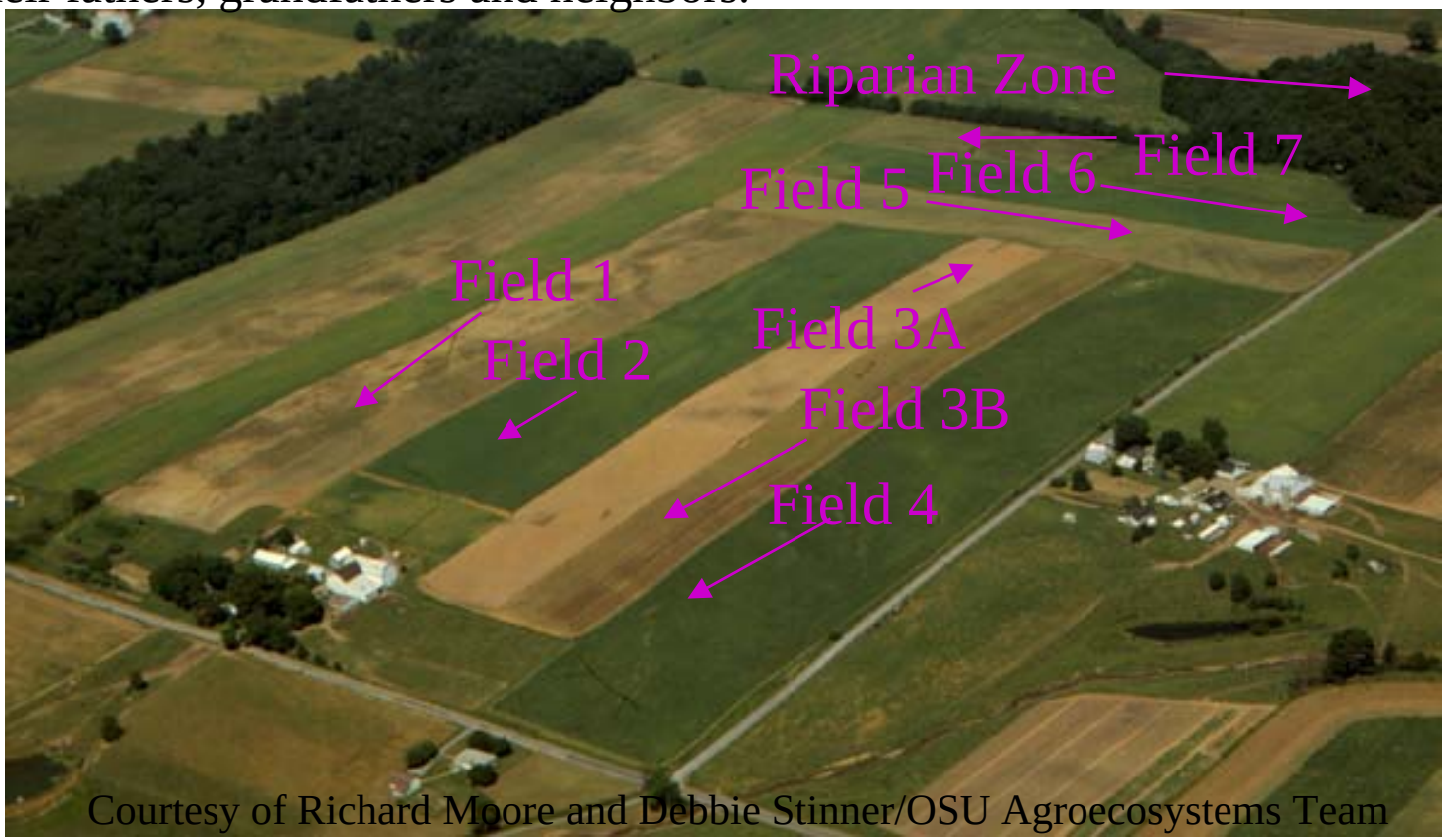
**Corn and Soybeans (2 year rotation)**

**Dairy**

**Hogs**

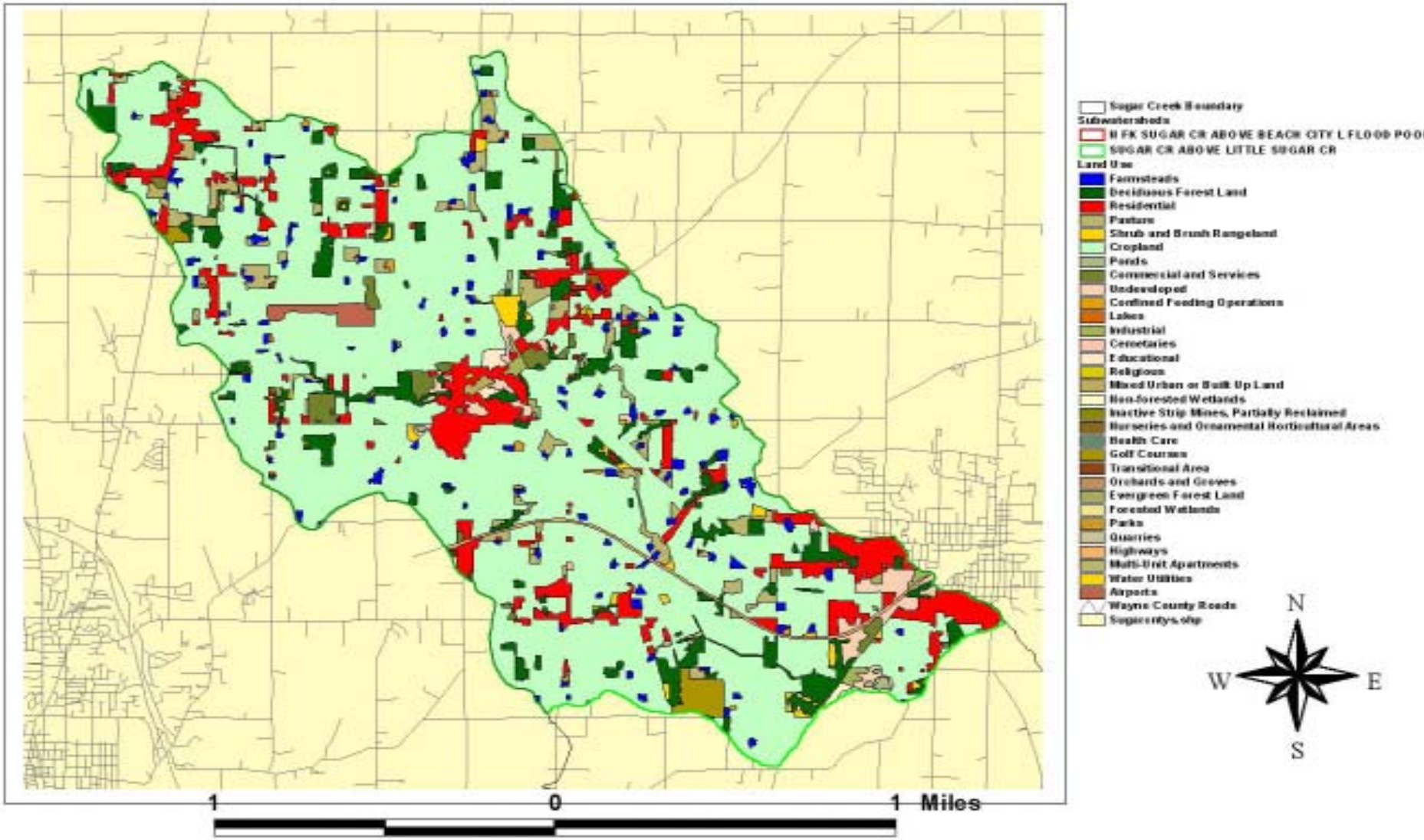
# CROP ROTATIONS ON HOLMES COUNTY AMISH FARMS

Traditional Amish farms are diversified and usually include dairy cows as well as other livestock. A 4 - 5 year rotation including: hay, corn, oats and wheat or spelts (emmer wheat) is the foundation of Amish agriculture. Manure (10 -12 T/A) is applied to the hay fields going into corn. Amish farmers have a high degree of flexibility that helps them cope with bad weather. The indigenous knowledge needed to make these farming systems work is learned by sons from their fathers, grandfathers and neighbors.




Courtesy of Richard Moore and Debbie Stinner/OSU Agroecosystems Team

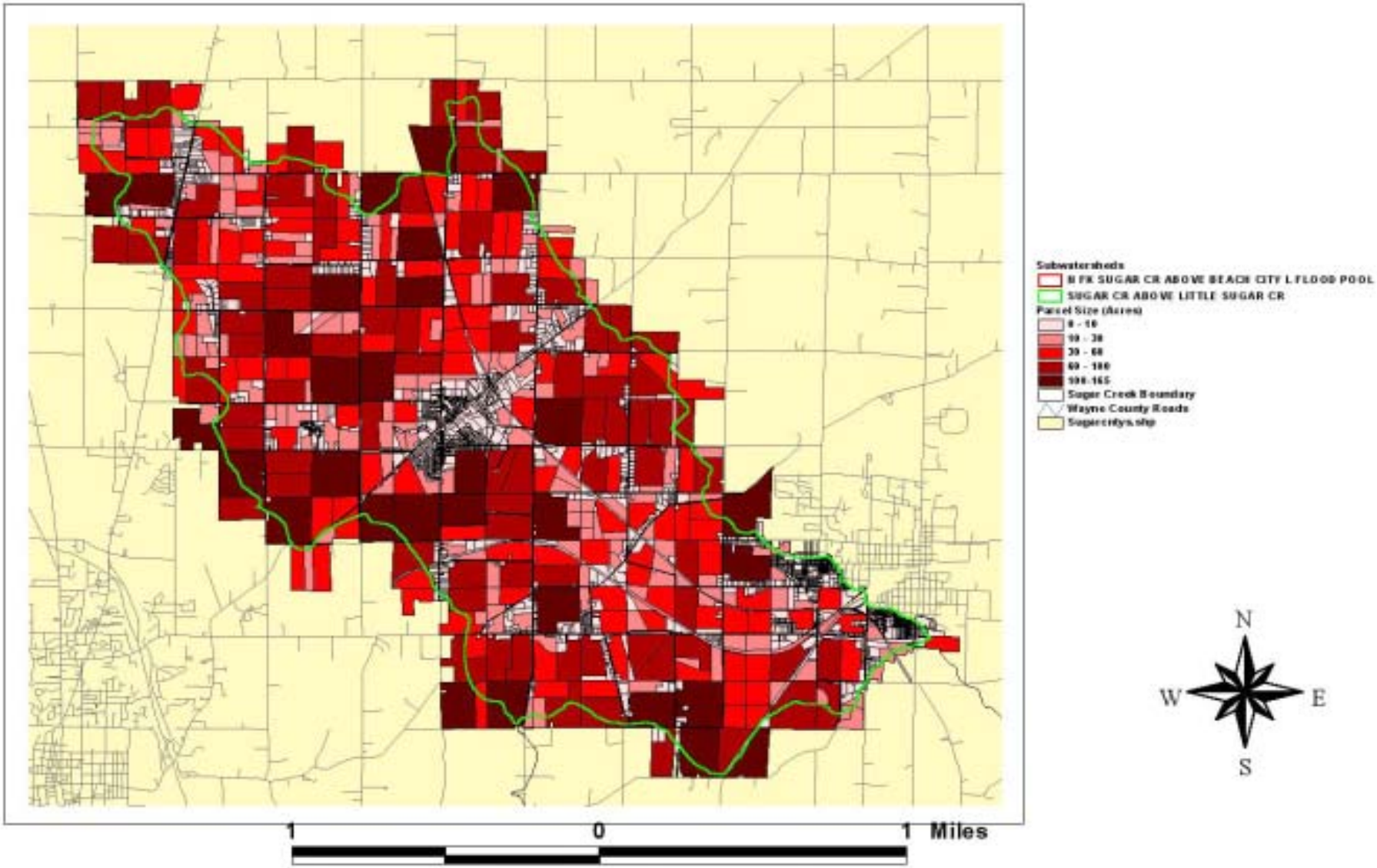
# Sugar Creek Headwaters Land Use




Source: USGS, OEPA

AMP GIS, 20

# Sugar Creek Headwater Parcels




Source: USGS, OEPA

AMP GIS, 2000

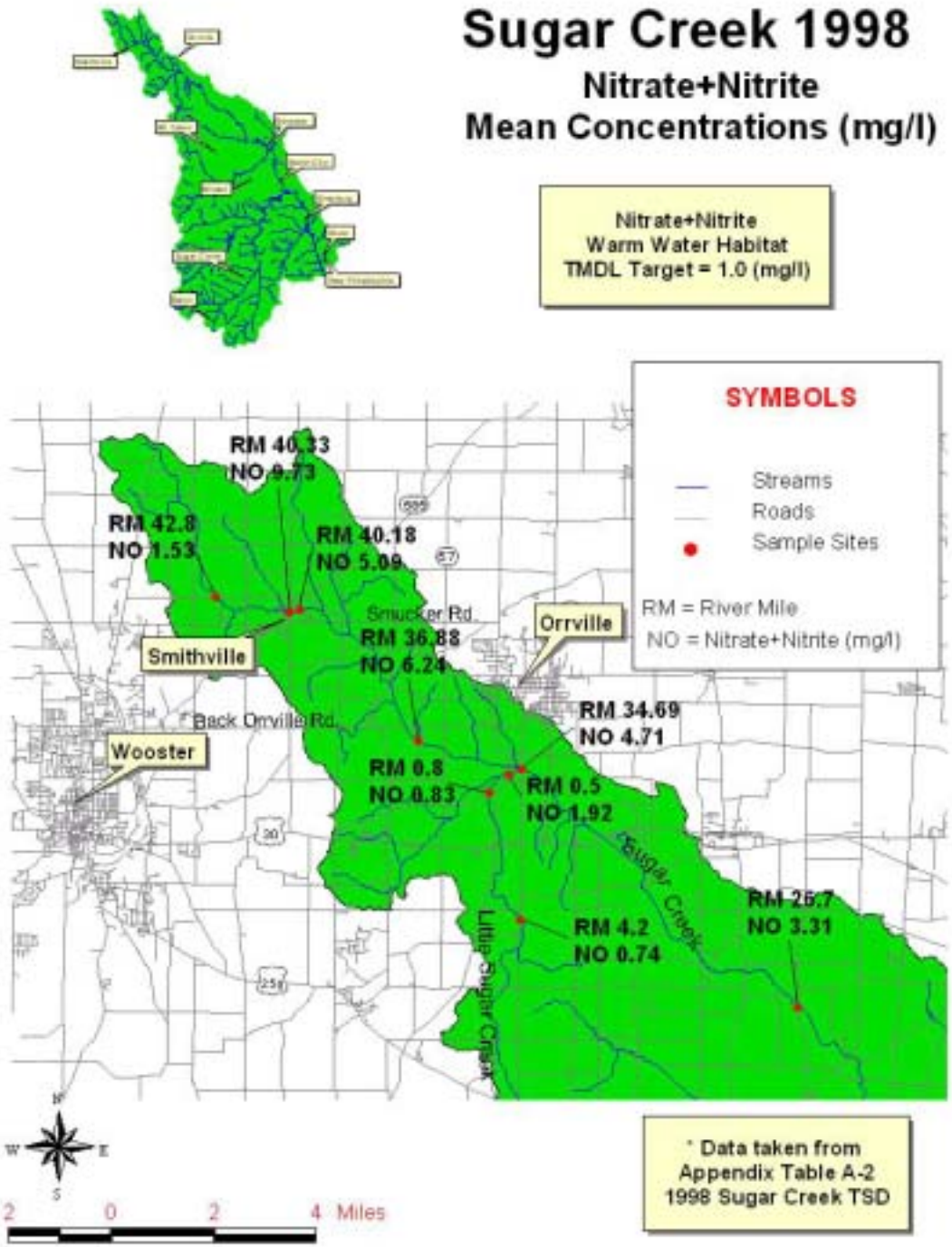
# THE SUGAR CREEK METHOD (2)

- Benchmark headwaters
  - Social survey to benchmark resident landowners' awareness level
  - Discover concerns, aspirations, attachments

    Discover trust levels in agencies
  - Water quality benchmarking: Farmers' lack of awareness of problem and distrust in EPA data led to 21 sites for water quality testing—every farm has reference point.

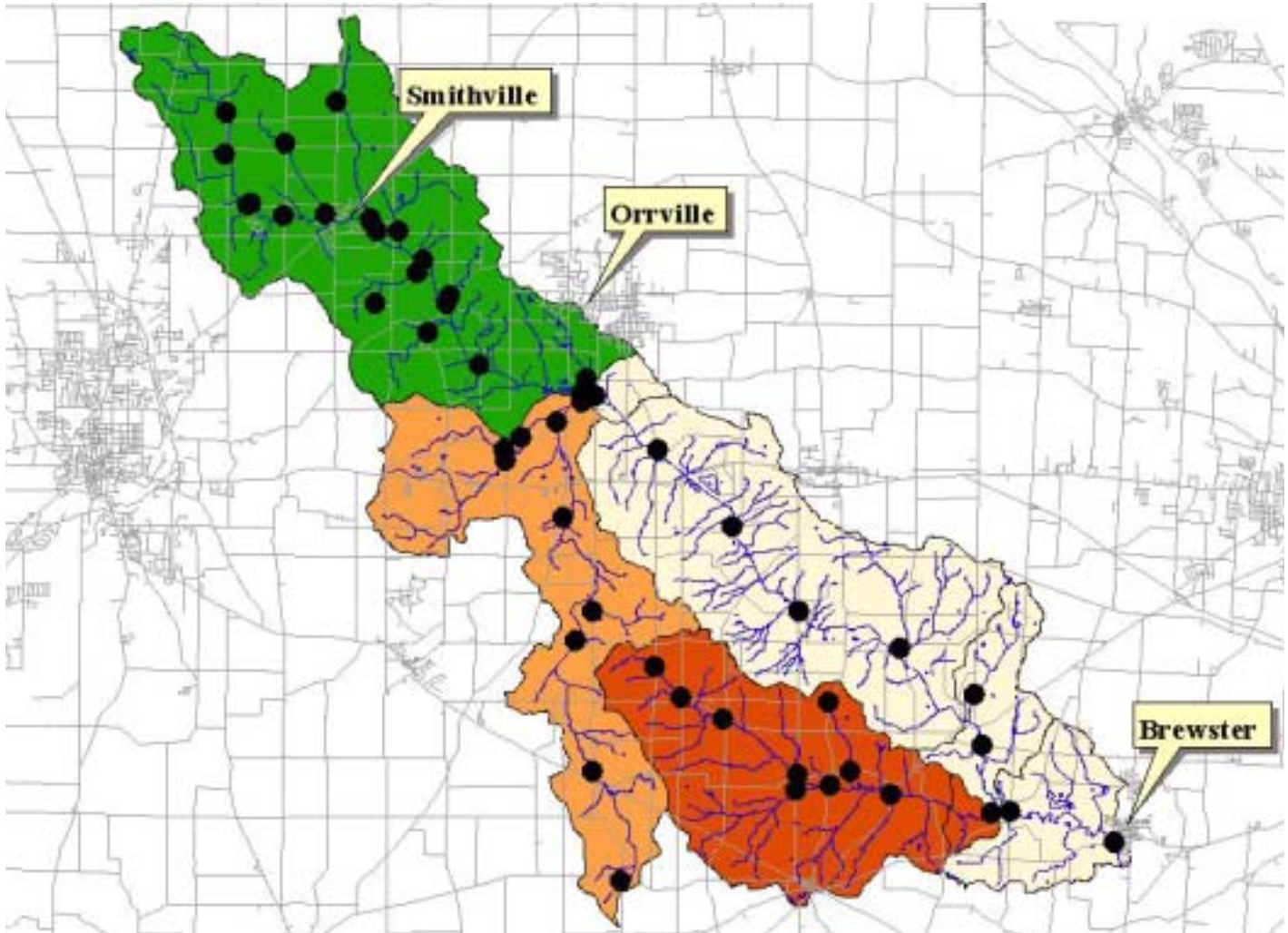
**Sugar Creek at Kansas Road: One of 22 Water Quality Testing Sites**

# SMITHVILLE SUGAR CREEK HEADWATERS STREAM WALK WITH WAYNE WATERSHED COORDINATOR

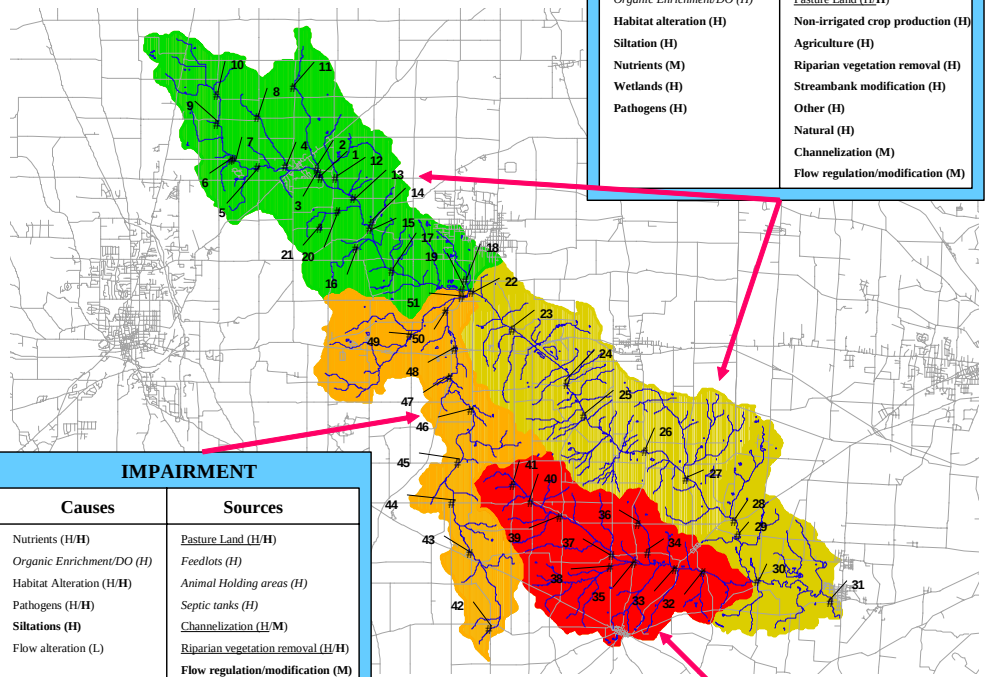



# MAKING WATER QUALITY DATA EASY TO UNDERSTAND

# BENCHMARKING WATER QUALITY: NEW TESTING SITES IN ADJACENT SUBWATERSHEDS



# Sugar Creek Watershed Research Area



**IMPAIRMENT**

| Causes | Sources |
|---|---|
| *Organic Enrichment/DO (H)* | Pasture Land (H/**H**) |
| **Habitat alteration (H)** | **Non-irrigated crop production (H)** |
| **Siltation (H)** | **Agriculture (H)** |
| **Nutrients (M)** | **Riparian vegetation removal (H)** |
| **Wetlands (H)** | **Streambank modification (H)** |
| **Pathogens (H)** | **Other (H)** |
| | **Natural (H)** |
| | **Channelization (M)** |
| | **Flow regulation/modification (M)** |

**IMPAIRMENT**

| Causes | Sources |
|---|---|
| Nutrients (H/**H**) | Pasture Land (H/**H**) |
| *Organic Enrichment/DO (H)* | *Feedlots (H)* |
| Habitat Alteration (H/**H**) | *Animal Holding areas (H)* |
| Pathogens (H/**H**) | *Septic tanks (H)* |
| **Siltations (H)** | Channelization (H/**M**) |
| Flow alteration (L) | Riparian vegetation removal (H/**H**) |
| | **Flow regulation/modification (M)** |
| | **Point Source (M)** |
| | **Minor Ind. Point Source (M)** |

**IMPAIRMENT**

| Causes | Sources |
|---|---|
| *Organic Enrichment/DO (H)* | Pasture Land (H/**H**) |
| **Habitat alteration (H)** | **Non-irrigated crop production (H)** |
| **Siltation (H)** | **Agriculture (H)** |
| **Nutrients (M)** | **Riparian vegetation removal (H)** |
| **Flow alteration (L)** | **Streambank modification (H)** |
| **Pathogens (H)** | **Channelization (M)** |
| | **Flow regulation/modification (M)** |

**SYMBOLS**

- Sample Sites
- Roads
- Streams
- Little Sugar Creek
- North Fork Sugar Creek
- Headwaters Sugar Creek
- Main Stem Sugar Creek

H – High; M- Moderate; L – Low

Causes & Sources in **bold:** were identified in 1998; underlined: were identified both in 303(d) and 1998 survey; in *italics*: identified in 303(d) only

# KIDS CAPTURE CRAWDADS IN SMITHVILLE PARK DURING TEAM STREAM WALK

# SMITHVILLE PARK TEAM WALK (SUMMER 2001)

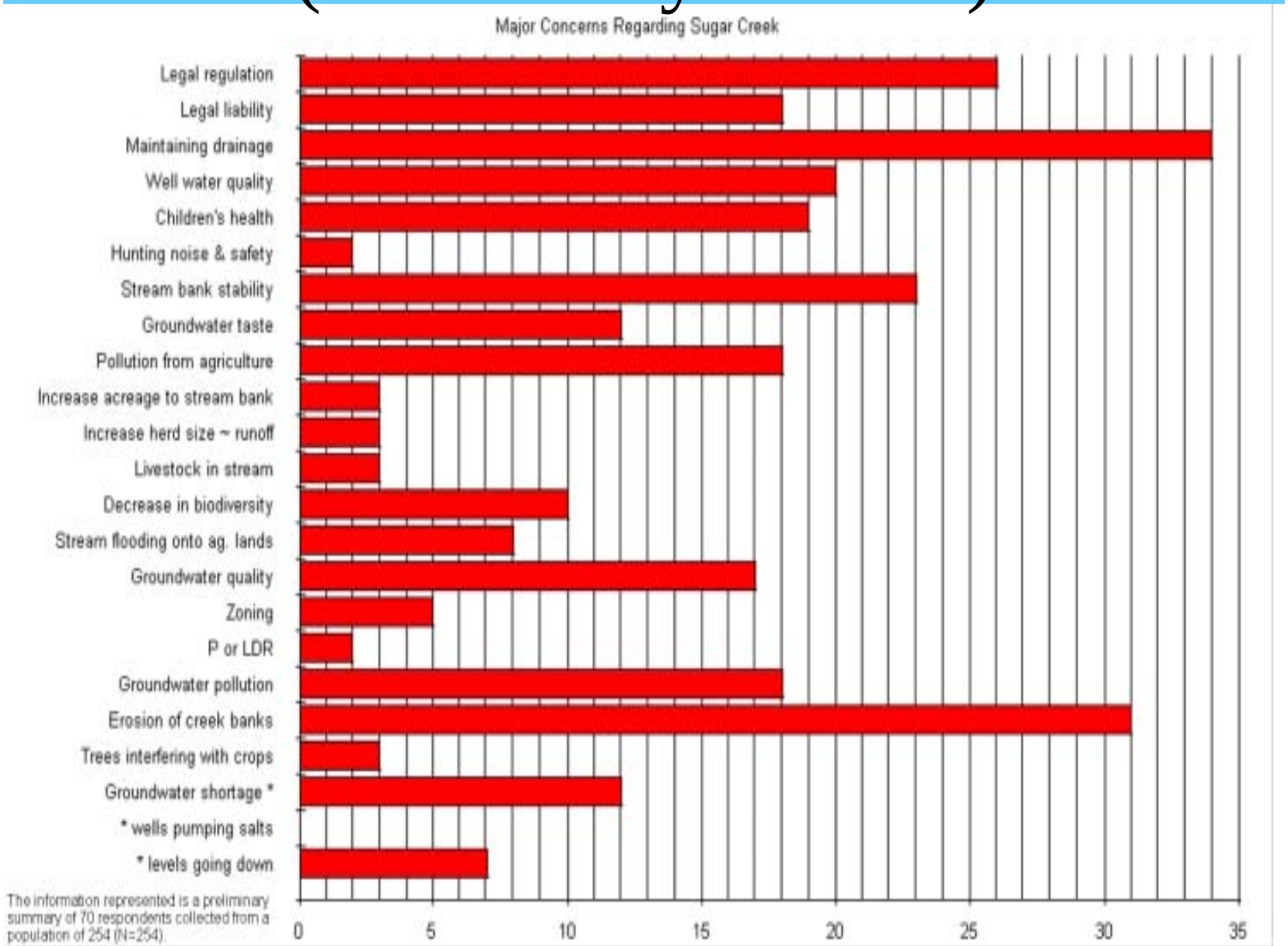
## THE FUTURE IS SAFE IN THEIR HANDS!

# SUGAR CREEK FARMING FAMILIES EXPLORE THE CREEK IN SMITHVILLE PARK

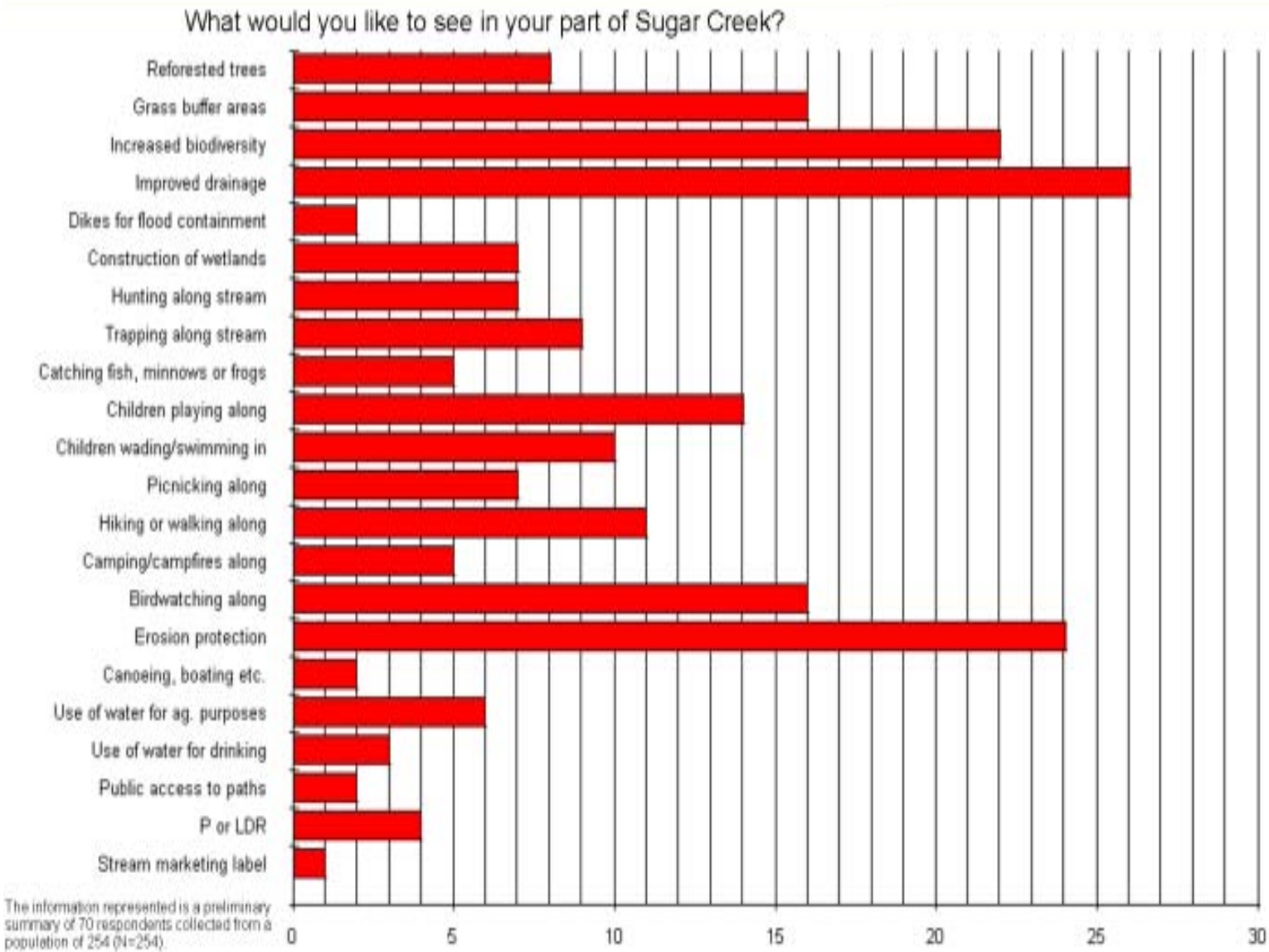
# SUGAR CREEK FARMING FAMILIES
# OSU AMP TEAM AND
# WAYNE SWCD WORK TOGETHER

# Geyers Chapel Artesian Well

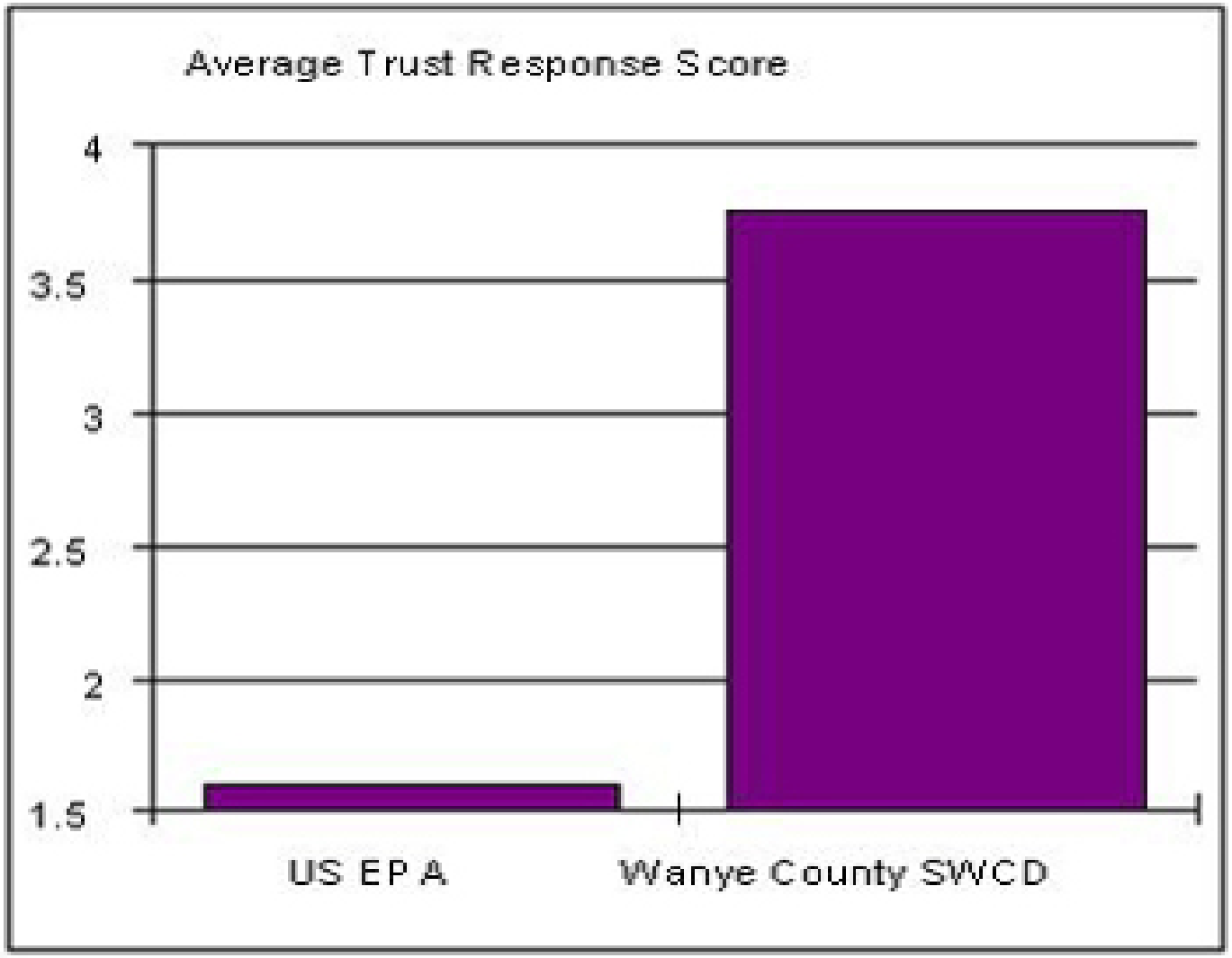
# THE SUGAR CREEK METHOD (2A: Survey Results)



# THE SUGAR CREEK METHOD (2B: Survey Results)



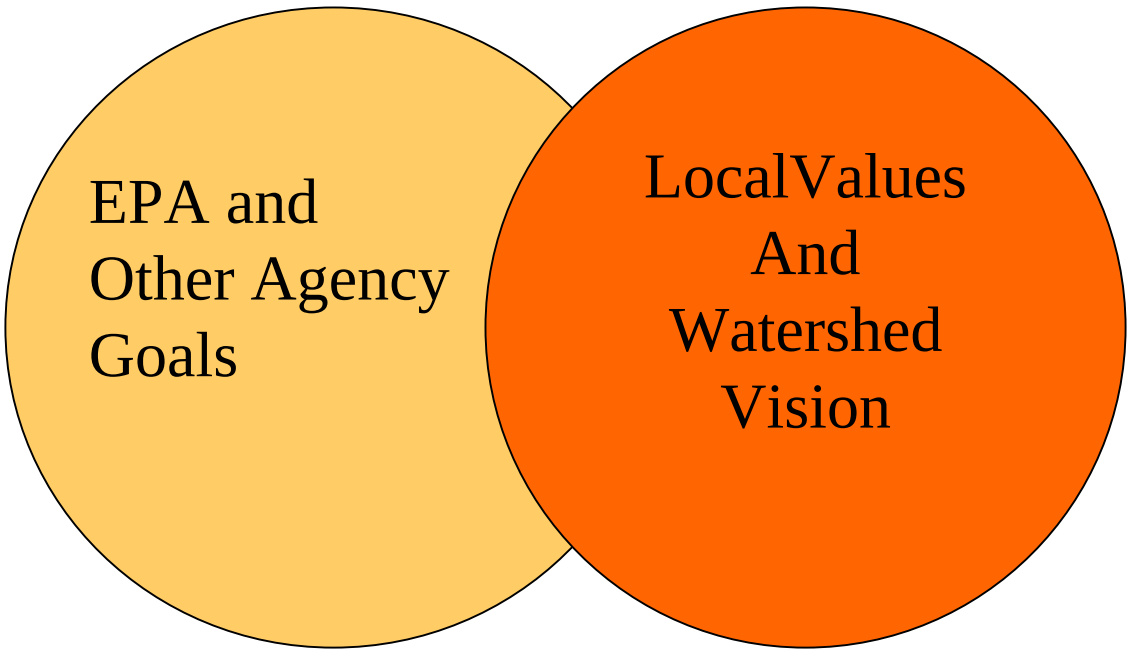
# THE SUGAR CREEK METHOD (2D: Survey Results)



# THE SUGAR CREEK METHOD (3)

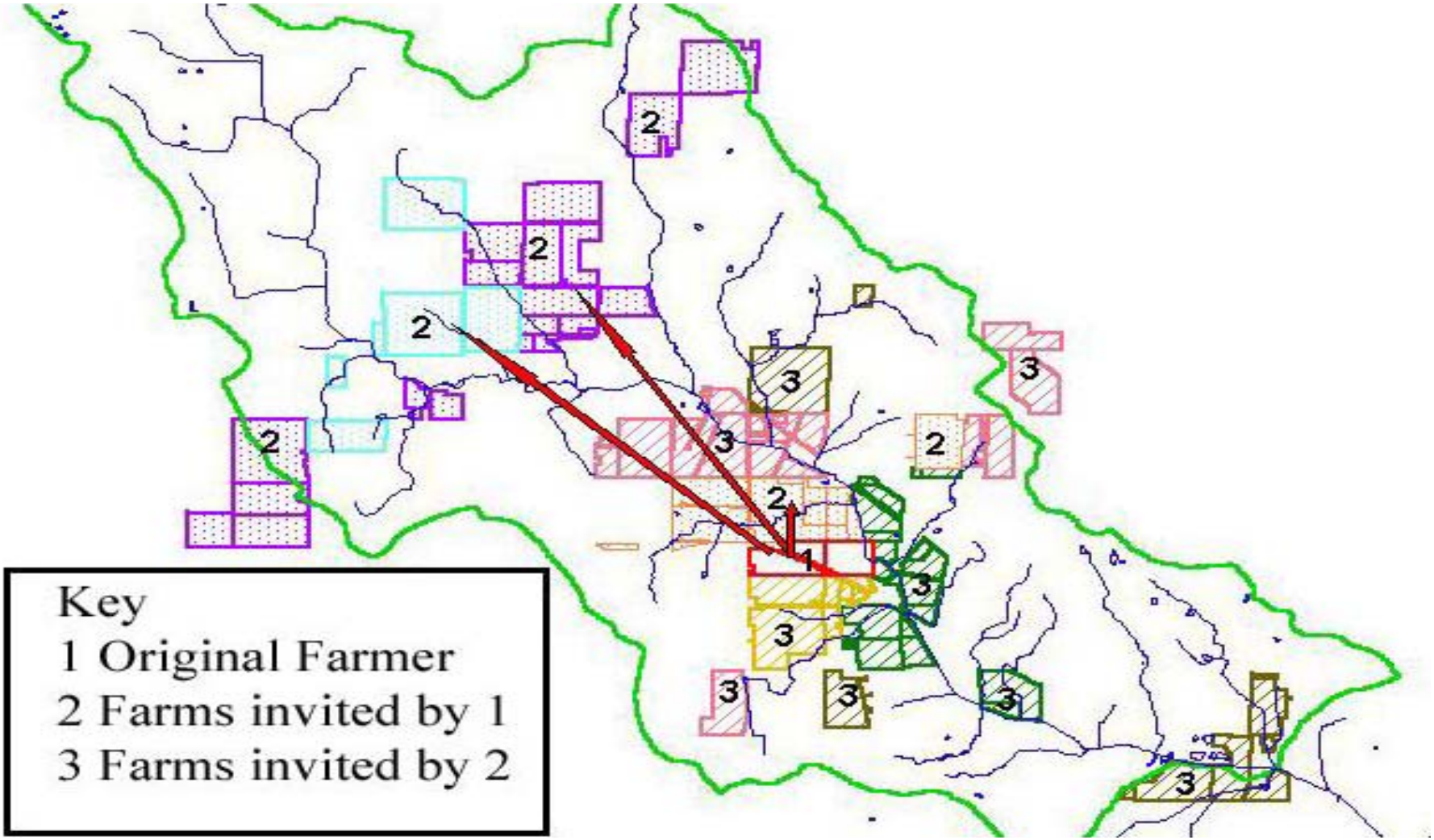
- Catalyzing local level participatory learning communities that seek their own subwatershed visions.
  - We start with local subwatershed level values and try and find compatible goals of government and non-government agencies.

# THE SUGAR CREEK METHOD (3A)



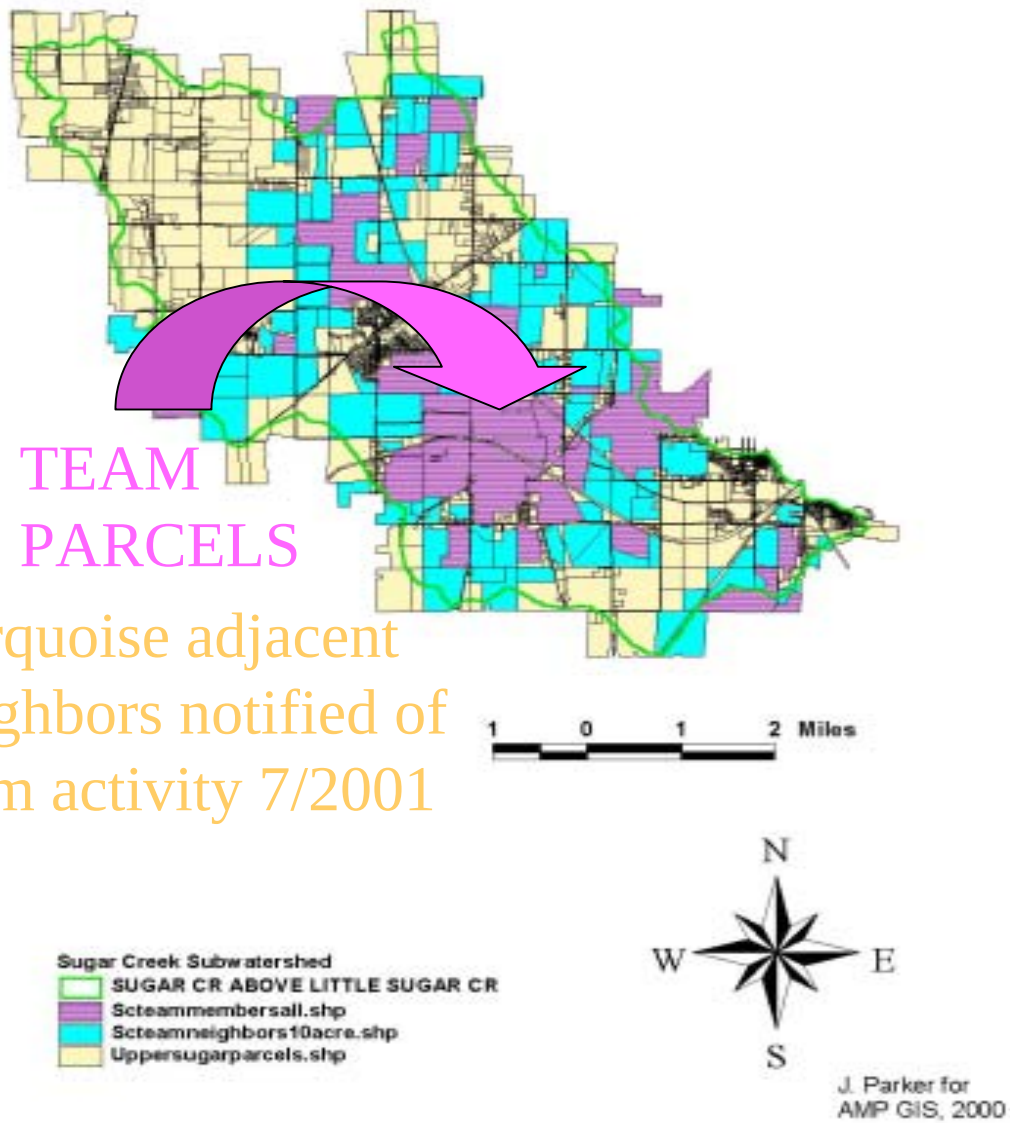
THE SUGAR CREEK METHOD (3B)

# SUGAR CREEK HEADWATERS TEAM PHASE 1: NEIGHBORS FORM TEAM



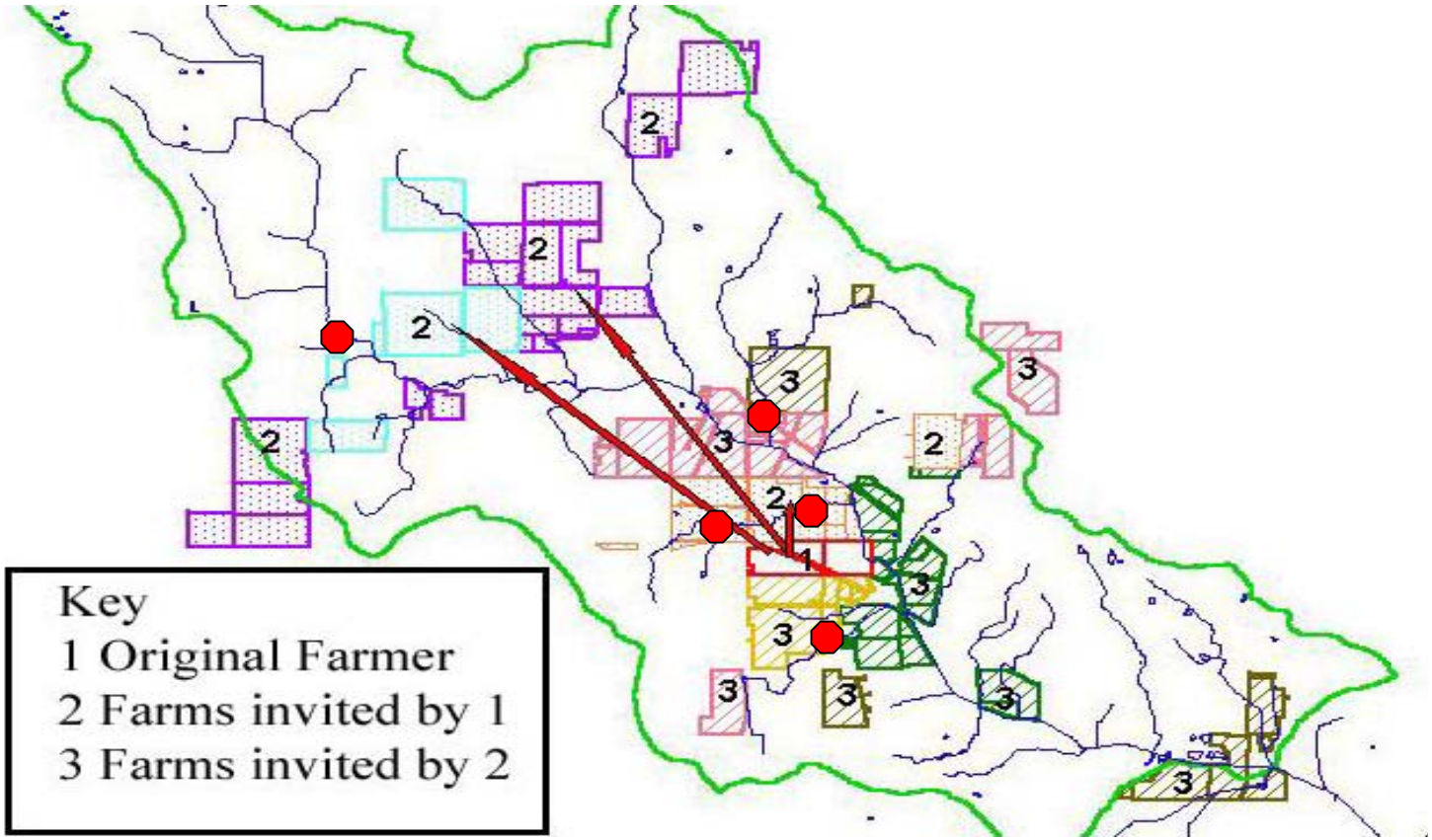
# THE SUGAR CREEK METHOD (3C)

## Sugar Creek Team Neighbors with >10 Acres of Land



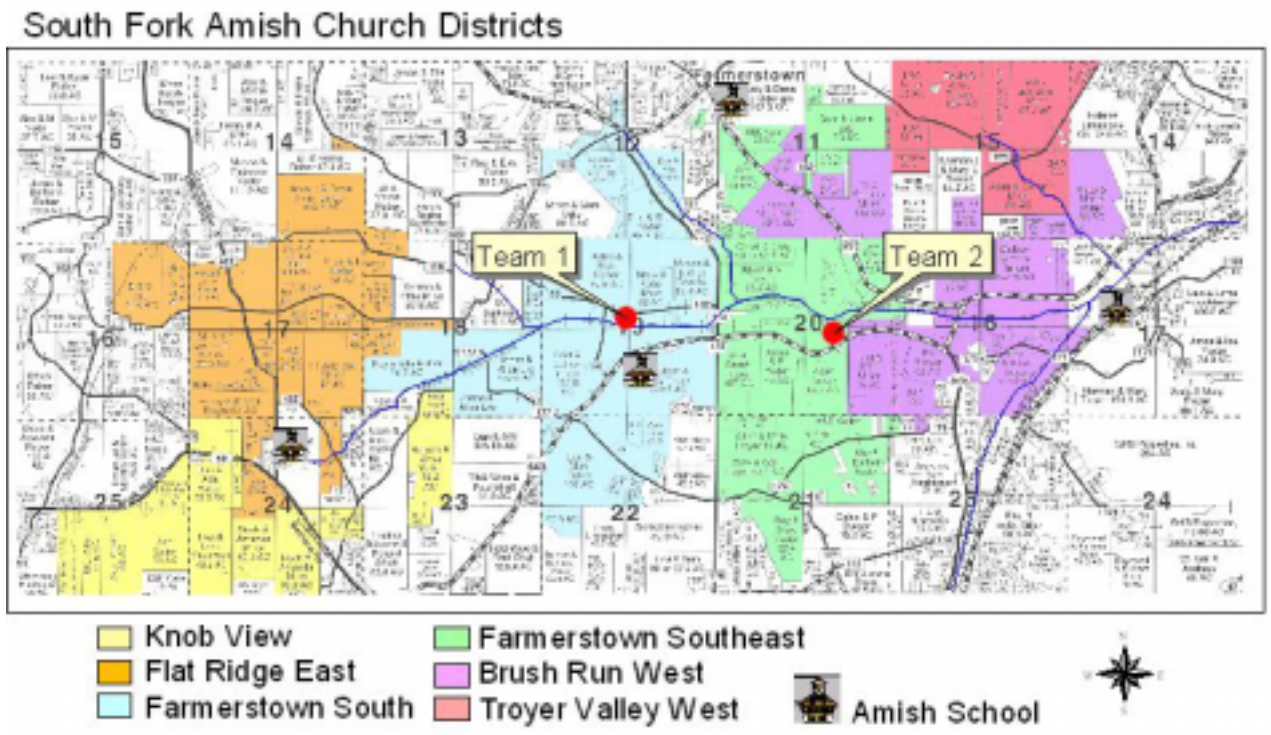
THE SUGAR CREEK METHOD (3D)

# SUGAR CREEK HEADWATERS TEAM PHASE 2 (DEC 2001): TEAM INVITES NEIGHBORS WITH FARMS NEAR N& P “HOT SPOTS” TO JOIN TEAM



# Hot Spots Are Given Piority

# PROPOSED TEAM IN THE SOUTH FORK BASED ON AMISH CULTURAL INSTITUTIONS (OAT THRESHING RINGS, CHURCH DISTRICTS, PAROCHIAL SCHOOLS)



# THE SUGAR CREEK METHOD (4)

Collaborate with downstream teams with the help of extension and soil and water quality agents

---team members attend Muskingum Watershed Conservation District citizens meeting, local nature center, and Tuscarawas SWCD meeting (Oct.2001)

---headwaters group near Smithville attend North Fork subwatershed workshop in Kidron (Jan.2002)

# THE SUGAR CREEK METHOD (5)

- Build on the concept that a healthy environment leads to healthy people and profitable agriculture

  --collaboration with Wayne County Health Department on septic system education

  --testing of team members' well water and fecal coliform in the stream

# THE SUGAR CREEK METHOD (6)

- A holistic approach seeking to find more sustainable methods at the family, farm, subwatershed, community, and watershed levels.

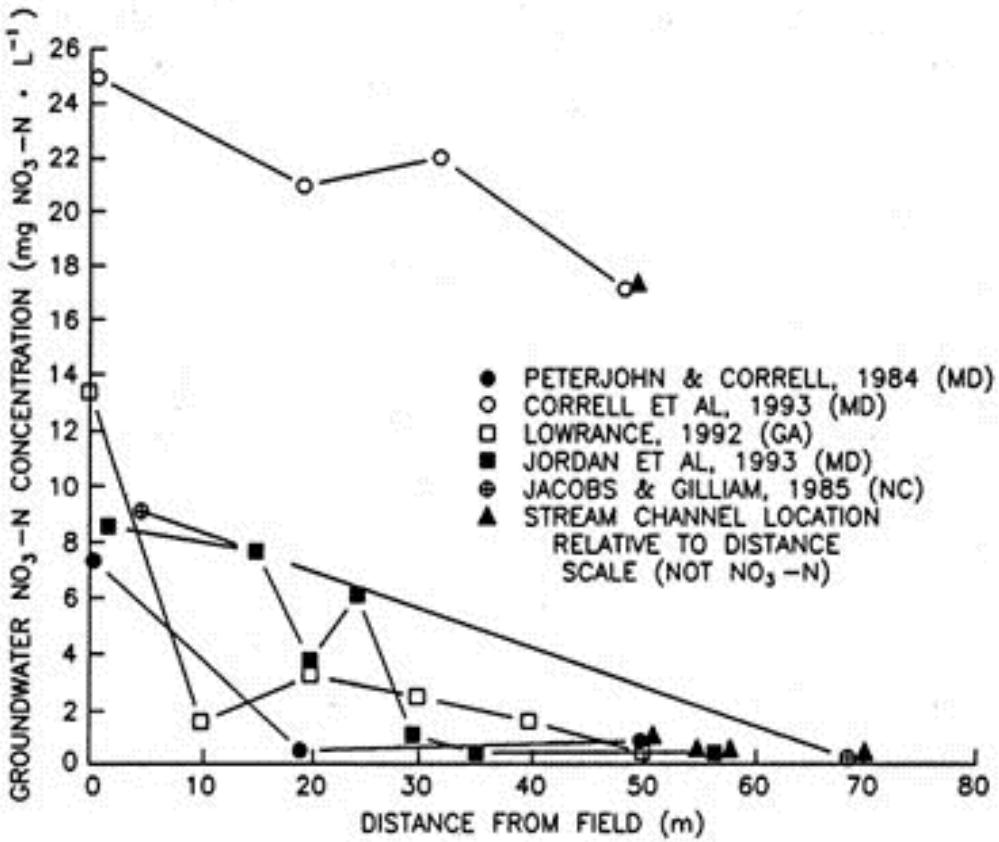
  --the farmer team is examining farming systems at the barn, field, and stream locations (farmers' classifications).

  -- the researchers are using GIS, agroecosystems, and computer modeling at all levels.

# SMITHVILLE SUGAR CREEK HEADWATERS TEAM PROJECTS

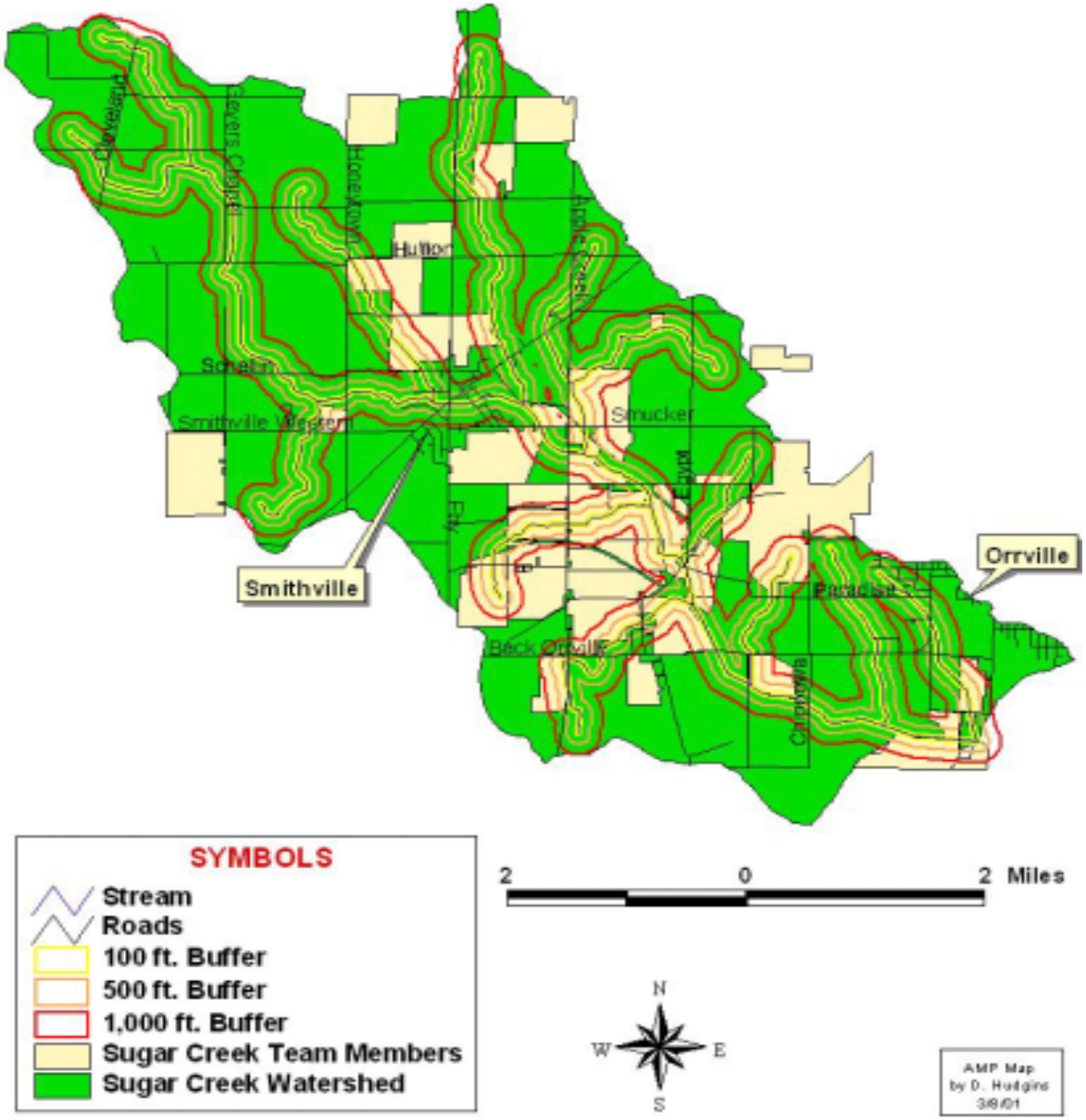
THE 8 MILE CONTIGUOUS RIPARIAN BUFFER MAY STOP ABOUT 75% OF THE NITRATES THAT ENTER IT, AND SERVES AS A RESERVOIR FOR THE PHOSPHORUS PREVENTING IT FROM ENTERING THE STREAM. But the most significant aspect of this BMP is its symbolic role in connecting diverse farmer and non-farmer partners.

# RIPARIAN BUFFERS AND N FILTERING

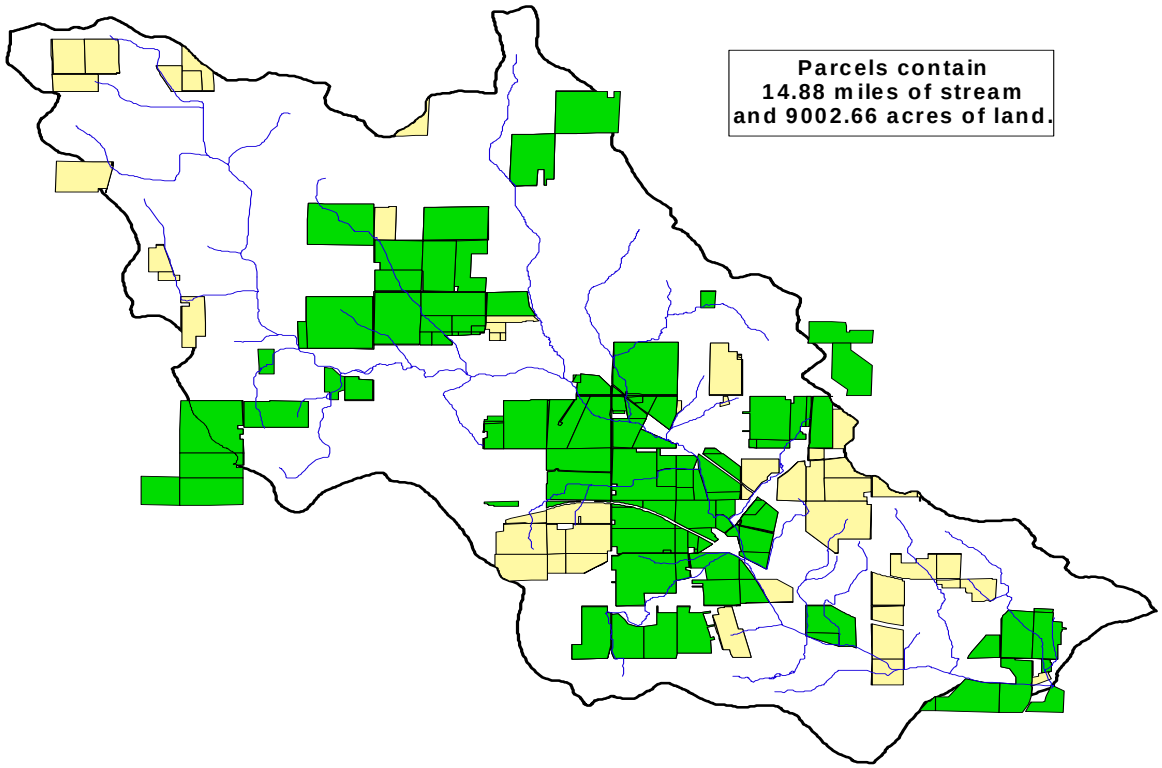


***Based on the stream corridor frontage of the existing Upper Sugar Creek farmer team members who plan to add CRP buffers, there are 8 miles of potential contiguous stream buffers. If we add to this the survey results showing parcels of those individuals expressing an interest in creating buffers, there are more than 14 miles of potential buffer.***

# Sugar Creek Headwaters with Buffers in Relation to Team Member Land



# Headwaters Farmers with an Interest in Buffers



Parcels contain
14.88 miles of stream
and 9002.66 acres of land.

3 0 3 Miles

N
W E
S

**SYMBOLS**

- Stream
- Team Member Land
- Non-Team Farmers with Interest in Buffers
- Headwaters

Data for AMP internal use only.

AMP Map
by D. Hudgins
11/05/01

Data from Wayne Co. Audtitor's Office, ODNR, & US Census Bureau.

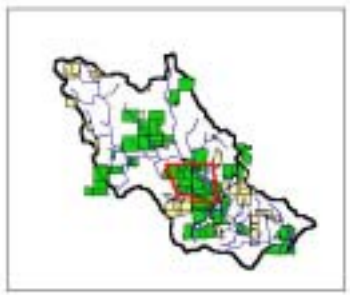
Data Disclaimer
The data herein has been obtained from sources believed to be reliable, but its accuracy and completeness, and the opinions based thereon, are not guaranteed. The requestor bears responsibility for the appropriate use of the information with respect to possible errors, original map scale, collection methodology, currency of data, and other conditions scecific to certain data.

# Planned Contiguous Buffer Strip Upper Sugar Creek; Phase 1

0.5 0 0.5 Miles

Data for AMP internal use only.

SYMBOLS
Stream
30 ft. Buffer
60 ft. Buffer
Team Member
Team Member
Team Member
Team Member



AMP Map
by D. Hudgins
11/05/07

Data from Wayne Co. Auditor's Office, DDNR, & US Census Bureau

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**Joe Hartzler**

# VISUALIZING THE FUTURE (1)

## AERIAL VIEW WITH GIS PARCEL DATA AND NEARBY TRIBUTARIES

0.5 0 0.5 Miles

N
W E
S

Data obtained from the Wayne County Auditor's Office and ODNR.

AMP Map
by D. Hudgins
5/1/01

**SYMBOLS**

- Roads
- Stream
- Headwaters
- Your Land

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Joe Hartzler

# VISUALIZING THE FUTURE (2)

# AERIAL VIEW WITH GIS PARCEL DATA AND POSSIBLE BUFFER SCENARIOS

0.3 0 0.3 Miles

N
W E
S

**SYMBOLS**

- Stream
- Headwaters
- Your Land
- 35 ft. Buffer
- 50 ft. Buffer
- 100 ft. Buffer
- 300 ft. Buffer
- 500 ft. Buffer
- 1000 ft. Buffer

Data obtained from the Wayne County Auditor's Office and ODNR.

AMP Map
by D. Hudgins
5/1/01

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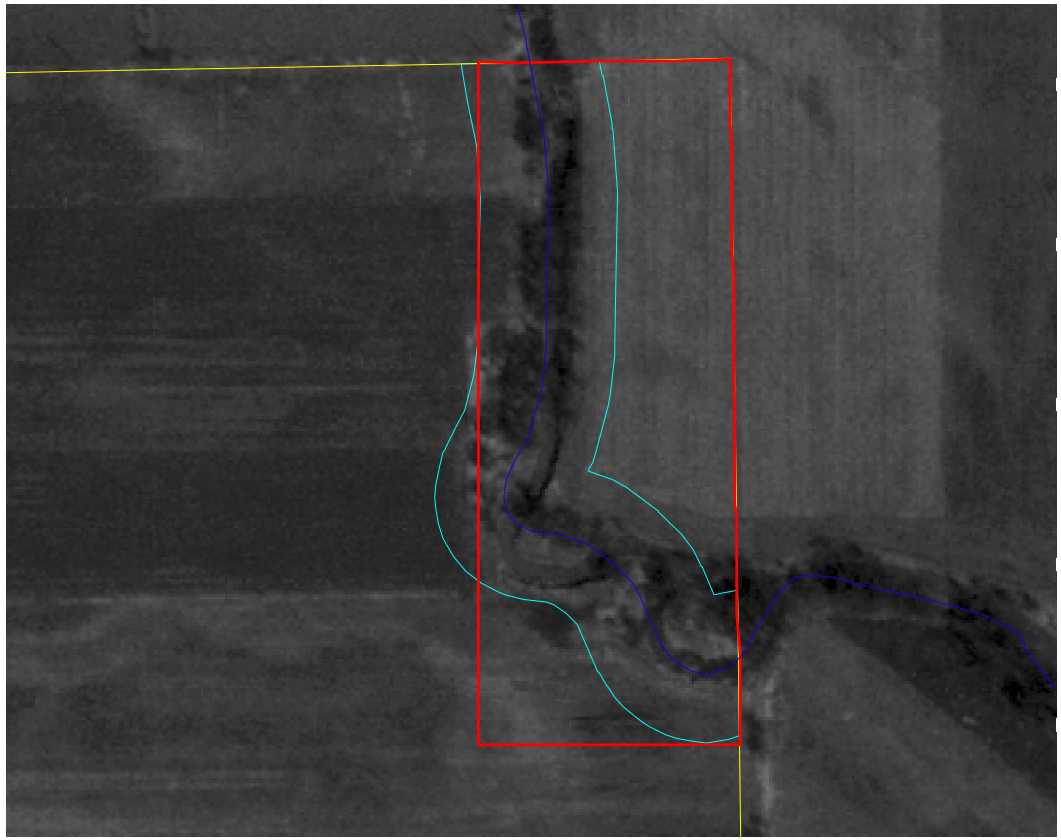
# Joe Hartzler

# VISUALIZING THE FUTURE (3)

# AERIAL VIEW WITH GIS PARCEL DATA AND CRP BUFFER



0.07 0 0.07 Miles

N W E S

**SYMBOLS**

- Stream
- Proposed Buffer
- Your Land
- 100 ft. Buffer

Data obtained from the Wayne County Auditor's Office and ODNR.

AMP Map
by D. Hudgins
5/1/01

Data Disclaimer
The data herein has been obtained from sources believed to be reliable, but its accuracy and completness, and the opinions based thereon are not guaranteed. The requestor bears responsibility for the appropriate use of the information with respect to possible errors, original map scale, collection methodology, currency of data, and other conditions specific to certain data.

# SMITHVILLE SUGAR CREEK HEADWATERS TEAM PROJECTS

- Joe Hartzler showing his planned stream modifications and CRP buffer. The corn field is rented by Rex Miller. Joe is planning to convert it to a forest buffer.

# SMITHVILLE SUGAR CREEK HEADWATERS TEAM PROJECTS

Joe Hartzler's

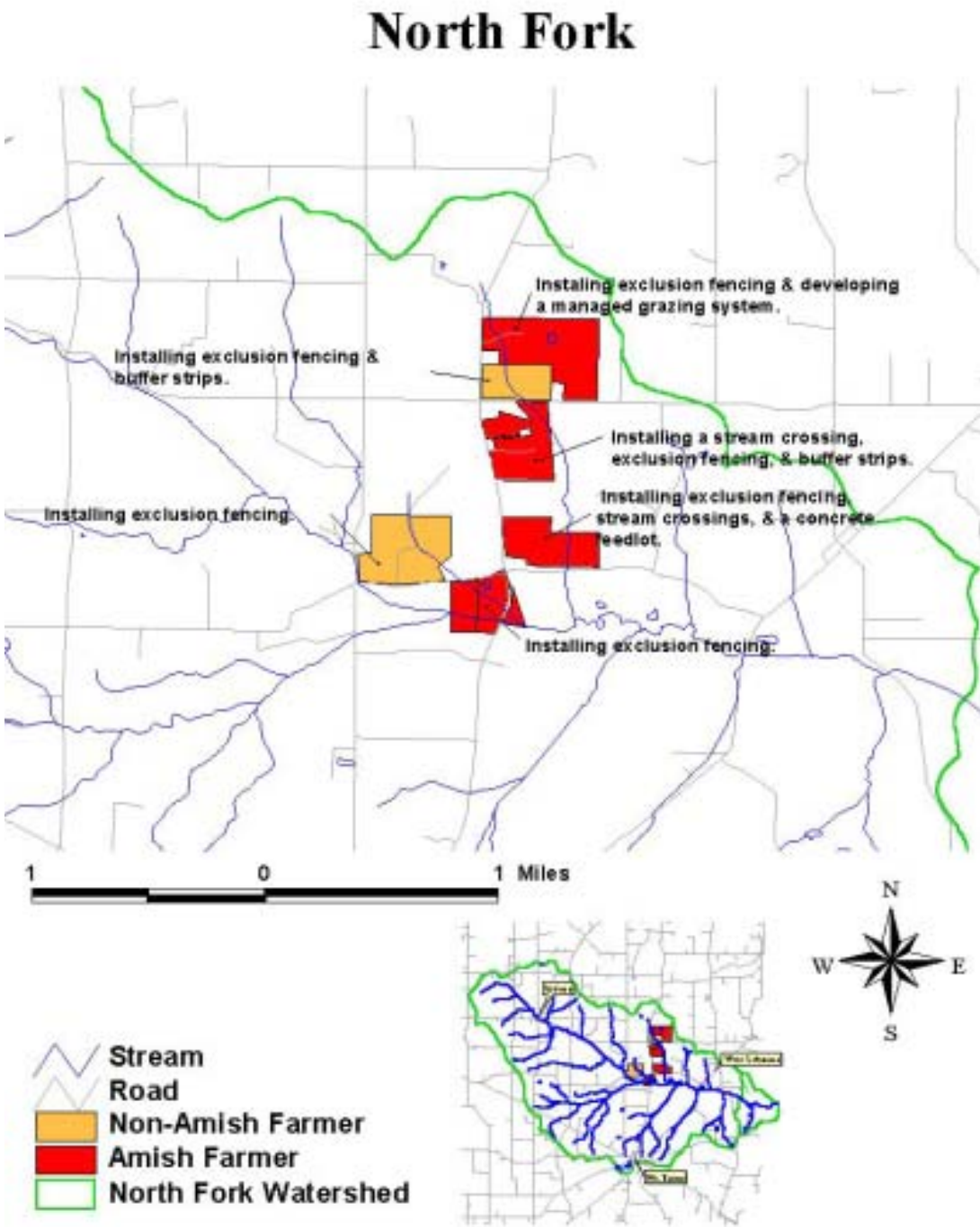
Bank Erosion

2001.

# SMITHVILLE SUGAR CREEK HEADWATERS TEAM PROJECTS

Arlen Hostetler shows Richard Moore the future location of his 2 mile CRP buffer. September 2001

# NORTH FORK SUGAR CREEK TEAM PROJECTS (Wayne SWCD facilitated team of leading local citizens)



# NORTH FORK SUGAR CREEK TEAM PROJECTS (Wayne SWCD facilitated team of leading local citizens)

Fencing cattle out of stream

# NORTH FORK SUGAR CREEK TEAM PROJECTS
# (Wayne SWCD facilitated team of leading local citizens)

Switchgrass buffer

# NORTH FORK SUGAR CREEK TEAM PROJECTS
# (Wayne SWCD facilitated team of leading local citizens)

Watershed signs
To increase awareness