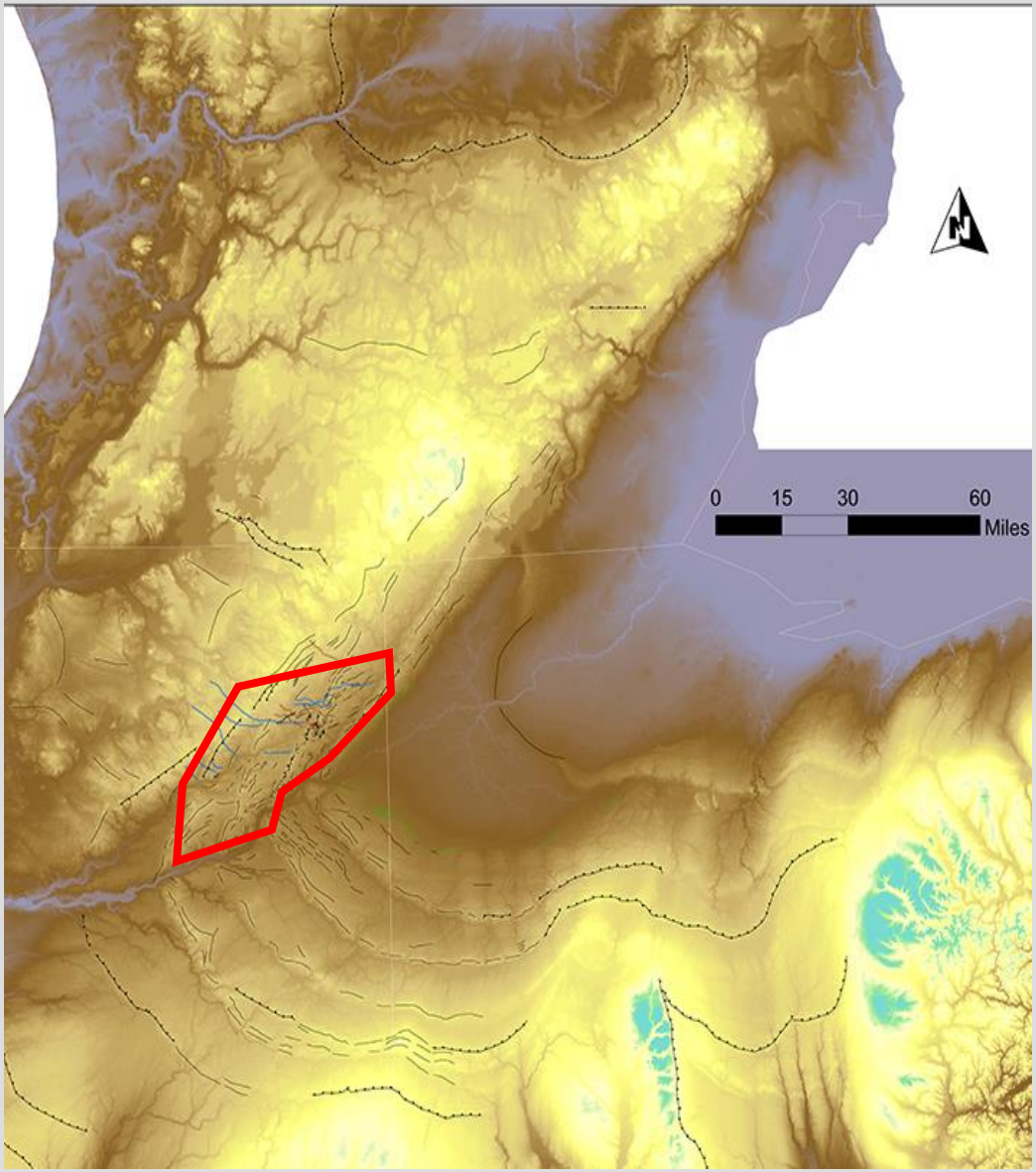
Erie Lobe Till Studies in Northeastern Indiana Reveal a Dynamic Ice Margin



M.L. Prentice[1], P.W. Ducey[1], A. M. Ismail[2], S.L. Letsinger[1], S.L. Sargent[2], B.S. Fenerty[1]

- [1] Indiana Geological Survey
- [2] Illinois State Geological Survey

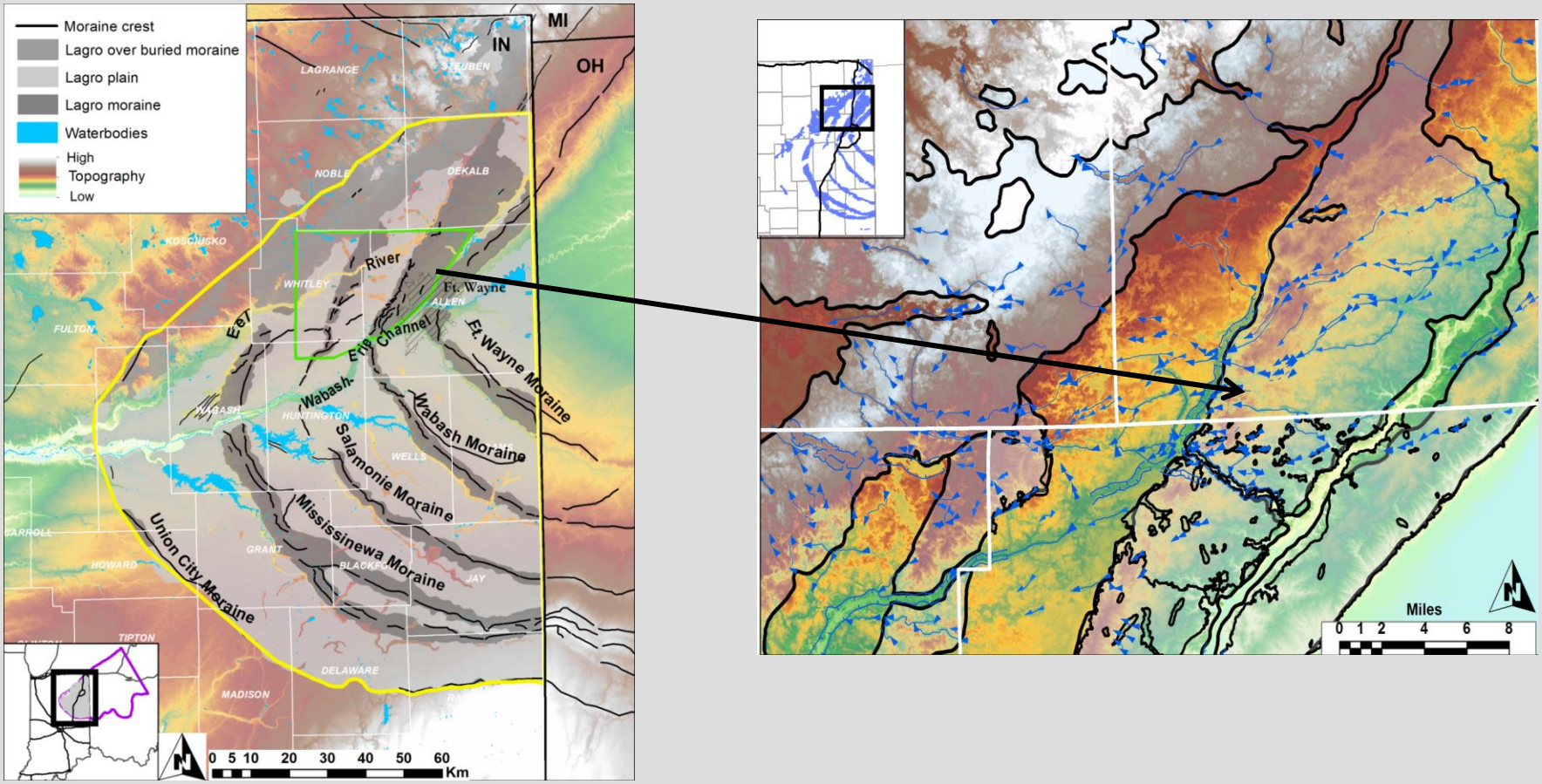
The prominent end-moraine landsystem in northeastern Indiana made up of Erie lobe (Lagro) tills fades out just north of the Wabash-Erie channel and is replaced by a morphologically different landsystem that reflects a more complex glacial history.

This “interlobate” area (red) is the focus of the talk.

Problem: Erie Lobe Impact on Composite Landsystem?

Gray's Indiana glacial map and Fleming's Allen Co. map depict Lagro moraines across the northern sector as ice-marginal moraines ~ contiguous with Lagro moraines to south.

This conflicts with subglacial landsystem that cuts Lagro tills.



Hypothesis: Lagro in northern zone is older than Lagro in end-moraine landsystem to south.
Two mega-sequences of Lagro drift.
Shear zone develops in Erie lobe preventing lateral moraine formation.

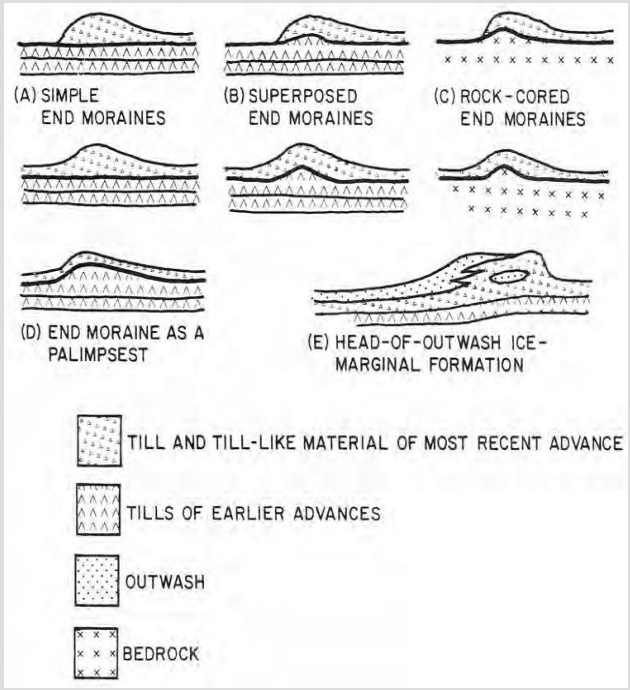
Outline:

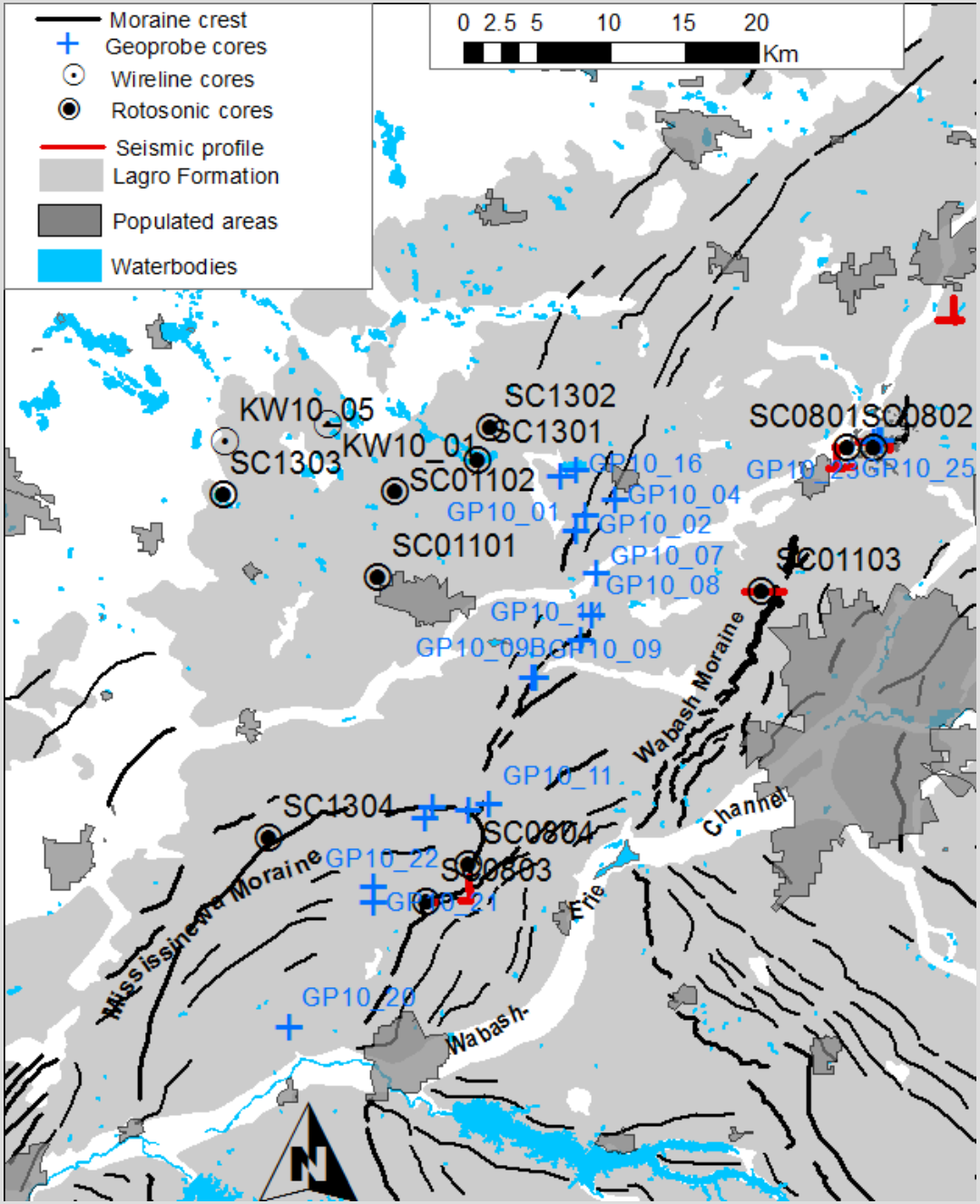
I. Seismic-reflection (shear-wave) profiles of Wabash moraine

1). Cedar Creek: Chapman Rd,
Cedar Canyons

2). Wallen Rd

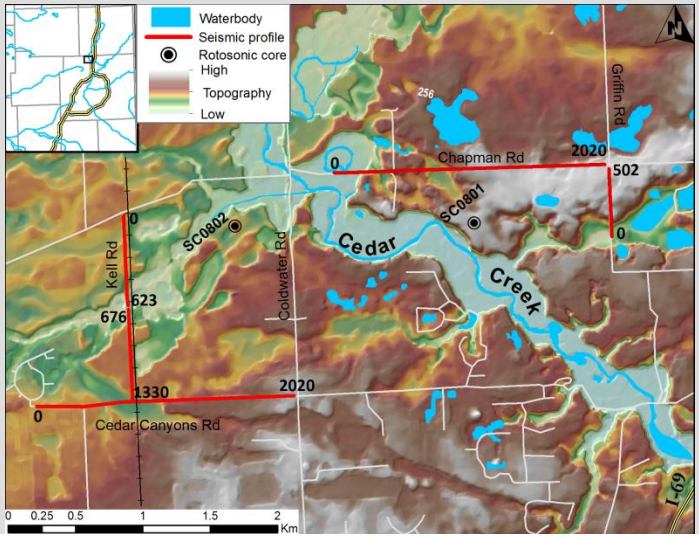
What kind of moraine?



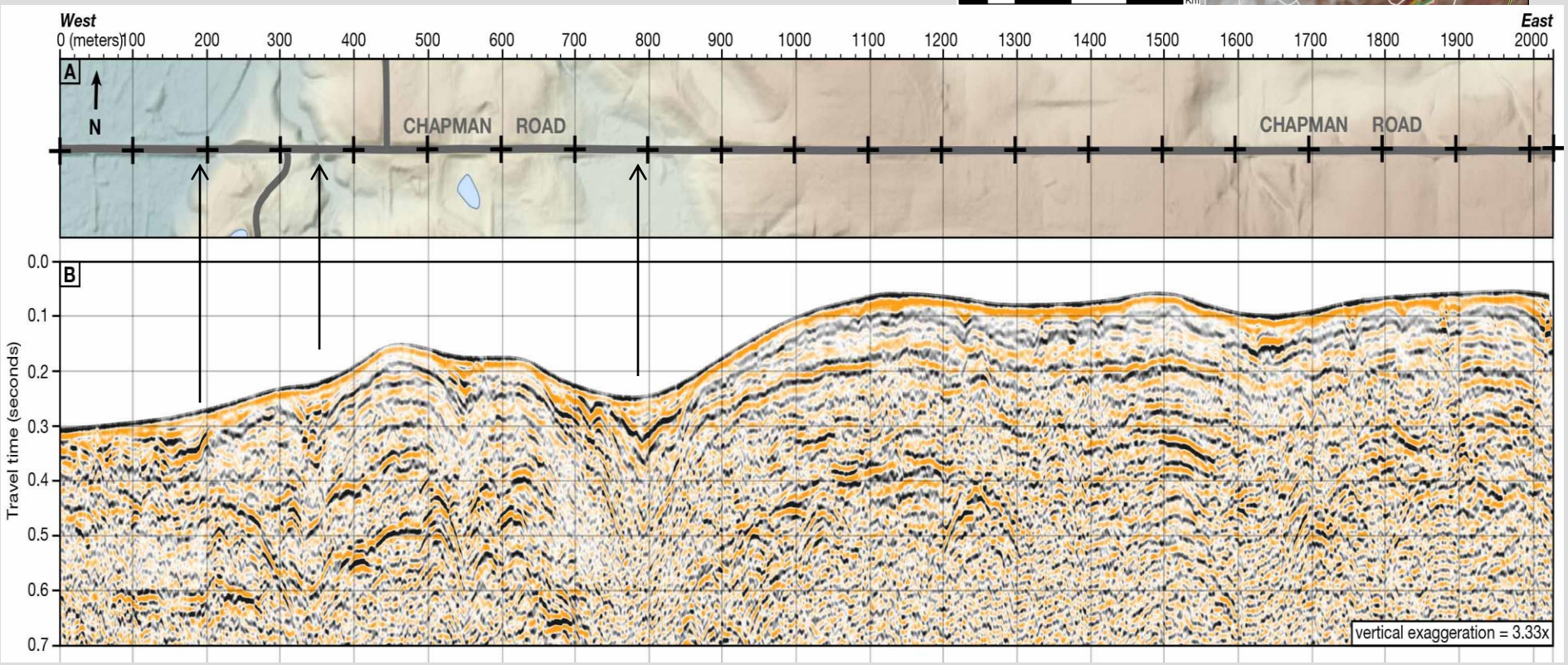


Seismic-reflection data collection w/ Illinois State Geological Survey

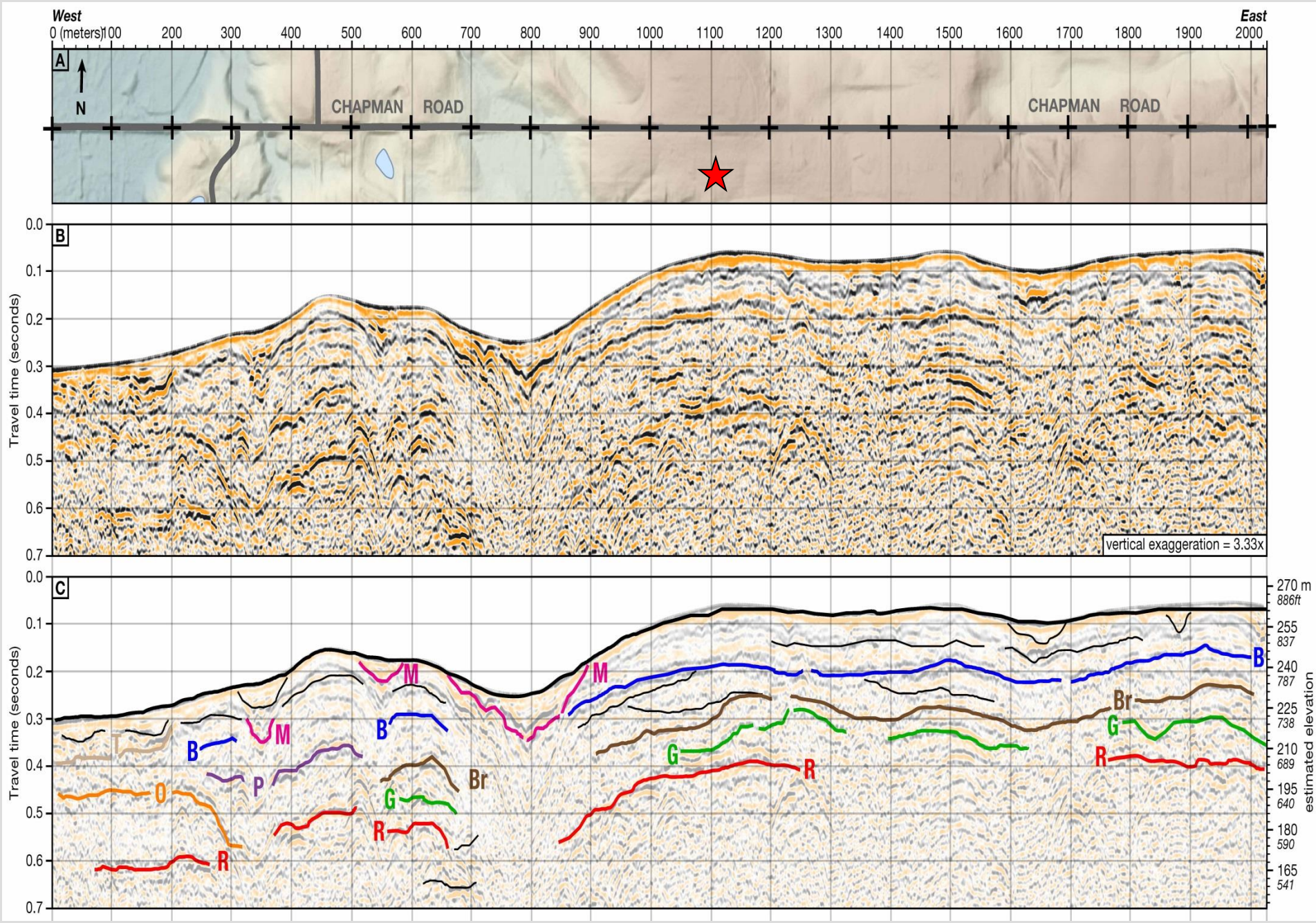
Cedar Creek: Chapman Rd Seismic Reflection



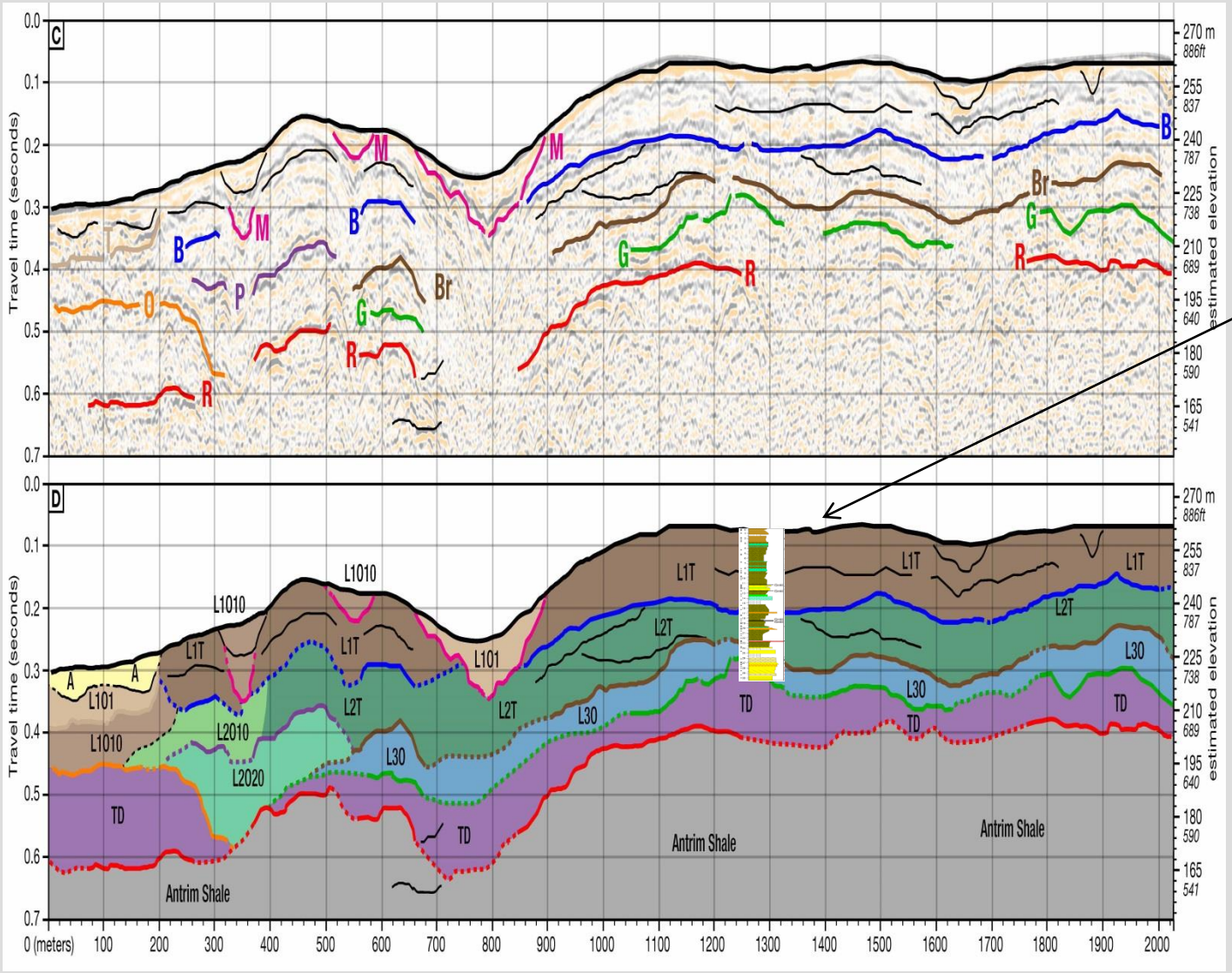
Shallowest reflectors correspond with surface features



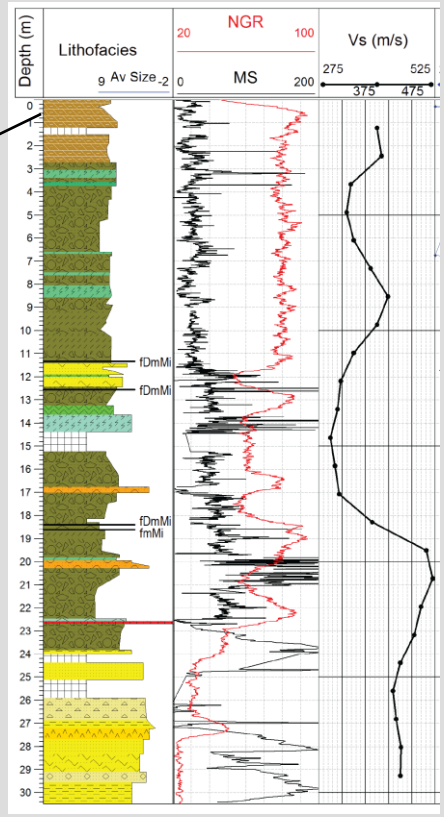
Cedar Creek: Chapman Rd Seismic Reflectors



Cedar Creek: Chapman Rd Seismic- Lithostratigraphic Interpretation



Lagro tills:
layered architecture
some pinching



L1O: Lagro 1 outwash
L1T: Lagro 1 till

L2O: Lagro 2 outwash
L2T: Lagro 2 till

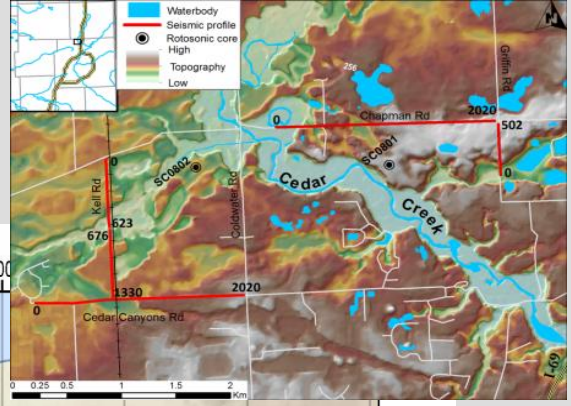
L3O: Lagro 3 drift?
TD: Trafalgar drift?

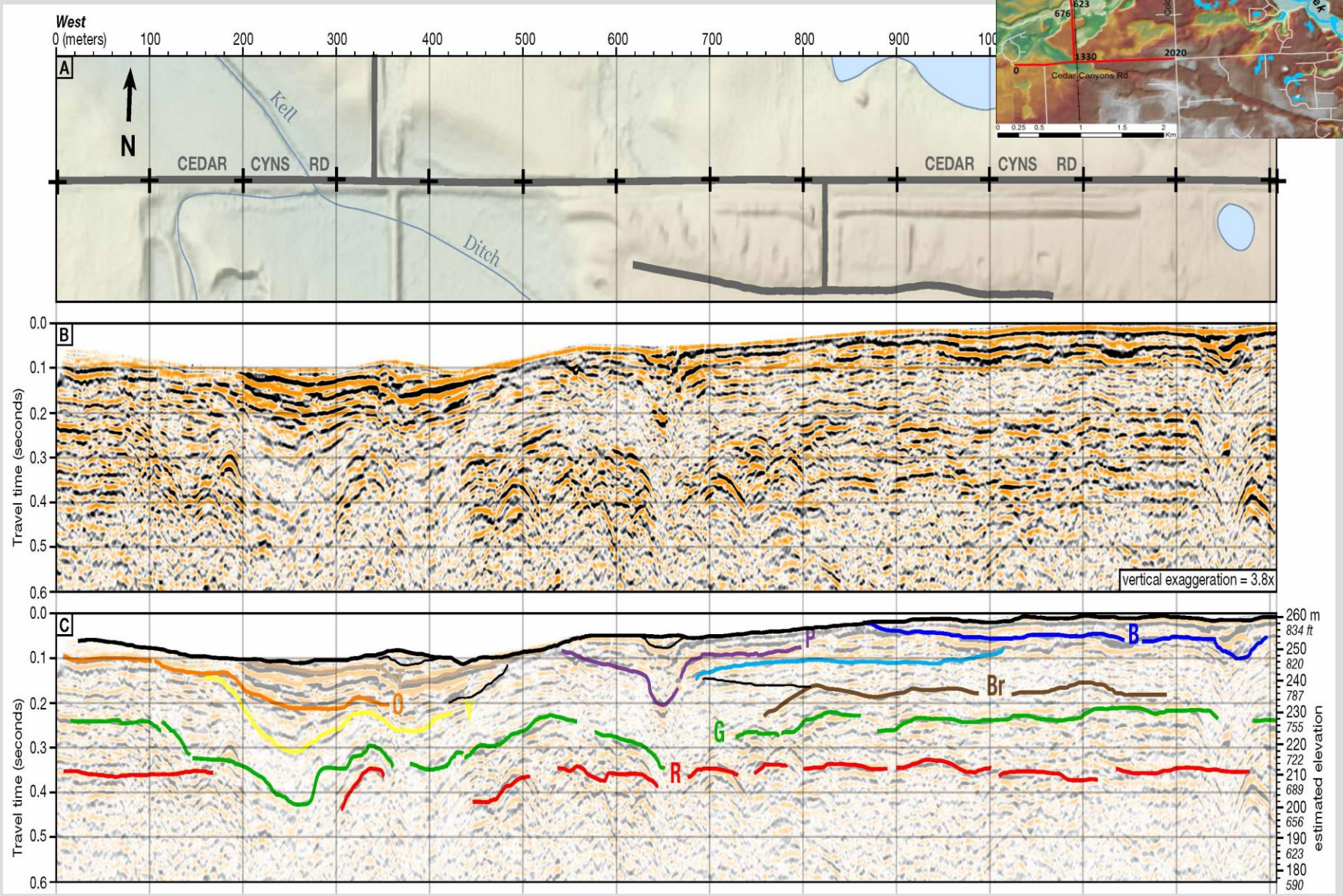
Seismic: Cedar Canyon Rd

Reflector patterns differ west to east

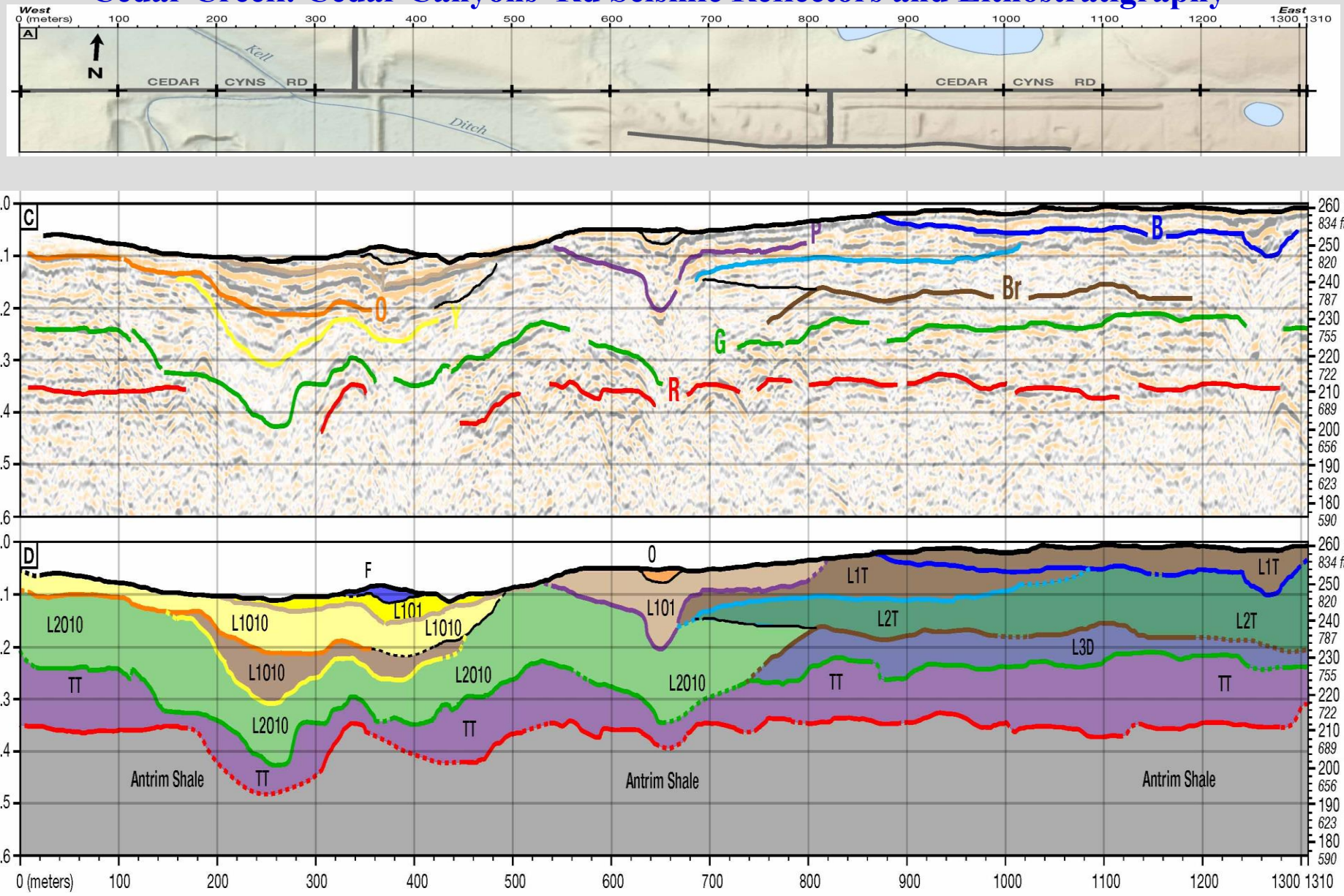
Wabash moraine (east): subhorizontal reflectors that overlap and pinch out

Basal reflector is horizontal

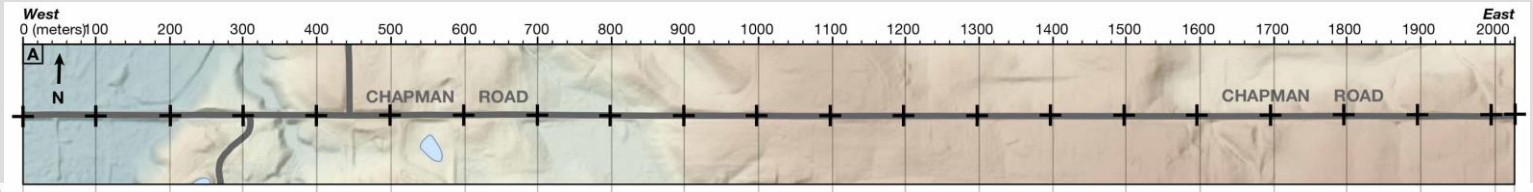


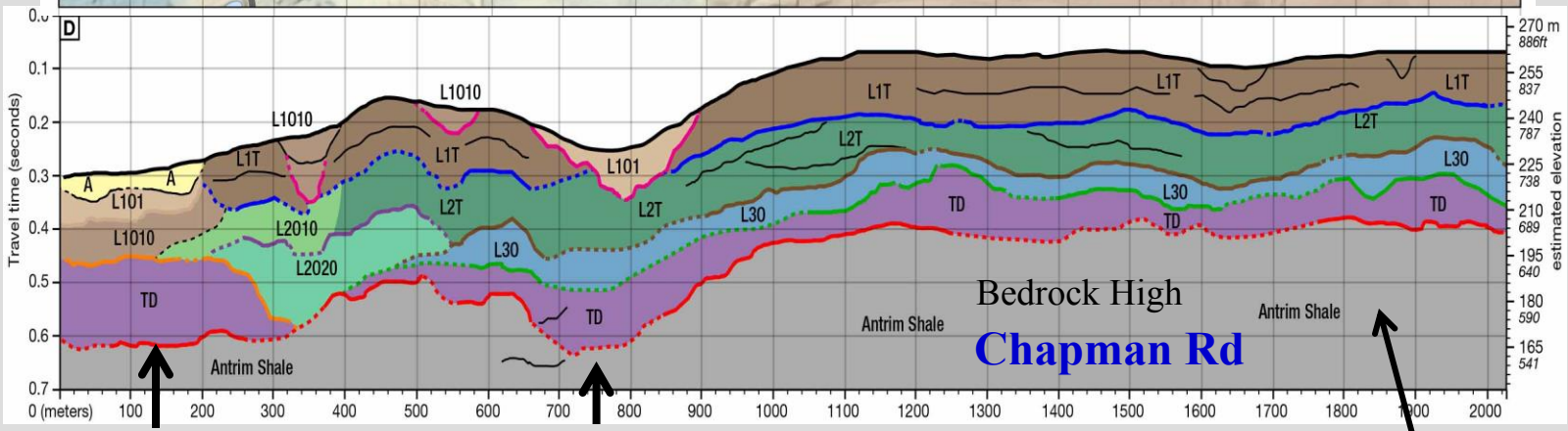


Cedar Creek: Cedar Canyons Rd Seismic Reflectors and Lithostratigraphy



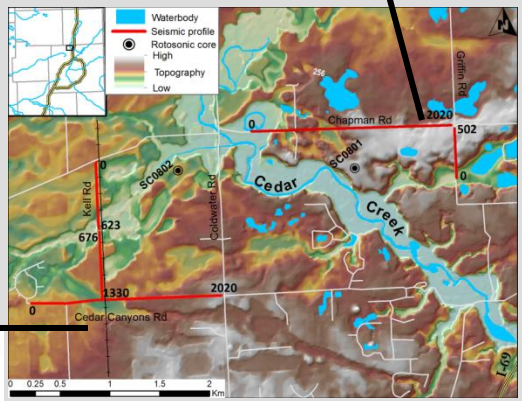
Wabash moraine: Wedge of Lagro 2 drift sheet overlain by Lagro 1

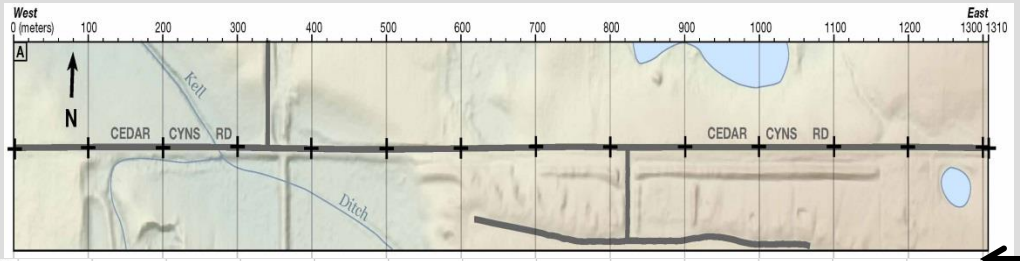


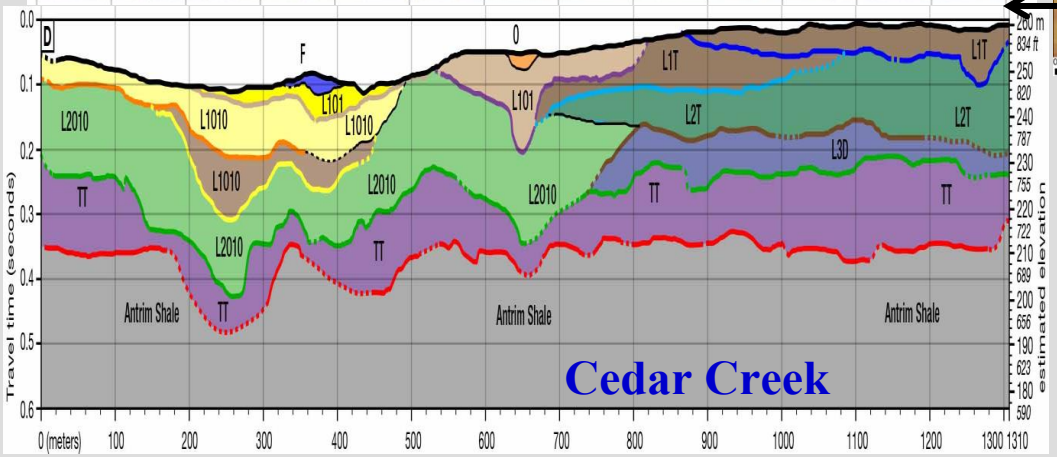


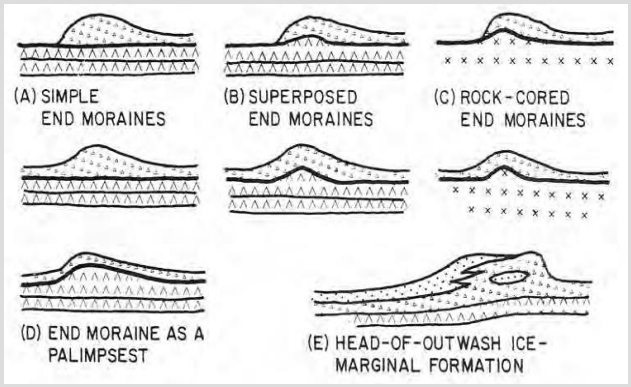
Channel

Channel

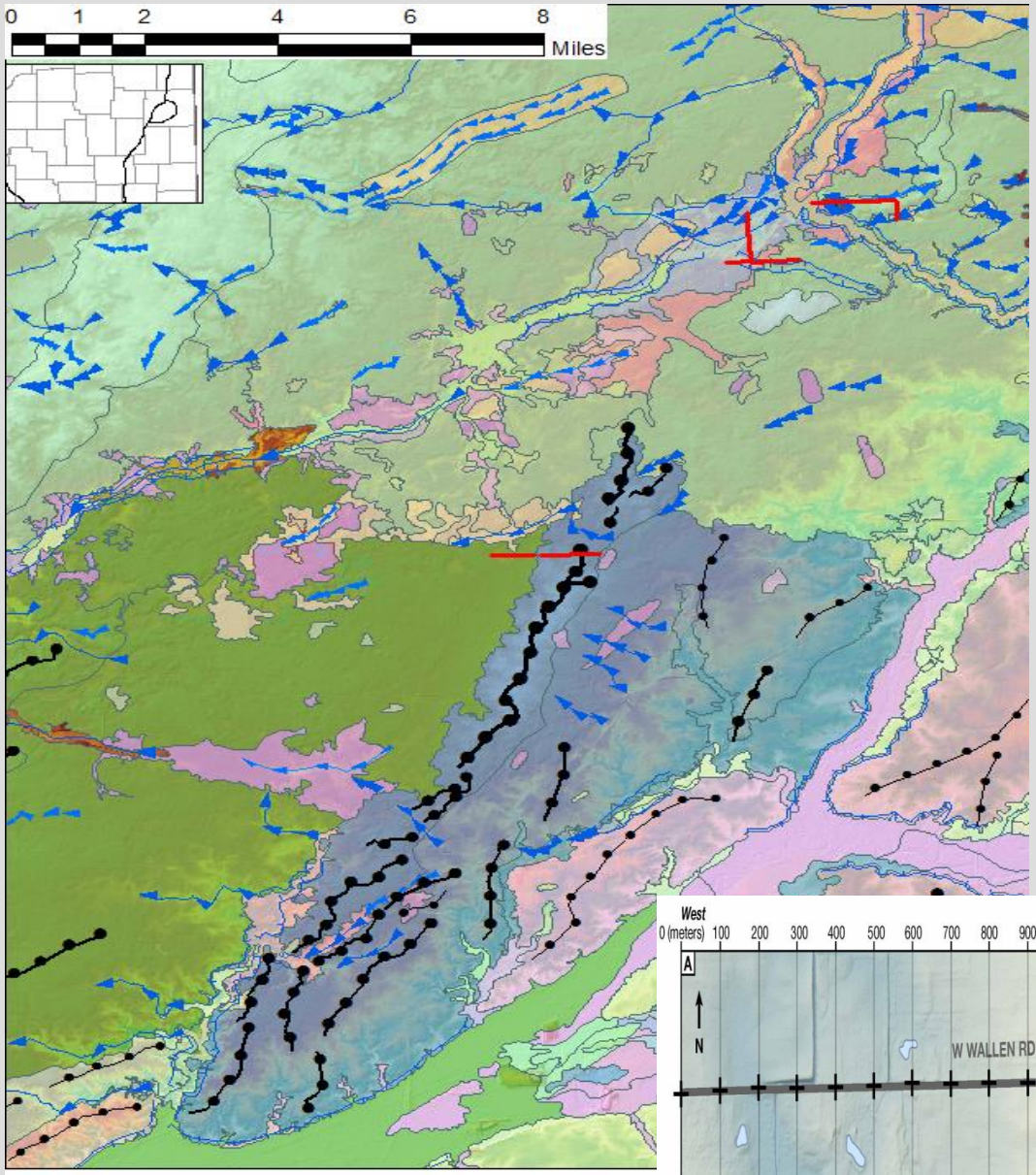


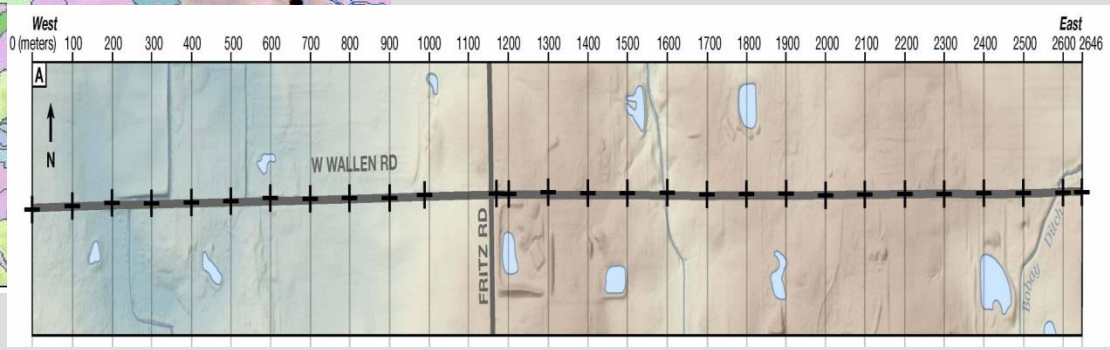




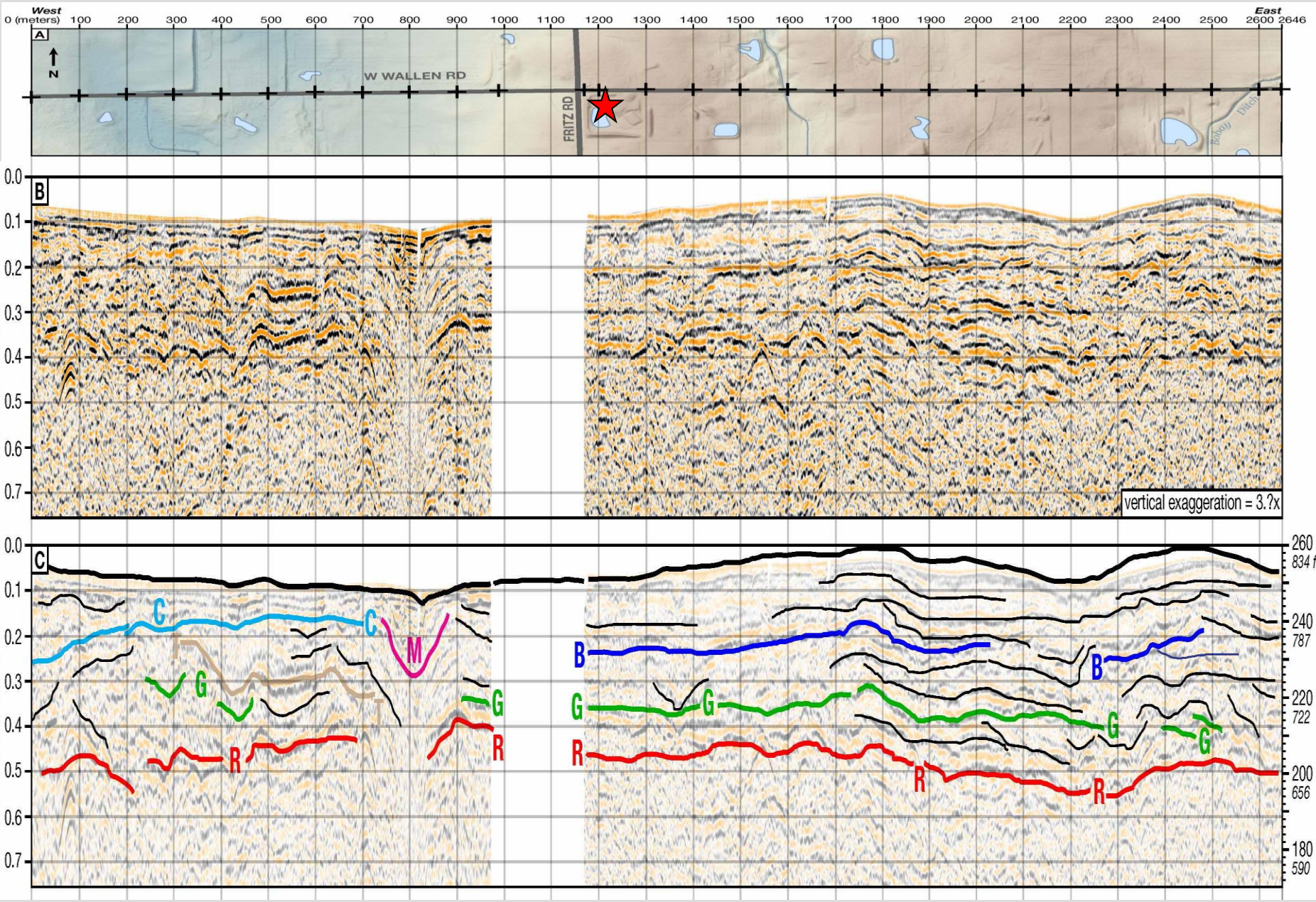


Wabash moraine: Wallen Rd Seismic-Reflection (Shear-Wave) Profile

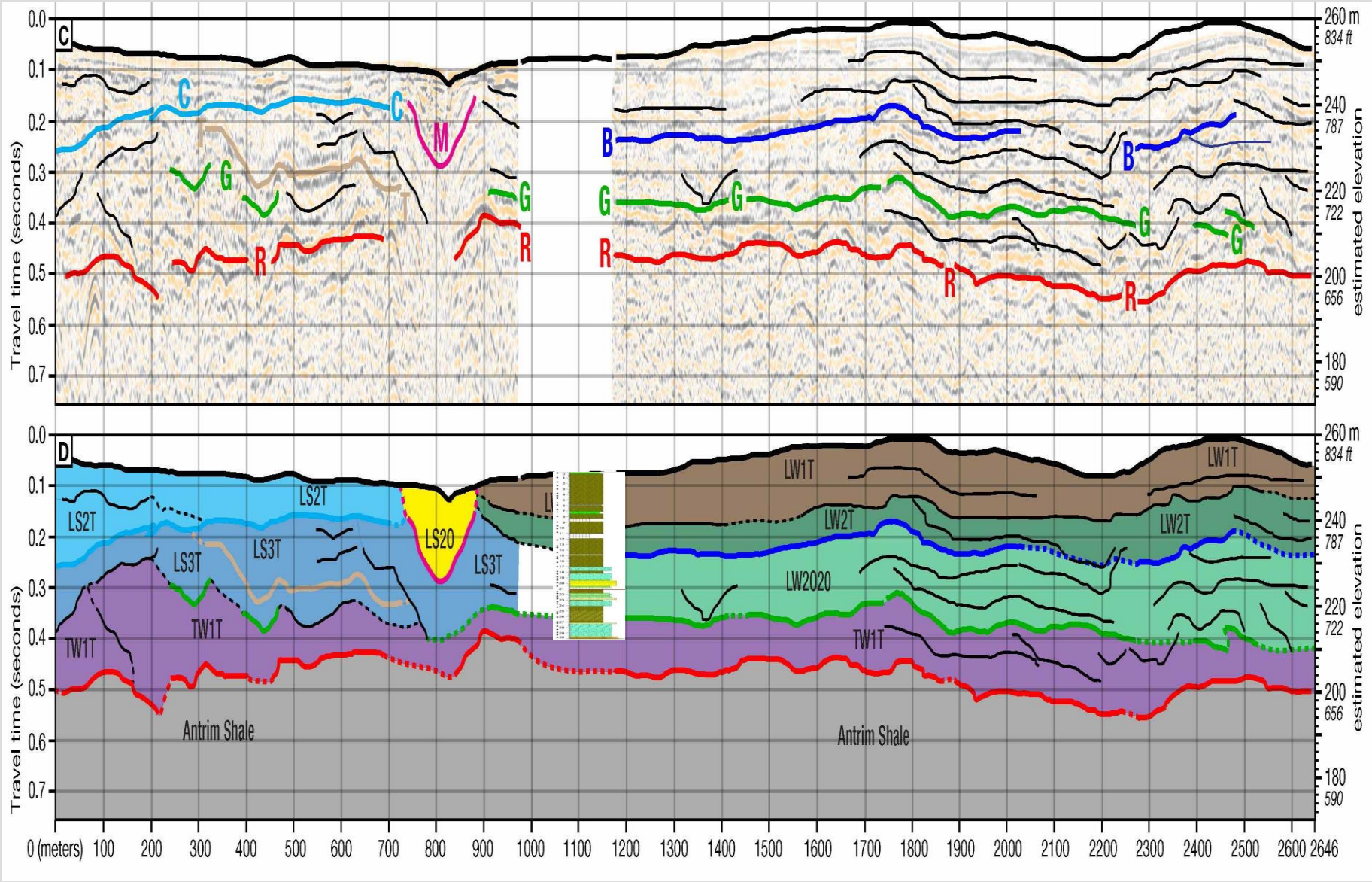




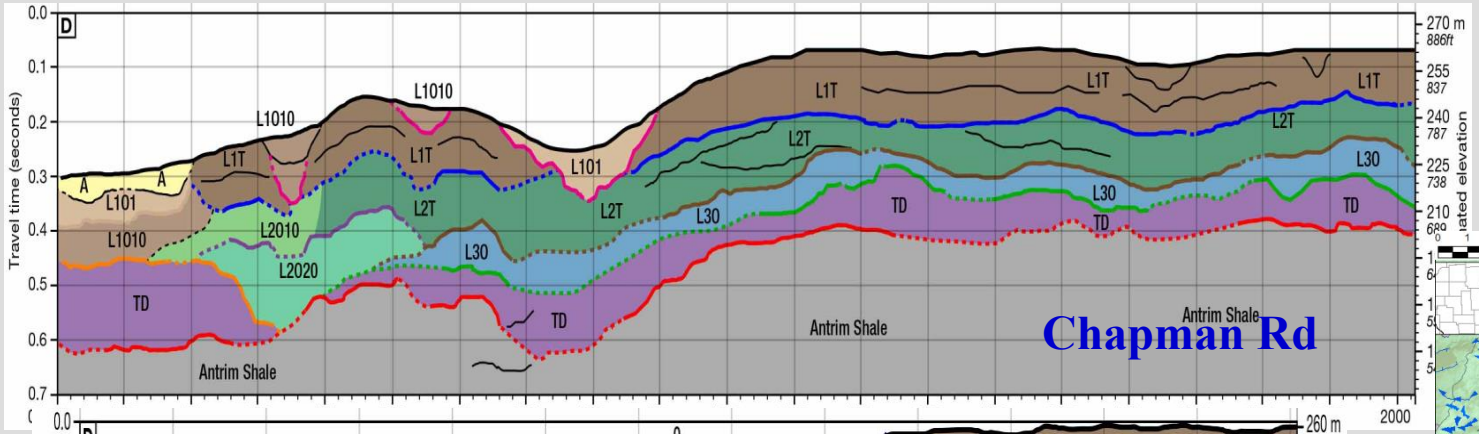
Wallen Rd Seismic-Reflection (Shear-Wave) Profile and Reflectors

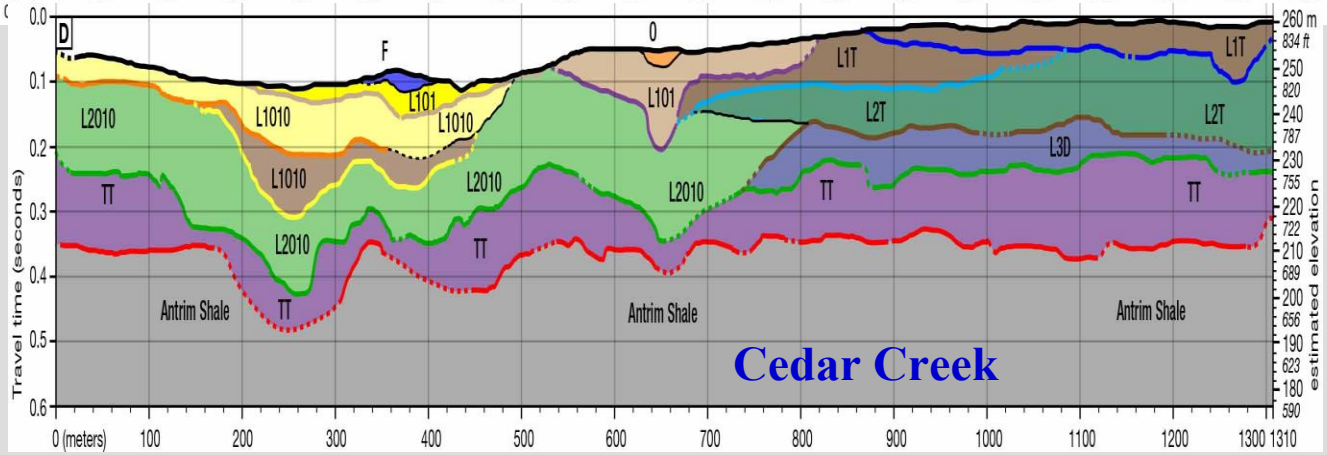


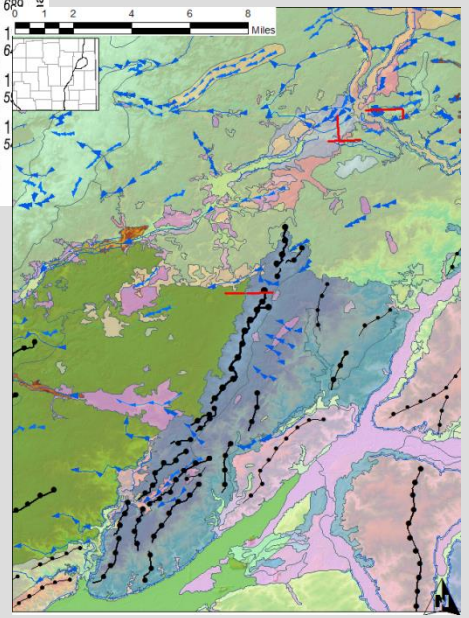
Wallen Rd Seismic-Reflection (Shear-Wave) Lithostratigraphy

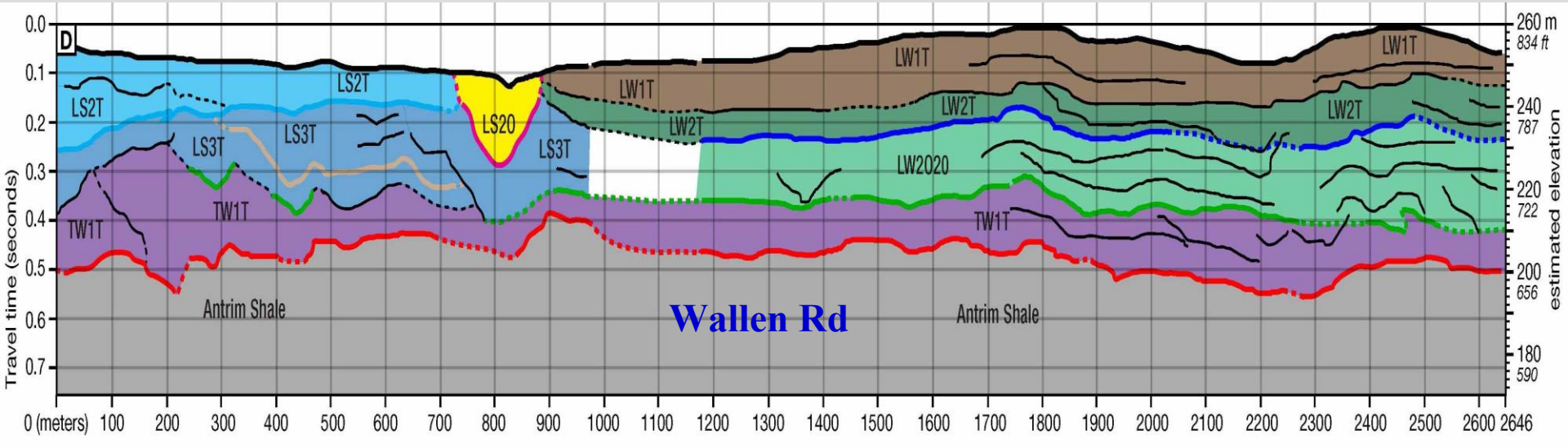


Wabash moraine: composed of a relatively large number of Lagro till layers that pinch out toward west


D
Travel time (seconds)
estimated elevation
L1010
L1T
L101
L2T
L2010
L2020
L30
TD
Antrim Shale
Chapman Rd


D
Travel time (seconds)
estimated elevation
F
0
L101
L1010
L1T
L2010
L2T
L3D
TT
Antrim Shale
Cedar Creek

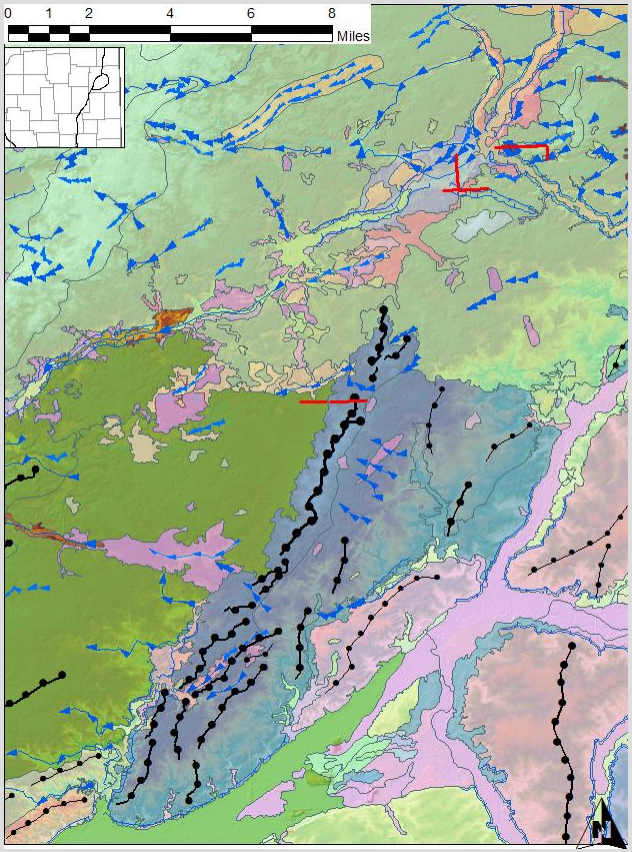

Miles

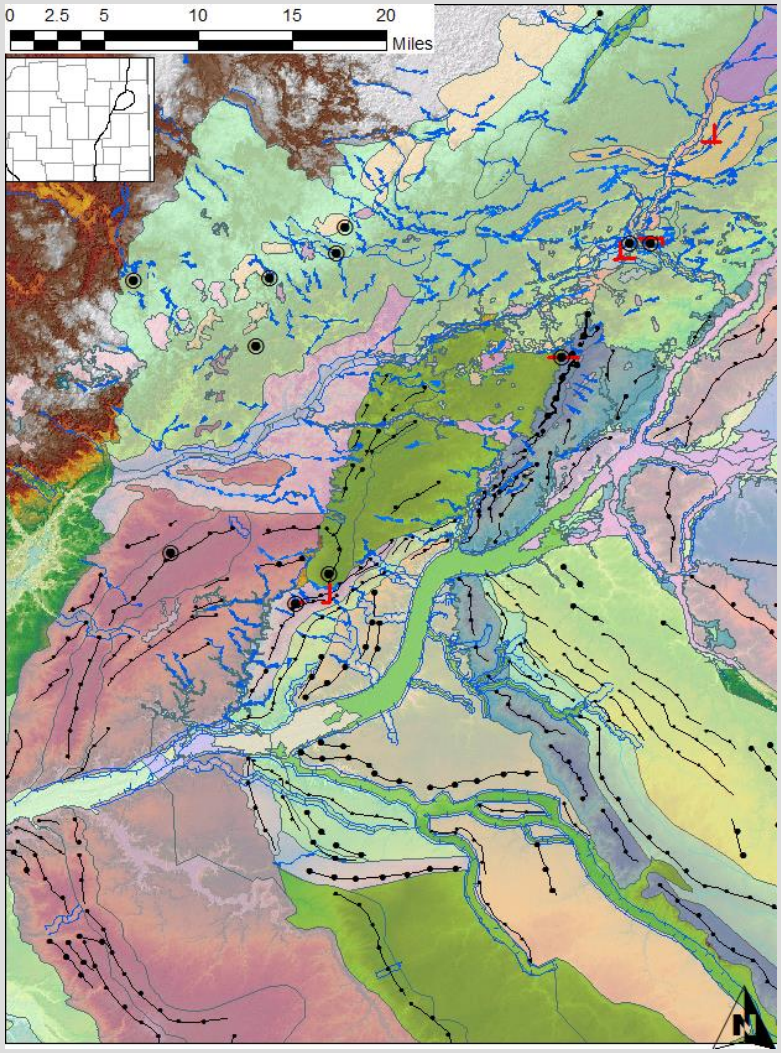

D
Travel time (seconds)
estimated elevation
LS2T
LS3T
LS20
TW1T
LW1T
LW2T
LW2020
Antrim Shale
Wallen Rd

Wabash “moraine” north Eel River and Cedar Creek

Lagro at Cedar Creek represents palimpsest Wabash moraine

Lagro at Wallen simple Wabash end moraine

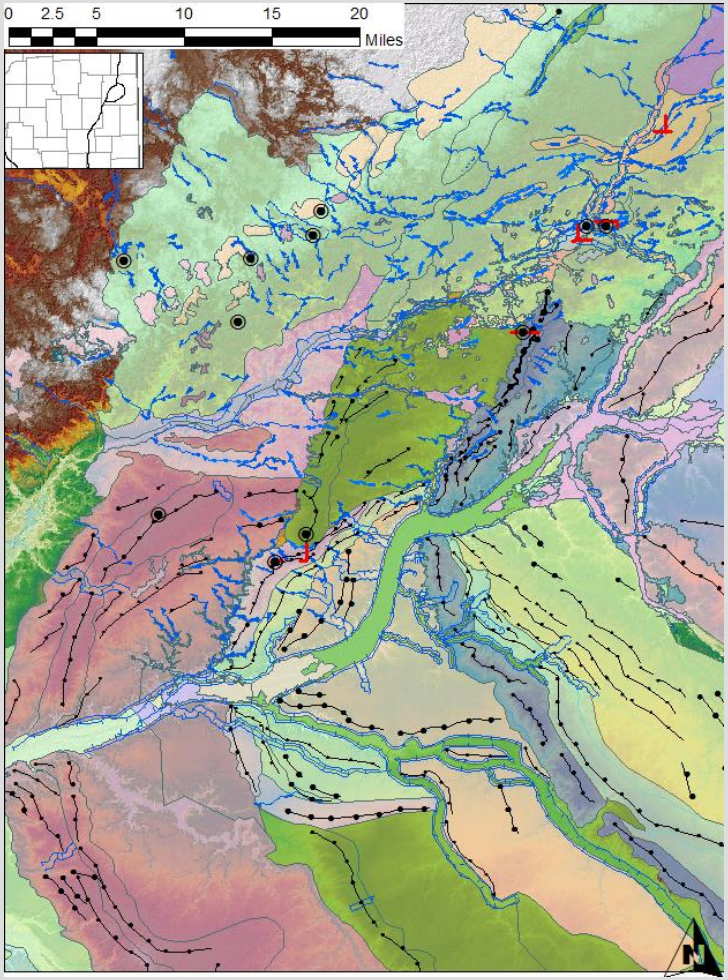


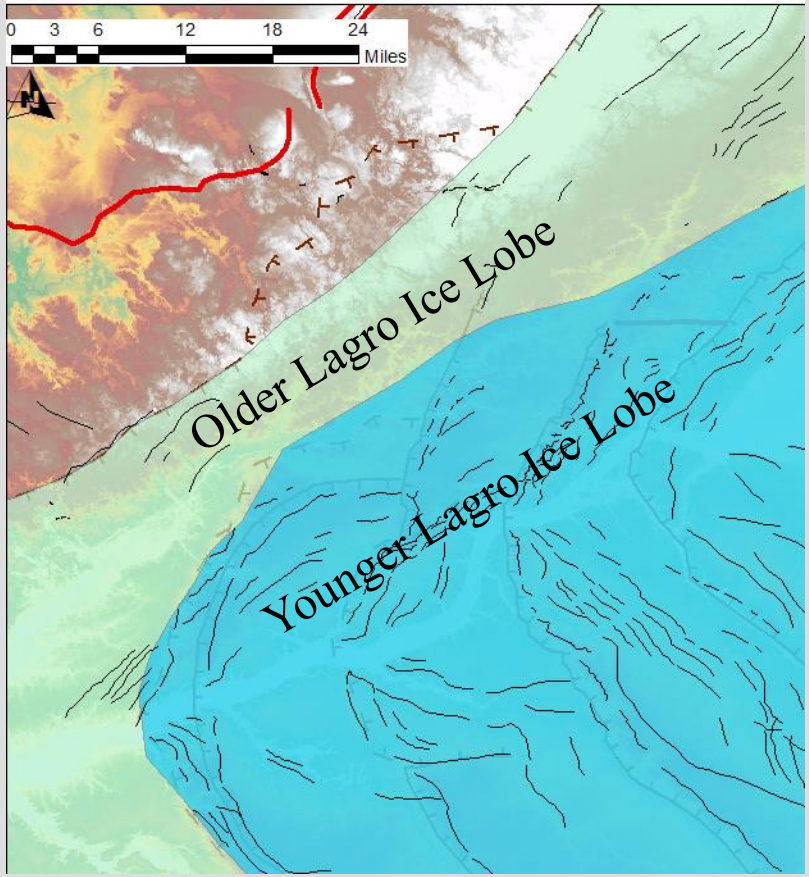


Based on cores, morphology, and seismic: Lagro north of Eel River appears older than Lagro south of Eel River.

Conclusions:

- Seismic reflection (shear-wave) seems to provide insight into Lagro drift architecture.
- Lagro drift north of the Eel River contains deep subglacial basal till that overlies still older, ice-marginal Lagro drift. South of Eel River, Lagro drift varies west to east but is largely basal till deposited near ice-margin.
- Lagro drift north of the Eel River is older than Lagro drift south of the Eel.





Acknowledgments

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Landowners:

Mr. K. Wheeler

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Mr. J. Helvie,

Mr. M. Warner,

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ACRES Land Trust