A Pilot Study: Inventorying Forest Communities of the Kaskaskia Resource Rich Area using GIS /GPS Technology

Project Report; June 2005

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OBJECTIVE

The purpose of this project is to develop a predictive habitat model utilizing GIS technology. A model that is capable of identifying specific habitat types within the larger community will give resource managers a better understanding of the overall ecosystem to help guide planning, management assistance, and restoration efforts. Building an inventory of the *community types* present within an ecosystem has the potential to:

1. Establish the extent of various communities and the placement of community types in a larger geographic context, and

2. Identify potential areas of restoration, and

3. Determine potential for endangered and threatened species, as well as other species of interest, and

4. Enhance communication among resource providers, and

5. Enhance communication between resource providers and the public, and

6. Provide a spatial tool for development of restoration and management plans when used with other data sets.

BACKGROUND

The forest of the Kaskaskia River corridor is a rich and complex system that supports a high diversity of species and biotic communities. The 200,000-acre area located in Southwestern Illinois between Carlyle Lake and New Athens includes the state's largest contiguous bottomland hardwood forest. The Critical Trends Analysis Project (CTAP) recognized this region as a resource rich area (RRA). RRA's are landscape level areas with a high concentration of critical resources including streams, wetlands, forests and Illinois Natural Area Inventory (INAI) sites. The INAI was completed in 1978 to systematically survey the entire state for the existence of lands that represented the original natural habitats of Illinois. In doing this inventory, a classification of the State's natural communities was developed. Communities such as forest, prairie and wetlands are examples. A grading system of these communities was also established. Those examples with a grade of A or B qualified as Illinois Natural Area Inventory sites.

The natural resources of the area have been the focus of attention for a number of federal, state, and local agencies, as well as researchers. The Kaskaskia River Corridor Stewardship Plan, (1995) provides a blueprint for present and future stewardship efforts. This community based, multi-disciplinary plan identified important resources and methods of private land stewardship and protection. The area was designated as a C2000 partnership in 1996. Members of the partnership began to implement the plan by facilitating multiple research efforts; including the compilation of current resource information in the CTAP Kaskaskia River Area Assessment volumes.[i]

Although biological inventorying is ongoing in the river corridor, little work has been done to classify and inventory the forest *community types* present. Because the land is predominantly privately owned in relatively small parcels, such work would require extensive landowner contacts, permission from all landowners, and exhaustive field-work. However, GIS technology can combine digital imagery, a useful, multidisciplinary classification system based on the INAI, and resource layers to develop a predictive habitat model. The extent of various communities in the habitat model can be measured, verified through imagery, and located within the field.

Mapping the extent of specific communities provides potential for endangered and threatened species, as well as other species of interest. GIS used as a tool can enhance communication among resource providers, as well as between resource providers and the public. It incorporates previously assembled data to better guide current managers in development of management plans. GIS technology simplifies the task of placing specific habitats or communities within a larger geographic context. Additional analysis could focus on the potential areas of restoration, and the potential for endangered and threatened species.

The Southwestern Illinois Resource Conservation and Development, Inc. (SWI R&CD)[ii] received a grant in 2001 from **The McKnight Foundation**[iii] to develop a *Land Registry for Forest Health of the Kaskaskia River* project. This project, completed in December of 2003, compiled and developed GIS data that helps to identify changes in the forest cover of the state's largest contiguous bottomland hardwood forest. These data layers include forest cover from different time periods, (pre-construction of Carlyle Lake dam (circa – 1960) to Year 2000) current parcel ownership, designated floodplain and extent of the 2002 flood event on the Kaskaskia River.

By collecting and analyzing the forest losses and gains along the lower Kaskaskia River, the project was able to quantify the impacts of deforestation in this important ecosystem, and also put tools for displaying the area into the hands of stakeholders. The data standards used conform to a regional and statewide collection of data used by SWI R&CD. This digital data is continually enhanced to illustrate a variety of issues and to support conservation efforts throughout the Kaskaskia watershed. By matching the technical resources of SWI RC&D staff and the subject area expertise of Illinois Department of Natural Resources, the task of identifying forest communities builds upon previous data sets and analysis.

PROJECT TEAM

The initial task of the project was the establishment of a Project Team to assist in developing procedures, as well as to participate in the collection and review of data for the effort. Members of the Project Team include:

Southwestern Illinois GIS Resource Center (SWI GIS)
- Julia Cole, GIS Coordinator
- Sharie Heller, GIS Technician III

Illinois Department of Natural Resources (IDNR)
- Diane Tecic, Heritage Biologist[1]
- Mark Koch, District Forester, field research

[1] Due to staff reassignments, Mark Phipps replaced Diane Tecic on the project team in 2004.

Marty Kemper, District Biologist, field research
Mark Phipps, Heritage Biologist, assistance with analysis and linkage of species to soils

USDA/Natural Resources Conservation Services (NRCS)
Paul Kremmel, GIS Specialist, has offered invaluable assistance in understanding the digital soil classifications
Jerry Berning, Resource Soil Scientist, has provided increased understanding of the soil types and linkages to soils with similar properties.

DATA LAYERS

In the course of defining criteria, the Project Team was able to utilize available data. Data creation was limited to GPS collection of sample communities that could be visually identified. Sites were focused upon in Washington and St. Clair Counties due to the availability of county level soils data provided by NRCS. Existing GIS layers used for this project include the following:

- 2000 Illinois LANDSAT landcover, IL-GAP classification
- Pre-settlement Landcover
- Base Map Data (County Boundaries, Road Network, Hydrography Network, Urban Areas, etc.)
- 100-year flood zone
- 2002 Kaskaskia flood extent
- National wetlands inventory
- Draft SSURGO[iv] soils by county
- USGS DEM Elevation data
- Southern Till Plain delineation
- Streams
- Watersheds
- Resource Rich Area delineation
- Digital orthophoto quadrangles
- Geology: presence of karst, sinkholes or caves
- CTAP Eco Watch data

All map data utilized is from existing data sets available from IDNR, the Illinois State GIS Clearinghouse and the Southwestern Illinois GIS Resource Center. The data has been developed to conform to UTM North American Datum (NAD) 1983, Zone 16, meters, standard coordinate system. This reference provides a final product consistent with existing data sets available throughout the GIS community in Illinois.

Procedure

The example natural community selected for this project is the Southern Flatwoods, (flatwoods) which is increasingly rare. This community type is found predominately in the Southern Till Plain natural division. Some of the highest quality examples are located within the Kaskaskia River corridor. Although some areas of flatwoods have already been identified in the project area, other flatwoods, likely somewhat degraded, have gone undistinguished, and thus, not managed for their characteristically unique flora and fauna. This community develops because of a certain set of edaphic[2] and topographic conditions. Therefore, identification of existing flatwoods could likely be accomplished using GIS tools and layers, including soil types, landcover, and aerial photos.

Utilizing Southern Flatwoods as the project sample community type, the following procedure has been established by the Project Team:

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[2] Edaphic:

1. of or relating to soil, especially as it affects living organisms. Influenced by the soil rather than by the climate.

1. Located known bottomland and upland Southern Flatwoods communities with GPS, noting size and quality of existing plants (notably Post Oak).

2. Mapped the data with existing data layers, looking for correlations between community location and reference layers in both upland and bottomland locations. (Maps 1 and 2)

3. Noted particular similarities within soils data for identified points.

4. Reselected soils that intersected flatwoods communities. Developed list of preferred soils based on current existence of flatwoods. (see Appendix A)

5. Established soil-based criteria for community type. Developed a secondary list of soil types with similar profiles where flatwoods are predicted to occur.

6. Created a community predictor map based on soil subset. Compared overlays for forested lands and floodplain to select a likely area for additional flatwoods to be found. (Map 3)

7. Made field visit to probable sites to verify existence of hardwoods; if not, what criteria have changed?

8. Digitally re-classify forest area using soil list to identify potential flatwoods forest communities and potential flatwoods restoration areas. (Map 4)

The purpose of this project was to test the effectiveness of using GIS data layers to discover probable community locations based on specific habitat criteria. Identifying plant community locations based on habitat criteria depends initially on the existence of an accurate profile of suitability factors for the specific plant type. *"Post Oak / Southern flatwoods characteristically are low density woodlands intermediate between savannah and closed forest with local openings, small microdepressions that often retain water during spring and a flora that responds both temporally and spatially to extremes in soil moisture availability. Flatwoods are...characterized by poorly drained and slowly permeable soils that contain a nearly impervious subsoil horizon."*[3]

The habitat profile for our example community type, Southern Flatwoods, was developed by first collecting GPS locations of known existing communities. Both bottomland and upland sites were included. The digital point locations were displayed and classified according to the quality attribute assigned during the field collection (high, medium or low). The points were compared to existing data layers (eg: landcover, floodplain and soils) and evaluated for consistent elements. Geographic correlations that emerged between layers were used to determine criteria for the Southern Flatwoods community profile.

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[3] John B. Taft, "Vegetation ecology of flatwoods on the Illinoian till plain," Journal of Vegetation Science, 6 (1995), 647.

Upon review, the Project Team found that Southern Flatwoods locations appear to be more closely tied to soils data than other available GIS data. Elevation also plays a factor, as no known communities occur within the 100-year floodplain. (The 100-year floodplain dataset was used to verify that none of the GPS locations landed within this low region.) The soils data appear to not only capture this fact, but also contribute additional information about the characteristics of flatwoods locations. Examples of soils identified through GPS inventory appear in **Appendix A**.

In order to test the profile derived from sample sites, the Project Team used the soils identified from the initial collection to isolate these soil groups in the data. The soils are displayed as an isolated subset of the countywide soil classification. This map becomes the "community predictor map" used to investigate in the field for existing flatwoods communities (**Map 3**). Development of a predictor map allowed the team to isolate areas based on soils that would likely contain additional flatwoods communities. Because of the limited set of known communities that was inventoried, additional soil types with similar characteristics were also identified. These can also be considered as potential soils that would support the flatwoods community type, and displayed in the predictor map as secondary areas to investigate for flatwoods.

In order to further isolate a potential community, forest landcover data was overlaid with the predictor map. The intersection of appropriate soils and existing forest indicates a potential Southern Flatwoods community, and eliminates field research in areas where the land has been cleared for some other use. This area of the forest is then visited as a field exercise to verify presence of Post Oak and other indicator species of the Southern Flatwoods community type. The Project Team completed such an evaluation on June 6, 2005. Each of the predicted sites did show evidence of flatwoods community development, though each varied in quality. A few were highly disturbed by human activity and the flatwoods indicator species were no longer the dominant habitat. In order to navigate to the predicted sites, some interpretation of the digital soils was necessary. This is where taking actual soil samples at the identified flatwoods sites would verify the soils data layer and substantiate the identification of the community type.

The positive existence of a community reinforces the utilization of GIS technology to locate existing and potential communities based on digital habitat layers prior to doing field investigation. If profiles of a variety of community types were developed, a predictor map layer could be developed for each community. When compared to landcover data, communities could be further evaluated for extent. The Eco Watch program could use the community type predictor map to evaluate sustained health of the forest by community type.

When field investigation does not verify the presence of a Southern Flatwoods community, then other circumstances or criteria must be examined to understand why the expected community has not established itself or thrived in the selected location. An immediate check of the digital data might be in order.

Digital soils data is developed based on sample testing and development of soil unit boundaries by experienced soil scientists. However, it is not fool proof. NRCS soil staff that has assisted the Project Team has suggested a manual soil sampling in areas where Southern Flatwoods communities are anticipated or found, in order to verify the digital soils data, or investigate other factors in the soil that might preclude the development of a Southern Flatwoods community.

Often, the savannah like character of the Southern Flatwoods has encouraged the conversion of these areas to farming or residential use. Several of the sites visited during this project were characterized by the Project Team as highly disturbed or poor quality examples. This was most often due to human changes on the landscape rather than a naturally occurring phenomenon taking place that changed the community conditions. Knowledge of the dominant soil types and ability to sustain Southern Flatwoods in these highly disturbed areas does provide information to resource managers regarding future plantings or conversions that would be appropriate.

PROJECT TIMELINE

February 2003: Initial concept meeting was held. The primary question stated as a goal for the project: "can we classify the existing Kaskaskia River floodplain and upland forest into specific plant community types based on environmental indicators currently available in GIS format"?

April 9, 2003: Submitted application to IDNR, Office of Resource Conservation for funding

July 11, 2003: Wildlife Preservation Fund Grant #04-L39W

October – November 2003: Collected data layers, researched online documents on forest community typing; investigated CTAP program, ILGAP analysis

March 30, 2004: Project Team members visited ILGAP and CTAP research staff (Tari Tweddale, Brenda Molano-Flores) in Champaign, IL. The purpose of this visit was to gain a greater understanding of the CTAP Eco Watch activities and to verify that the project concept was not a duplication of existing research or procedure. The visit clarified the purpose of the Eco Watch program. Ultimately, the data provided by the Eco Watch programs can be used to evaluate the relative health of specific communities once they have been identified and located.

April 6, 2004: Initial GPS field survey of known Southern Flatwoods locations, focusing on the bottomland flatwoods of Washington County. Existing communities were identified by IDNR staff based on the presence of the Southern Flatwoods and associated indicator species.

May 6, 2004: Review of initial GPS data points in conjunction with existing data layers. GPS point locations were compared to the digital soils data to determine soil preferences of the community. A preferred list of suitable soils was established. It was determined that the relationship to floodplain soils is marginal to the location of Southern Flatwoods. M. Koch provided 1989 list of potential vegetation per soil type which leads to the decision to survey upland sites during next field collection. P. Kremmel assisted with the soil data sets and soil survey information.

May 27, 2004: Explored a relationship with J. Berning that would allow sampling at previous locations that were recorded by GPS, and a secondary point within a certain radius to see what criteria changes in soil. Due to staffing limitations and a temporary assignment placed on Mr. Berning, we were not able to complete this activity.

September 28, 2004: Second GPS field survey of known Southern Flatwoods locations in upland forests of Washington County.

October 14, 2004: Meeting of Project Team to review all GPS data and to determine next steps. Per meeting with Jerry Berning, Resource Soil Scientist, and Mark Koch, District Forester, a hypothesis was drawn that soil type, slope and aspect are very important to determining vegetation type. Soils are the single most important factor responsible for tree growth. Soils provide trees with water, nutrients and root anchorage. Not all soils are equally suited for all species of trees. Soils have chemical, physical and biological properties. Chemical properties that vary from site to site include available nutrients, soil ph and organic matter content.

May 2005: Project Team members review the draft report. Focus on the soils-subset developed from the initial data collection is used to identify a potential Southern Flatwoods community.

June 2005: The area identified in community predictor map was visited by Project Team members to verify the existence of Southern Flatwoods communities, and other indicator species.

SUMMARY

The procedure established by this study involves identifying forest community types by observing what is growing there; matching the species present to a particular community; evaluating the health of the community; comparing the locations to existing digital soils to derive most suitable soils. This evaluation of soils data as a way to establish the plant community location provides a soil criteria for a specific community type.

With the soils criteria, the digital soils data can be queried for locations that match the plant communities' needs. The resulting "community predictor map" establishes probable locations of specific plant communities based solely on the soil characteristics. By using existing GIS data layers, the potential for a plant community can also be evaluated by considering existing landuse patterns (i.e.: is the area currently forested?), elevation and floodplain data, and the impact of other human activity. These contextual clues offer additional validation, while still in an office setting, of potential for the plant community. By mapping the most likely sites this way, the GIS data can then be printed or loaded into a GPS unit and used to navigate to new locations. In this way specific community types can be found, evaluated and documented with a minimum of field time.

Preliminary analysis of the data collected for this project indicates that the community types are largely dictated by the soils of a given locale. Other factors, including elevation, flood tendency and the effects of human development are secondary to the existence of a particular forest type, but directly impact the community's health. Further questions raised by this review include:

- What changes in soil are evidenced by a transect taken in a known location; how do the plants change as the soils change?

- How is the historic development of the Kaskaskia River channel tied to the soil development and occurrence of certain communities?

- What effects do human development (agricultural practices and controlled flooding) have the community?

- What impact does fire history on public vs. private lands have a community?

Additional digital soils information is currently a priority of NRCS. The development of the detailed local soil survey (SSURGO) could be used by IDNR staff to develop restoration goals. Currently the most consistent level of digital soil mapping is the STATSGO (state level). This is insufficient for the purpose of identifying individual communities within a forest. When the SSURGO data is available throughout the state, it will provide a standard base data acceptable for this type of application. It will also allow for review of communities within adjacent counties. Individual soil criteria may need to be developed for neighboring counties due to minor differences in soil map unit codes across jurisdictional lines.

The ability to map and review plant communities within GIS also allows natural resource managers a "big picture" way of analyzing community health. This technology could be used even more effectively with more accurate digital information. A more detailed elevation model, such as LIDAR, would allow greater analysis of the relationship of soils and elevation. Slight variations in slope seem to have a profound impact on a plant communities' development. By visualizing existing communities in the context of a larger forest or a region, potential impacts on the future of the community can be addressed. The network of pattern of specific community types within the forest allows a more detailed understanding of the composition of the forest as a whole.

PROJECT BUDGET

	Expense	Budget	Actual
1	Creation of Data Sets	11,000	13,540.00
2	Meetings/Project Implementation		
3	Administration	1,350.0	1,350.00
4	Final Report	2,000.0	30.00
5	Data Distribution; Map Printing	650.0	80.00
	Total	**15,000.0**	**15,000.00**

ENDNOTES

[i] Completed and Ongoing resource projects in the corridor include:

- Illinois Natural History Survey studies, led by Dr. Scott Robinson (Biological inventories of birds, reptiles and amphibians, and vegetation) (Completed)
- INHS fish nurseries study, led by Dave Wahl. (Completed)
- Southern Illinois University, Carbondale, Forest Health study led by Dr. Karl Williard.

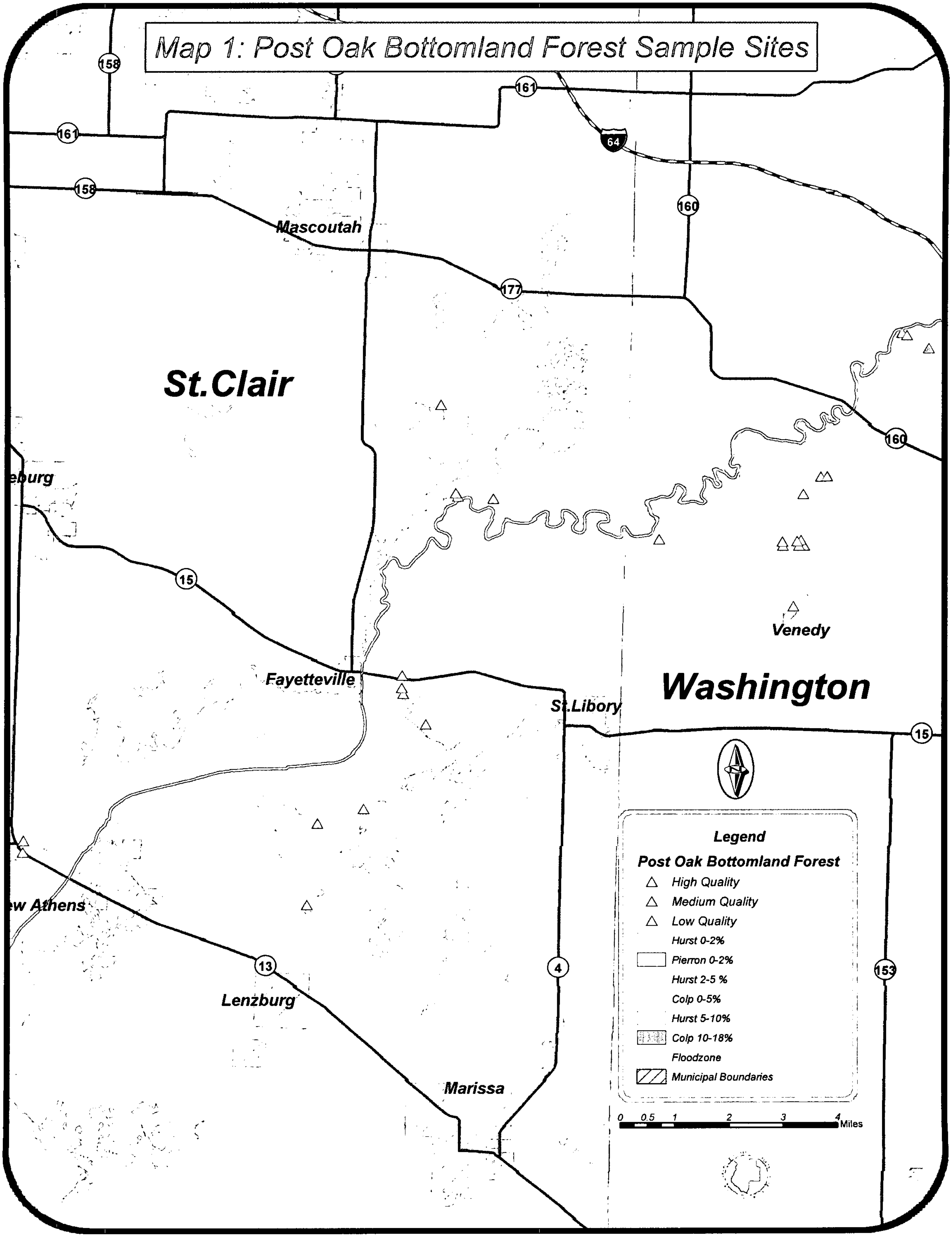
[ii] The Southwestern Illinois RC&D, Inc. has a long history of involvement in protecting the varied resources of the Kaskaskia River and its watershed. Through a variety of projects, the region has been analyzed on the basis of forestation loss, water quality, agriculture and livestock practices and their impacts, and the effects of human development patterns. On February 14, 2003, Southwestern Illinois RC&D, Inc. hosted a presentation for the Coordinating Team and stakeholders of the *Land Registry for Forest Health of the Kaskaskia River Watershed.* This meeting was held to discuss interim findings of that project and to bring together resource managers interested in protecting and restoring the watershed. During the ensuing conversation, the concept of identifying specific habitat communities within the larger forest arose. The project *Inventorying Forest Communities in the Kaskaskia Resource Rich Area using GIS /GPS Technology – Pilot* is a result of that conversation.

[iii] The McKnight Foundation began environmental grant-making in 1992. Their river-related grant-making has three focuses:

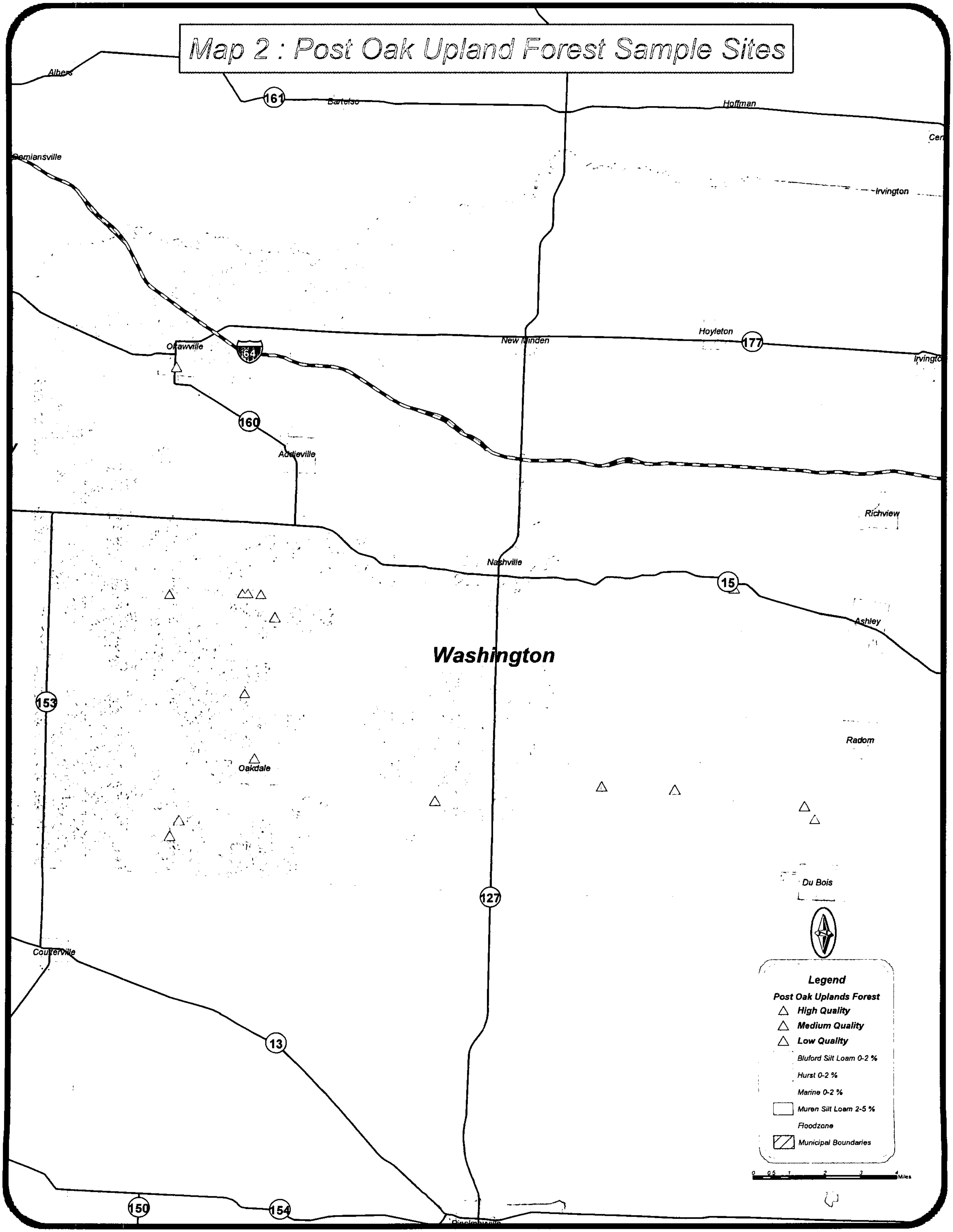
- Improve water quality to reduce pollution and encourage restorative river management
- Conserve land to reduce and prevent pollution by encouraging less polluting farming practices, protect and restore fragile riverside bluffs, and restore floodplains and wetlands
- Strengthen citizen advocacy to engage people in experiences on the river, efforts to improve riverfront communities, and issues that affect water quality

The overarching goal of The McKnight Foundation is to maintain and restore the Mississippi River by directly increasing land and water protection and restoration, expanding the capacity of other organizations to do this work, and transforming systems that impede progress. They support organizations working within the 10-state corridor from Minnesota to Louisiana. The geographic focus of the program includes the Mississippi River, its banks, bluffs, floodplains and important tributaries.

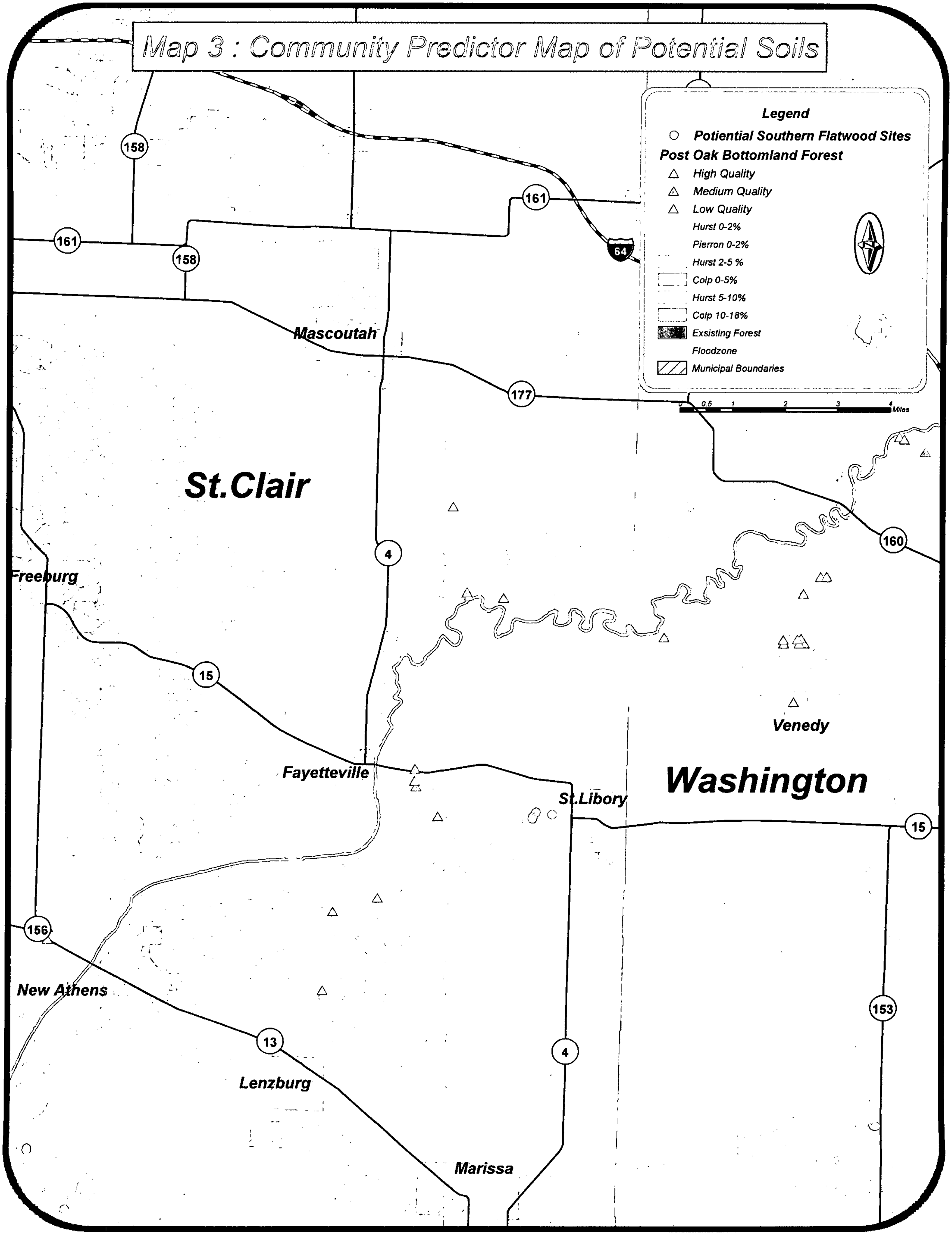
[iv] SSURGO is Soil Survey Geographic (SSURGO) Database, NRCS versus STATSGO, State Soil Geographic (STATSGO) database which are produced by generalizing the detailed soil survey data. The mapping scale for STATSGO is 1:250,000.

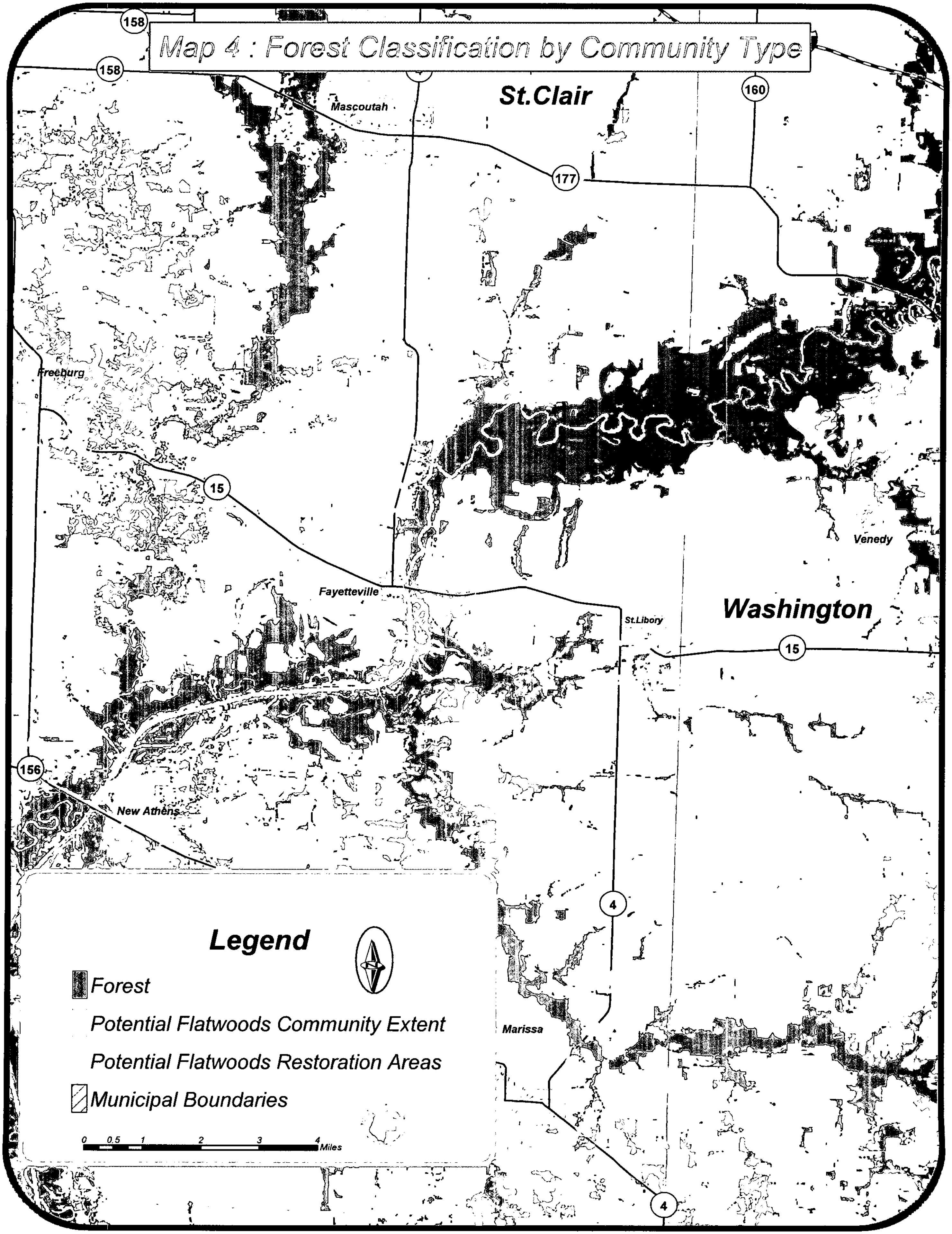

Map 1: Post Oak Bottomland Forest Sample Sites
158
161
64
160
177
Mascoutah
St.Clair
eburg
15
Fayetteville
St.Libory
Venedy
Washington
ew Athens
13
Lenzburg
4
153
Marissa
Legend
Post Oak Bottomland Forest
High Quality
Medium Quality
Low Quality
Hurst 0-2%
Pierron 0-2%
Hurst 2-5 %
Colp 0-5%
Hurst 5-10%
Colp 10-18%
Floodzone
Municipal Boundaries
0 0.5 1 2 3 4 Miles

Map 2 : Post Oak Upland Forest Sample Sites



Map 3 : Community Predictor Map of Potential Soils




Map 4 : Forest Classification by Community Type
St.Clair
Washington
Mascoutah
Freeburg
Fayetteville
St.Libory
Venedy
New Athens
Marissa
158
160
177
15
156
4
Legend
Forest
Potential Flatwoods Community Extent
Potential Flatwoods Restoration Areas
Municipal Boundaries
0 0.5 1 2 3 4 Miles

Appendix A: Soils Identified by Intersecting with Known Flatwoods GPS Locations

Bottomland GPS Sites

County	Flatwood quality	Name	Label	Slope %	Flood frequency
Washington	High	Okaw Silt Loam	84	0-2	Occas. flooded
	High, Medium	Hurst Silt Loam	7338A	0-2	rarely flood
	High, Medium	Hurst Silt Loam	338A	0-2	Occas. flooded
	Low	Marine Silt Loam	517A	0-2	none
St. Clair	High	Petrolia Silty Clay	3288L	0-2	freq flooded
	Medium	Okaw Silt Loam	8084A	0-2	Occas. flooded
	Medium	Colp Silty Clay	8122D	10-18	severe err, occ flood
	Medium	Hurst Silt Loam	8338A	0-2	Occas. flooded
	Medium	Hurst Silt Loam	8338B	2-5	Occas. flooded
	Low	Hurst Silt Loam	8338C	5-10	Occas. flooded
	Low	Pierron Silt Loam	31A	0-2	none
	Low	Floraville Silt Loam	433A	0-2	none
	Low	Marine Silt Loam	517A	0-2	none

Upland GPS Sites

County	Flatwood quality	Name	Label	Slope	Flood frequency
Washington	High	Bluford	13A	0-2	
	High	Rushville	16		
	High	Marine Silt Loam	517A	0-2	
	Medium	Bluford	13A	0-2	
	Medium	Bluford	13B	2-5	
	Medium	Muren	453B	2-5	
	Medium	Marine Silt Loam	517A	0-2	
	Low	Bluford	13B	2-5	
	Low	Marine Silt Loam	517A	0-2	
	Low	Darmstadt	916A	0-2	

Soils Identified as having Similar Characteristics

Oconoee	916A
Cowden	916A
Huey	916A

* See NRCS Tabular Soil reports for detailed soil properties

Chemical Soil Properties

St Clair County, Illinois

[Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorption ratio
	In	*meq/100 g*	*meq/100 g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
31A:								
Pierron	0-8	9.1-25	---	4.5 - 7.3	0	0	0.0	0
	8-20	3.6-12	---	4.5 - 7.3	0	0	0.0	0
	20-36	---	14-27	3.5 - 5.5	0	0	0.0	0
	36-66	8.5-21	---	4.5 - 6.5	0	0	0.0	0
	66-80	6.6-16	---	5.1 - 7.3	0	0	0.0	0
433A:								
Floraville	0-9	5.0-15	---	5.1 - 7.3	0	0	0.0	0
	9-18	5.0-10	---	4.5 - 7.3	0	0	0.0	0
	18-44	20-32	---	3.5 - 6.0	0	0	0.0	0
	44-70	15-35	---	4.5 - 7.8	0-5	0	0.0	0
	70-80	10-30	---	5.6 - 8.4	0-15	0	0.0	0
517A:								
Marine	0-9	9.0-15	---	5.1 - 7.3	0	0	0.0	0
	9-17	5.0-10	---	4.5 - 6.5	0	0	0.0	0
	17-43	20-30	---	4.5 - 5.5	0	0	0.0	0
	43-62	10-20	---	5.1 - 7.3	0	0	0.0	0
	62-80	12-17	---	5.6 - 7.8	0	0	0.0	0
3288L:								
Petrolia	0-8	20-25	---	5.6 - 7.8	0	0	0.0	0
	8-55	15-20	---	6.1 - 7.3	0	0	0.0	0
	55-80	10-20	---	5.1 - 7.8	0	0	0.0	0
8084A:								
Okaw	0-7	10-20	---	4.5 - 7.3	0	0	0.0	0
	7-15	10-15	---	4.5 - 6.5	0	0	0.0	0
	15-54	24-36	---	3.6 - 7.3	0	0	0.0	0
	54-80	21-35	---	4.5 - 8.4	0-10	0	0.0	0
8338A:								
Hurst	0-7	14-20	---	5.1 - 7.3	0	0	0.0	0
	7-12	11-19	---	3.5 - 6.0	0	0	0.0	0
	12-62	21-29	---	3.5 - 7.8	0	0	0.0	0
	62-80	12-27	---	5.1 - 8.4	0-5	0	0.0	0
8338B:								
Hurst	0-6	14-20	---	5.1 - 7.3	0	0	0.0	0
	6-10	11-19	---	3.5 - 6.0	0	0	0.0	0
	10-56	21-29	---	3.5 - 7.8	0	0	0.0	0
	56-80	12-27	---	5.1 - 8.4	0-5	0	0.0	0

Chemical Soil Properties

Washington County, Illinois

[Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorption ratio
	In	*meq/100 g*	*meq/100 g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
12:								
Wynoose	0-8	10-19	---	4.5 - 7.8	0	0	0.0	0
	8-21	7.0-12	---	3.6 - 7.3	0	0	0.0	0
	21-54	---	21-26	3.6 - 6.0	0	0	0.0	0
	54-60	---	15-23	3.6 - 6.0	0	0	0.0	0
13A:								
Bluford	0-6	14-22	---	4.5 - 7.3	0	0	0.0	0
	6-13	---	9.0-17	3.6 - 6.0	0	0	0.0	0
	13-37	---	21-26	3.6 - 5.5	0	0	0.0	0
	37-60	---	13-22	3.6 - 6.0	0	0	0.0	0
Wynoose	---	---	---	---	---	---	---	---
13B:								
Bluford	0-6	14-22	---	4.5 - 7.3	0	0	0.0	0
	6-13	---	9.0-17	3.6 - 6.0	0	0	0.0	0
	13-37	---	21-26	3.6 - 5.5	0	0	0.0	0
	37-60	---	13-22	3.6 - 6.0	0	0	0.0	0
16:								
Rushville	0-10	---	---	4.5 - 7.3	---	---	0.0	0
	10-20	---	---	4.5 - 7.3	---	---	0.0	0
	20-45	---	---	4.5 - 6.5	---	---	0.0	0
	45-60	---	---	5.6 - 8.4	---	---	0.0	0
84:								
Okaw	0-15	11-22	---	4.5 - 7.3	0	0	0.0	0
	15-42	22-38	---	4.5 - 7.3	0	0	0.0	0
	42-60	24-36	---	3.6 - 8.4	---	0	0.0	0
338A:								
Hurst	0-8	14-20	---	5.1 - 7.3	0	0	0.0	0
	8-16	---	11-19	3.6 - 6.0	0	0	0.0	0
	16-60	21-29	---	3.6 - 7.3	0	0	0.0	0
Okaw	---	---	---	---	---	---	---	---
453B:								
Muren	0-12	7.0-21	---	5.1 - 6.5	0	0	0.0	0
	12-54	8.0-18	---	5.1 - 6.0	0	0	0.0	0
	54-60	3.0-12	---	5.6 - 6.5	0	0	0.0	0

Chemical Soil Properties

Washington County, Illinois

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity	Sodium adsorption ratio
	In	*meq/100 g*	*meq/100 g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
517A:								
Marine	0-14	---	---	4.5 - 7.3	---	---	0.0	0
	14-21	---	---	4.5 - 6.5	---	---	0.0	0
	21-60	---	---	5.1 - 6.5	---	---	0.0	0
Rushville	---	---	---	---	---	---	---	---
916A:								
Darmstadt	0-12	7.0-20	---	5.1 - 7.3	0	0	0.0-2.0	0-5
	12-19	16-23	---	4.5 - 7.8	0	0	0.0-2.0	10-20
	19-55	16-23	---	6.6 - 9.0	0-5	0	0.0-2.0	10-25
	55-60	9.0-20	---	7.4 - 9.0	0-5	0	0.0-2.0	5-20
Oconee	0-8	---	---	5.6 - 7.8	---	---	0.0	0
	8-19	---	---	4.5 - 7.3	---	---	0.0	0
	19-35	---	---	4.5 - 6.0	---	---	0.0	0
	35-57	---	---	5.1 - 6.5	---	---	0.0	0
	57-60	---	---	5.6 - 8.4	---	---	0.0	0
Cowden	---	---	---	---	---	---	---	---
Huey	---	---	---	---	---	---	---	---
3288:								
Petrolia	0-9	---	---	5.6 - 8.4	---	---	0.0	0
	9-28	---	---	6.1 - 7.3	---	---	0.0	0
	28-60	---	---	4.5 - 7.8	---	---	0.0	0
7338A:								
Hurst	0-5	14-20	---	5.1 - 7.3	0	0	0.0	0
	5-10	---	11-19	3.6 - 6.0	0	0	0.0	0
	10-32	21-29	---	3.6 - 7.3	0	0	0.0	0
	32-60	12-27	---	4.5 - 7.8	0-5	0	0.0	0
Okaw	---	---	---	---	---	---	---	---

Engineering Properties

St Clair County, Illinois

[Absence of an entry indicates that the data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
31A:												
Pierron	0-8	Silt loam	CL, ML	A-4, A-6	0	0	100	98-100	90-100	85-100	30-40	10-20
	8-20	Silt, Silt loam	CL, ML	A-4, A-6	0	0	100	98-100	90-100	85-100	25-40	10-20
	20-36	Silty clay, Silty clay loam	CH	A-7-6	0	0	100	100	95-100	93-100	50-60	30-40
	36-66	Silty clay, Silty clay loam	CH, CL, MH	A-7-6	0	0	100	100	95-100	93-100	45-60	25-35
	66-80	Clay loam, Loam, Silty clay loam, Silt loam	CL, ML	A-6	0	0	100	100	90-100	80-100	35-45	15-25
433A:												
Floraville	0-9	Silt loam	CL	A-6	0	0	100	98-100	90-100	85-100	30-40	10-20
	9-18	Silt, Silt loam	CL	A-6	0	0	100	98-100	90-100	85-100	25-40	10-20
	18-44	Silty clay, Silty clay loam	CH, CL	A-7-6	0	0	100	100	95-100	93-100	40-60	20-30
	44-70	Silty clay, Silty clay loam, Silt loam	CH, CL	A-7-6	0	0	100	100	90-100	85-100	40-70	20-45
	70-80	Silty clay, Silty clay loam, Silt loam	CH, CL	A-6, A-7-6	0	0	100	100	90-100	85-100	35-60	15-35
517A:												
Marine	0-9	Silt loam	CL	A-4, A-6	0	0	100	100	95-100	95-100	30-35	10-15
	9-17	Silt, Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	17-43	Silty clay, Silty clay loam	CH	A-7	0	0	100	100	95-100	95-100	50-65	30-40
	43-62	Silty clay loam, Silt loam	CL	A-6, A-7	0	0	100	100	95-100	85-100	30-50	15-30
	62-80	Clay loam, Loam, Silty clay loam, Silt loam	CL, ML	A-6	0	0	100	100	90-100	80-100	35-45	15-25

This report shows only the major soils in each map unit. Others may exist.

Engineering Properties

St Clair County, Illinois

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
3288L:												
Petrolia	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	80-100	35-40	15-20
	8-55	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-100	35-40	15-20
	55-80	Silty clay loam, Silt loam	CL	A-6, A-7	0	0	100	95-100	80-100	60-100	30-40	10-20
8084A:												
Okaw	0-7	Silt loam	CL	A-6	0	0	100	100	95-100	90-100	30-40	15-25
	7-15	Silty clay loam, Silt loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-45	10-25
	15-54	Clay, Silty clay	CH	A-7	0	0	100	100	95-100	85-100	55-75	35-50
	54-80	Stratified clay to silty clay loam	CH	A-7	0	0	100	100	95-100	80-100	50-70	30-45
8338A:												
Hurst	0-7	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	75-100	35-40	15-20
	7-12	Silty clay loam, Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	35-45	15-25
	12-62	Clay, Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	62-80	Sr to silty clay loam to silty clay	CH, CL	A-6, A-7	0	0	100	100	90-100	85-100	45-60	25-35
8338B:												
Hurst	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	75-100	35-40	15-20
	6-10	Silty clay loam, Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	35-45	15-25
	10-56	Clay, Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	56-80	Sr to silty clay loam to silty clay	CH, CL	A-6, A-7	0	0	100	100	90-100	85-100	45-60	25-35

This report shows only the major soils in each map unit. Others may exist.

Engineering Properties

Washington County, Illinois

[Absence of an entry indicates that the data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
12:												
Wynoose	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-95	20-35	5-15
	8-21	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	85-95	15-30	2-15
	21-54	Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	20-35
	54-60	Clay loam, Silty clay loam, Silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	70-90	30-45	15-25
13A:												
Bluford	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	20-35	5-15
	6-13	Silt loam	CL, CL-ML, ML	A-4	0	0	100	95-100	95-100	90-100	20-30	NP-10
	13-37	Silty clay, Silty clay loam	CL	A-6, A-7	0	0	100	95-100	95-100	90-100	35-50	15-30
	37-60	Clay loam, Loam, Silt loam	CL, CL-ML	A-4, A-6	---	0-5	100	95-100	90-100	70-90	25-40	5-20
Wynoose	---	---	---	---	---	---	---	---	---	---	---	---
13B:												
Bluford	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	20-35	5-15
	6-13	Silt loam	CL, CL-ML, ML	A-4	0	0	100	95-100	95-100	90-100	20-30	NP-10
	13-37	Silty clay, Silty clay loam	CL	A-6, A-7	0	0	100	95-100	95-100	90-100	35-50	15-30
	37-60	Clay loam, Loam, Silt loam	CL, CL-ML	A-4, A-6	---	0-5	100	95-100	90-100	70-90	25-40	5-20

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Engineering Properties

Washington County, Illinois

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				Pct	Pct					Pct	
16:												
Rushville	0-10	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	NP-15
	10-20	Silt, Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	95-100	20-40	NP-15
	20-45	Silty clay, Silty clay loam	CH, CL	A-7-6	0	0	100	100	95-100	95-100	45-60	20-35
	45-60	Silty clay loam, Silt loam	CL	A-4, A-6, A-7-6	0	0	100	100	95-100	90-100	30-45	8-20
84:												
Okaw	0-15	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	15-42	Clay, Silty clay, Silty clay loam	CH	A-7	0	0	100	100	95-100	90-100	50-70	30-50
	42-60	Clay, Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	45-60	20-35
338A:												
Hurst	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	75-100	20-35	4-15
	8-16	Silty clay loam, Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	20-35	5-15
	16-60	Clay, Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-60	20-35
Okaw	---	---	---	---	---	---	---	---	---	---	---	---

Engineering Properties

Washington County, Illinois

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
453B:												
Muren	0-12	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-30	5-15
	12-54	Silty clay loam, Silt loam	CL	A-4, A-6	0	0	100	100	90-100	80-100	25-35	8-15
	54-60	Silt, Silt loam	CL, CL-ML, ML	A-4	0	0	100	100	90-100	70-90	15-25	NP-10
517A:												
Marine	0-14	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	20-35	5-15
	14-21	Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	40-60	20-35
	21-60	Silty clay loam, Silt loam	CL	A-4, A-6, A-7	0	0	100	100	95-100	80-100	30-45	8-20
Rushville	---	---	---	---	---	---	---	---	---	---	---	---
916A:												
Darmstadt	0-12	Silt loam	CL, CL-ML	A-4, A-6, A-7	0	0	95-100	95-100	95-100	75-100	25-45	5-20
	12-19	Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	95-100	95-100	90-100	40-65	20-40
	19-55	Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	95-100	95-100	90-100	40-65	20-40
	55-60	Loam, Silty clay loam, Silt loam	CL	A-4, A-6, A-7	0	0	95-100	95-100	90-100	75-100	20-50	7-30

This report shows only the major soils in each map unit. Others may exist.

Engineering Properties

Washington County, Illinois

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
916A:												
Oconee	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	0	100	100	95-100	90-100	20-40	3-20
	8-19	Silt loam	CL	A-4, A-6	0	0	100	100	95-100	90-100	20-35	8-20
	19-35	Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-65	20-45
	35-57	Silty clay loam, Silt loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-50	10-25
	57-60	Silt loam	CL	A-4, A-6, A-7-6	0	0	100	100	90-100	85-100	20-45	8-25
Cowden	---	---	---	---	---	---	---	---	---	---	---	---
Huey	---	---	---	---	---	---	---	---	---	---	---	---
3288:												
Petrolia	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	80-100	30-45	10-20
	9-28	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	80-100	35-45	15-25
	28-60	Silty clay loam, Silt loam	CL	A-4, A-6, A-7	0	0	100	95-100	80-100	60-100	20-45	8-20

This report shows only the major soils in each map unit. Others may exist.

Engineering Properties

Washington County, Illinois

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
7338A:												
Hurst	0-5	Silt loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	75-100	20-35	4-15
	5-10	Silty clay loam, Silt loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	20-35	5-15
	10-32	Clay, Silty clay, Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-60	20-35
	32-60	Sr to sandy clay loam to silty clay	CH, CL	A-6, A-7	0	0	100	100	90-100	85-100	35-55	15-30
Okaw	---	---	---	---	---	---	---	---	---	---	---	---

Physical Soil Properties

St Clair County, Illinois

[Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to the surface layer. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
31A:														
Pierron	0-8	1-7	71-85	12-25	1.25-1.45	4.23-14.11	0.18-0.22	0.0-2.9	1.0-3.0	.43	.43	3	5	56
	8-20	1-7	71-88	10-22	1.30-1.50	0.42-1.41	0.15-0.20	0.0-2.9	0.1-0.5	.55	.55			
	20-36	1-7	48-64	35-45	1.35-1.60	0.07-0.42	0.10-0.18	6.0-8.9	0.1-0.5	.37	.37			
	36-66	1-7	54-70	27-42	1.35-1.60	0.07-0.42	0.12-0.18	6.0-8.9	0.1-0.5	.37	.37			
	66-80	5-30	45-70	20-30	1.40-1.60	1.41-4.23	0.17-0.22	0.0-2.9	0.1-0.5	.49	.49			
433A:														
Floraville	0-9	1-15	70-85	12-25	1.25-1.45	4.23-14.11	0.18-0.22	0.0-2.9	1.0-2.0	.43	.43	5	5	56
	9-18	1-15	70-85	10-22	1.30-1.50	0.42-1.41	0.15-0.20	0.0-2.9	0.1-0.5	.55	.55			
	18-44	1-7	50-70	27-48	1.35-1.60	0.07-0.42	0.12-0.18	6.0-8.9	0.1-0.5	.37	.37			
	44-70	1-7	50-65	24-55	1.35-1.60	0.07-0.42	0.10-0.18	6.0-8.9	0.1-0.5	.37	.37			
	70-80	5-15	50-65	20-45	1.30-1.55	0.42-1.41	0.12-0.20	6.0-8.9	0.1-0.5	.37	.37			
517A:														
Marine	0-9	1-7	75-85	12-18	1.30-1.50	4.23-14.11	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	5	56
	9-17	1-7	75-90	8-18	1.30-1.50	4.23-14.11	0.22-0.24	0.0-2.9	0.1-0.5	.49	.49			
	17-43	1-7	45-64	35-48	1.45-1.70	0.42-1.41	0.11-0.18	6.0-8.9	0.3-0.8	.37	.37			
	43-62	1-7	60-80	15-35	1.45-1.65	1.41-4.23	0.18-0.22	3.0-5.9	0.1-0.5	.37	.37			
	62-80	5-30	45-70	20-30	1.40-1.60	1.41-4.23	0.17-0.22	0.0-2.9	0.1-0.3	.37	.37			
3288L:														
Petrolia	0-8	5-20	50-65	27-35	1.20-1.40	1.41-4.23	0.21-0.23	3.0-5.9	1.0-3.0	.32	.32	5	7	38
	8-55	5-15	50-65	27-35	1.35-1.45	1.41-4.23	0.18-0.20	3.0-5.9	0.2-1.0	.32	.32			
	55-80	5-25	50-65	20-35	1.40-1.60	1.41-4.23	0.18-0.20	3.0-5.9	0.1-0.5	.32	.32			

This report shows only the major soils in each map unit. Others may exist.

Physical Soil Properties

St Clair County, Illinois

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/in*	*Pct*	*Pct*					
8084A:														
Okaw	0-7	1-10	60-80	15-27	1.20-1.40	4.23-14.11	0.22-0.24	0.0-2.9	1.0-2.0	.43	.43	3	6	48
	7-15	1-10	60-80	12-30	1.30-1.50	1.41-4.23	0.18-0.20	0.0-2.9	0.1-0.5	.49	.49			
	15-54	5-15	30-50	40-60	1.35-1.60	0.07-0.42	0.09-0.18	6.0-8.9	0.1-0.5	.32	.32			
	54-80	5-15	30-60	35-55	1.50-1.70	0.07-0.42	0.08-0.20	6.0-8.9	0.1-0.5	.37	.37			
8338A:														
Hurst	0-7	1-15	60-78	20-27	1.25-1.45	1.41-4.23	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	48
	7-12	1-15	60-78	18-30	1.30-1.50	1.41-4.23	0.20-0.22	0.0-2.9	0.1-0.5	.49	.49			
	12-62	1-15	35-60	35-55	1.45-1.70	0.07-0.42	0.10-0.17	6.0-8.9	0.1-0.5	.32	.32			
	62-80	5-20	45-65	27-45	1.50-1.70	0.07-0.42	0.10-0.18	6.0-8.9	0.1-0.5	.37	.37			
8338B:														
Hurst	0-6	1-15	60-78	20-27	1.25-1.45	1.41-4.23	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	48
	6-10	1-15	60-78	18-30	1.30-1.50	1.41-4.23	0.20-0.22	0.0-2.9	0.1-0.5	.49	.49			
	10-56	1-15	35-60	35-55	1.45-1.70	0.07-0.42	0.10-0.17	6.0-8.9	0.1-0.5	.32	.32			
	56-80	5-20	45-65	27-45	1.50-1.70	0.07-0.42	0.10-0.18	6.0-8.9	0.1-0.5	.37	.37			

Physical Soil Properties

Washington County, Illinois

[Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to the surface layer. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/in*	*Pct*	*Pct*					
12:														
Wynoose	0-8	---	---	15-25	1.25-1.45	4.23-14.11	0.22-0.24	0.0-2.9	0.5-2.0	.43	.43	3	6	---
	8-21	---	---	12-18	1.30-1.50	0.42-1.41	0.18-0.20	0.0-2.9	0.2-0.5	.43	.43			
	21-54	---	---	35-42	1.40-1.60	0.00-0.42	0.09-0.13	6.0-8.9	0.2-0.5	.43	.43			
	54-60	---	---	25-37	1.50-1.70	0.42-1.41	0.11-0.15	3.0-5.9	0.2-0.5	.43	.43			
13A:														
Bluford	0-6	---	---	20-27	1.30-1.50	4.23-14.11	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	---
	6-13	---	---	15-25	1.40-1.60	1.41-4.23	0.18-0.20	0.0-2.9	0.0-1.0	.43	.43			
	13-37	---	---	35-42	1.45-1.65	0.42-4.23	0.11-0.20	3.0-5.9	0.0-0.5	.43	.43			
	37-60	---	---	22-35	1.60-1.70	0.42-1.41	0.11-0.16	3.0-5.9	0.0-0.5	.43	.43			
Wynoose	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13B:														
Bluford	0-6	---	---	20-27	1.30-1.50	4.23-14.11	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	---
	6-13	---	---	15-25	1.40-1.60	1.41-4.23	0.18-0.20	0.0-2.9	0.0-1.0	.43	.43			
	13-37	---	---	35-42	1.45-1.65	0.42-4.23	0.11-0.20	3.0-5.9	0.0-0.5	.43	.43			
	37-60	---	---	22-35	1.60-1.70	0.42-1.41	0.11-0.16	3.0-5.9	0.0-0.5	.43	.43			
16:														
Rushville	0-10	---	---	15-27	1.25-1.45	4.23-14.11	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	---
	10-20	---	---	10-22	1.30-1.50	0.42-1.41	0.15-0.20	0.0-2.9	---	.43	.43			
	20-45	---	---	35-45	1.30-1.50	0.00-0.42	0.09-0.20	6.0-8.9	---	.43	.43			
	45-60	---	---	18-30	1.40-1.55	0.42-1.41	0.16-0.21	3.0-5.9	---	.43	.43			
84:														
Okaw	0-15	---	---	15-27	1.20-1.40	4.23-14.11	0.22-0.24	0.0-2.9	1.0-3.0	.43	.43	3	6	---
	15-42	---	---	35-60	1.35-1.60	0.00-0.42	0.09-0.18	6.0-8.9	0.5-1.0	.32	.32			
	42-60	---	---	35-55	1.50-1.70	0.00-0.42	0.08-0.20	6.0-8.9	0.0-0.5	.32	.32			

This report shows only the major soils in each map unit. Others may exist.

Physical Soil Properties

Washington County, Illinois

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
338A:														
Hurst	0-8	---	---	20-27	1.25-1.45	1.41-4.23	0.22-0.24	0.0-2.9	1.0-2.0	.43	.43	3	6	---
	8-16	---	---	18-30	1.30-1.50	1.41-4.23	0.20-0.22	0.0-2.9	0.1-0.4	.43	.43			
	16-60	---	---	35-48	1.45-1.70	0.00-0.42	0.10-0.17	6.0-8.9	0.0-0.2	.32	.32			
Okaw	---	---	---	---	---	---	---	---	---	---	---	---	---	---
453B:														
Muren	0-12	---	---	15-27	1.25-1.40	4.23-14.11	0.22-0.24	0.0-2.9	0.5-2.0	.37	.37	5	6	---
	12-54	---	---	22-30	1.35-1.50	4.23-14.11	0.18-0.20	3.0-5.9	0.0-0.5	.37	.37			
	54-60	---	---	8-20	1.30-1.45	4.23-14.11	0.20-0.22	0.0-2.9	---	.37	.37			
517A:														
Marine	0-14	---	---	12-18	1.30-1.50	4.23-14.11	0.22-0.24	0.0-2.9	1.0-2.0	.37	.37	3	5	---
	14-21	---	---	35-48	1.45-1.70	0.42-1.41	0.11-0.18	6.0-8.9	---	.32	.32			
	21-60	---	---	15-35	1.45-1.65	1.41-4.23	0.18-0.22	3.0-5.9	---	.43	.43			
Rushville	---	---	---	---	---	---	---	---	---	---	---	---	---	---
916A:														
Darmstadt	0-12	---	---	10-27	1.30-1.50	0.42-1.41	0.22-0.24	0.0-2.9	0.5-2.0	.43	.43	3	6	---
	12-19	---	---	27-35	1.40-1.65	0.42-1.41	0.11-0.20	3.0-5.9	0.0-1.0	.43	.43			
	19-55	---	---	27-35	1.40-1.65	0.00-0.42	0.09-0.10	3.0-5.9	0.0-1.0	.43	.43			
	55-60	---	---	15-30	1.50-1.70	0.00-0.42	0.10-0.15	0.0-2.9	0.0-1.0	.43	.43			
Oconee	0-8	---	---	20-27	1.20-1.30	4.23-14.11	0.22-0.24	3.0-5.9	2.0-3.0	.32	.32	3	6	---
	8-19	---	---	18-27	1.30-1.45	0.42-1.41	0.20-0.22	3.0-5.9	---	.43	.43			
	19-35	---	---	35-42	1.30-1.50	0.42-1.41	0.11-0.17	6.0-8.9	---	.43	.43			
	35-57	---	---	20-35	1.40-1.60	0.42-1.41	0.16-0.21	3.0-5.9	---	.43	.43			
	57-60	---	---	17-27	1.40-1.60	0.42-1.41	0.20-0.22	3.0-5.9	---	.43	.43			
Cowden	---	---	---	---	---	---	---	---	---	---	---	---	---	---

This report shows only the major soils in each map unit. Others may exist.

Physical Soil Properties

Washington County, Illinois

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensi-bility	Organic matter	Erosion factors			Wind erodi-bility group	Wind erodi-bility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
916A:														
Huey	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3288:														
Petrolia	0-9	---	---	27-35	1.20-1.40	1.41-4.23	0.21-0.23	3.0-5.9	2.0-3.0	.32	.32	5	7	---
	9-28	---	---	27-35	1.35-1.45	1.41-4.23	0.18-0.20	3.0-5.9	---	.32	.32			
	28-60	---	---	20-35	1.40-1.60	1.41-4.23	0.18-0.20	3.0-5.9	---	.32	.32			
7338A:														
Hurst	0-5	---	---	20-27	1.25-1.45	1.41-4.23	0.22-0.24	0.0-2.9	1.0-2.0	.43	.43	3	6	---
	5-10	---	---	18-30	1.30-1.50	1.41-4.23	0.20-0.22	0.0-2.9	0.1-0.4	.43	.43			
	10-32	---	---	35-48	1.45-1.70	0.00-0.42	0.10-0.17	6.0-8.9	0.0-0.2	.32	.32			
	32-60	---	---	20-45	1.50-1.70	0.00-0.42	0.10-0.18	6.0-8.9	0.1-0.4	.32	.32			
Okaw	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Hydric Soils

St Clair County, Illinois

[This report lists only those map unit components that are rated as hydric. Dashes (---) in any column indicate that the data were not included in the database. Definitions of hydric criteria codes are included at the end of the report]

Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
31A:					
PIERRON SILT LOAM, 0 TO 2 PERCENT SLOPES	Pierron	90	Till plain	Yes	2B3
433A:					
FLORAVILLE SILT LOAM, 0 TO 2 PERCENT SLOPES	Floraville	90	---	Yes	2B3
3288L:					
PETROLIA SILTY CLAY LOAM, 0 TO 2 PERCENT SLOPES, FREQUENTLY FLOODED, LONG DURATION	Petrolia	90	---	Yes	2B3, 3, 4
8084A:					
OKAW SILT LOAM, 0 TO 2 PERCENT SLOPES, OCCASIONALLY FLOODED	Okaw	90	---	Yes	2B3

Explanation of hydric criteria codes:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
   - B. are poorly drained or very poorly drained and have either:
     - 1.) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
     - 2.) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
     - 3.) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

Hydric Soils

Washington County, Illinois

[This report lists only those map unit components that are rated as hydric. Dashes (---) in any column indicate that the data were not included in the database. Definitions of hydric criteria codes are included at the end of the report]

Map symbol and map unit name	Component	Percent of map unit	Landform	Hydric rating	Hydric criteria
12:					
WYNOOSE SILT LOAM	Wynoose	100	---	Yes	2B3
13A:					
BLUFORD SILT LOAM, 0 TO 2 PERCENT SLOPES	Wynoose	5	---	Yes	2B3
16:					
RUSHVILLE SILT LOAM	Rushville	100	---	Yes	2B3
84:					
OKAW SILT LOAM	Okaw	100	---	Yes	2B3
338A:					
HURST SILT LOAM, 0 TO 2 PERCENT SLOPES	Okaw	2	---	Yes	2B3
517A:					
MARINE SILT LOAM, 0 TO 2 PERCENT SLOPES	Rushville	5	---	Yes	2B3
916A:					
DARMSTADT-OCONEE COMPLEX, 0 TO 2 PERCENT SLOPES	Cowden	2	---	Yes	2B3
	Huey	2	---	Yes	2B3
3288:					
PETROLIA SILTY CLAY LOAM, FREQUENTLY FLOODED	Petrolia	100	---	Yes	2B3
7338A:					
HURST SILT LOAM, 0 TO 2 PERCENT SLOPES, RARELY FLOODED	Okaw	5	---	Yes	2B3

Explanation of hydric criteria codes:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
   - B. are poorly drained or very poorly drained and have either:
     - 1.) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
     - 2.) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
     - 3.) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

Water Features

St Clair County, Illinois

[Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
31A:										
Pierron	D	Negligible	January	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			February	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			March	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			April	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			May	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
433A:										
Floraville	D	---	January	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			February	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			March	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			April	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	---	None
			May	0.0-1.0	>6.0	---	---	None	---	None
			December	---	---	0.0-0.5	Brief	Frequent	---	None
517A:										
Marine	C	High	January	0.5-2.0	1.5-3.0	---	---	None	---	None
			February	0.5-2.0	1.5-3.0	---	---	None	---	None
			March	0.5-2.0	1.5-3.0	---	---	None	---	None
			April	0.5-2.0	1.5-3.0	---	---	None	---	None
			May	0.5-2.0	1.5-3.0	---	---	None	---	None

Water Features

St Clair County, Illinois

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
3288L:										
Petrolia	C/D	---	January	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			February	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			March	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			April	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			May	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			June	---	---	---	---	None	Long	Frequent
			November	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
			December	0.0-1.0	>6.0	0.0-0.5	Long	Frequent	Long	Frequent
8084A:										
Okaw	D	---	January	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Occasional
			February	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Occasional
			March	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Occasional
			April	0.0-1.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Occasional
			May	0.0-1.0	>6.0	---	---	None	Brief	Occasional
			June	---	---	---	---	None	Brief	Occasional
			November	---	---	0.0-0.5	Brief	Frequent	---	None
			December	---	---	0.0-0.5	Brief	Frequent	---	None
8338A:										
Hurst	D	---	January	0.5-2.0	1.5->6.0	---	---	None	---	None
			February	0.5-2.0	1.5->6.0	---	---	None	Brief	Occasional
			March	0.5-2.0	1.5->6.0	---	---	None	Brief	Occasional
			April	0.5-2.0	1.5->6.0	---	---	None	Brief	Occasional
			May	---	---	---	---	None	Brief	Occasional

Water Features

St Clair County, Illinois

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
8338B:										
Hurst	D	---	January	1.0-2.0	1.5->6.0	---	---	None	---	None
			February	1.0-2.0	1.5->6.0	---	---	None	Brief	Occasional
			March	1.0-2.0	1.5->6.0	---	---	None	Brief	Occasional
			April	1.0-2.0	1.5->6.0	---	---	None	Brief	Occasional
			May	---	---	---	---	None	Brief	Occasional

Water Features

Washington County, Illinois

[Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
12:										
Wynoose	D	---	March	0.0-2.0	2.0->6.0	---	---	None	---	None
			April	0.0-2.0	2.0->6.0	---	---	None	---	None
			May	0.0-2.0	2.0->6.0	---	---	None	---	None
			June	0.0-2.0	2.0->6.0	---	---	None	---	None
13A:										
Bluford	C	---	March	1.0-3.0	2.0->6.0	---	---	None	---	None
			April	1.0-3.0	2.0->6.0	---	---	None	---	None
			May	1.0-3.0	2.0->6.0	---	---	None	---	None
			June	1.0-3.0	2.0->6.0	---	---	None	---	None
Wynoose	---	---	Jan-Dec			---	---	None	---	None
13B:										
Bluford	C	---	March	1.0-3.0	2.0->6.0	---	---	None	---	None
			April	1.0-3.0	2.0->6.0	---	---	None	---	None
			May	1.0-3.0	2.0->6.0	---	---	None	---	None
			June	1.0-3.0	2.0->6.0	---	---	None	---	None
16:										
Rushville	D	---	March	0.0	>6.0	0.0-1.0	Brief	Occasional	---	None
			April	0.0	>6.0	0.0-1.0	Brief	Occasional	---	None
			May	0.0	>6.0	0.0-1.0	Brief	Occasional	---	None
			June	0.0	>6.0	0.0-1.0	Brief	Occasional	---	None

Water Features

Washington County, Illinois

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
84:										
Okaw	D	---	March	0.0	>6.0	0.0-0.5	Brief	Occasional	---	None
			April	0.0	>6.0	0.0-0.5	Brief	Occasional	---	None
			May	0.0	>6.0	0.0-0.5	Brief	Occasional	---	None
			June	0.0	>6.0	0.0-0.5	Brief	Occasional	---	None
338A:										
Hurst	D	---	February	1.0-3.0	>6.0	---	---	None	---	None
			March	1.0-3.0	>6.0	---	---	None	---	None
			April	1.0-3.0	>6.0	---	---	None	---	None
Okaw	---	---	Jan-Dec			---	---	None	---	None
453B:										
Muren	B	---	March	2.0->6.0	>6.0	---	---	None	---	None
			April	2.0->6.0	>6.0	---	---	None	---	None
517A:										
Marine	C	---	January	1.0-2.0	1.0->6.0	---	---	None	---	None
			February	1.0-2.0	1.0->6.0	---	---	None	---	None
			March	1.0-2.0	1.0->6.0	---	---	None	---	None
			April	1.0-2.0	1.0->6.0	---	---	None	---	None
			May	1.0-2.0	1.0->6.0	---	---	None	---	None
Rushville	---	---	Jan-Dec			---	---	None	---	None
916A:										
Darmstadt	D	---	February	1.0-3.0	2.0->6.0	---	---	None	---	None
			March	1.0-3.0	2.0->6.0	---	---	None	---	None
			April	1.0-3.0	2.0->6.0	---	---	None	---	None
			May	1.0-3.0	2.0->6.0	---	---	None	---	None

This report shows only the major soils in each map unit. Others may exist.

Water Features

Washington County, Illinois

Map symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
916A:										
Oconee	C	---	March	1.0-3.0	>6.0	---	---	None	---	None
			April	1.0-3.0	>6.0	---	---	None	---	None
			May	1.0-3.0	>6.0	---	---	None	---	None
			June	1.0-3.0	>6.0	---	---	None	---	None
Cowden	---	---	Jan-Dec			---	---	None	---	None
Huey	---	---	Jan-Dec			---	---	None	---	None
3288:										
Petrolia	C/D	---	March	---	---	---	---	None	Brief	Frequent
			April	0.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Frequent
			May	0.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Frequent
			June	0.0	>6.0	0.0-0.5	Brief	Frequent	Brief	Frequent
7338A:										
Hurst	D	---	February	1.0-3.0	>6.0	---	---	None	---	None
			March	1.0-3.0	>6.0	---	---	None	---	None
			April	1.0-3.0	>6.0	---	---	None	---	None
Okaw	---	---	Jan-Dec			---	---	None	---	None

This report shows only the major soils in each map unit. Others may exist.