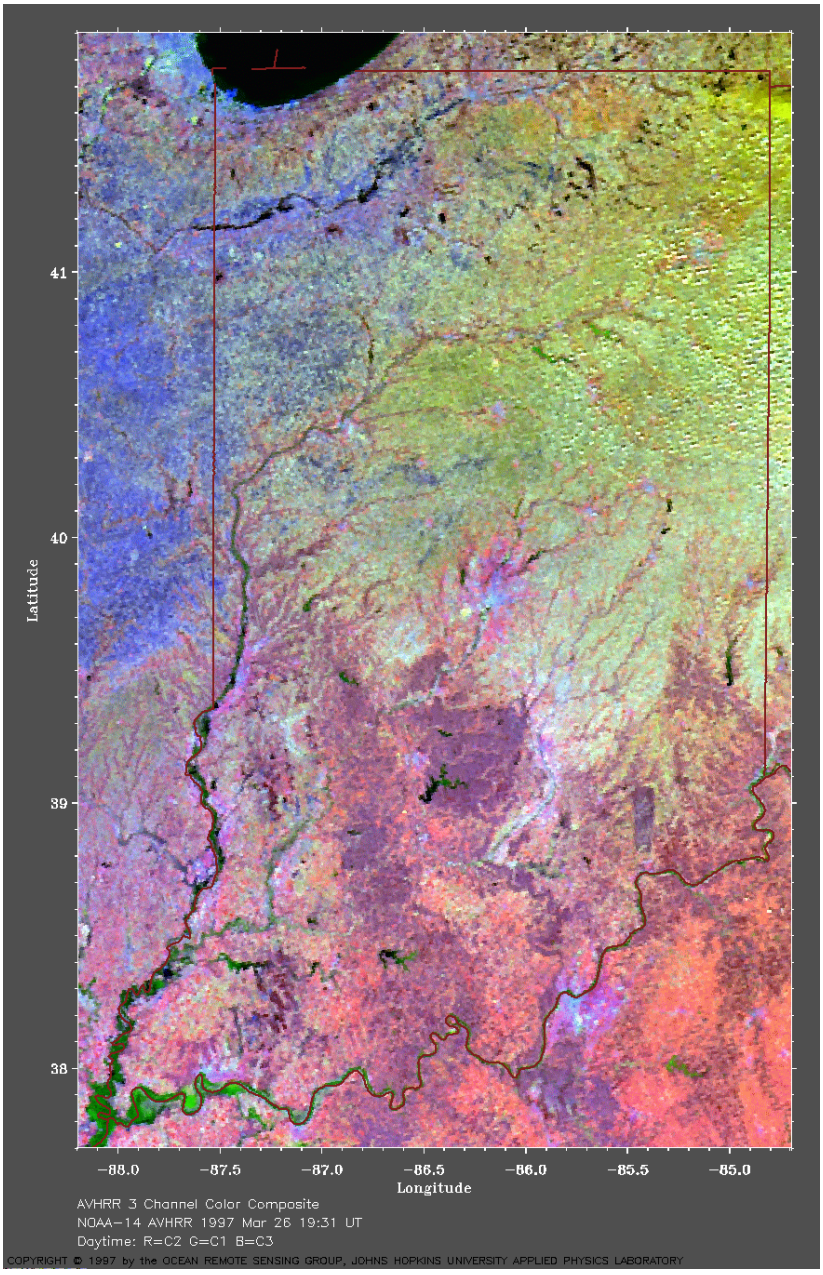
ISCO '99

10th International Soil Conservation Organization Conference Field Tour

Sustaining the Global Farm
Local Action for Land Stewardship
May 26, 1999
Purdue University
West Lafayette, Indiana



Guidebook composed by Darrell Norton and Stan Livingston

USDA-ARS National Soil Erosion Research Laboratory

USDA

Agricultural Research Service

Purdue University

Map Guidebook for the Midweek Tour of ISCO99

The tour will begin from the West End of Stewart Center near the Loeb Playhouse. When you register for the meeting you will be given a color-coded ticket either BLACK and GOLD (Purdue University colors) to identify which group you will be touring with. **You must present this ticket in order to board the appropriate color-coded bus.** The two groups (BLACK and GOLD) will travel in opposite directions and meet again at the Stewart Center. **Please locate and board the bus with the proper color code prior to the 7:30 a.m. departure.** The Union Club will be open for breakfast at 6:30 a.m., and the Stone Hall Cafeteria will be open at 7:00 a.m. A catered lunch will be provided at the Indianapolis 500 Motor Speedway.

Please prepare for the possibility of cool temperatures and rainfall. Most of the stops will have some covered areas but not sufficient in size for the entire group. The busses will have a restroom onboard, and all stops except the research plots will have facilities. Rainwear, umbrellas, warm layered clothing and field shoes are encouraged.

Participants are encouraged to have breakfast in time so that they can be on the buses in order to leave at the prescribed time. Table 1 refers to the itinerary, if you are in the black group follow the times in the leftt hand column and go from top to bottom. If you are in the gold group look in the right hand column and go from bottom to top.

Table 1. Itinerary for Black and Gold tour group.

Black Group Times	Stop	Brief Description	**Gold Group Times**
7:30AM	Stewart Center	START/END	**6:00PM**
7:30-7:45	travel		**5:45-6:00PM**
7:45-8:30	Soil Amendments	Research plots to study the effect of soil amendments on runoff and erosion on steep slopes/Rainfall simulator	**5:00-5:45PM**
8:30-8:45	travel		**4:45-5:00PM**
8:45-9:30	Fort Quiatenon	Demonstration and discussion of the soils and geology of the area and cultural history	**4:00-4:45PM**
9:30-10:30	travel		**3:00-4:00PM**
10:30-11:30AM	Jim Moseley Farm	Production agriculture and issues of farming in the cornbelt	**2:00-3:00PM**
11:30-12:30	travel		**1:00-2:00PM**
12:30-2:00PM	Indianapolis 500 Track	Lunch and visitation of the 500 track and museum	**11:30-1:00PM**
2:00-2:30	travel		**11:00-11:30AM**
2:30-4:00PM	Eagle Creek Park	Conservation fair illustrating USDA-NRCS and partners activities in the area	**9:30-11:00AM**
4:00-4:15	travel		**9:15-9:30AM**
4:15-5:00PM	Royal Run Development	Example of erosion problems and conservation activities associated with urban sprawl	**8:30-9:15AM**
5:00-6:00PM	travel		**7:30-8:30AM**
6:00PM	Stewart Center	START/END	**7:30AM**

Figure 1. Travel route to/from Stewart Center to/from Fort Quiatenon and Soil Amendment Field Plots.

Between Stewart Center and the Soil Amendments Stop

From Stewart Center the buses will be traveling on a glacial terrace of late-Wisconsinan age(Figure 1.). The soils are coarse textured and well drained. To the south of the Purdue Campus most of the terrace has been used for mining which presents a reclamation problem for the University since the entire soil profile has been destroyed. From the terrace we rise up to the dissected till plain typical of the area near the drainage ways. The soils are formed from loess, which originated from the terrace overlying loamy glacial till. We will then drop back down onto the terrace, which is covered with eolian sand dunes all along the way to the stop, located in the gravel pit.

Soil Amendments and Field Rainfall Simulator Research Plots Stop

Plate 1. Amendment Plots

Plate 2. Sand dune over outwash

The USDA-ARS National Soil Erosion Research has been doing laboratory and fieldwork on soil amendments since 1990 when the concept of only treating the very soil/air/water interface was developed. This allowed for a range of materials that had been shown to improve soil structure in past research but were found too expensive when mixed in the plow layer to be economically feasible to be studied using small amounts for erosion control. The research plots you will visit(Plate 1) are treated with two of the most promising materials we have found. Byproduct gypsum from the scrubbing of stack gases for pollution control, which is widely available and low in cost and anionic polyacrylamide (PAM). In this study we collect runoff and sediment samples from both natural rain and rainfall simulation to study of the effectiveness of Gypsum, PAM

and PAM+Gypsum on controlling erosion on a steep construction slope. The Purdue Programmable Rainfall Simulator will also be demonstrated.

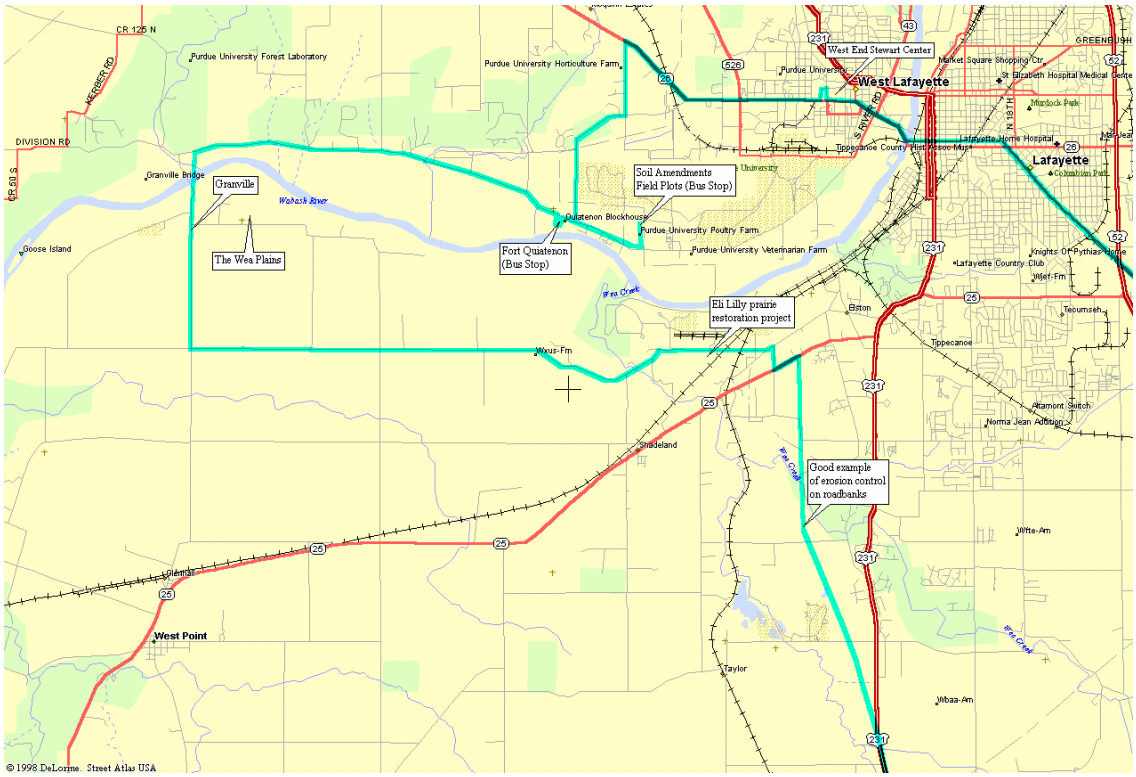


Figure 2. Points of interest along the northern portion of tour route.

Fort Quiatenon Stop

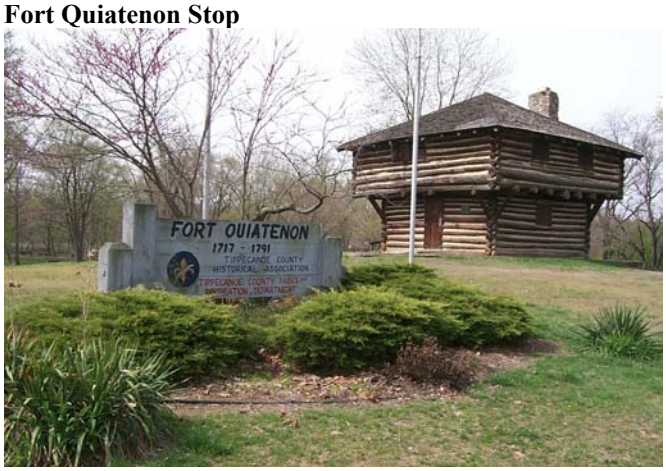


Plate 3. Fort Quiatenon

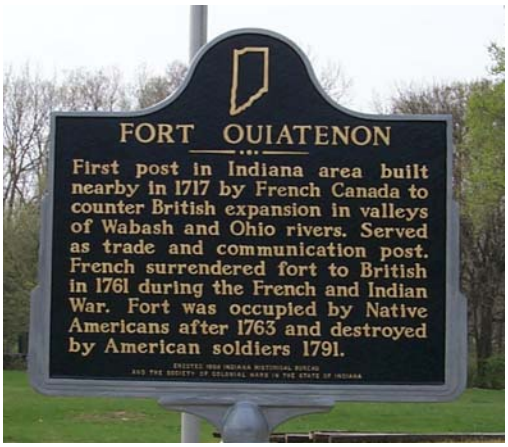


Plate 4. Fort Quiatenon history

The Fort Quiatenon Park (Plates 3 and 4) is operated by the Tippecanoe Co. Historical Society and located on fluvial soils of the Wabash River. The site was thought to be the location of a large French Fort that was part of a network of Forts to protect New France. At one time the Fort was said to be able to field 700 fully armed soldiers. The actual site of the Fort was approximately 1 mile down river. The Park contains a blockhouse of that time period. At this stop Dr. Don Franzmeier of the Purdue University Department of Agronomy will discuss the soils and geology of the area. Also, Dale Bartlet from the Tippecanoe Co. Historical Society will discuss the pre and post European settlement cultural history of the area.

Between Ft. Quiatenon and the Moseley Farm

Granville

The buses will leave the Ft. Quiatenon and travel down South River Road to the Granville Bridge crossing the Wabash. The canal era town of Granville (Plate 6) once existed just south of the bridge. The town was located on the Wabash and Erie Canal (Plate 5) which was the means by which goods were transported in the region prior to the development of the rail system. Following rail development the Canal could not compete and the city of Granville disappeared. By contrast, Lafayette was located on several rail lines and therefore prospered.

Plate 5. Wabash and Erie Canal remnants

Wea Plains

From Granville we cross the Wea Plains (Plates 7-9), which was home to the Wea Indians who had large areas of the plains under cultivation when Europeans came to the area (Figure 2.). The soils are similar to those that the Purdue Campus is built upon. The plains were originally covered with prairie vegetation. As we pass the large Eli Lilly Pharmaceutical Plant you will see an area of restored prairie vegetation on the right. This would be typical of that growing on the Wea Plains when the Europeans came to the area.

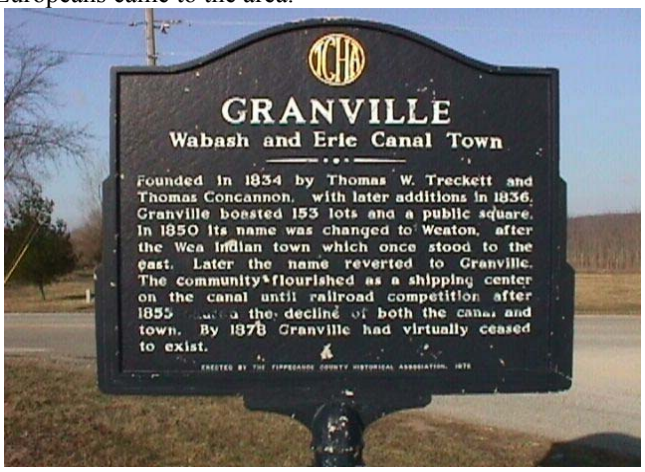


Plate 6. Granville History

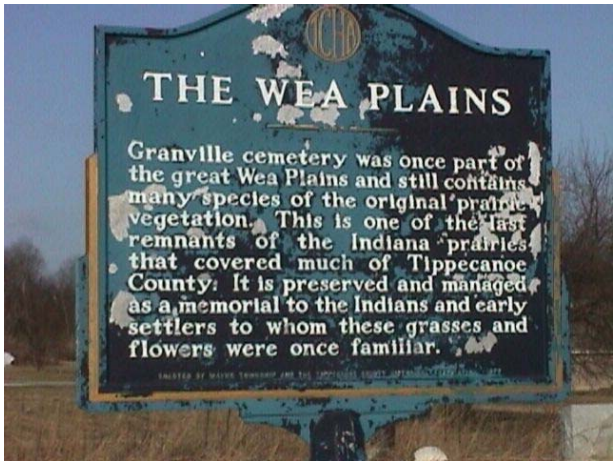


Plate 7. Wea Plains history

Plate 8. Wea Plains native vegetation

Plate 9. Cultivated Wea Plains

Eli Lilly

The Eli Lilly Plant (Plate 12) is one of the largest employers in the area and produces a biosolid that is high in fertility, clean and consistent in content. Research from the USDA-ARS National Soil Erosion Research Laboratory in cooperation with Purdue University, Eli Lilly and Amax Coal Company developed a process to create a synthetic soil for land reclamation. The process involves using the unstable high water content sludge and adding it to the hot ashes from the Purdue University Power Plant produced from the burning of high sulfur coal. The ashes lend a structural backbone to the sludge and the entire process produces a nutrient rich "topsoil" like material. Plans are to use this topsoil to reclaim both the Purdue gravel pit and in a haul back program to the coal strip mines for reclamation.

Plate 10. Soilermaker Site

Plate 11. Erosion control Structures

Plate 12. Eli Lilly Plant

Plate 13. Lilly prairie restoration project

Erosion Control

We will then travel down a new section of US 231 where as we cross the Wea Creek we will see the extensive efforts to control erosion on roadsides with vegetation and riprap (Plate 11). The vegetation and riprap do slow down erosion but are

largely cosmetic. Various erosion processes such as clay dispersion and seepage occur under the cover. The erosion control industry in the USA is a multi-billion dollar per year business. Some erosion control techniques may cost as much as 100US$ per square meter to apply on the land.

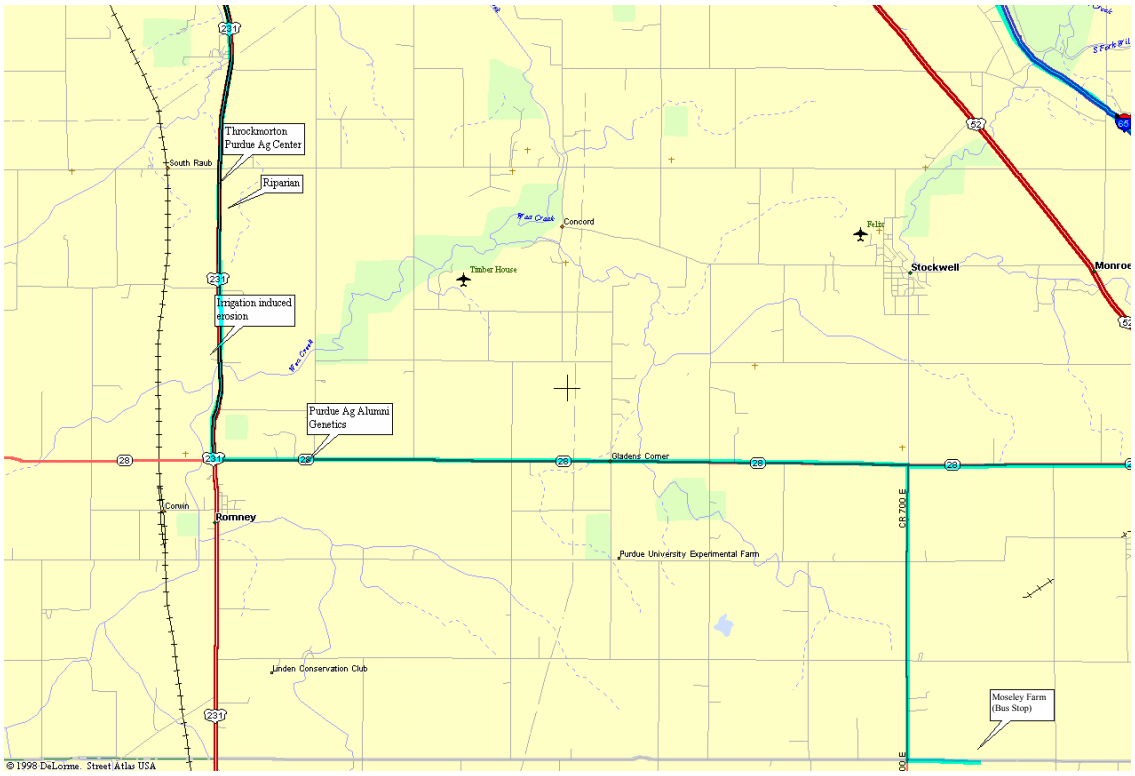


Figure 3. Points of interest along the way to/from the Moseley Farm.

Throckmorton Purdue Agriculture Center


Plate 14. Throckmorton Farm


Plate 15. Tillage and cropping systems at Throckmorton

The Throckmorton Farm (Figure 3., Plates 14 and 15) has been the site of erosion studies for many years. It once contained instrumented watersheds to measure sediment and runoff of which the data were used by Wischmeier to help develop the USLE. For the past 16 years erosion plots (Plate 15) have been maintained to collect rainfall simulator data on the effect of tillage and cropping system effects on soil erosion.

Riparian Area

Plate 16. Riparian area

Plate 17. Grass waterway and stand pipe for drainage

Buffer strips (Plates 16 and 17) and riparian areas are one of the preferred methods to enhance water quality in the USA. The Throckmorton Farm contains a large riparian area that serves as both a buffer strip to filter out sediment and also serves as wildlife habitat.

Irrigation Induced Erosion

Center pivot irrigation systems are common in US Agriculture. When applied to sloping land they have the potential to cause erosion. On the west side of the road just south of the Throckmorton Purdue Ag. Center we have such a system that due to poor irrigation scheduling and over application of high-energy irrigation water, erosion is induced.

Purdue Ag Alumni Genetics

Seed production is a major agricultural activity in the US and is a major economic activity for some growers. The Purdue Ag Alumni Seeds was established to commercialize the production of Purdue developed genetic lines for farmers.

Moseley Farm

The Jim Moseley Farm is a combination grain production and confined animal feeding operation (CAFO). Mr. Moseley (former Under Secretary of Agriculture) will make a presentation on the issues facing this type of farming operation, including the role of precision agriculture and conservation tillage in his operation. Mark Eastman the USDA-NRCS District Conservationist for Tippecanoe Co. will make a presentation on the issues related to CAFO's and nutrient management.

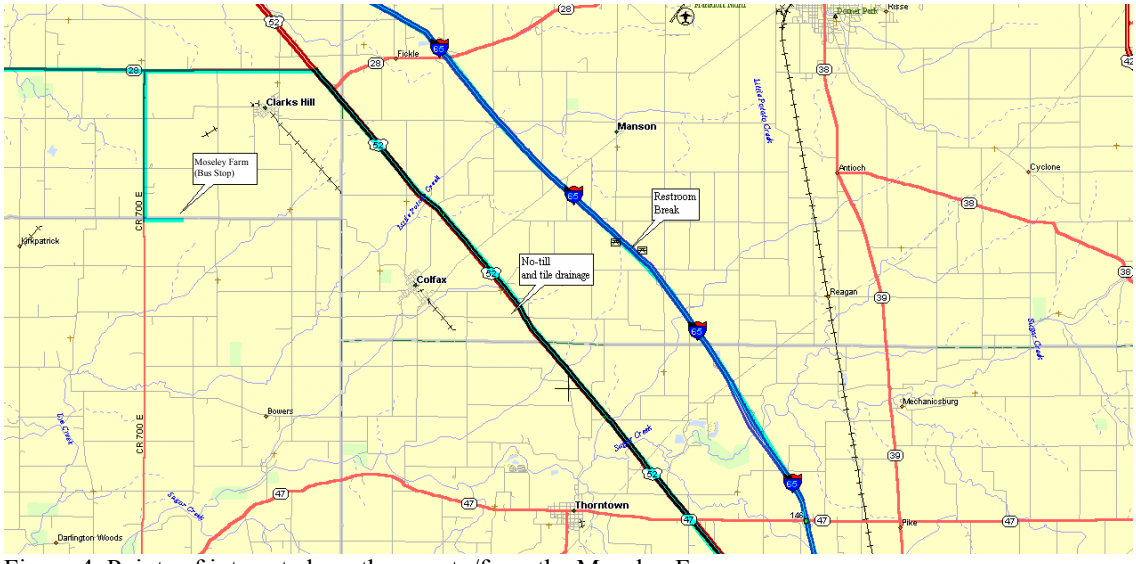


Figure 4. Points of interest along the way to/from the Moseley Farm.

Between the Moseley Farm and the Indianapolis 500 Track.

Tile Drainage

The buses will travel between the farm and the track over the till plain typical of central Indiana. Most of the soils are poorly drained so tile drainage is necessary. You will see large low-lying wet areas where yields are limited due to excess moisture even though they have tile drainage. You will see many tile risers (Plate 17) which are there to allow for surface water to be drained down to the subsurface tile. These are needed because clays that are dispersed by the low electrolyte content rainwater collect in these low areas and effectively seal off the soil surface. The presence of these risers effectively short circuits the hydrology and allows nutrients and pesticides to go directly into the tile drains adversely affecting the water quality.

Conservation Tillage

Along the way you will see that many of the sloping fields are farmed with conservation tillage. This may be completely no-tilled soybeans or zone tilled corn. Also, many fields are being farmed with clean (no surface residue) tillage.

Sedimentation of Eagle Creek Reservoir

Eagle Creek is one of the major drinking water supplies for the City of Indianapolis. The sedimentation that you can observe from I-65 is from erosion upstream in the Eagle Creek watershed and is reducing the capacity of the reservoir. In the US, sedimentation of lakes and rivers is a multi billion-dollar problem per year and a major impact of soil erosion.

The Indianapolis 500 Track

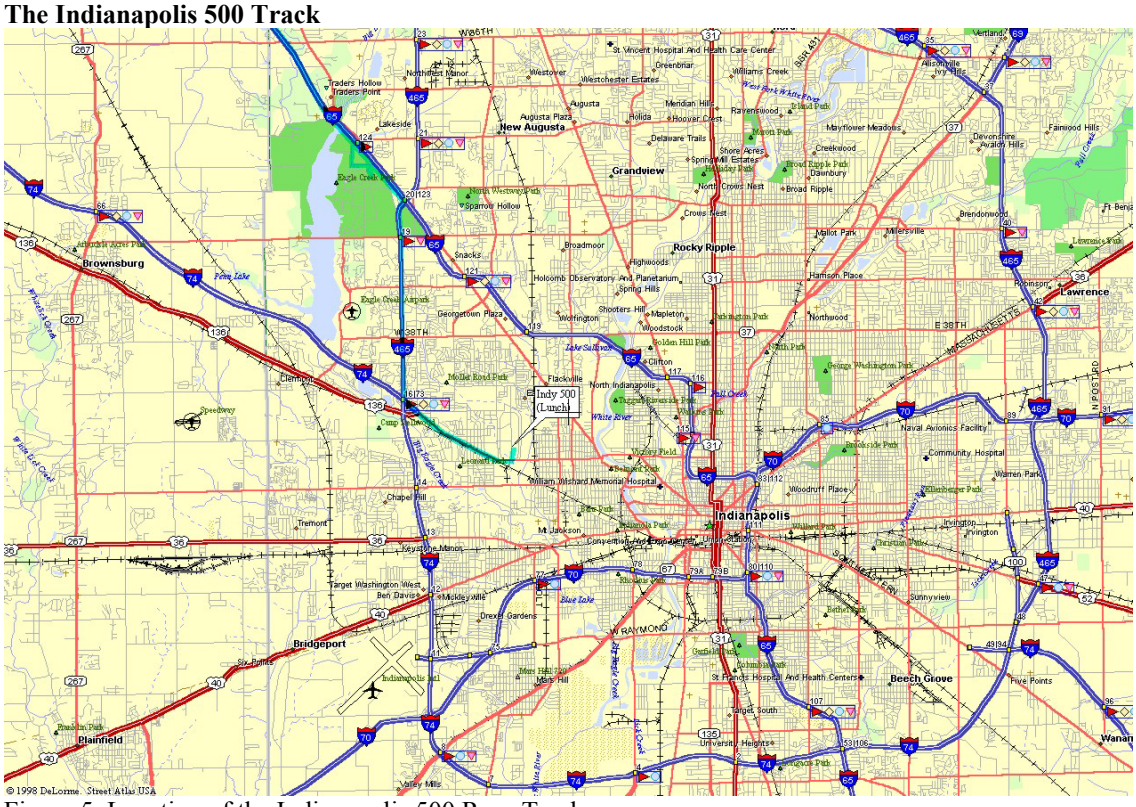


Figure 5. Location of the Indianapolis 500 Race Track.

The Indianapolis 500 Speedway (Figure 5.) was first constructed in 1909 as a combination racetrack and automobile test track. It has been designated a National Historic Landmark. Since 1911 it has been the home of the world famous Indianapolis 500 race. It is also the home the Brickyard 400 NASCAR race and beginning in 2000 will host a Formula One race. The catered lunch will be held in a tent in the infield. Officially May 26 is not officially a practice day, but there should be plenty of activity since the 500 will be held the following weekend.

Eagle Creek Park

The shelter areas of Eagle Creek Park (Figures 6 and 7) will have several speakers/displays to highlight conservation activities and issues that will not be addressed at the other stops. The USDA-NRCS staff along with the Conservation Information Technology Center and the Indiana T by 2000 education staff will be available to discuss their work being conducted in the area with the participants.

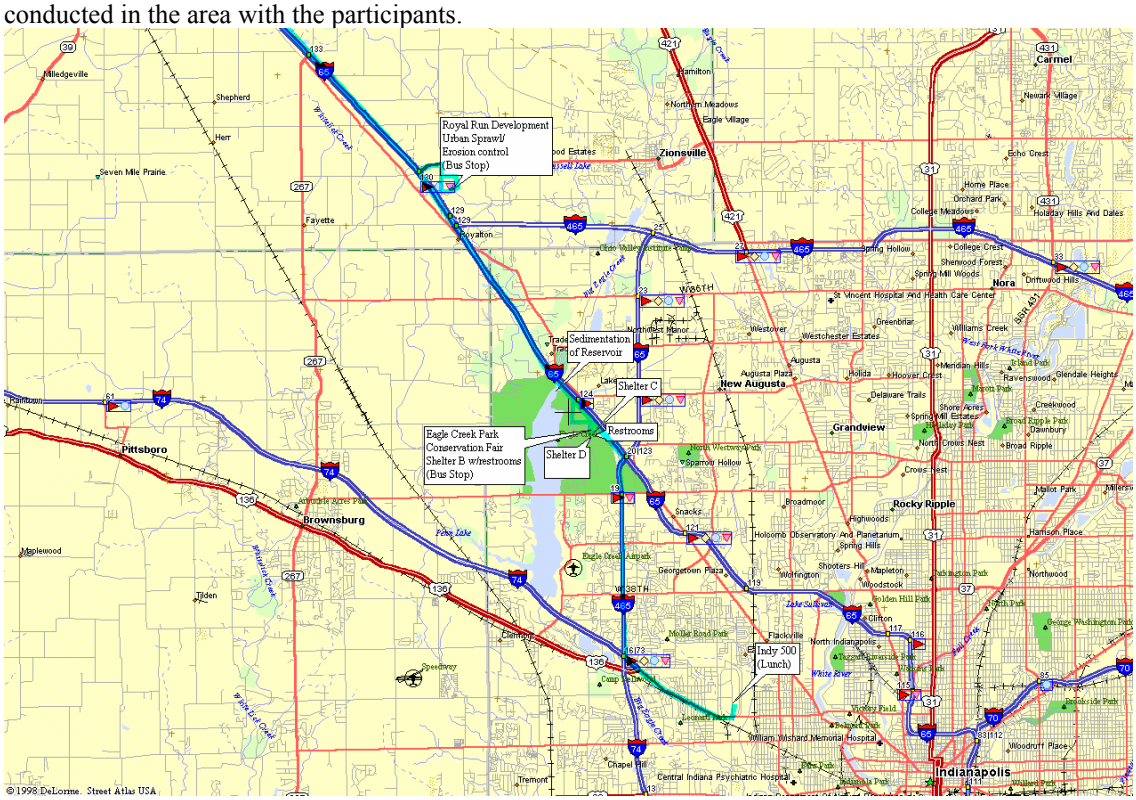


Figure 6. Location of Eagle Creek Park and Royan Run relative to the Indianapolis 500 Track.

Figure 7. Location of the shelter areas where poster displays and speakers will be located.


Plate 18. Silt fence


Plate 19. Urban Sprawl

Royal Run Development
Rapid urbanization is a major problem facing US agriculture. Record acres of productive farmland are being converted to residential areas. This can greatly affect the hydrology and sediment loading of the affected watershed. We will see examples of urban erosion control (Plate 18) and the developer and the NRCS District Conservationist will discuss what is being done to control erosion in these disturbed areas (Plate 19).

Between Royal Run and Stewart Center

More of the same as on the way down and a short restroom break at the I-65 rest area.

Soil Association Map of Indiana

SR 1 – Low-lying, sandy and loamy, wet soils on sandy outwash and lacustrine plains with scattered d ry sand duens; mainly Aquolls, Psamments, and Udolls, used for row crops, and recreation areas.

SR 2 – Medium- and fine-textured, wet soils on lake plains; mainly Aqualfs, Aquolls, and Aquepts, used row crops.

SR 3 – Medium- and coarse-textured, dry soils on outwash plains, terraces, and flood plains; mainly Udalfs, Udolls, Ochrepts, and Fluvents, used for row crops and natural vegetation.

SR 4 – Dry soils on sand dunes; mainly Udalfs and Psamments, used for forage crops, row rops, fruits and vegetables.

SR 5 – Silty, moist soils on loess hills; mainly Udalfs and Aqualfs, many with fragipans, used for row and forage crops.

SR 6 – rolling, loamy, moist soils on Wisconsinan end moraines; mainly Udalfs and Aqualfs, used for forage crops (largely for dairy cattle), and row crops.

SR 7 – Fine-textured, wet soils on Wisconsinan till plains; mainly Aqualfs, Aquolls, Udalfs, and Udolls, used for row crops.

SR 8 – Medium-textured, wet soils on Wisconsinan till plains; mainly Aqualfs, Aquolls, Udalfs, and Udolls, used for row crops.

SR 9 – Medium-textured, wet soils on loess-capped Wisconsinan till plains; mainly Aqualfs, Aquolls, Udalfs, and Udolls, used for row crops.

SR 10 – Silty, wet soils on thick loess over Illinoian till; mainly Aqualfs and Udalfs, many with fragipans, used for row crops.

SR 11 – Hilly, silty, moist soils formed in loess and siltstone, sandstone, and shale; mainly Udalfs, many with fragipans, used for forestry, pasture, and forages.

SR 12 – Fine-textured, moist soils formed in loess and weathered limestone on karst topography; mainly Udalfs, used for pasture, forage crops, and row crops.

SR 13 – Hilly, medium-textured moist soils formed in loess and weathered shale and limestone; mainly Udalfs, used for forage crops and pasture.

Explanation of terms and patterns:

Dry: Mainly well-drained soils with low water holding capacity.

Moist: Mainly medium-textured soils with moderate water holding capacity and a range of natural drainage conditions.

Wet: Mainly poorly and somewhat poorly drained soils.

Meanings of formative elements:

Aqu-: Poorly drained soils.

Fluv-: Soils on flood plains.

Ochr-: Light-colored surface horizons.

Psamm-: Sandy soils.

Ud-: Freely drained soils in a humid climate.

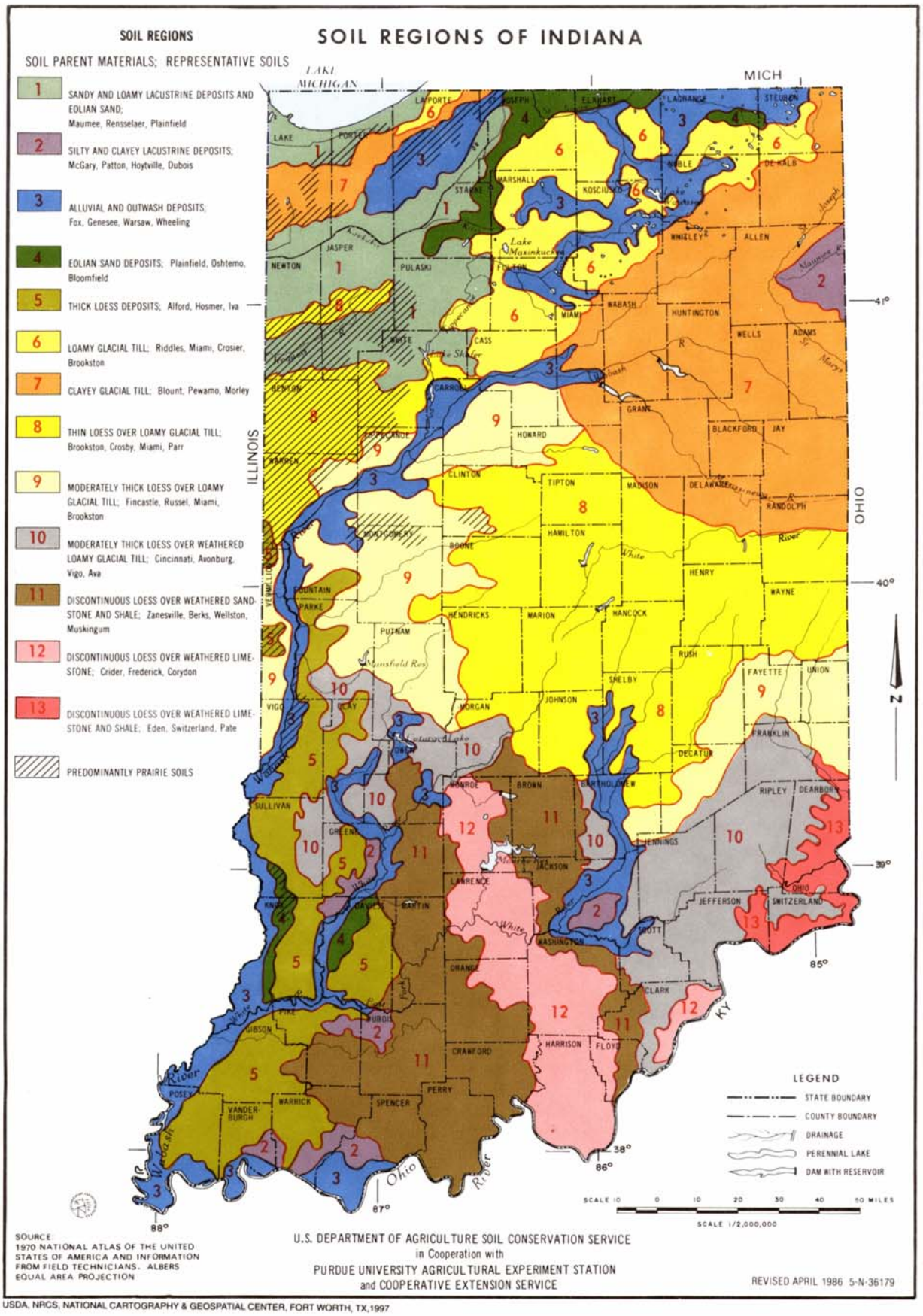
-alfs: Soils with a subsoil clay accumulation.

-epts: Weakly developed soils.

-ents: Soils that lack distinctive horizons.

-olls: Soils with a dark surface horizon.

 Predominantly prairie soils. Dark colored soils cover the entire landscape. The rest of the state had predominantly forest soils with light soils on the higher areas. Refer to map legend on the next page.


SOIL REGIONS OF INDIANA
SOIL REGIONS
SOIL PARENT MATERIALS; REPRESENTATIVE SOILS
1 SANDY AND LOAMY LACUSTRINE DEPOSITS AND EOLIAN SAND; Maumee, Rensselaer, Plainfield
2 SILTY AND CLAYEY LACUSTRINE DEPOSITS; McGary, Patton, Hoytville, Dubois
3 ALLUVIAL AND OUTWASH DEPOSITS; Fox, Genesee, Warsaw, Wheeling
4 EOLIAN SAND DEPOSITS; Plainfield, Oshtemo, Bloomfield
5 THICK LOESS DEPOSITS; Alford, Hosmer, Iva
6 LOAMY GLACIAL TILL; Riddles, Miami, Crosier, Brookston
7 CLAYEY GLACIAL TILL; Blount, Pewamo, Morley
8 THIN LOESS OVER LOAMY GLACIAL TILL; Brookston, Crosby, Miami, Parr
9 MODERATELY THICK LOESS OVER LOAMY GLACIAL TILL; Fincastle, Russel, Miami, Brookston
10 MODERATELY THICK LOESS OVER WEATHERED LOAMY GLACIAL TILL; Cincinnati, Avonburg, Vigo, Ava
11 DISCONTINUOUS LOESS OVER WEATHERED SANDSTONE AND SHALE; Zanesville, Berks, Wellston, Muskingum
12 DISCONTINUOUS LOESS OVER WEATHERED LIMESTONE; Crider, Frederick, Corydon
13 DISCONTINUOUS LOESS OVER WEATHERED LIMESTONE AND SHALE; Eden, Switzerland, Pate
PREDOMINANTLY PRAIRIE SOILS
LAKE MICHIGAN
MICH
ILLINOIS
OHIO
KY
LEGEND
STATE BOUNDARY
COUNTY BOUNDARY
DRAINAGE
PERENNIAL LAKE
DAM WITH RESERVOIR
SCALE 10 0 10 20 30 40 50 MILES
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SOURCE:
1970 NATIONAL ATLAS OF THE UNITED STATES OF AMERICA AND INFORMATION FROM FIELD TECHNICIANS. ALBERS EQUAL AREA PROJECTION
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
in Cooperation with
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