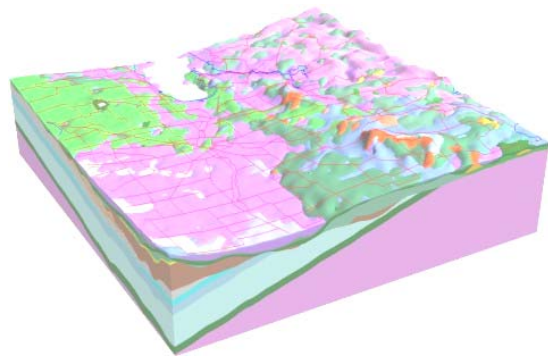


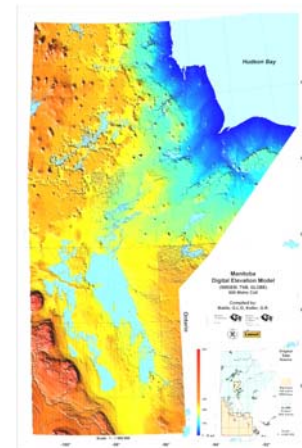
# Slicing into Manitoba

## Integrating Geography and Geology through Technology



**Greg Keller**

**Manitoba Industry, Trade and Mines  
Manitoba Geological Survey**





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## Who am I?

- **Modeler/GIS Specialist with the department of Industry, Trade and Mines - Manitoba Geological Survey**
- **Graduated from the University of Winnipeg in 1999**
- **4yr- B.Sc. in Geography**





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## **The University of Winnipeg experience...**

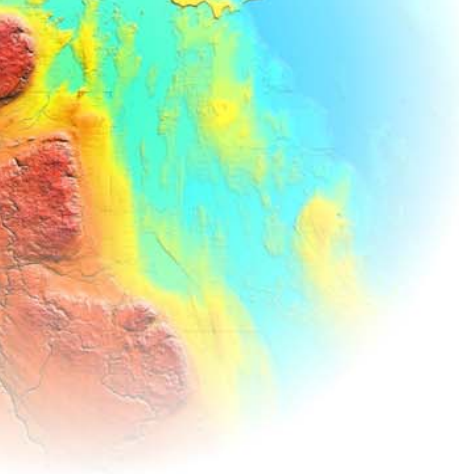
- **Direction - Biology vs geography**
- **Deciding factor - Physical geography**
- **Refinement of goals (course work/hobbies)**
- **Job experience**



# The University of Winnipeg experience...

- Physical Geography
- GIS/Advanced GIS
- Computer Mapping
- Geology
- Hydrology
- Statistics
- Quaternary Environments
- Business Computing courses (Programming)
- Soils and Vegetation





**Manitoba**

*Building for the Future*

## What is the Manitoba Geological Survey?



# **The Manitoba Geological Survey:**

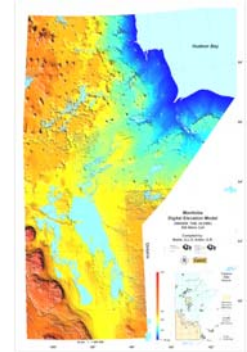
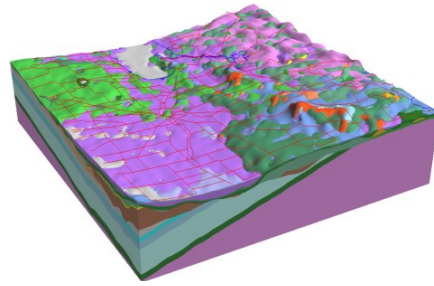
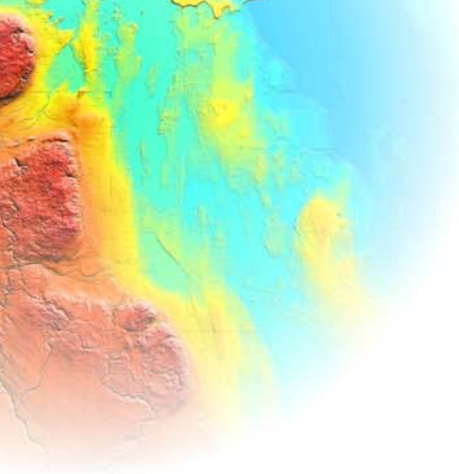
- **conducts a wide range of investigations in Manitoba's Precambrian Shield, Western Canada Sedimentary Basin, and Hudson Bay Basin.**
- **examines exposed bedrock, subsurface materials, and surficial sediments including sand, gravel and organic deposits.**
- **provides data and products such as geological maps and reports, metallic and industrial mineral deposit reports and databases, mineral resource assessments, targeted geoscience research, development of exploration models, and maintenance of data inventories.**
- **promotes mineral exploration opportunities and contributes to wise land-use management.**



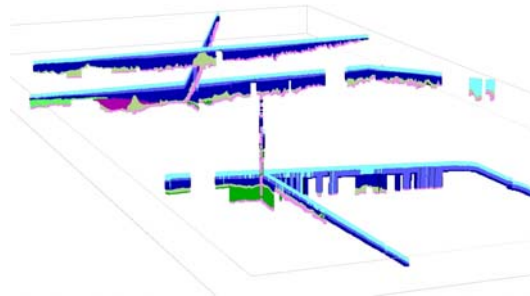
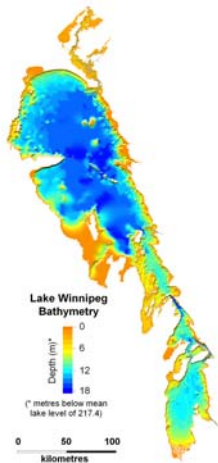
# Modeler/GIS Specialist:

- Produce maps for geologists from field data, chemistry, and drill data
- Projects/partnered with geologist (Gaywood Matile)
- System development for data access
- Database design and implementation
- 3D Geological modeling
- Field work

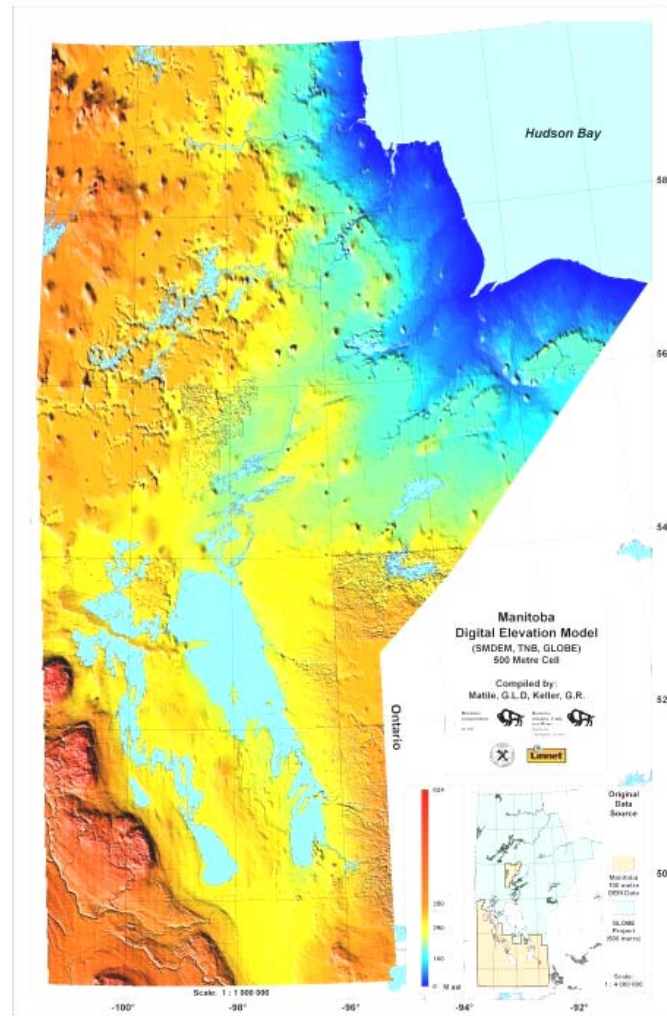
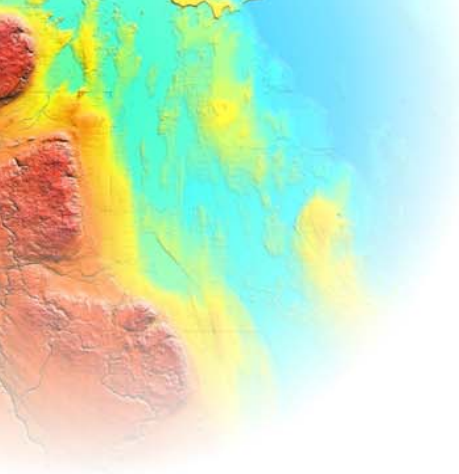




# Manitoba Geological Survey Projects







# Digital Elevation Model of Manitoba





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## **Why build a digital elevation model?**

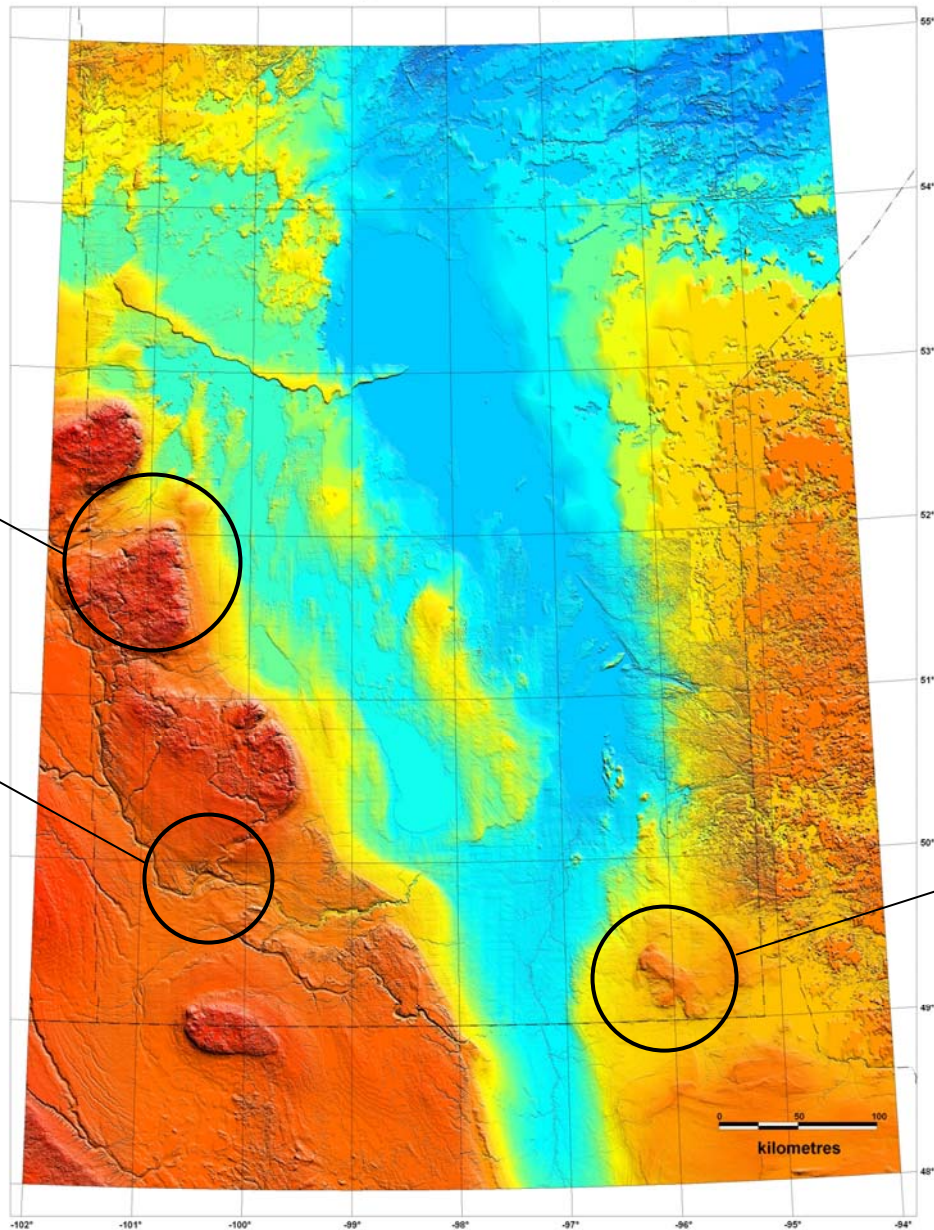
- **To locate drill holes vertically in space**

## **DEM Specifications:**

- **Compilation of over 2200 DEM files from digital ortho photo's**
- **Over 15 000 000 datapoints in the current model**
- **4 solid days of processing time**



Manitoba Digital Elevation Model (100 metre Grid)

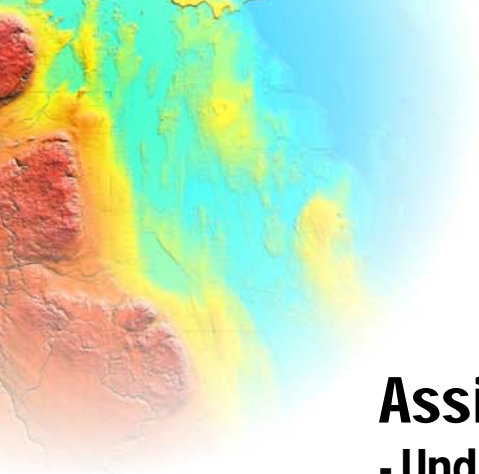


**Duck Mountain**

**Assiniboine Flats**

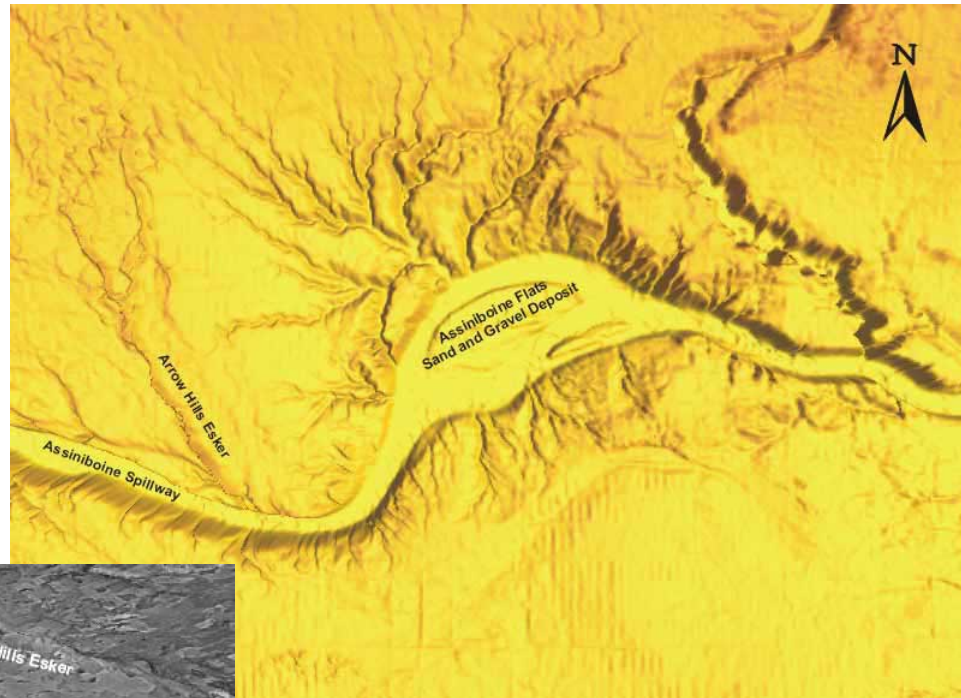
**Sandilands**





# Assiniboine Flats

- Undraped DEM

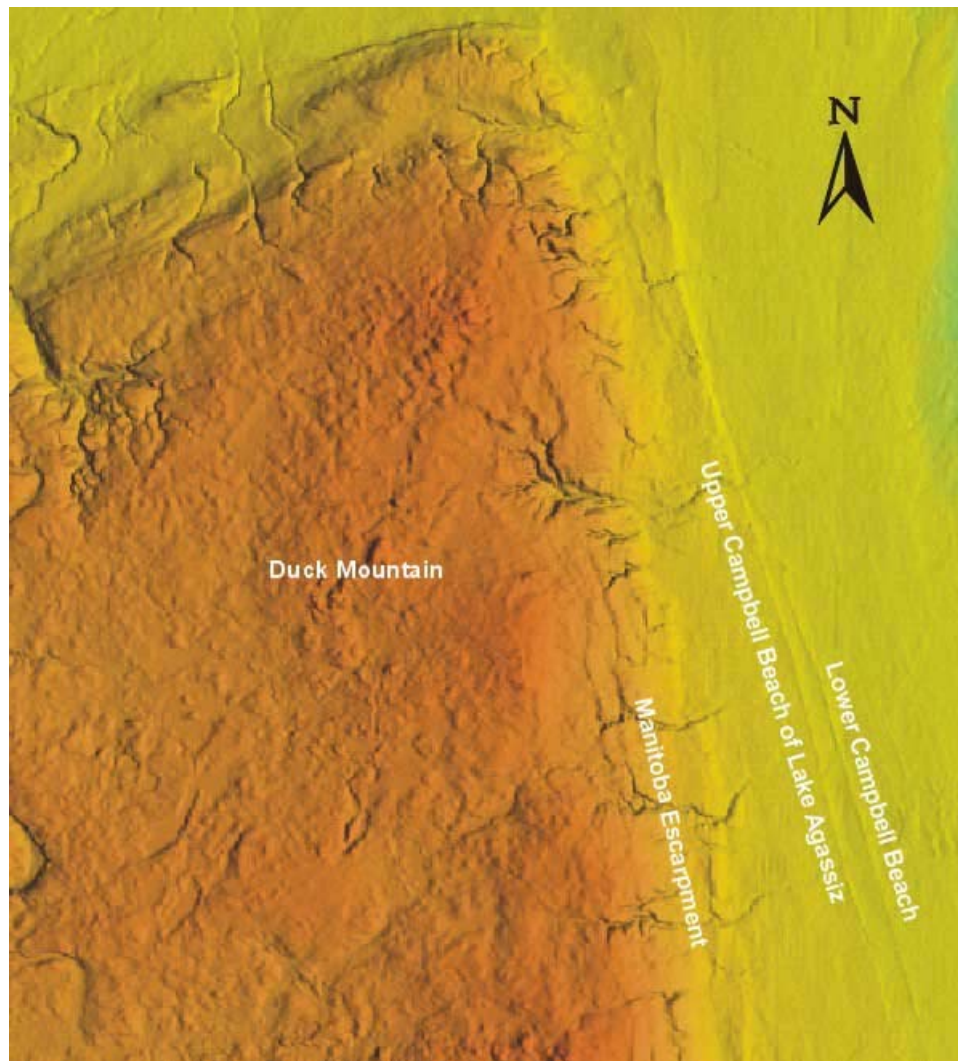


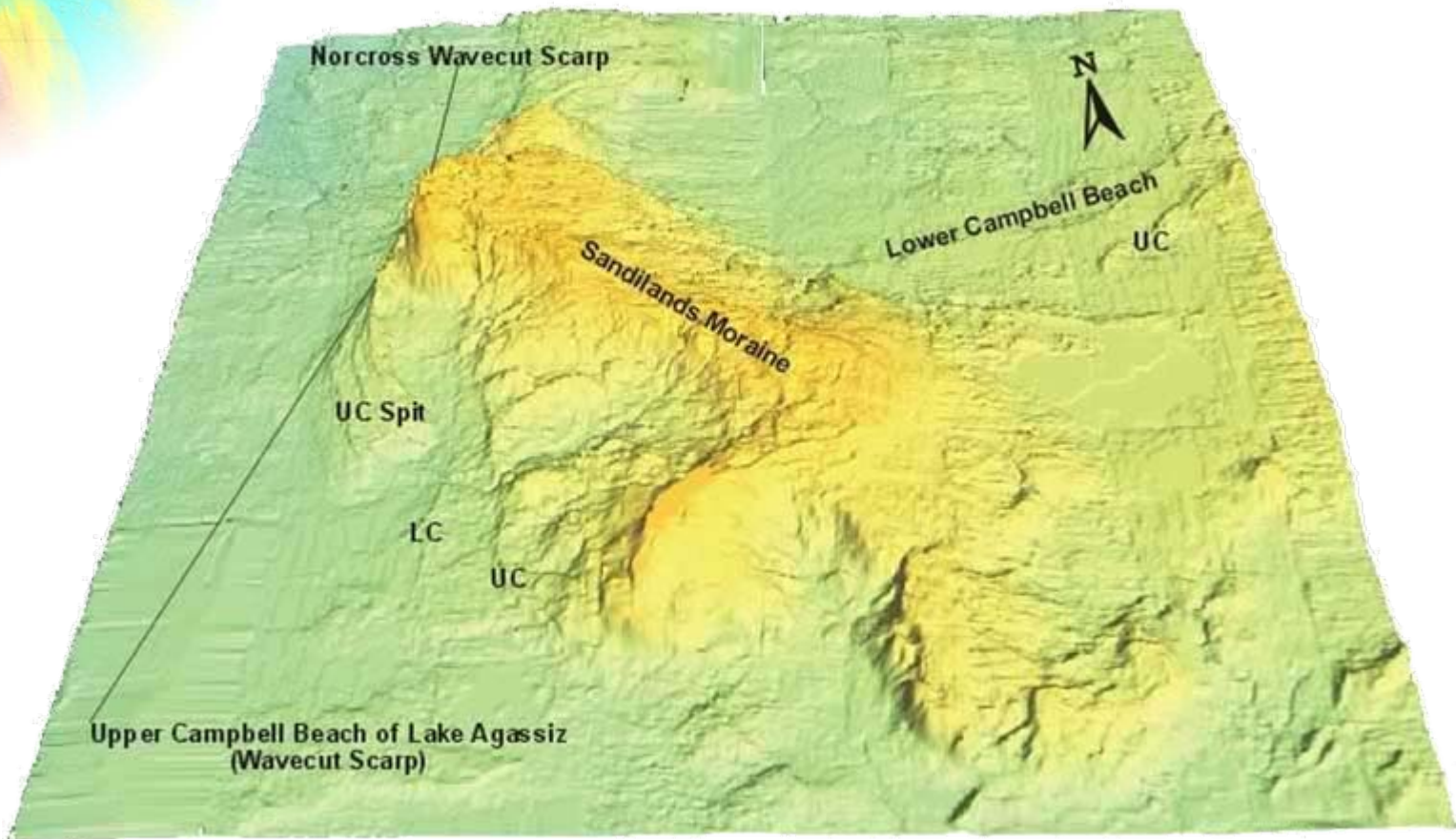
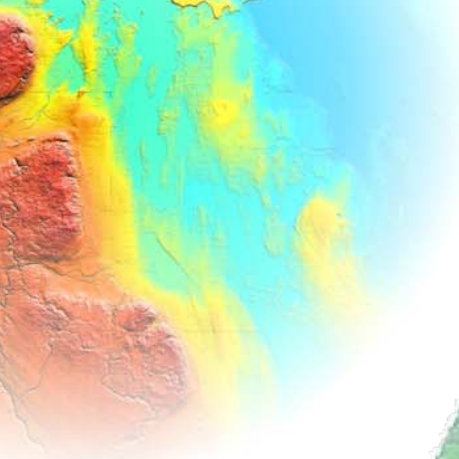
# Assiniboine Flats

- Draped with Orthophoto



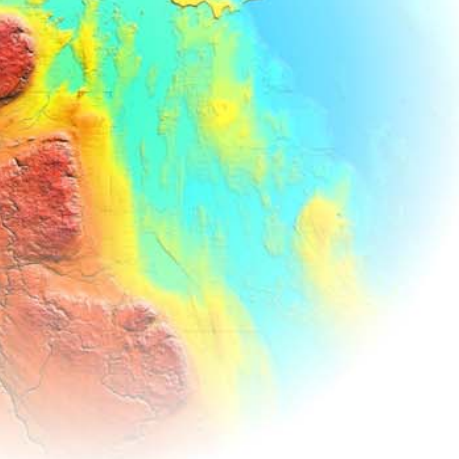
# Duck Mountain





# Sandilands





Lake Winnipeg  
(South Basin)

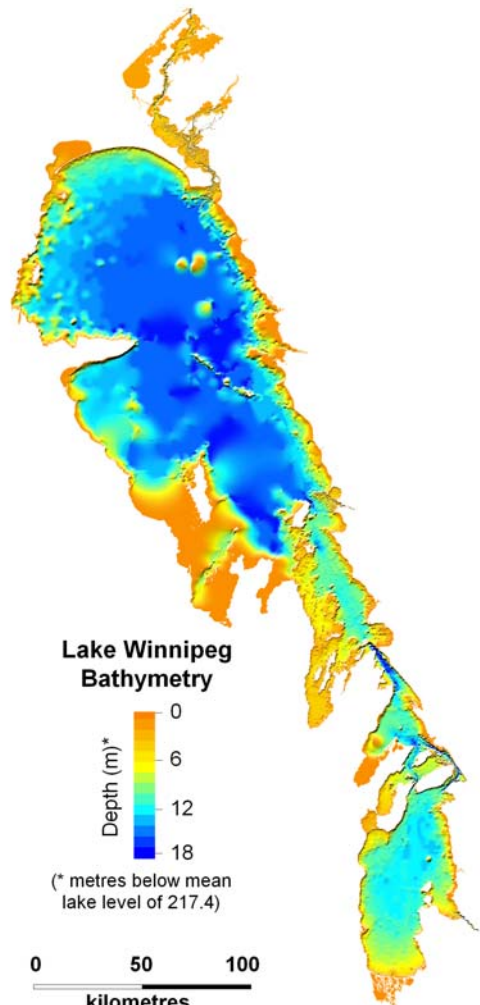
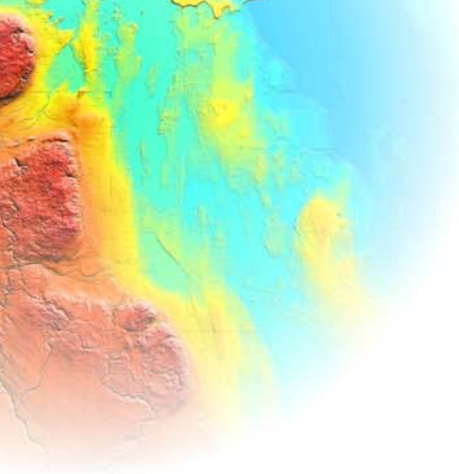
Winnipeg

N

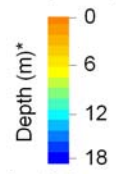
Sandilands

# South Eastern Manitoba





Lake Winnipeg  
Bathymetry



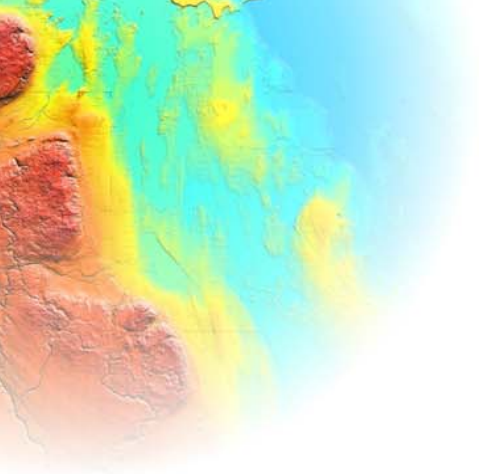
(\* metres below mean lake level of 217.4)



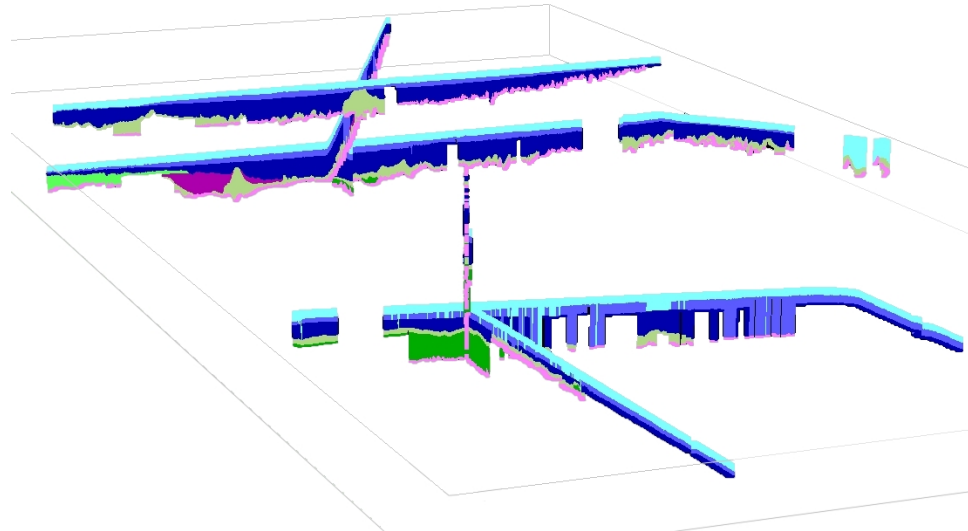
# Lake Winnipeg Seismic/Bathymetry

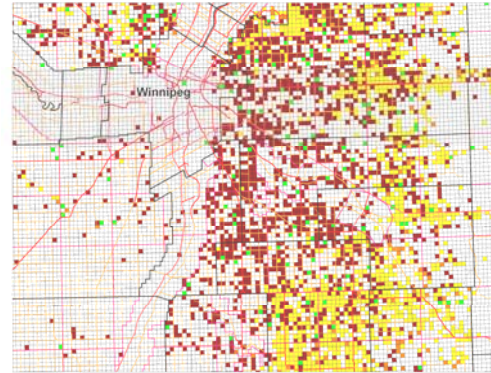
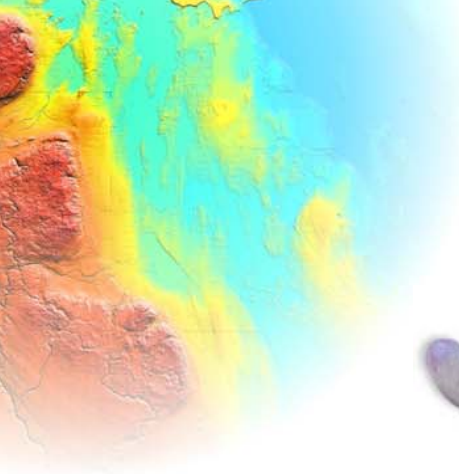






- Echosounding on Lake Winnipeg
- Digitizing existing bathymetric charts
- Better understanding of subsurface deposits in Lake Winnipeg





## Hog farms and geology?



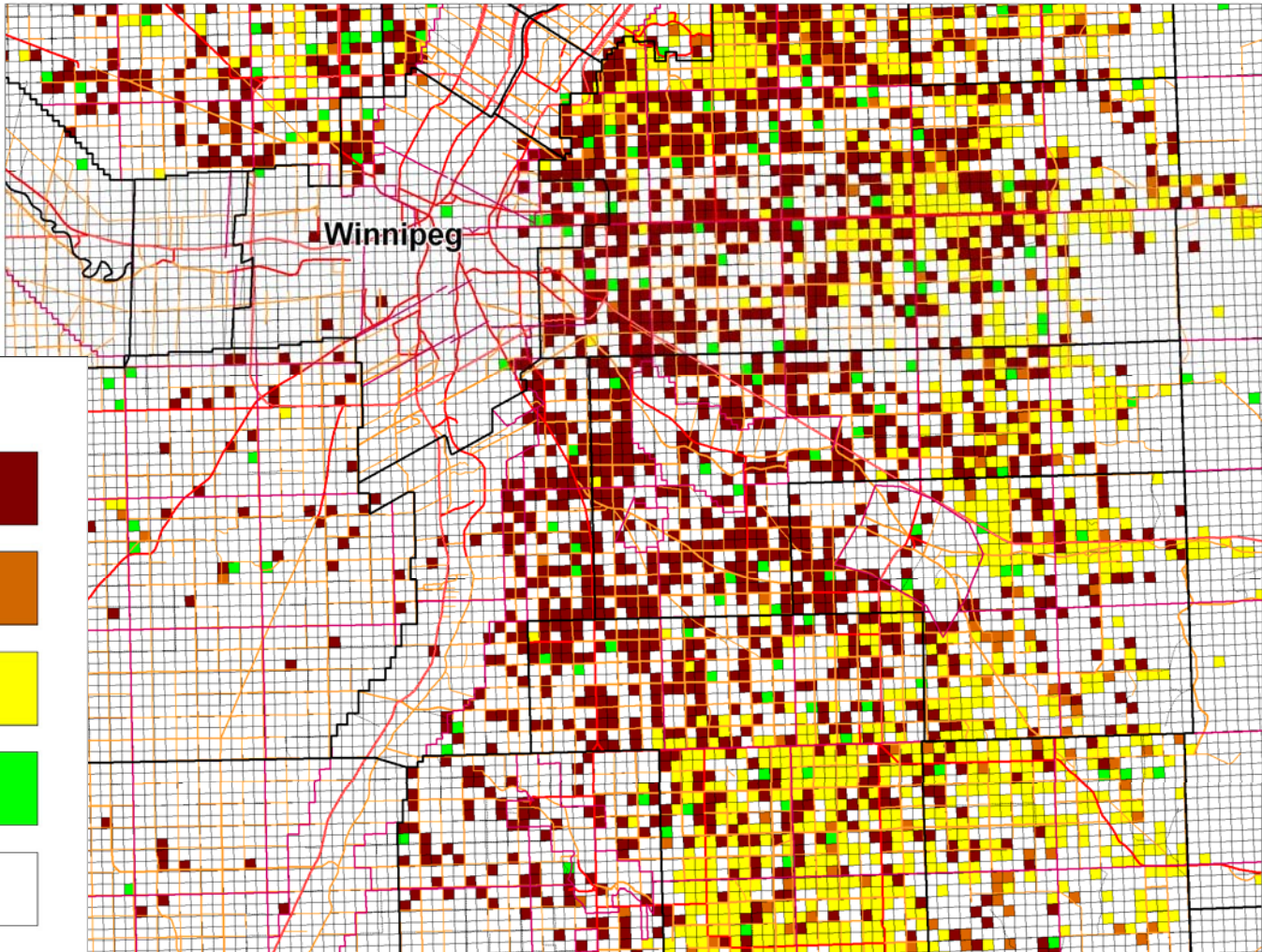
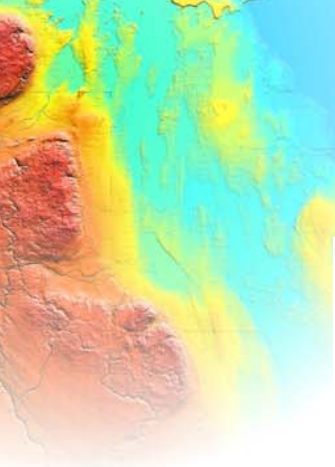


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# Hog farms and groundwater sensitivity mapping

- Manitoba Agriculture and Agri-Food Canada asked us to apply our geological modeling knowledge to the pressing problem of groundwater contamination by the hog industry.
- Mapping susceptible and less susceptible areas on a quarter section basis



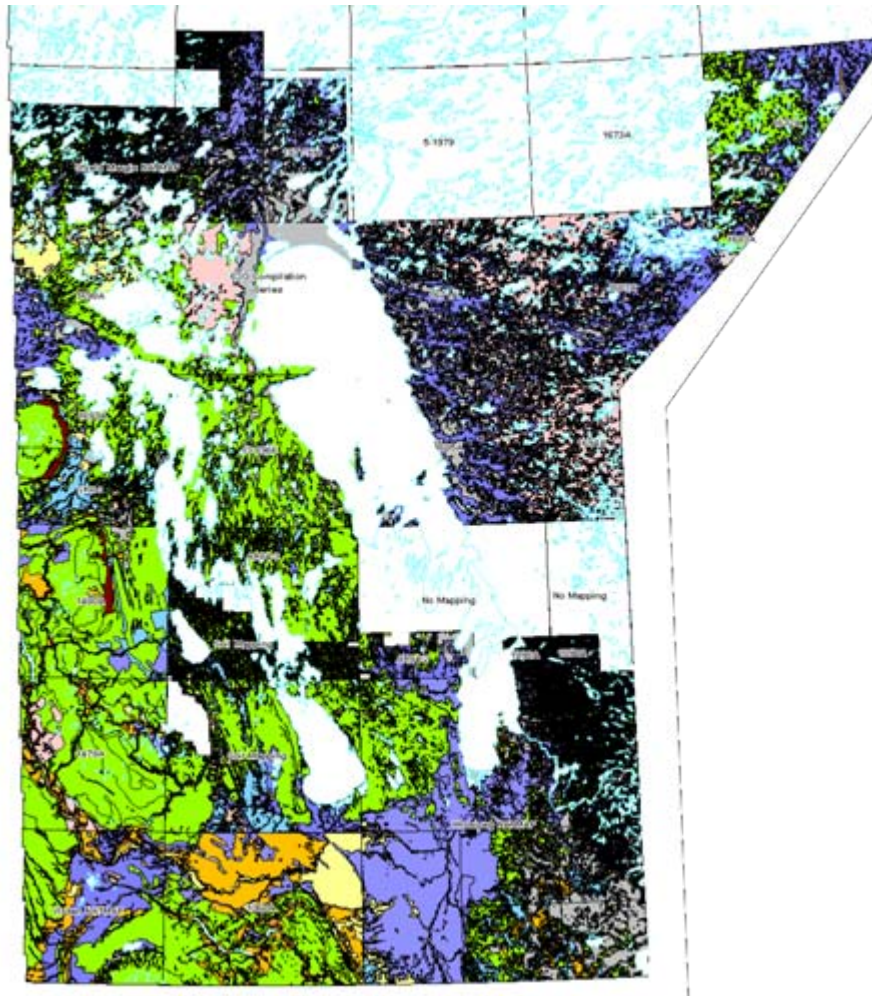
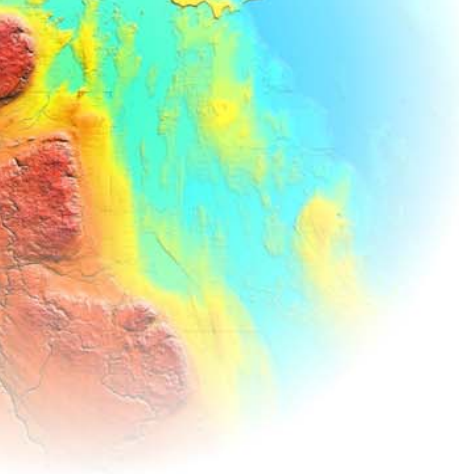


### Legend

- Low Permeability 
- Moderate Permeability 
- High Permeability 
- Other 
- No Data 

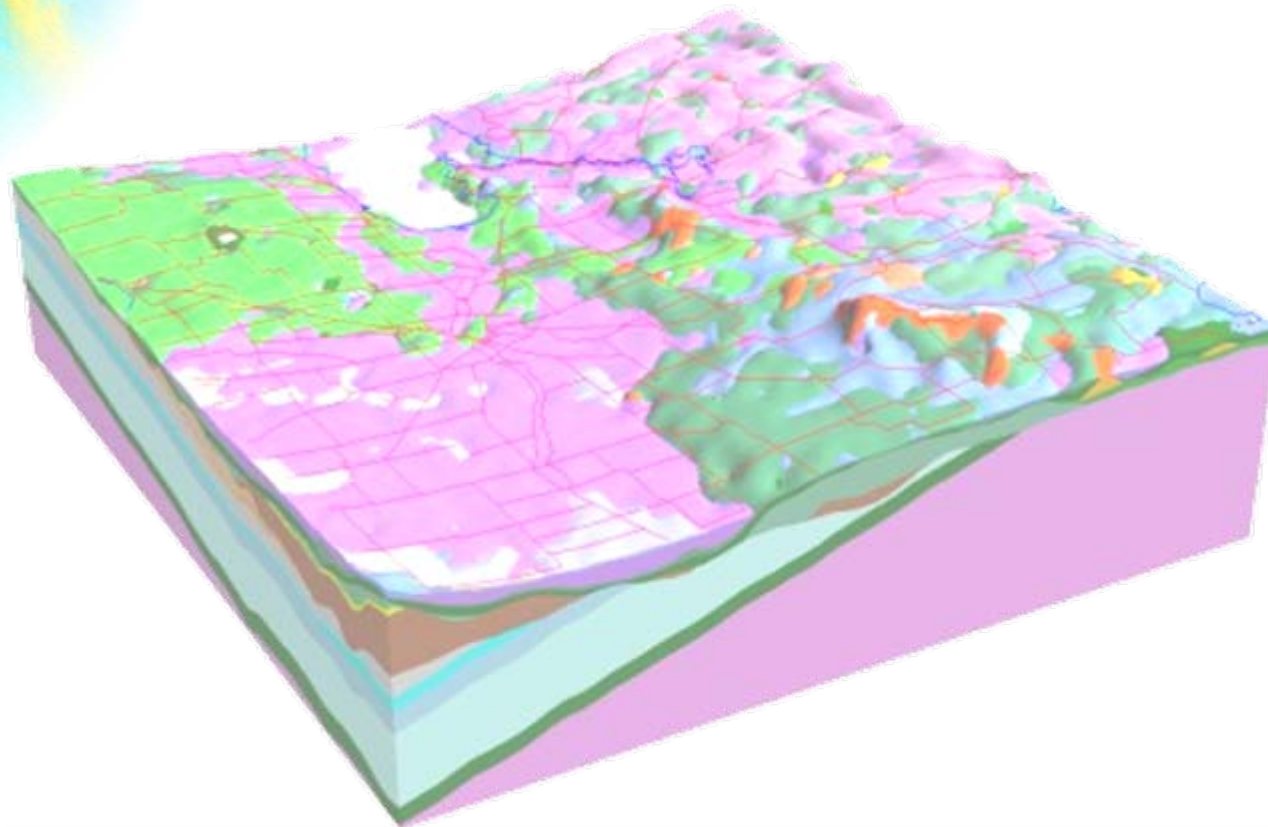
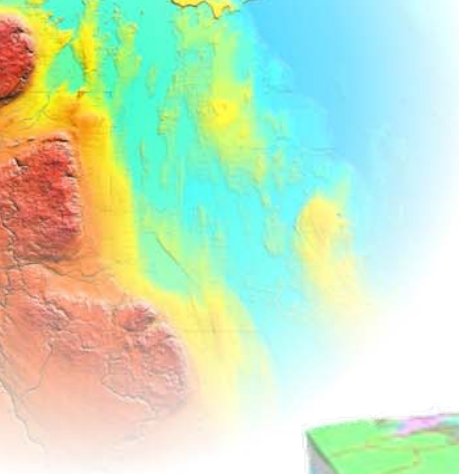
\* NOTE:  
NOT SUITABLE FOR SITE SPECIFIC  
INVESTIGATION





## Traditional 2D mapping



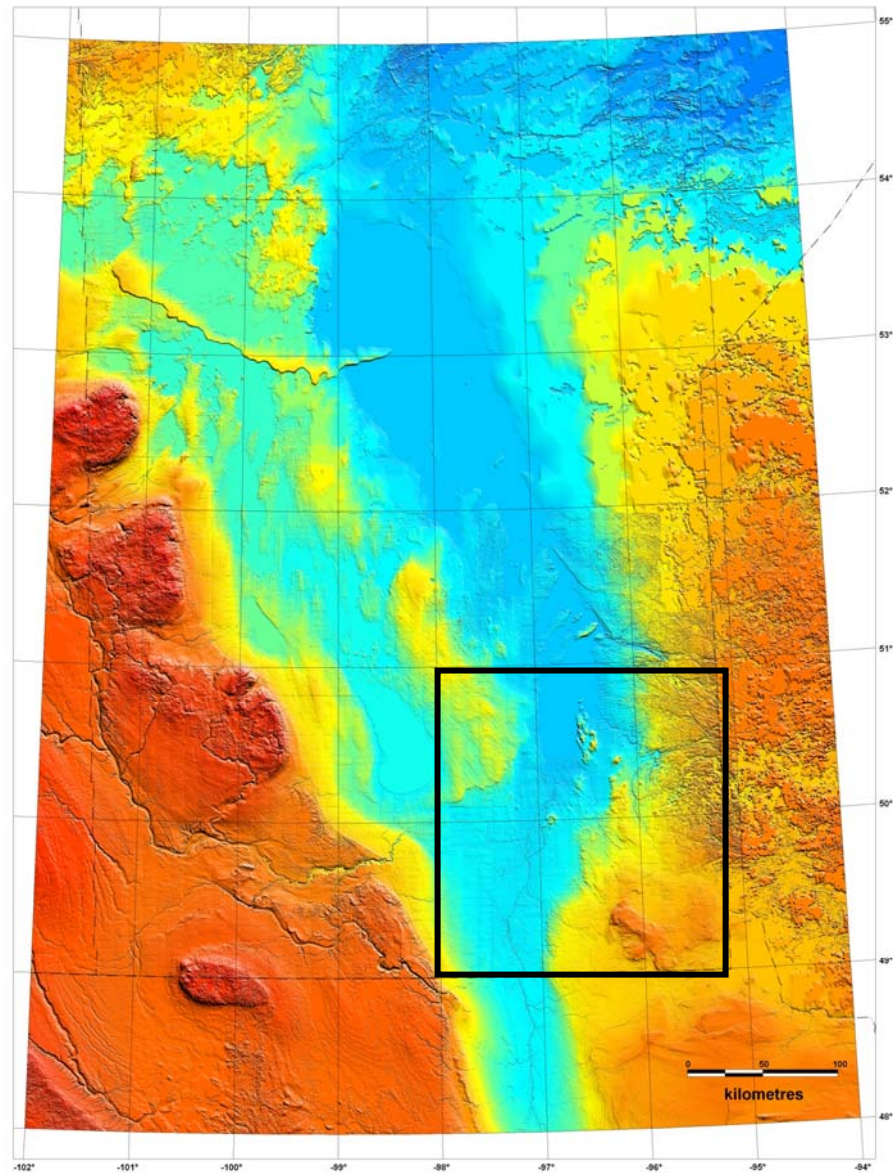


## 3D Model of Southern Manitoba

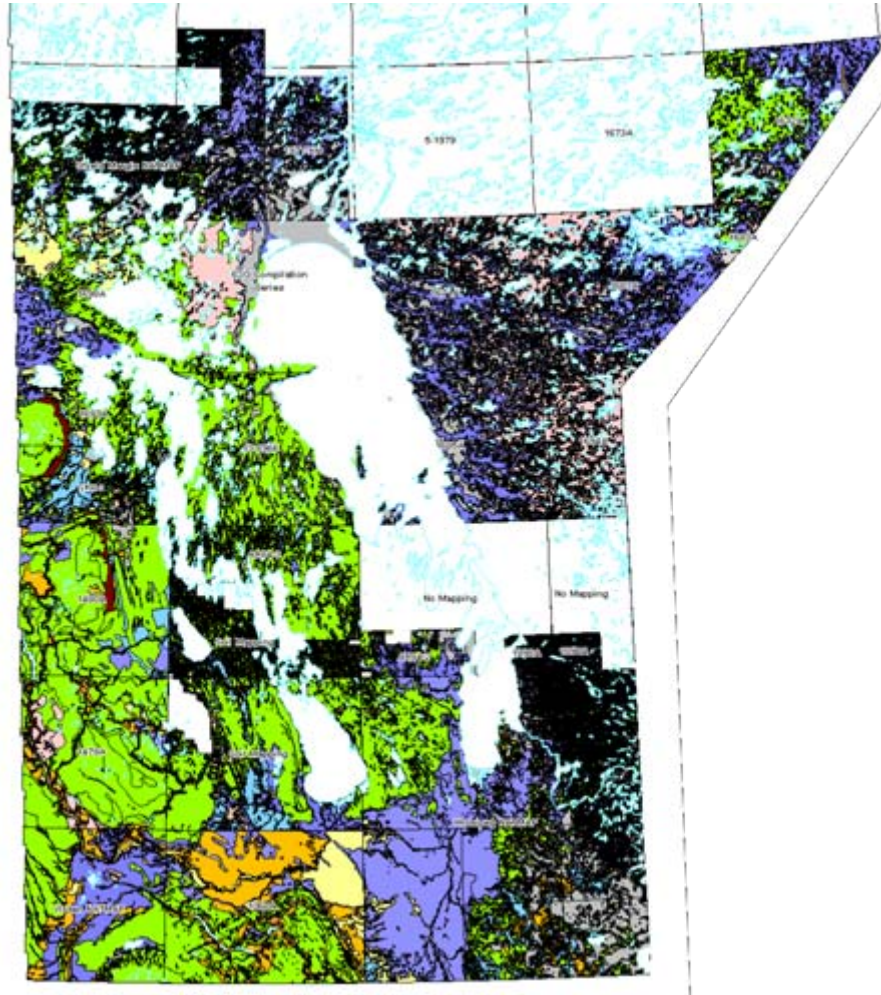


**Begins with Digital elevation data from the Manitoba DEM**

Manitoba Digital Elevation Model (100 metre Grid)

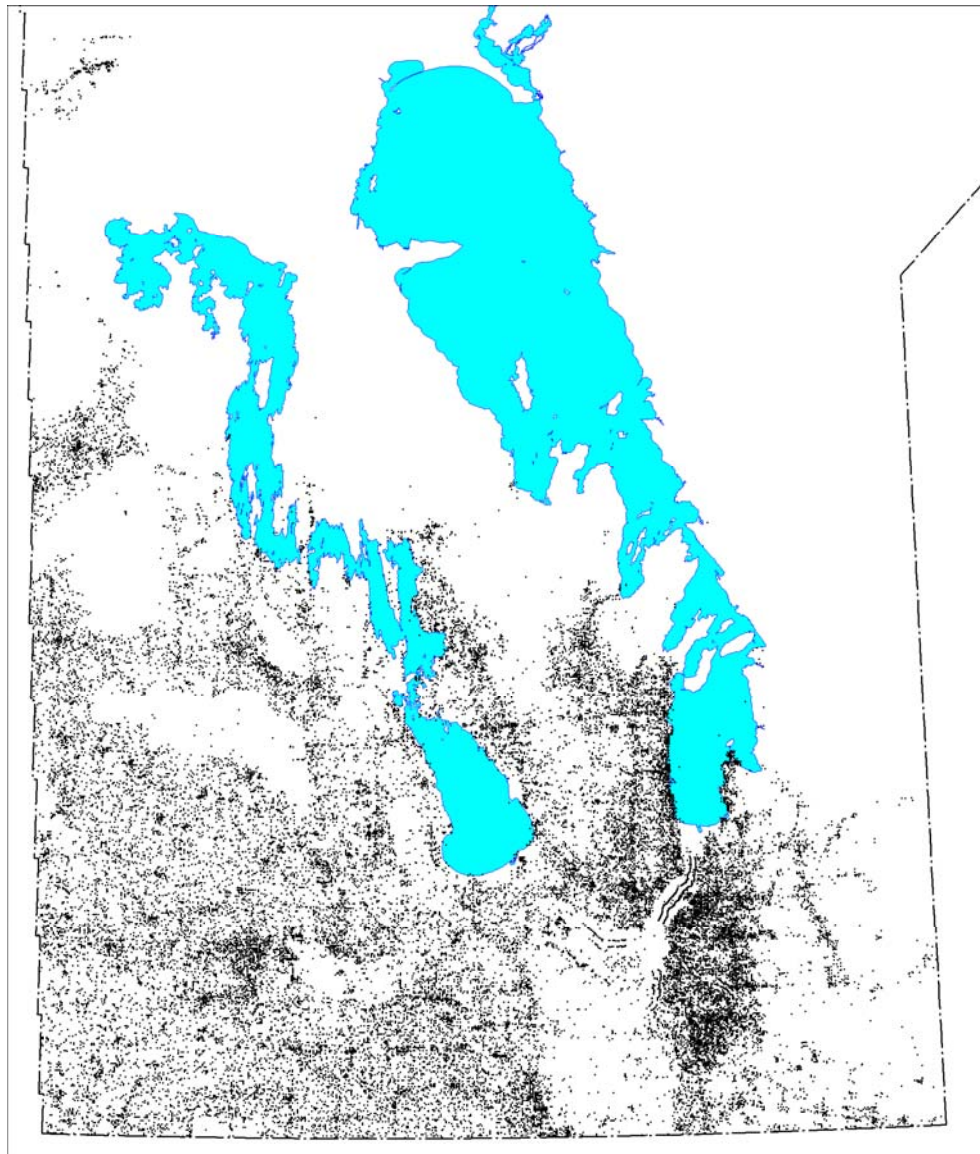


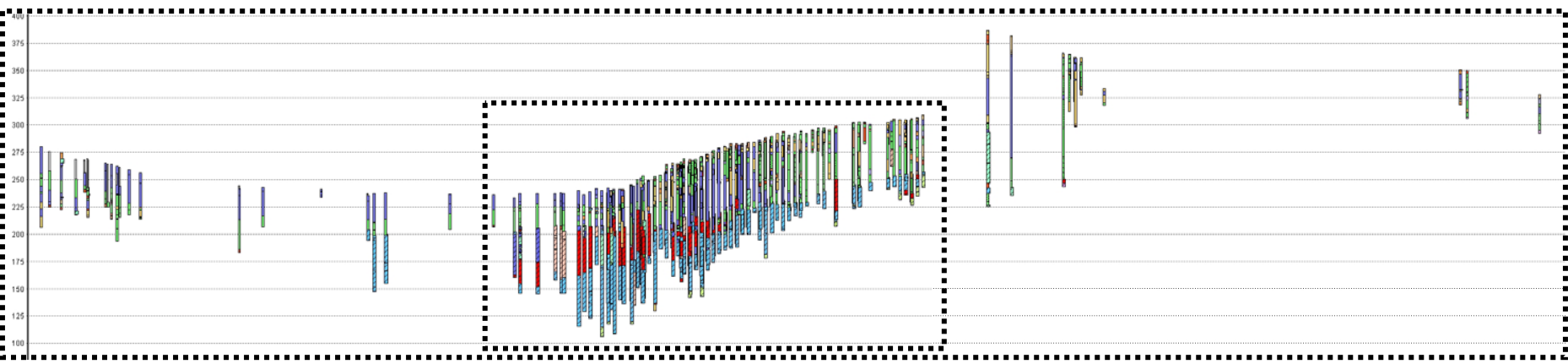
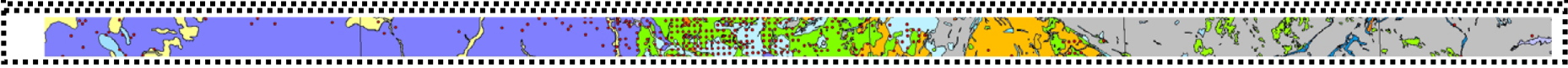
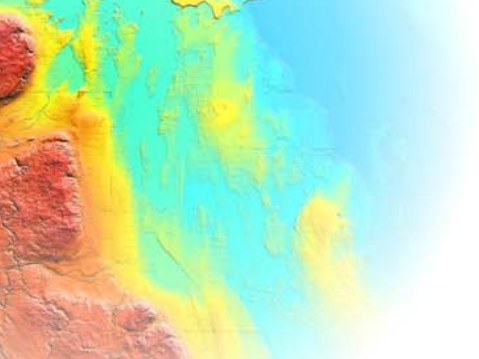
## Traditional 2D surficial and bedrock mapping

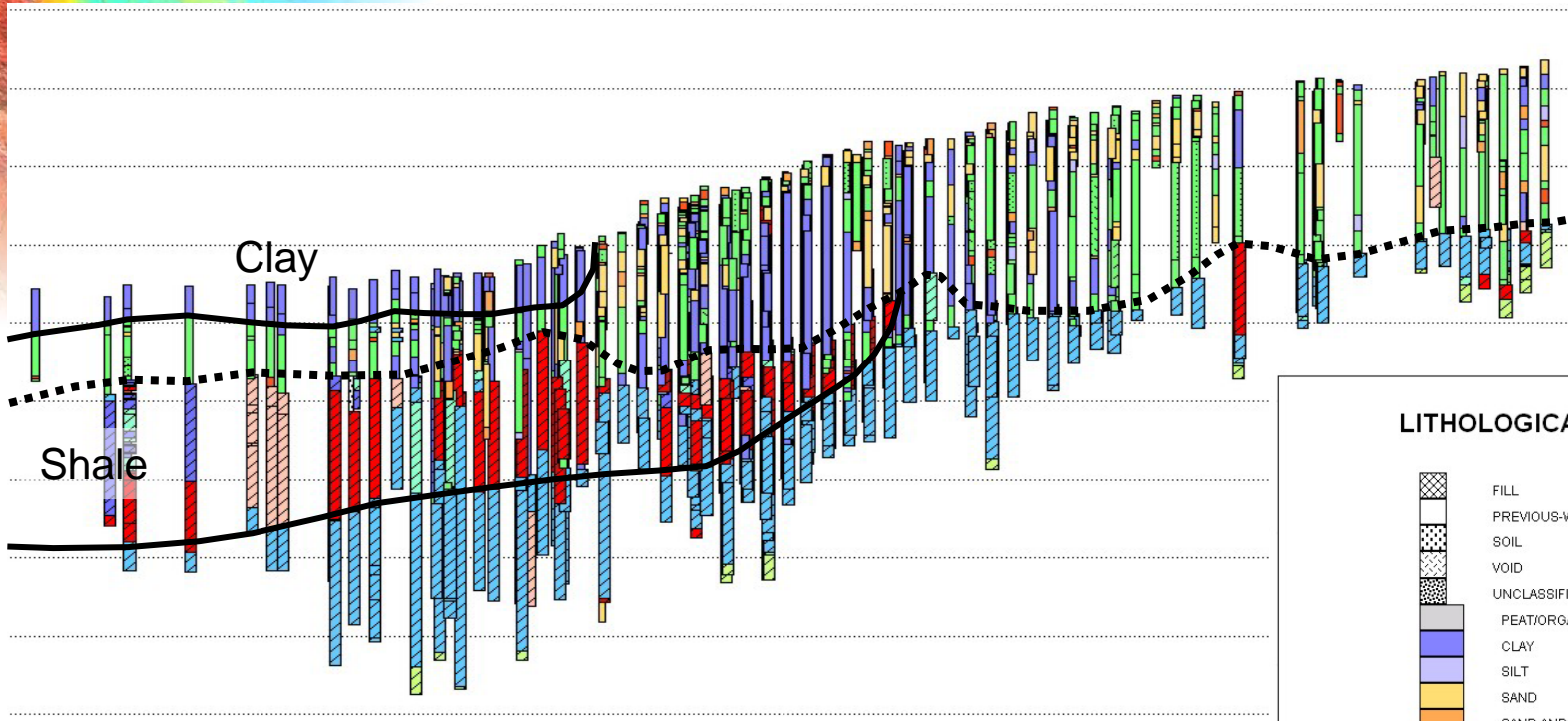




**Drillhole data from many  
Manitoba databases**







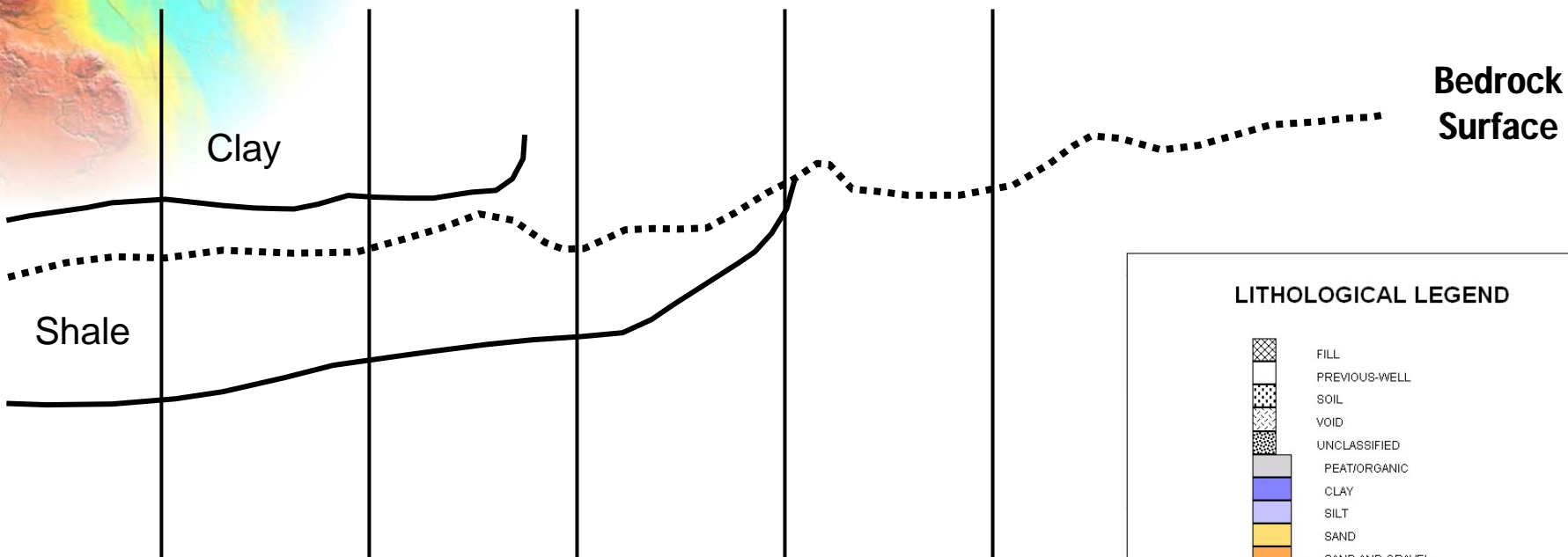
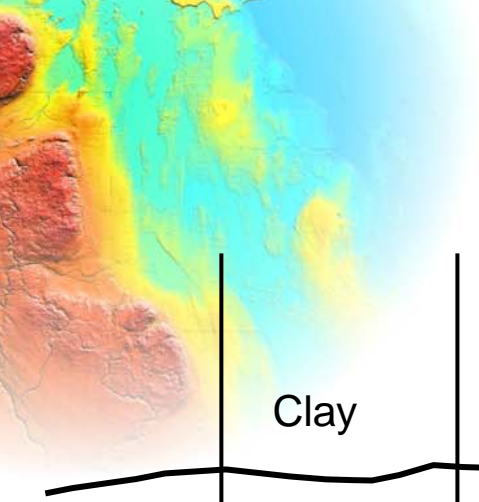
**Bedrock  
Surface**

**Clay**

**Shale**

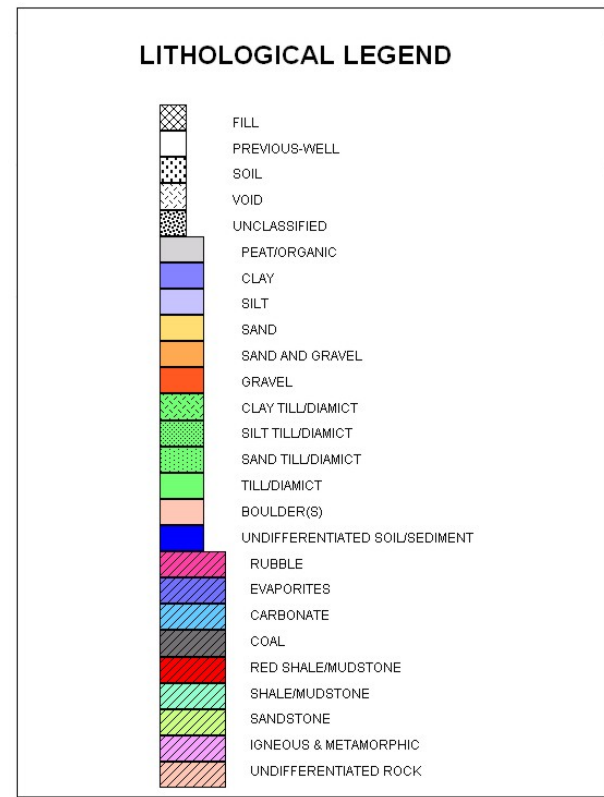
**Standardized lithological legend** →

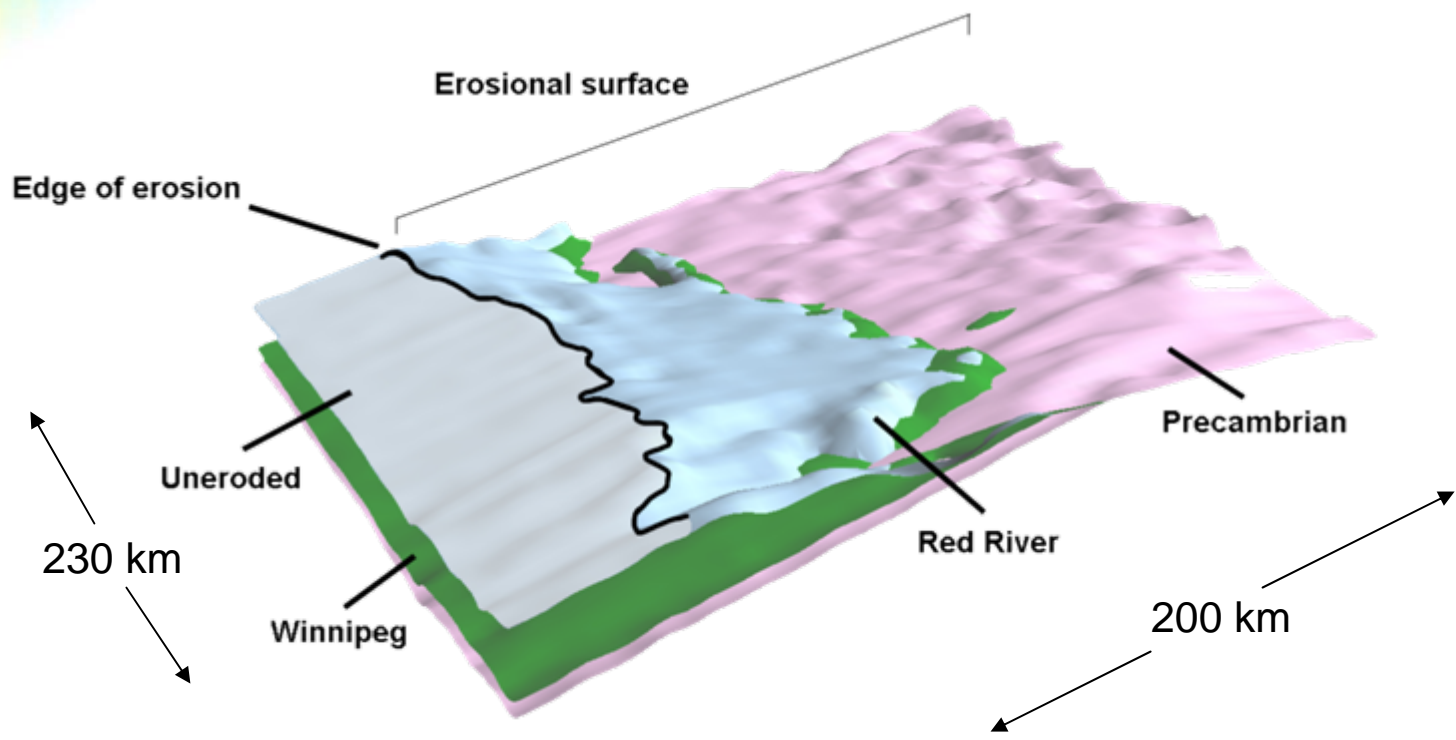
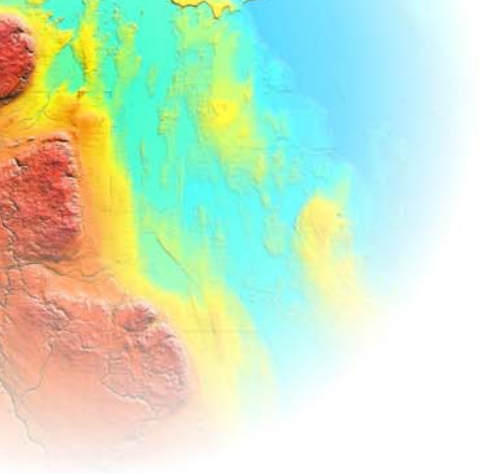


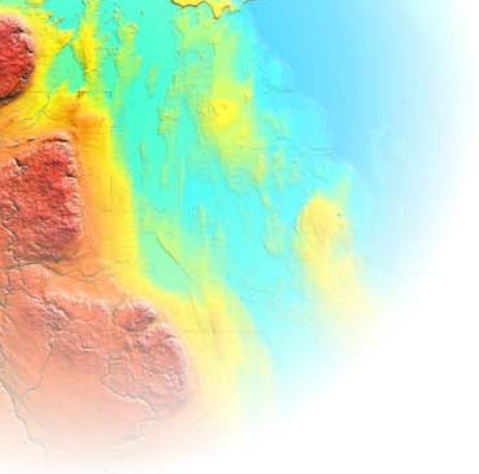


← 5 km →

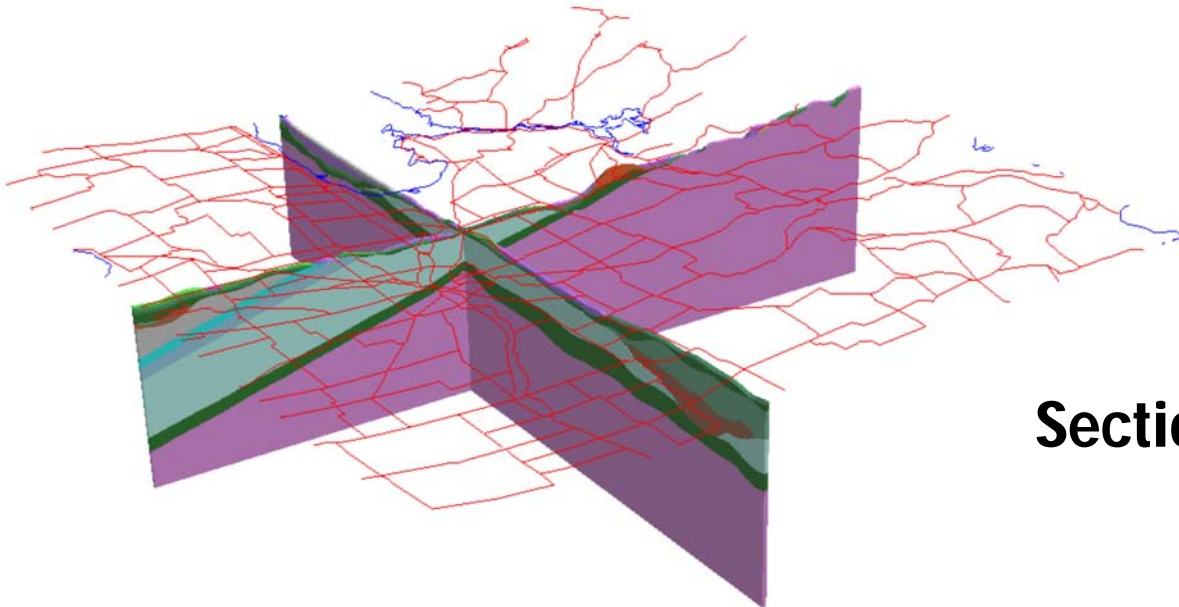
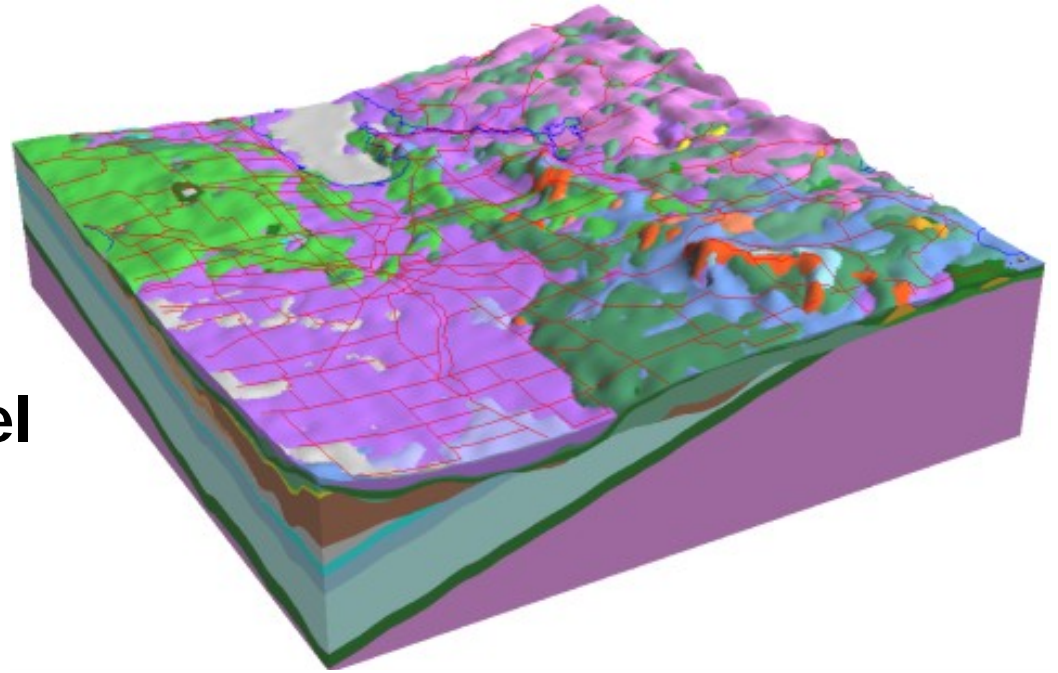
**Standardized lithological legend** →





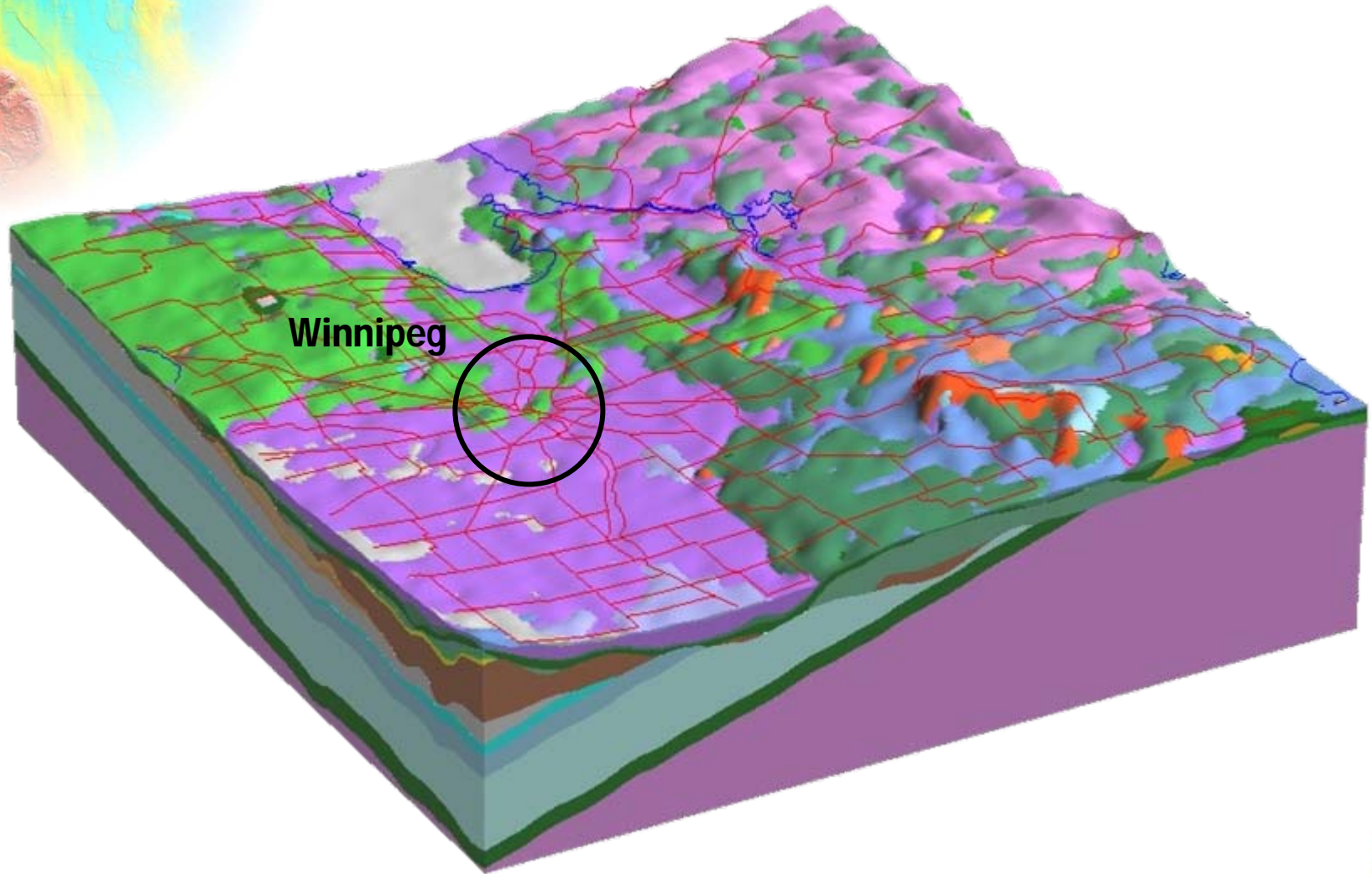
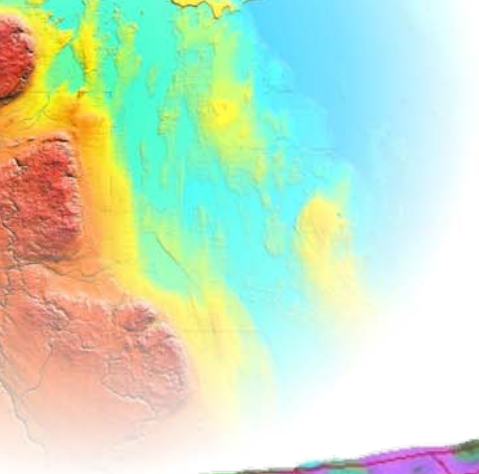


**Block Model**



**Section View**

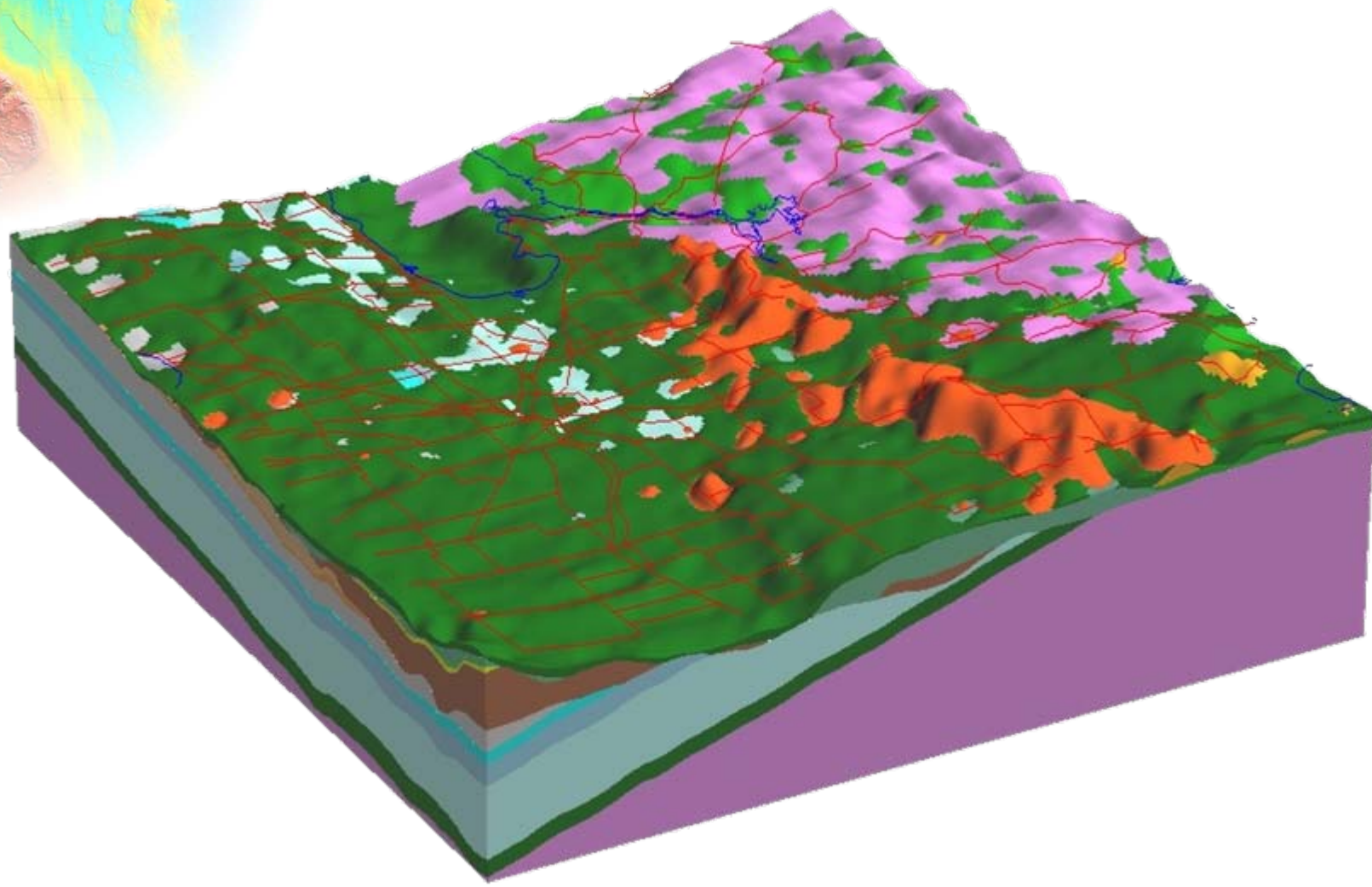
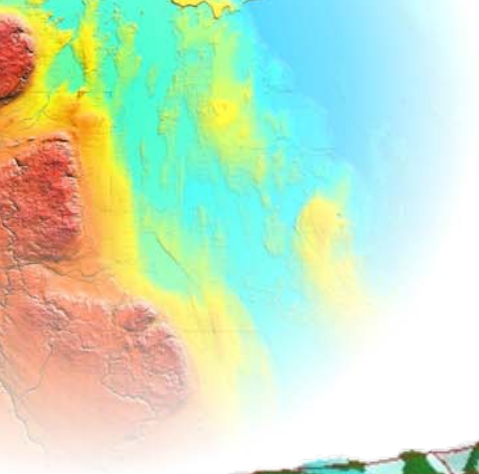




Winnipeg

# Complete Quaternary and Bedrock Sequence

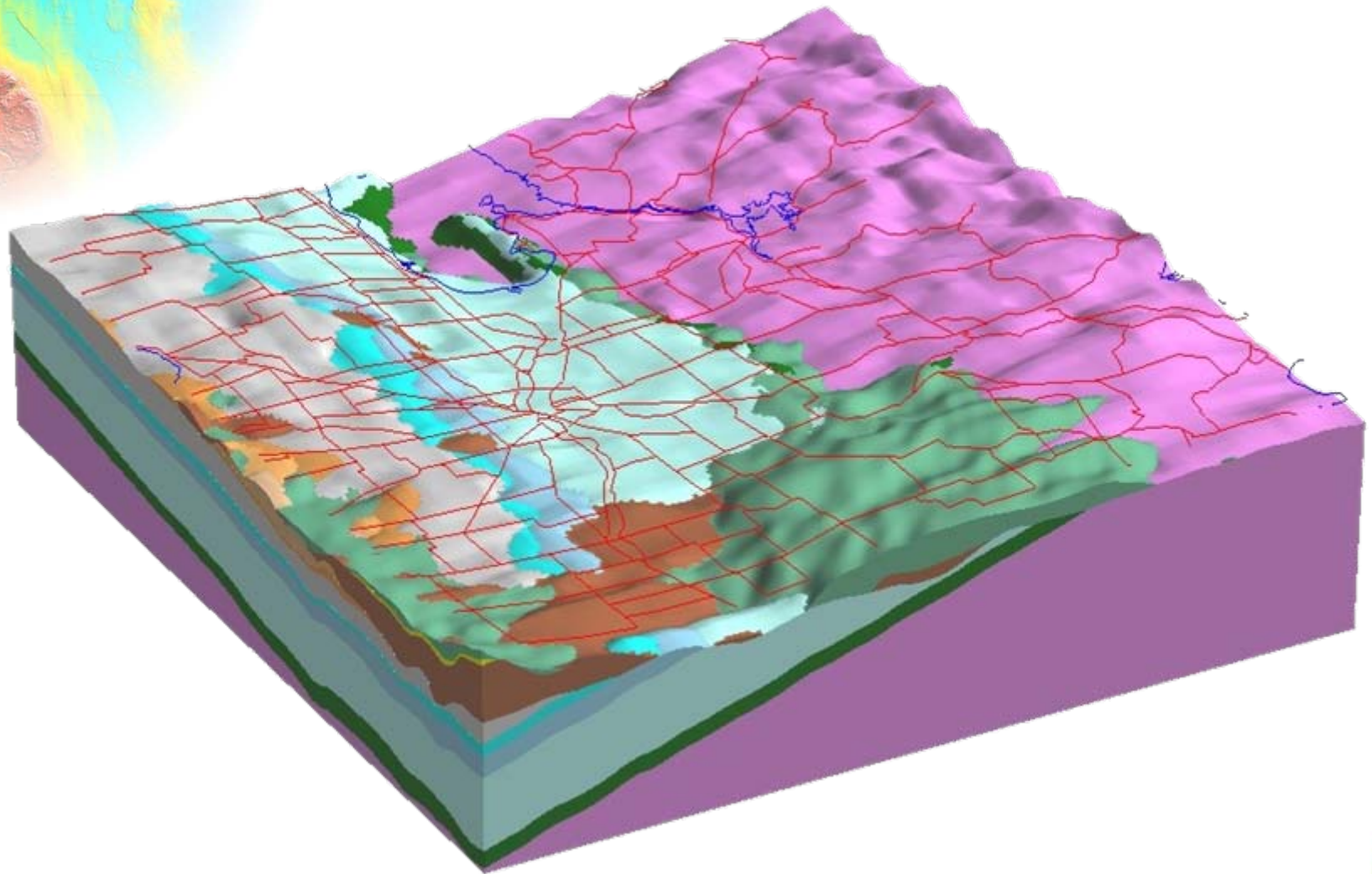
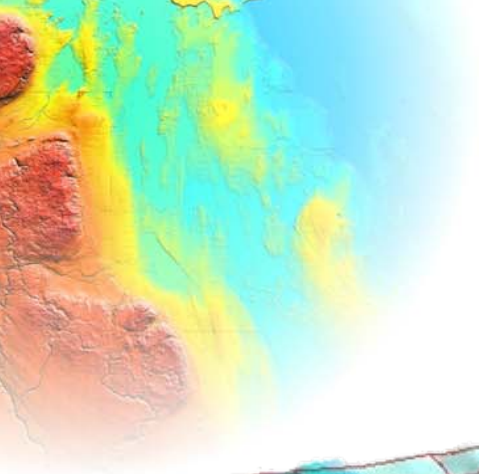




# Sandilands Uppermost Unit

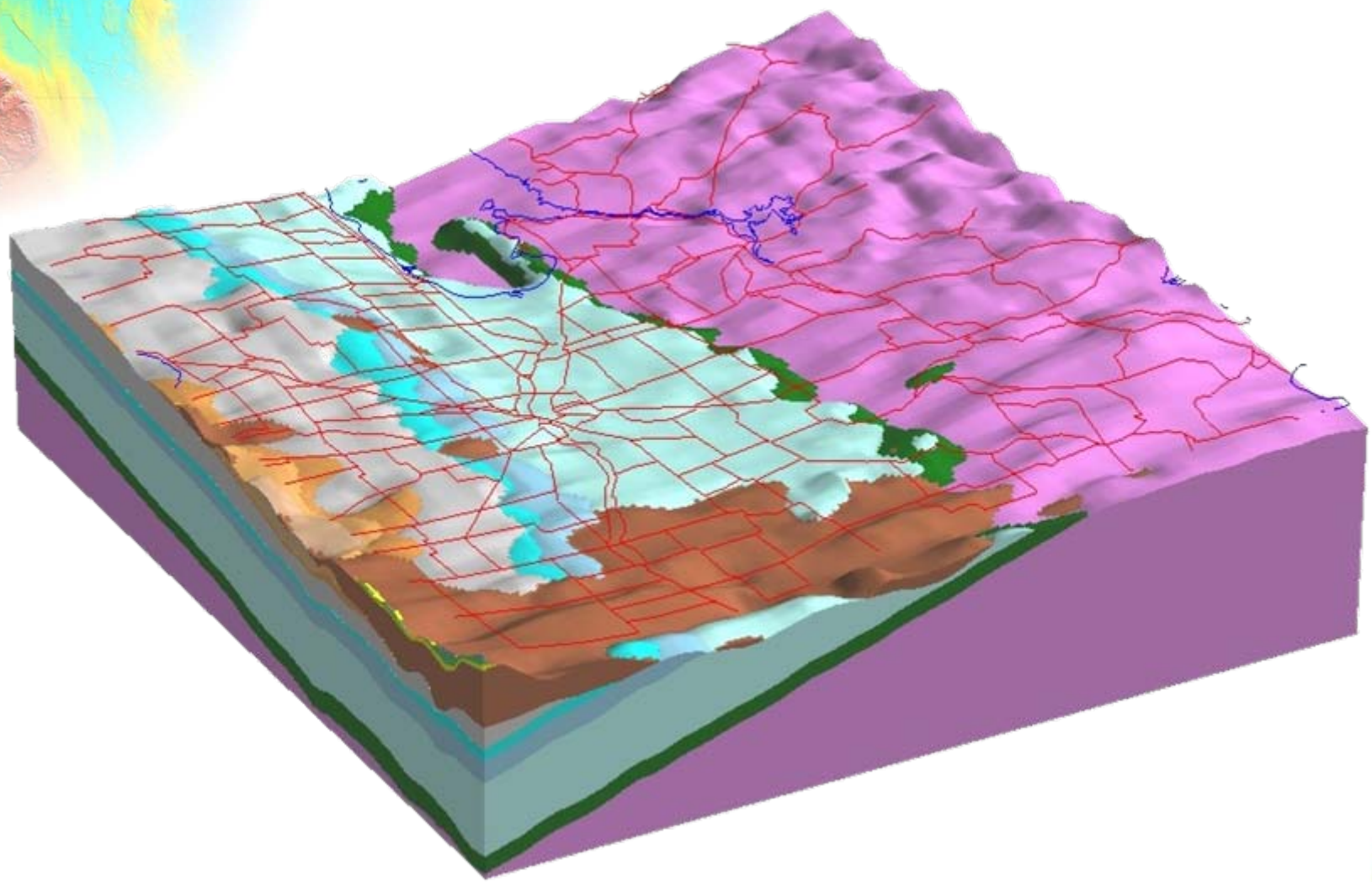
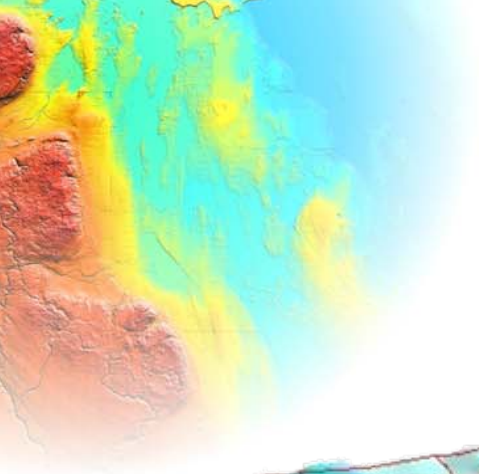






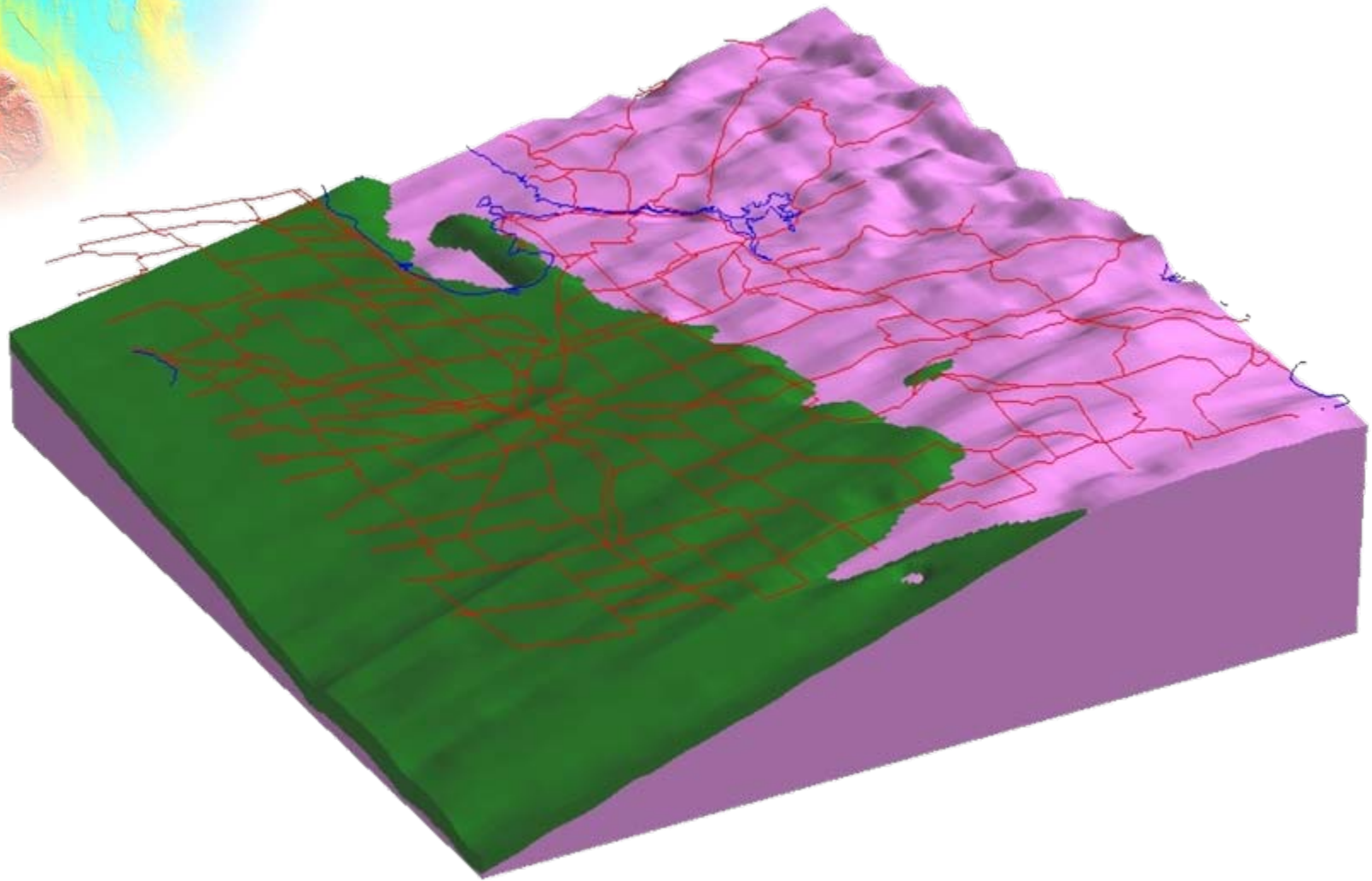
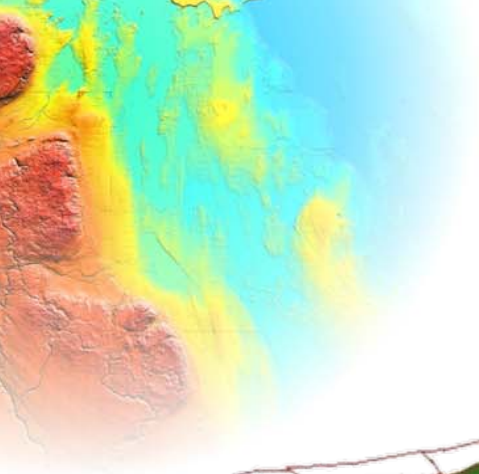
# Glacial Sediments





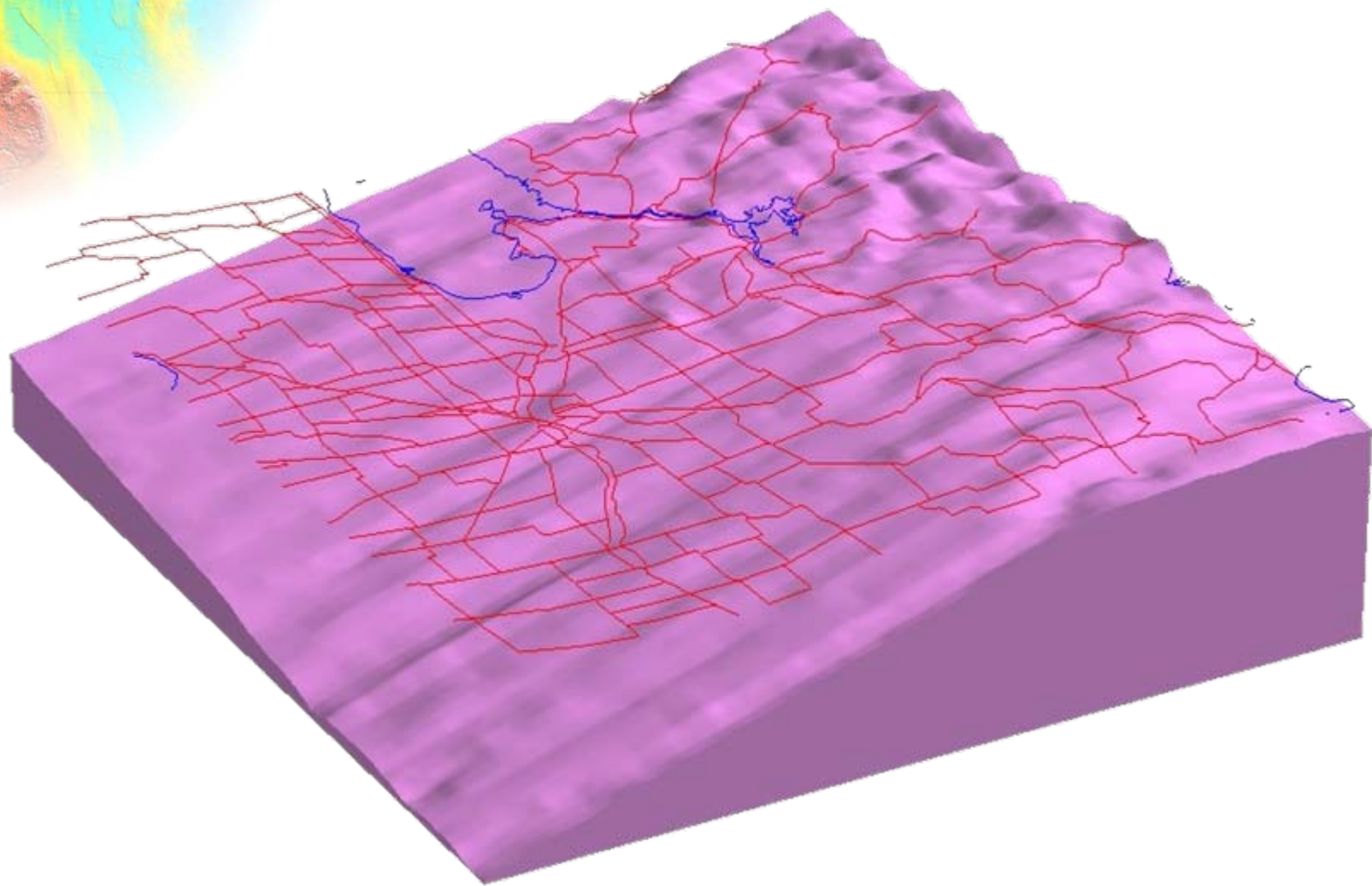
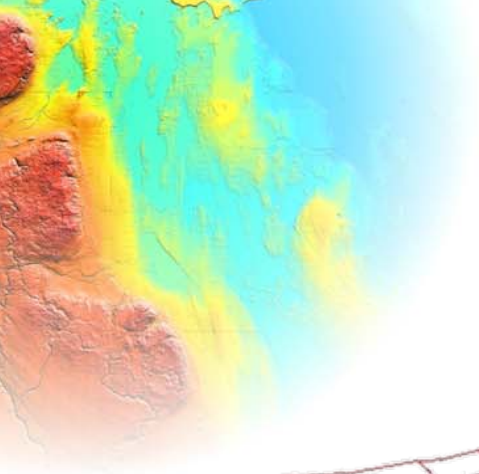
**Bedrock  
Surface**





# Winnipeg Sandstone

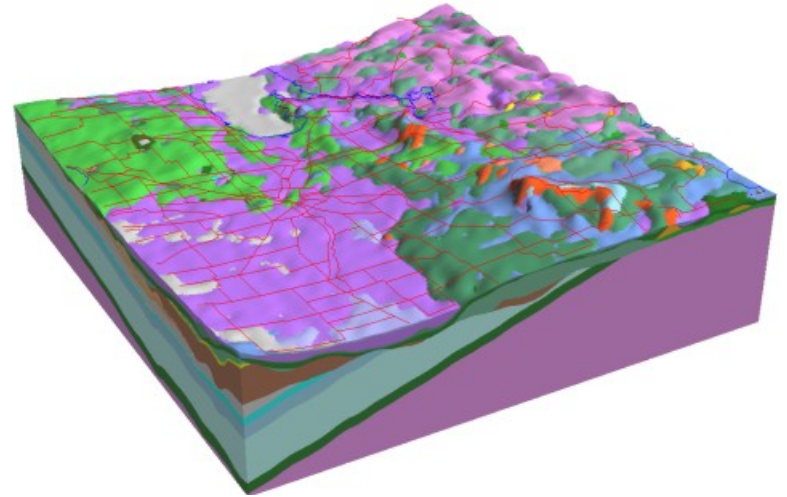




**Precambrian  
Surface**



## Why a 3D model?



- Better understanding of the geology of Manitoba
- Groundwater modeling
- Drill targeting for mineral exploration



# Interested in GIS and/or 3D Modeling?



- Don't limit your learning to one software package
  - We must be proficient in Mapinfo, ArcView, CAD, etc...
- Gain some programming skills
  - We are constantly writing scripts, user interfaces, etc...
- Have database knowledge
  - 70% of our work is in database manipulation
- Have knowledge of statistics
- Learn about projections
  - Latitude/Longitude, UTM projection and zones, etc...



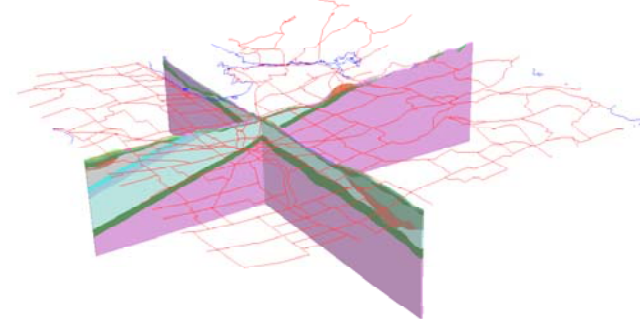
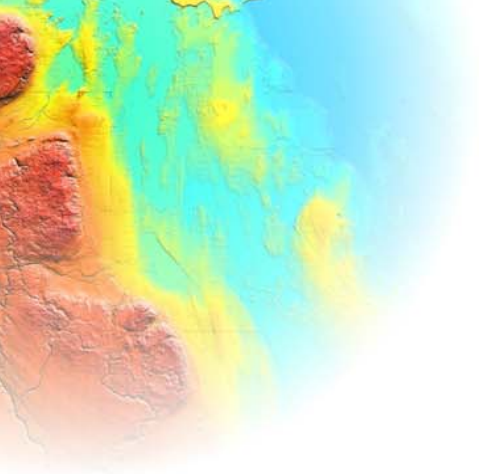


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## **Most Importantly...**

- **Realize that a lot of what you'll be doing you'll learn on the job**
- **Sign up for the Manitoba Geological Survey job interviews**





# Thank you!

**Bill Buhay, Danny Blair**

**Gaywood Matile, Scott St. George**

**Greg Keller**

**Manitoba Industry, Trade and Mines  
Manitoba Geological Survey**

