

DIGITAL MAPPING TECHNIQUES 2016

The following was presented at DMT'16
(May 22-25, 2016 - Florida Geological Survey,
Tallahassee, FL)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2016)

<http://ngmdb.usgs.gov/info/dmt/>

21st Century Mapping Products

or

“Ok...We made some cool maps and publications but it is 2016 and is this really conveying the information to our constituents!”

By Melony Barrett, Jennifer Carrell, Yu Feng Lin, Jennifer Obrad, and Mark Yacucci
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The Illinois State Geological Survey has been exploring new ways to reach constituents with information derived from geologic mapping. Traditional quadrangle, county, and state compilations produce fantastic maps that provide reliable, detailed information essential to making good decisions about the complex issues affecting our state's water, land, energy supplies, and aggregate resources. Technical publications produced along with these maps provide much of the explanation and detail about the mapped area. These maps and publications, however, may not be the mechanism for all who need our data. These tend to be geared to the scientific community and not the city planner, commercial user, or general population who also needs and values this important data. The following three “products” are presented as examples of alternative ways to disseminate the same mapped/described geologic data.

ILSTRAT – Slides 3 – 15

ILSTRAT was designed to allow for faster more flexible dissemination and editing of the Illinois stratigraphy. Traditionally this has been accomplished through ISGS physical publications. Slides 4 to 8 give a brief overview of the history of our main stratigraphic publications. Moving forward the ISGS would like the ability to get scientific edits and changes out to our constituents shortly after editorial/administrative approval. ILSTRAT is an online wiki version of our classic stratigraphic publications and provides a mechanism to disseminate this information quickly and efficiently. Changes to a development version the wiki will be made by a select group of scientists with expertise in the various geologic systems based on current investigations going on at the ISGS. These changes will then undergo our typical vetting process and once approved migrated to the “live” version. Traditional physical publication can and will still occur when enough work on a system is completed to warrant.

Augmented Digital Hydrostratigraphic Model to 3D Printed Object – Slides 16 – 21

The ISGS has been experimenting with 3D printing technologies to better show the capabilities of 3D geologic mapping. The area printed is the Mahomet Aquifer in central Illinois. This aquifer is a major source of groundwater for the area. Slides 17 – 21 show

an overview of the various steps needed to Convert the mapped area from ArcGIS through various software into the printed physical model.

McHenry County Virtual Cross Section Viewer – Slides 22 – 24

The ISGS virtual cross section viewer takes a 3D model of McHenry County, Illinois and publishes the various surfaces to an interactive web interface that allows a user to create a cross section of an area of their choosing through the model. Data from the model is published through ArcGIS Server and read through a chart/graphing Java API. Depths are surveyed from each surface along the users designated line at regular intervals and the results are graphed as lines. Both top and bottom surfaces are sampled to create the 3D cross section.



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University of Illinois at Urbana-Champaign

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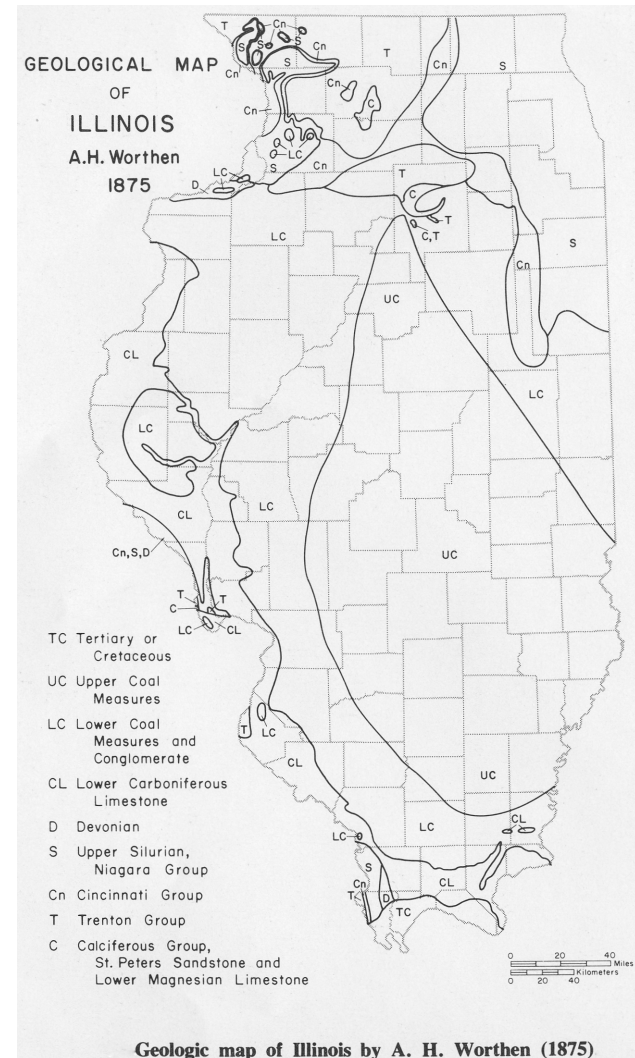
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A New Online Handbook of Illinois Stratigraphy -- ILSTRAT

By Jennifer Obrad, W. John Nelson, Ian Johnson, Alan Myers,
Chris Korose, and Scott D. Elrick
Illinois State Geological Survey

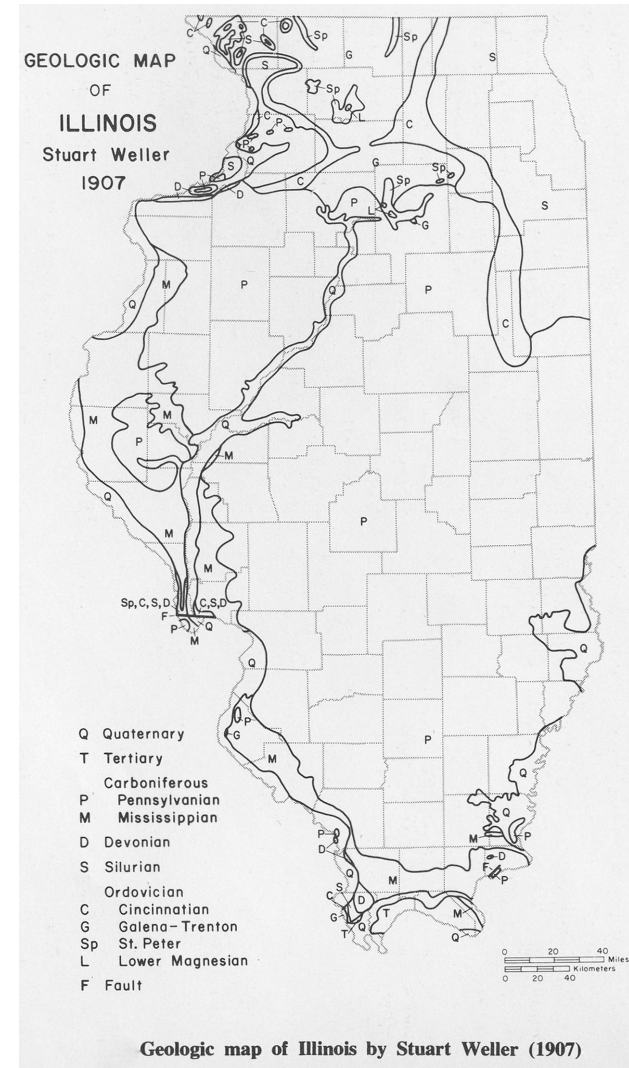
Introduction

- The stratigraphy of Illinois has been studied since the 1830s
- The first comprehensive survey of Illinois was published from 1866 to 1875 by A. H. Worthen (1st Director of the Geological Survey of Illinois) and his associates.
- These 'Worthen Reports' covered all aspects of Illinois geology.



From ISGS B95, 1975

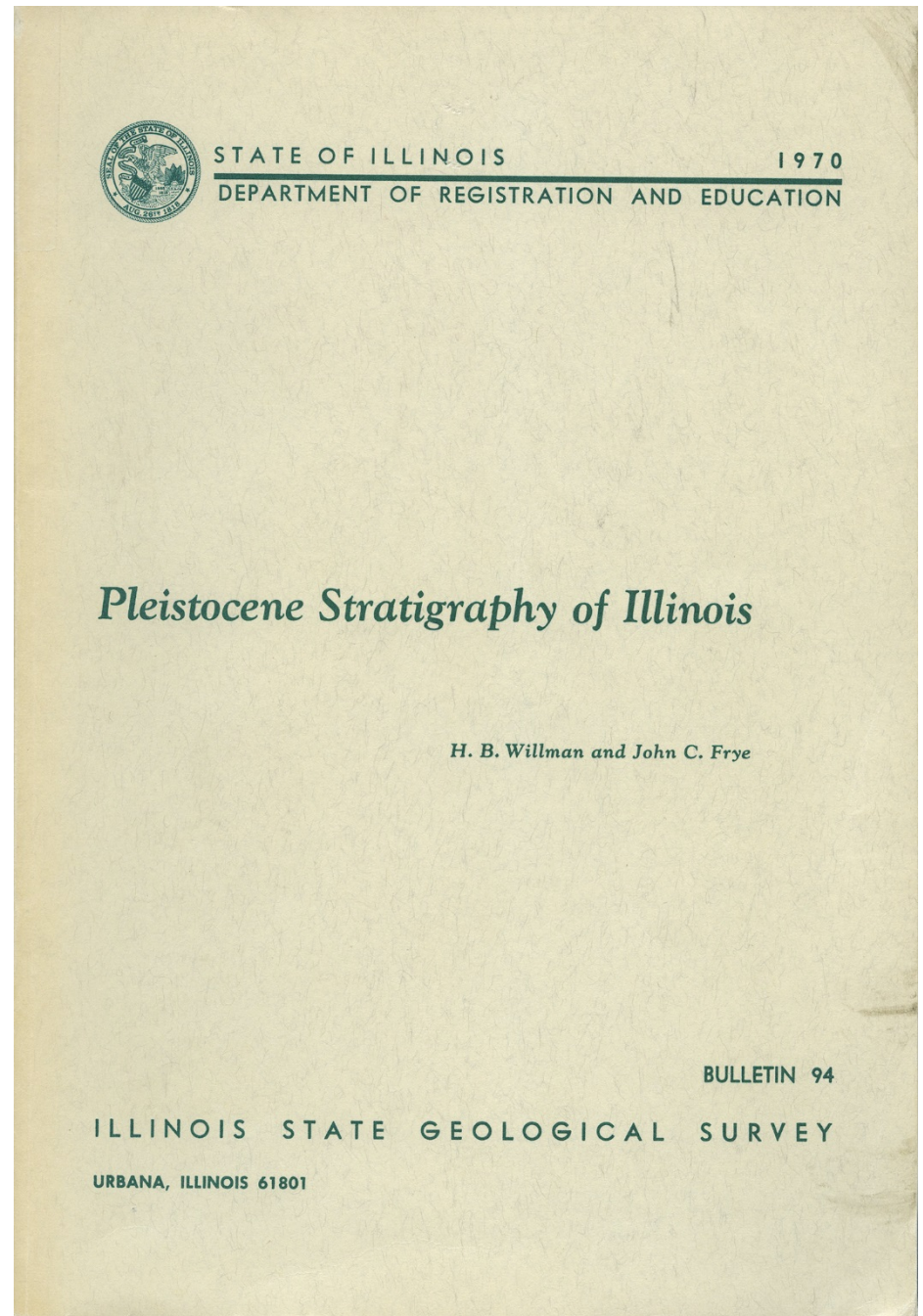
- In 1905, the new Illinois State Geological Survey was established.
- Research and mapping continued to refine the stratigraphic record
- Many reports and publications were produced, but no compilation of Illinois stratigraphy existed



From ISGS B95, 1975

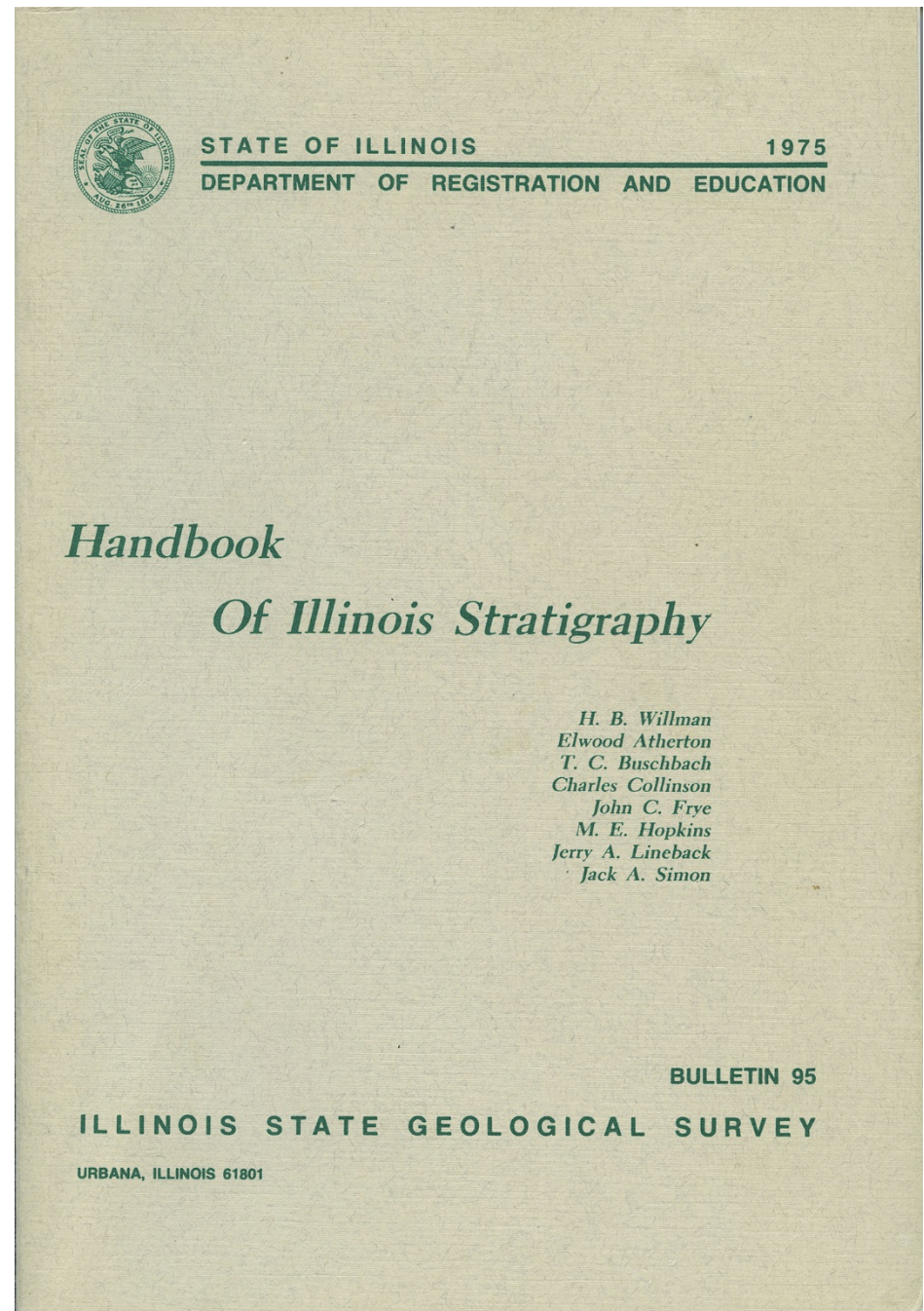
Bulletin 94

- Published in 1970
- Only covered the Pleistocene
- Classified by
 - Rock Stratigraphy
 - Soil Stratigraphy
 - Morphostrigraphy
 - Time stratigraphy



Bulletin 95

- Published in 1975
- It was the first comprehensive work to include descriptions of all geologic units in Illinois.
- It covers a total of 730 named stratigraphic units in Illinois.



Bulletin 104

- Contains new, revised and reclassified units
- Comprehensive information for the Wedron and Mason Groups of the Quaternary
- Still only covers a relatively small geologic time frame

WEDRON AND MASON GROUPS: Lithostratigraphic Reclassification of Deposits of the Wisconsin Episode, Lake Michigan Lobe Area

Ardith K. Hansel
W. Hilton Johnson



Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY

Bulletin 104 1996

Characteristics of a modern stratigraphic lexicon and interface

What we wanted to have:

- Web accessible
- Infinitely expandable
- Easily editable
- Trackable editing
- Exportable for formal publications
- Database driven

National Geologic Map Database

Geolex Search

Search Count

687
Units

Search

Clear



Welcome

The U.S. Geologic Names Lexicon ("Geolex"), a National compilation of names and descriptions of geologic units.



Find additional
Stratigraphic
Resources

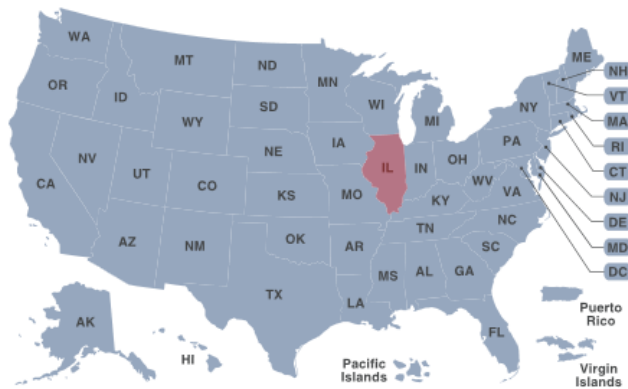


Search our Catalog
for any publication
cited in Geolex

Unit Name

enter 'Dakota Sandstone', 'Dakota', 'Dak', etc.

State or Territory



Canada Lexicon

Mexico Lexicon

Geologic Age Range

ERA	PERIOD	EPOCH		
Cenozoic ✓	Quaternary ✓	Holocene ✓		
		Pleistocene ✓		
	Tertiary ✓	late (Neogene) ✓	Pliocene ✓	
			Miocene ✓	
		early (Paleogene) ✓	Oligocene ✓	
			Eocene ✓	
			Paleocene ✓	
			Late ✓	
		Mesozoic ✓	Cretaceous ✓	Early ✓
				Late ✓
Jurassic ✓	Middle ✓			
	Early ✓			
Triassic ✓	Late ✓			
	Early ✓			
Paleozoic ✓	Permian ✓	Late* ✓		
		Middle* ✓		
		Early* ✓		
	Carbonif. ✓	Penn. ✓	Late ✓	
			Middle ✓	
		Miss. ✓	Early ✓	
			Late* ✓	
	Devonian ✓	Middle* ✓		
		Early ✓		
		Late ✓		
	Silurian ✓	Early ✓		
	Ordovician ✓	Late* ✓		
		Middle* ✓		
		Early* ✓		
	Cambrian ✓	Late ✓		
		Middle ✓		
Early ✓				
Precamb. ✓	Proterozoic ✓	Late ✓		
		Middle ✓		
		Early ✓		
Archean ✓	Early ✓			

* Epochs not yet searchable in Geolex. [Learn more](#)



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<http://ngmdb.usgs.gov/Geolex/search>

ILSTRAT



Welcome to **ILSTRAT**, the Online Handbook of Illinois Stratigraphy.

Use the links below to navigate to the stratigraphic unit you are looking for, or use the search box to navigate to any unit directly.

Please be aware that this Wiki is currently under construction, and as such, may not contain accurate information, or that information and format may change in the coming months. That being said, please have a look around and enjoy learning about the stratigraphy of Illinois.

- ILSTRAT
- Home
- Cenozoic
- Mesozoic
- Paleozoic
- Precambrian

- Navigation
- [Main page](#)
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	EON	ERA	PERIOD	EPOCH
Phanerozoic	PHANEROZOIC	CENOZOIC	QUATERNARY	HOLOCENE
				PLEISTOCENE
			TERTIARY	PLIOCENE
				MIOCENE
				OLIOCENE
				EOCENE
				PALEOCENE
		MESOZOIC	CRETACEOUS	
			JURASSIC	
			TRIASSIC	
		PALEOZOIC	PERMIAN	
			PENNSYLVANIAN	
			MISSISSIPPIAN	
			DEVONIAN	
			SILURIAN	
			ORDOVICIAN	
			CAMBRIAN	
		PRECAMBRIAN		
		Precambrian		



Editing and adding to ILSTRAT

- Not a free-for-all, to ensure good science
- Not a place to air geologic debates
- Approach must be systematic and organized so that the end product is consistent

A system will be set up to accommodate both minor and major revisions.

- Login created to track who makes changes
- Will need to appoint 'experts' for each System
- Minor edits and additions will only need approval from the expert for a given system
- Major edits will require peer-review

In the future..

- Ability to link to ILSTRAT
 - geologic maps (descriptions of units)
 - other ISGS publications
- Glossary terms
- And anything else we can think of to make this an up-to-date, living document of stratigraphy for Illinois

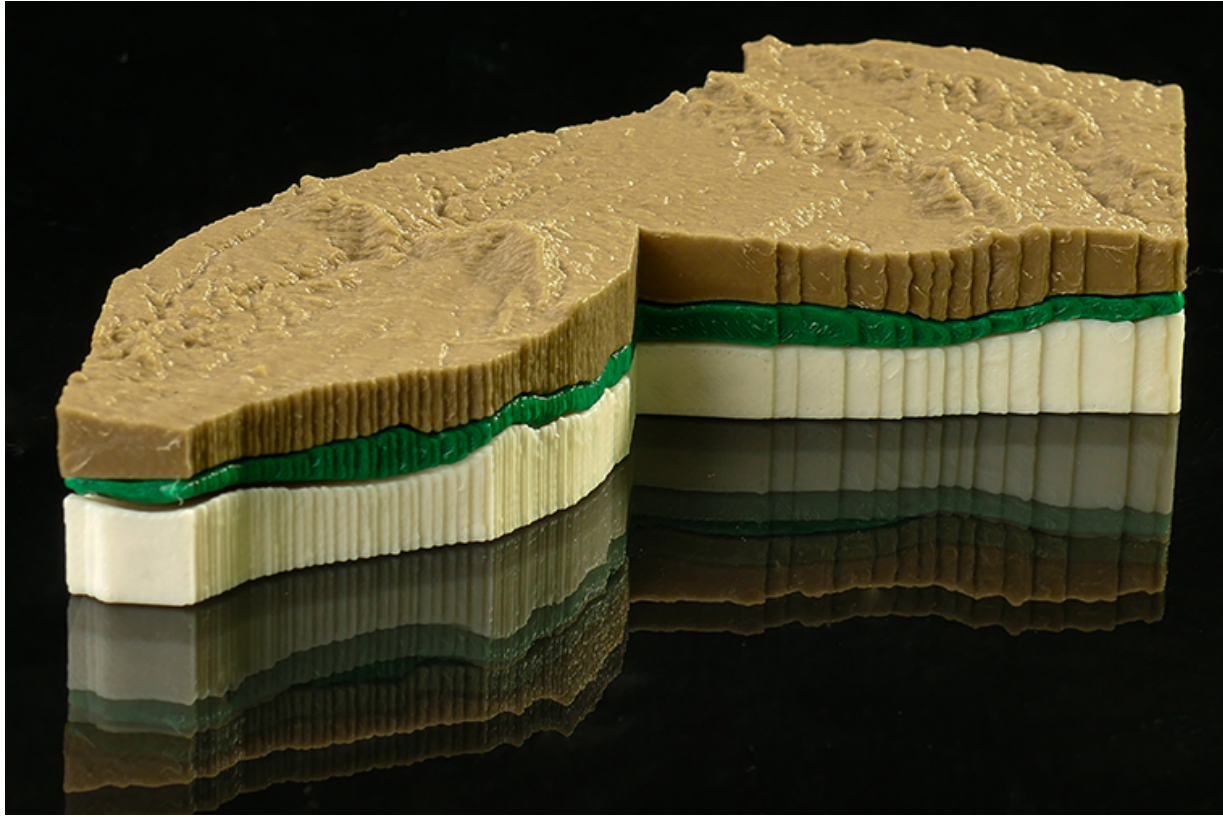
Augmenting Digital Hydrostratigraphic Model to 3-D Printed Object

Yu-Feng Forrest Lin,^{1,*} Shuheng Zhong,^{1,2} Andrew Stumpf¹

¹Illinois State Geological Survey, Prairie Research Institute, University of Illinois at
Urbana-Champaign

² College of Resources & Safety Engineering, China University of Mining and
Technology, Beijing

* Corresponding author



Needs...

- Two-dimensional surfaces in TIN format constructed to represent the top and bottom elevations of each unit
- Correct stratigraphy export file type that would allow easy importation of grids into 3-D Printing software
 - GIS Triangulated Irregular Network (TIN) format is compatible with the STereoLithography (STL) format of the printer

Basics...

- ArcGIS grids in TIN format are converted to Virtual Reality Modeling Language (VRML) using ESRI's ArcScene
- Files were next converted to STL files to construct a 3-D solid object models using the free software netfabb (<http://www.netfabb.com>) and Meshmixer (<http://www.meshmixer.com>).

NetFab

netfabb Basic 6.4 - bottom.fabbproject

Project Edit Part Extras View Settings Help Upgrade now

rotate/move move and rotate the selected parts by the mouse and the cursor keys

Context area

- Parts
 - bottom (100%)
- Slices

Cuts

X: 0.00 mm

Y: 0.00 mm

Z: 0.00 mm

<cutting disabled>

Execute cut Reset

Information

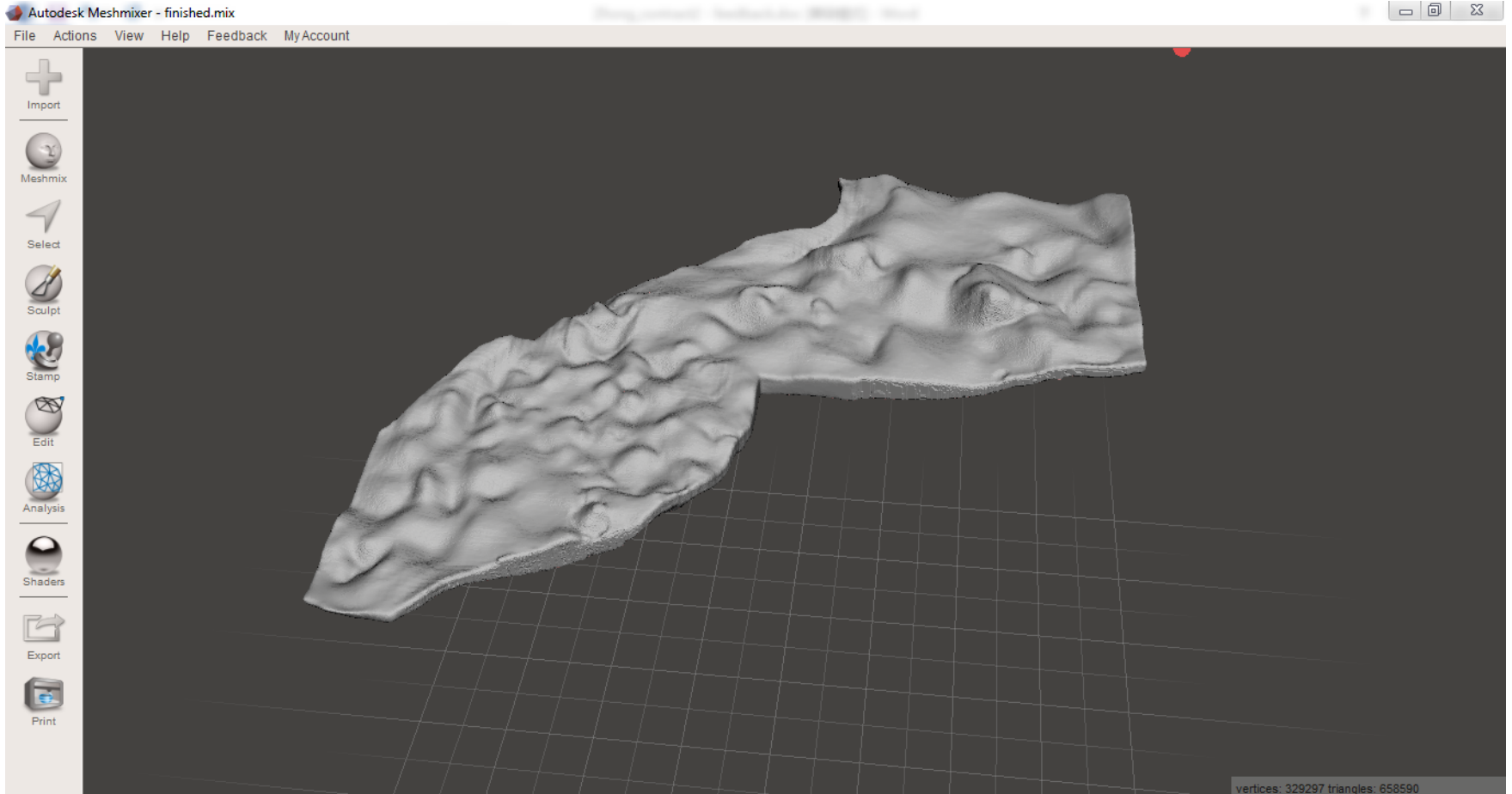
Length:	60388.00 mm	Volume:	---	cm ³
Width:	173.29 mm	Area:	8662556.16	cm ²
Height:	57288.00 mm	Triangles:	25641	

1 of 1 part is selected.

[Upgrade now!](#)

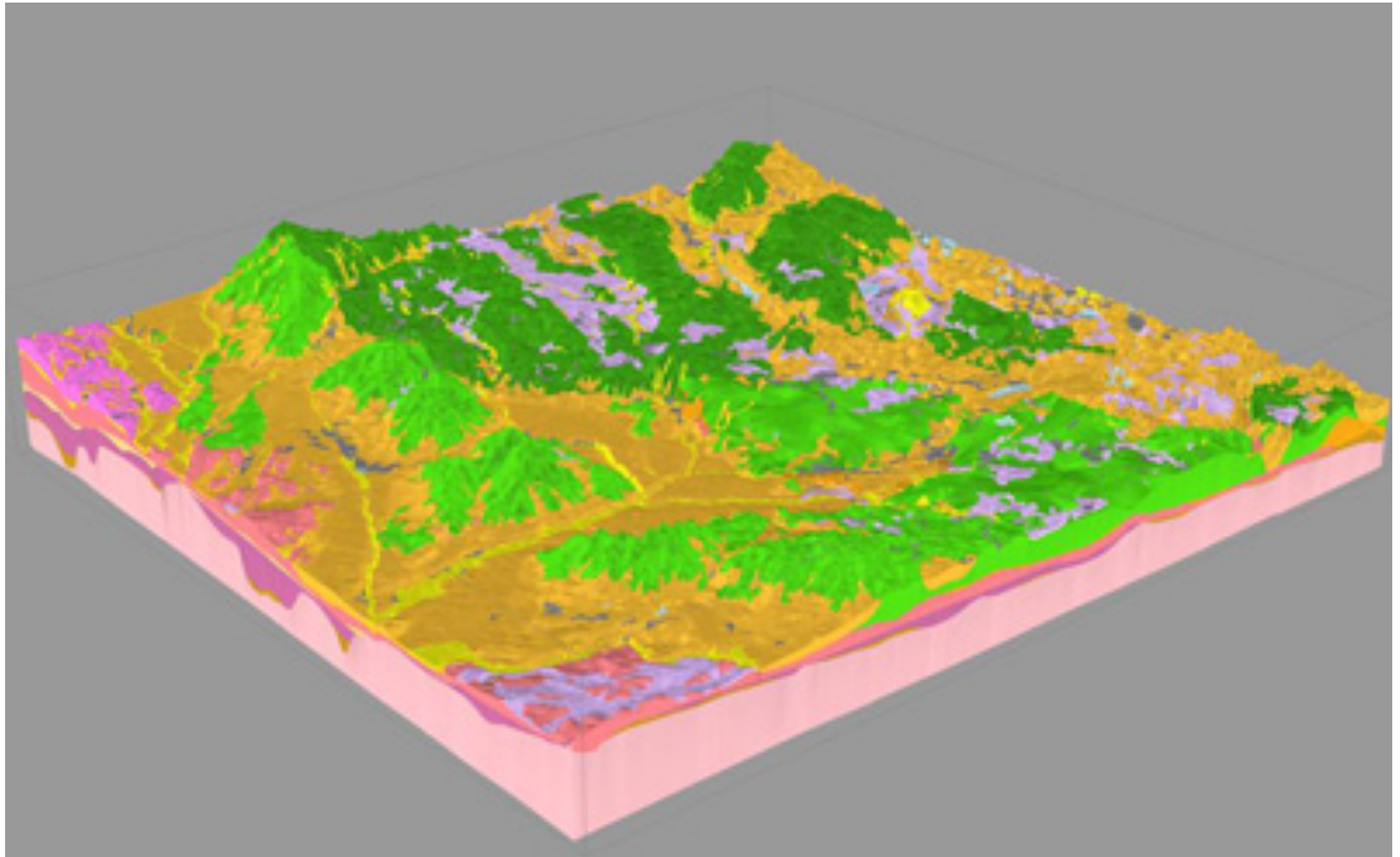


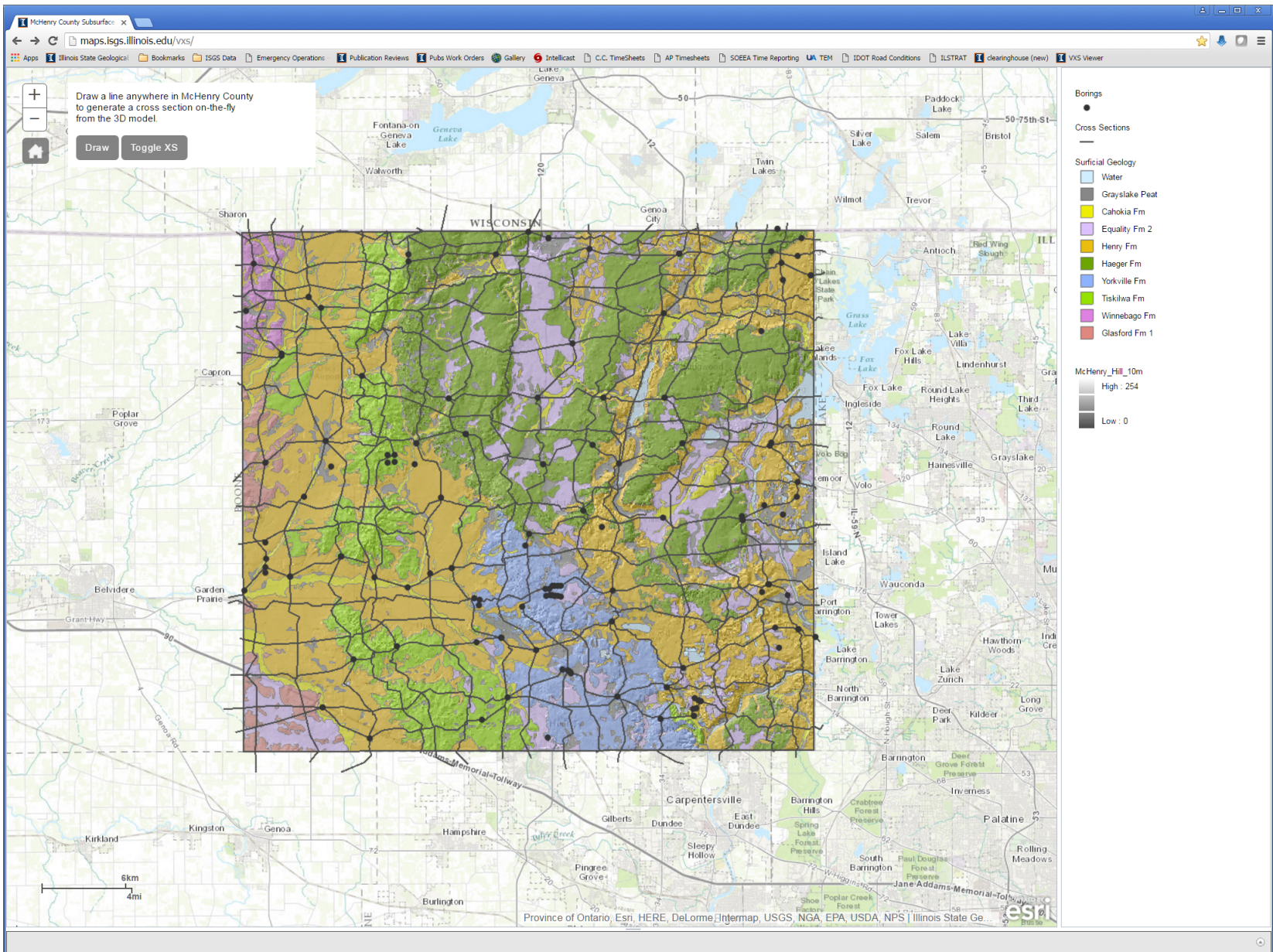
Meshmixer



McHenry County, Illinois Virtual Cross Section Viewer

By Melony Barrett and Jason Thomason
Illinois State Geological Survey







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ILSTRAT

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http://isgs.illinois.edu/ilstrat/index.php?title=Main_Page

Virtual Cross Section Viewer

Melony Barrett

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3-D Printing

Yu-Feng Lin

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<http://www.isgs.illinois.edu/achievements/february/3-d-hydrostratigraphic-model-3-d-printed-aquifer-model>

www.isgs.illinois.edu