Surficial Geologic Mapping Proposal for STATEMAP FY2022

presented by Brandon Curry
(lead mappers: Grimley, Stumpf, Phillips, Grimley, Curry)
Illinois State Geological Survey
Prairie Research Institute, University of Illinois
for IGMAC meeting, September 22th, 2021

Thanks to Dee Lund and Emily Bunse for updated map status figures!
SURFICIAL MAPPING STATUS

- **completing Nov. 2021**
  - McHenry Co. comp

- **current Sept. 2021—Aug. 2022**
  - Blue Island, Calumet City
  - Dyer
  - Fisher
  - Russelville
  - Monroe County compilation
STATEMAP FY22 Proposed and Planned Mapping

Proposed FY22 project areas (numbered on map)
1. Illinois surficial geology
   1a. Jackson Park, Lake
       Calumet, & Mansfield
   1b. Wabash Valley compilations
   1c. Statewide (phase 3)
2. Illinois bedrock geology
   2a. Bellevue, Hanover
       & Monomine
   2b. Illinois City, Muscatine,
       & Montpelier
   2c. Gallatin & Saline
       County compilations

Proposed STATEMAP (FY 2022)
- 7.5-minute quadrangle and county status
- Wabash Valley compilation
- Statewide SG (phase 3)

Future Planning
- Short-range plan (2-5 years)
- Long-range plan (5-25 years)

Sept 23, 2021
IGMAC Meeting
Calumet City Quadrangle

Left: Cross section across Toleston Beach complex at Wentworth woods (courtesy Todd Thompson)

Right: LiDAR DEM of Toleston Beach complex; line of section for diagram above on the right
Fossil highlights: **Calumet City Quadrangle**

Fossils discovered buried under 10 ft of well-sorted beach sand, Calumet Beach, downtown Lansing, IL, near IN
Yet to be dated from BLI-PP 9 (Blue Island)... in sequence... rootlets in soft diamicton (colluvium), wood (AO horizon), and needles in well-sorted sand
The top of the fossiliferous stratified sand is contains remarkably well preserved needles of larch, white spruce, black spruce, and blobs of... **SLAG!!**
Dyer Quadrangle (in progress now!!)

We will be integrating Olivier Caron’s work in Will County with our new mapping in southern Cook County in this quad... marriage of the Lake Chicago plain and morainal uplands

Bretz site (Plum Creek) described in the early 1930’s (published in 1955); from Caron and Curry (2016)
Fisher Quadrangle
Regional Setting

*Project Leader: Andrew Stumpf*

- in Upper Sangamon River Valley (area of NSF-funded critical zone [CiNET] project)
- completely overlies Mahomet Bedrock Valley and Mahomet Aquifer
- connects gap in prior 1:24,000 STATEMAP mapping (between Rantoul and Mahomet)
Russellville Quadrangle

Regional Setting

Project Leader:
Andrew Phillips

- On west side of Wabash River Valley
- Extensive terrace with last glacial outwash deposits
- Extends previous 1:24,000 mapping northward up-valley
Proposed project areas (highlighted in green & numbered on map)

1. Illinois surficial geology
   1a. Jackson Park, Lake Calumet, & Marnsfield
   1b. Wabash Valley comp.
   1c. Statewide (phase 3)

2. Illinois bedrock geology
   2a. Bellevue, Hanover & Menominee
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Critical mineral areas
- fluor spar district
- lead-zinc district

Structure data
- fault
- fault, bar on downdropped block
- monocline
- anticline
- syncline
- domes

Salem structure name
- County boundary
- Interstate highway

Sept 23, 2021
IGMAC Meeting
Lake Calumet and Jackson Park Quadrangles

Regional Context

Project Leader: Brandon Curry

- Mapping in a highly urbanized area, contiguous with soon-to-be completed maps of Blue Island and Calumet City.
- Surficial maps of the two quadrangles were mapped by Bretz (1930’s), but since then, considerable development has altered the landscape. We will provide cross sections, and accumulate subsurface data with the eye to the future 3-D mapping.
Lake Calumet and Jackson Park Quadrangles

Justification

Societal Relevance

- **Groundwater**: important aquifers within the Henry Fm. (between till units and below lake plain); connectivity of subsurface aquifers with surface hydrology (harvest geological data from Roadcap thesis)

- **Wetlands**: wetland ecosystems and restoration in glacial Lake Chicago plain

- **Flooding / green infrastructure siting**

- **Construction suitability, fill characterization**: various engineering projects (including Obama Library!!); important in this highly urbanized area

- **Sand and gravel / dolomite resources**: Depth-to-bedrock important to know for proposed onsite aggregate use on large projects (e.g. Olympic Village)

Research

- **Anthropology of post-Nipissing beaches**

- **Correlation with offshore sediment characterization; nature of sediment fill in bedrock valleys discovered by HTEM.**
Mansfield Quadrangle

Justification

• in Upper Sangamon River Valley (area of NSF-funded critical zone [CiNET] project)
• partly overlies Mahomet Bedrock Valley and Mahomet Aquifer
• Will become part of the contiguous regional mapping area of MBV
• Near Manlove Gas Storage facility
IGMAC questions and concerns?
Surficial Geologic Mapping Proposal
(Compilations) STATEMAP FY2022

presented by David A. Grimley
(contributing mappers: Grimley, Curry, Phillips, Stumpf)
Illinois State Geological Survey
Prairie Research Institute, University of Illinois
for IGMAC meeting, September 23rd, 2021
Surficial Geology Compilation Projects

- **FY2020 (current – nearing completion)**
  - Lineback (1979) digitization and GeMS update
  - Statewide Quaternary Map Phase 1
  - McHenry County SG

- **FY2021 (current – initial phase)**
  - Statewide Quaternary Map Phase 2
  - Lake and Kane County GeMS update
  - St. Clair and Madison County BT

- **FY2022 (new proposal)**
  - Statewide Quaternary Map Phase 3
  - Wabash Valley Compilation
Quaternary Deposits of Illinois (Lineback, 1979) digital compilation

original Lineback (1979) paper map [1:500,000 scale]
digital compilation (in GIS); modified from Barb Stiff and students
Lineback (1979) notes

Quality checked polygon codes and contacts

- abbreviations changed to match original Lineback map
- topology errors fixed
- fixed 110 polygons (of 9483 total) with wrong unit or symbol
- 31 polygons added (many water polys in Illinois River Valley)

GeMS standards added --- required by USGS
(Katie Mandera)

- coding of GeoMaterial and confidence
- coding of line and polygon confidence
- various other codings...
Illinois Quaternary Geology compilation

- **PHASE 1**: active ---- deliverable submitted to USGS November 2021

- **PHASE 2**: begins Fall 2021 ---- deliverable submitted to USGS in late summer 2022

- **PHASE 3**: new proposal (to begin Fall 2022)

  - phase 3 will complete mapping of last glacial Lake Michigan Lobe
Methods: Illinois Quaternary Compilation

- **compile new mapping** completed since 1979 (significant area in Phase 1)

- **generalization of 1:24,000 and 1:62,500 mapping** at the 1:100,000 scale (intended for use at 1:250,000 or 1:500,000 scale)

- **digitize new lines at 1:100,000 scale** with new mapping or Lineback 1979 map in background

- **use Illinois 10m DEM as base**

- **code with GeMS standards** (e.g., existence and identity confidence for polygons; line resolution confidence for geologic contacts; data source)

- **edge matching with surrounding states** to the degree possible; WI, IA, MO, IN, KY geologic surveys have all been contacted

- **map entire valleys along Mississippi, Ohio, and Wabash Valleys** rather than to state line
Southwestern Illinois (Kaskaskia Basin) comparison

- more **Pearl Formation** outwash mapped in middle Kaskaskia Lowland
- **Teneriffe Silt** mapped in St. Clair-Clinton counties
- **Hagarstown Member** split into **sandy** (brown) and **mixed** (red) texture facies
Ice-walled lakes in NE Illinois

- not previously recognized or mapped in 1979 or pre-2005 era maps
- adding large ones to new compilation map
Ice-walled lakes: De Kalb County, IL

After dissolving adjacent polygons and deleting polygons < 0.4 km²
McHenry County compilation

(Brandon Curry & Jason Thomason: Nov. 2021 submission)
McHenry County compilation: w/ice-walled lakes
Monroe County: electrical resistivity transects

- full profile across Mississippi River Valley

Outlet East

Mississippi River Valley transect
Wabash Valley Region: Seismic Features

Mt. Carmel 2008 5.2 M\textsubscript{w}
Lower Wabash Valley Region: Justification

*Societal Needs*

- **Groundwater supply**: Heavy use of WV fill for irrigation as well as municipal supply [confining layers, aquifer geometry]
- **Paleoseismicity**: Mapping has produced datasets to support seismic hazard studies.

*Basic research*

- **Extensive slackwater lake deposits**, formed over several periods generally during glacial advance. Slackwater conditions began **before 40 ka**. Deglacial periods appear to be more erosive.
- **Confirm maximum elevations and age of slackwater deposits**: up to 440 ft elevation ~35-40 ft ft above highest outwash terrace. Ages range from LGM to mid-Wisconsin Episode to Illinois Episode
- **Base-level control for slackwater lakes** (Wabash Valley aggradation or Ohio Valley?)
- **Thick lacustrine deposits found at depth in Wabash Valley**, earlier concepts mainly outwash-filled. Could it have been slackwater for periods?
- **Continued collaboration with Indiana Geological Survey**, such as Beste-1 borehole (Glacial Lake Solitude)
Lower Wabash Valley Region: Challenges and Goals

- Reconciliation of various mapping styles and units
- Reconciliation with Heinrich’s studies (stratigraphy) in glacial Lake Saline
- Fill in unmapped partial quadrangles to connect
- Fieldwork: outcrop studies, geophysics
- Final Map Product: geomorphic or geologic? + base map
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