Surficial Geologic Mapping Proposal for STATEMAP FY2020

Presented by Andrew Stumpf
(Project Leaders: Phillips, Grimley, Curry, Stumpf)
Illinois State Geological Survey
Prairie Research Institute
University of Illinois at Urbana-Champaign
IGMAC meeting, September 5th, 2019
SURFICIAL MAPPING STATUS
(1:24,000 scale quadrangles)

Completed August 2019

Palos Park
Completed

Beaver Creek
Completed

Lawrenceville
Completed
Mapping discoveries: Palos Park Quadrangle

- Two glacial diamicton units were identified: Haeger Member, Lemont Formation and Wadsworth Formation
- Thick succession (30–50 feet) of well-sorted glacigenic sediment (medium sand or silty lake sediment) is below Haeger diamicton
- Equality Formation mapped over large areas; largely glaciolacustrine sediments deposited in glacial Lake Chicago
- LiDAR DEMs facilitated mapping of several sinuous landforms (eskers)
- Shorelines of glacial Lake Chicago (early phase) mapped along Calumet Sag Channel at 640 and 620 feet; correspond to Glenwood & Calumet levels, respectively
Mapping discoveries: Beaver Creek Quadrangle

- Over 100 feet of gravelly sand occurs in parts of this esker ridge.
- A subglacial drainageway for glacial meltwaters during ice recession.
- Thin outwash occurs on terraces adjacent to and in front of the esker system.
Mapping discoveries: Lawrenceville Quadrangle

- Teneriffe Silt (Illinois Episode) occurs below last glacial Equality Formation or Henry Formation
- Equality Formation (Wisconsin Episode) extends into Wabash River valley, indicating basin-wide slackwater conditions, not just tributary valleys
- Possible liquefaction hazard exists in Embarras River valley sediments
SURFICIAL MAPPING STATUS
(1:24,000 scale quadrangles)

Started September 2019

Surficial Completed and Current

- Current STATEMAP (FY 2019)
- Completed quadrangle
- Completed county compilation
- Completed EDMIN
- Completed student map
- Both bedrock and surficial mapping completed

- Harvey
- Steger

- Crossville
- Williamson County
SURFICIAL MAPPING STATUS

Planned Mapping

Proposed project areas (numbered on map)

1. Illinois bedrock geology
   1a. Coal Valley & Silvis (partial)
   1b. Green Rock & Port Byron
   1c. Wedron

2. Illinois surficial geology
   2a. Blue Island & Calumet City
   2b. Fisher
   2c. Birds (& Russellville?)

3. Illinois geology
   Monroe County compilation (surficial geology)

Color Key:
- Proposed STATEMAP (FY 2020)
- Short-range plan (2–5 years)
- Long-range plan (5–10 years)
Blue Island and Calumet City Quadrangles

Regional Context

**Project Leaders:**
Brandon Curry
Andrew Phillips (?)

Green infrastructure study project areas
- Toleston Shoreline
- Calumet Shoreline
- Glenwood Shoreline

- Builds upon NE Illinois mapping: Palos Park Quadrangle (completed), Harvey & Steger Quadrangles (just started)
- Area mapped by Bretz in early 20th century; needs updating; no 3D component or geologic cross section
Blue Island and Calumet City Quadrangles

Justification

Societal Relevance

- **Groundwater**: important aquifers within the Henry Formation (between diamicton units and below lake plain); connectivity of subsurface aquifers with surface hydrology
- **Wetlands**: wetland ecosystems and restoration in glacial Lake Chicago plain
- **Flooding problems / green infrastructure siting**: related to funded Illinois-Indiana Sea Grant project to address flooding issues in glacial Lake Chicago plain (southern Cook County)
- **Construction suitability**: various engineering projects; important in this urbanized area. **Sand and gravel / bedrock resources**: Silurian dolomite is near-surface (<10 feet) in several areas locally; Thornton Quarry partially located in the Calumet City Quadrangle

Research

- **Origin of Blue Island** (Remnant of moraine? or Flood scoured upland? When did it form?) Geometry of diamicton units with onlapping fluvial or lacustrine units
- **History of the Chicago Outlet** and **glacial Lake Chicago** during the Glenwood, Calumet, and Toleston (?) Phases; Study transition from glaciated uplands to lacustrine plain of glacial Lake Chicago
Fisher Quadrangle

Regional Context

**Project Leader:** Andrew Stumpf

- Map area lies completely overlies Mahomet Bedrock Valley that contains the Mahomet Aquifer System
- Mapping will fill in gap between previous STATEMAP quadrangles
Fisher Quadrangle

Justification

Societal Relevance

- **Groundwater resources**: important aquifers are in the Pearl Formation, Glasford Formation and Grigg tongue (Illinois Episode), and Mahomet Sand Member (pre-Illinois Episode)

- **Potential for groundwater contamination**: Mahomet Aquifer System is a Sole Source Aquifer. There could be areas of surface-groundwater interaction along the Sangamon River valley. Also, there is a potential for the release of methane from gas storage wells into the Mahomet Aquifer.

- **Construction suitability**: expansion of County and State transportation systems

- **Sand and gravel resources**: aggregate resources along the Sangamon River valley

Research

- Characterize multiple glacigenic sequences of the Wisconsin, Illinois, and pre-Illinois Episodes

- Support mapping of the Mahomet Bedrock Valley and Mahomet Aquifer near the Manlove Gas Storage Field. PRI was directed under Illinois Senate Bill 2027 EPA-Mahomet Aquifer to undertake a helicopter-borne electromagnetic survey of the area around Manlove Natural Gas Storage field

- Related research about surface-groundwater interactions along the Sangamon River valley
Regional Setting

*Project Leader:* Andrew Phillips

- Includes confluence of Embarras River with Wabash River
- Extensive terrace with last glacial outwash deposits and slackwater lake terrace
- Known paleoliquefaction dikes
- Continues previous 1:24,000 mapping northward up-valley
- Looking for input on which quad to propose
Societal Relevance
- Groundwater supply & quality
- Seismic hazards (liquefaction & ground shaking)
- Extend prior mapping northward along the Wabash River valley
- Aggregate resources

Research
- Slackwater lake deposits and deglacial flood events

Annualized Earthquake Loss by county (Redrawn from FEMA, 2017).
Monroe County
Surficial Geology Map – Compilation

**Project Leader:** David Grimley

- Prior mapping completed by D. Grimley, A. Phillips, and M. Barnhardt (ISGS)
- Objective: edge-match geology between quadrangle maps, develop county maps for data point locations and bedrock topography, and construct county-wide geologic cross sections
- Revise Illinois Episode and pre-Illinois Episode glacial boundaries
Monroe County

Justification

Societal Relevance

- **Groundwater:** supply & quality
- **Karst:** structural stability and groundwater aspects
- **Seismic hazards:** ground shaking and liquefaction potential
- **Sand and gravel resources**

Research

- Limit of Illinois Episode and pre-Illinois Episode glaciations
- Origin and environment (and paleoclimate) of thick pre-Illinois Episode lacustrine deposits (e.g., Red Bud Quadrangle)
FY2020 Proposed Surficial Geologic Mapping (Projects 2 and 3)

PROJECT 2

NORTHERN ILLINOIS  Blue Island and Calumet City City Quadrangles

Societal relevance: Urban development, aggregate resources, groundwater supply, and surface hydrology

Scientific research: Glacial Lake Chicago shorelines and meltwater outlets, moraine formation, and till stratigraphy

CENTRAL – SOUTHERN ILLINOIS  Fisher, Birds, and Russellville Quadrangles

Societal relevance: Groundwater quality and supply; aggregate and seismic hazards (Birds and Russellville Quadrangles); aquifer contamination (Fisher Quadrangle)

Scientific research: Slackwater lake chronology and last glacial-postglacial transition (Birds and Russellville); Holocene to late-glacial deposition along Wabash and Sangamon River valleys; characterization of pre-Illinois Episode deposits in Mahomet Bedrock Valley (Fisher)

PROJECT 3

SOUTHWEST ILLINOIS  Monroe County

Compile and integrate GIS files; complete county-wide cross sections and data point map; adjust geologic map unit boundaries using recently acquired LiDAR elevation data
Proposed project areas (numbered on map)

1. Illinois bedrock geology
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Critical mineral areas

Structure data

- Fault
- Fault, bar on downthrown block
- Monoclinal
- Anticline
- Syncline
- Domes

Salem: structure name

County boundary
Interstate highway

Sept 5, 2019
IGMAC Meeting