2010 NECSS Update

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NE 1038: Hydropedology, Genesis, Properties, and Distribution of Hydromorphic Soils

The Challenge in PA…

1. Soil Limitations

Photo: PSU College of Ag.

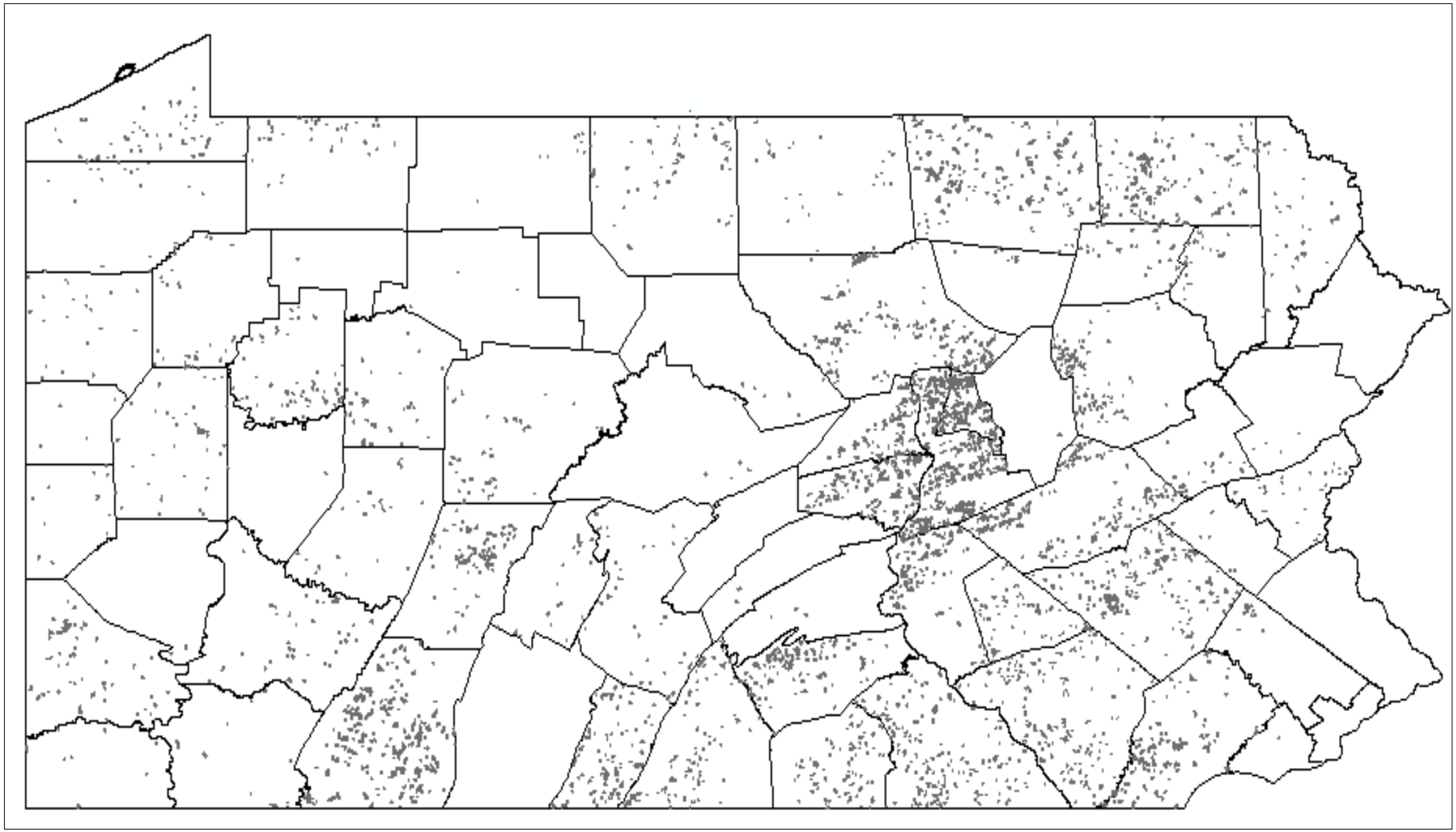
- 7% excessively wet
- 28% ↑ rock fragment
- 37% bedrock < 100cm
- 31% slopes > 8%
- 31% limited by Bx's

2. Landscape Legacy

Figure 2-3. Cutting a large American chestnut tree on the Fernow at Fork Mountain circa 1905. (Courtesy William Pennington)

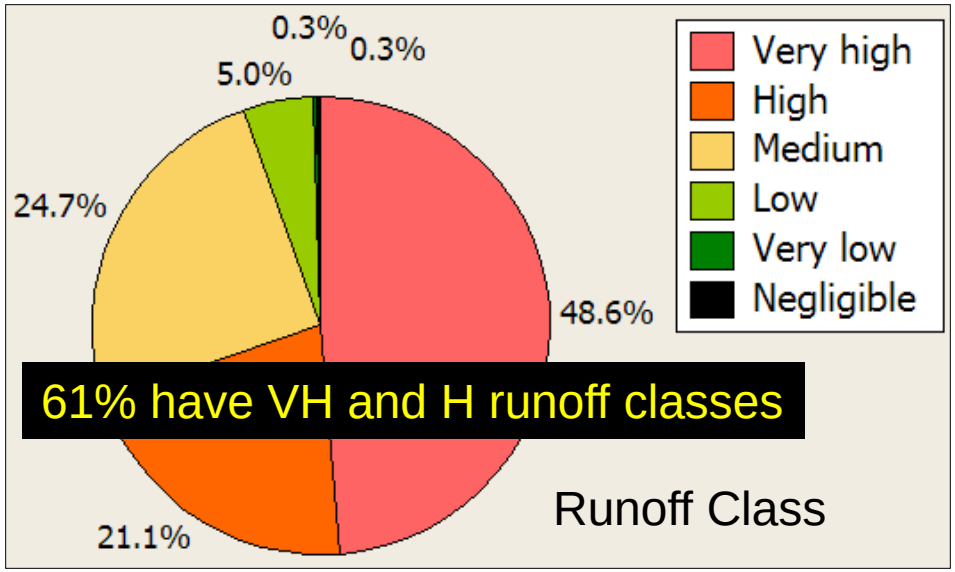
Kochenderfer (2006)

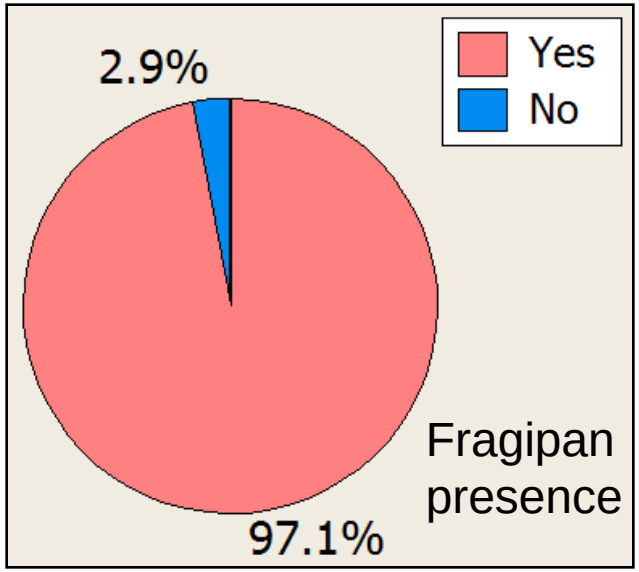
PA CRP/CREP Lands

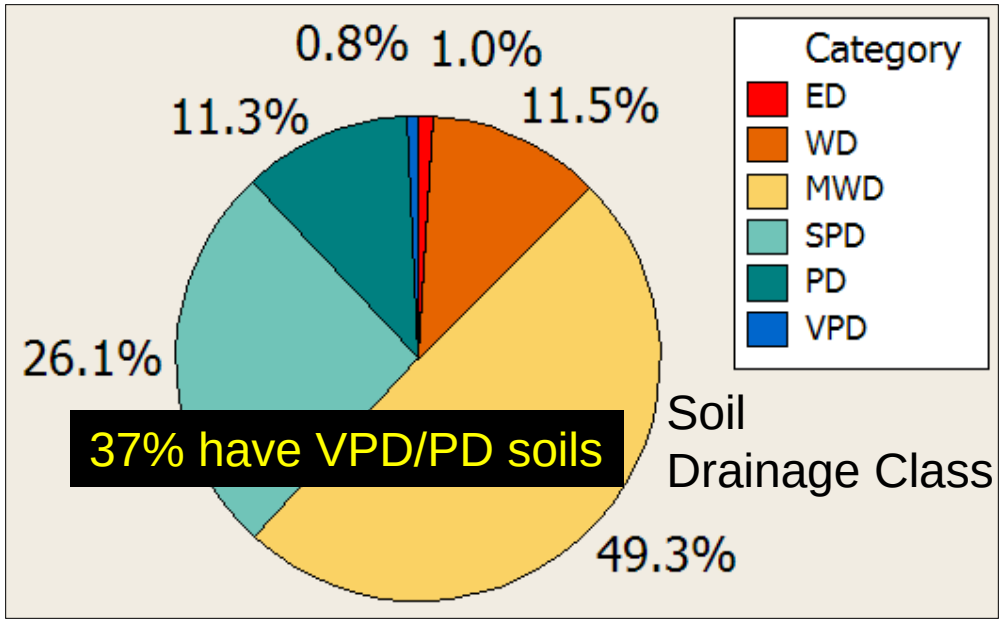


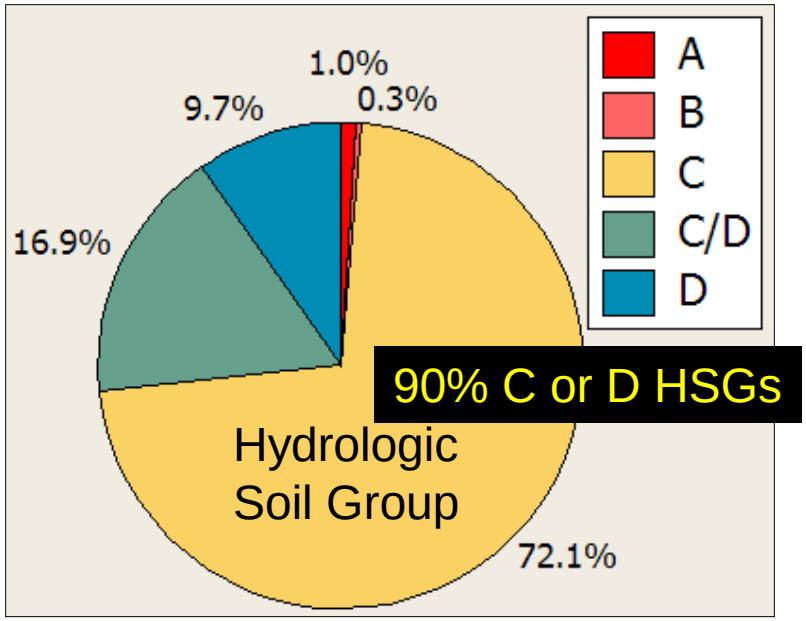
Drohan et al. (2010)

PA CRP/CREP Characteristics

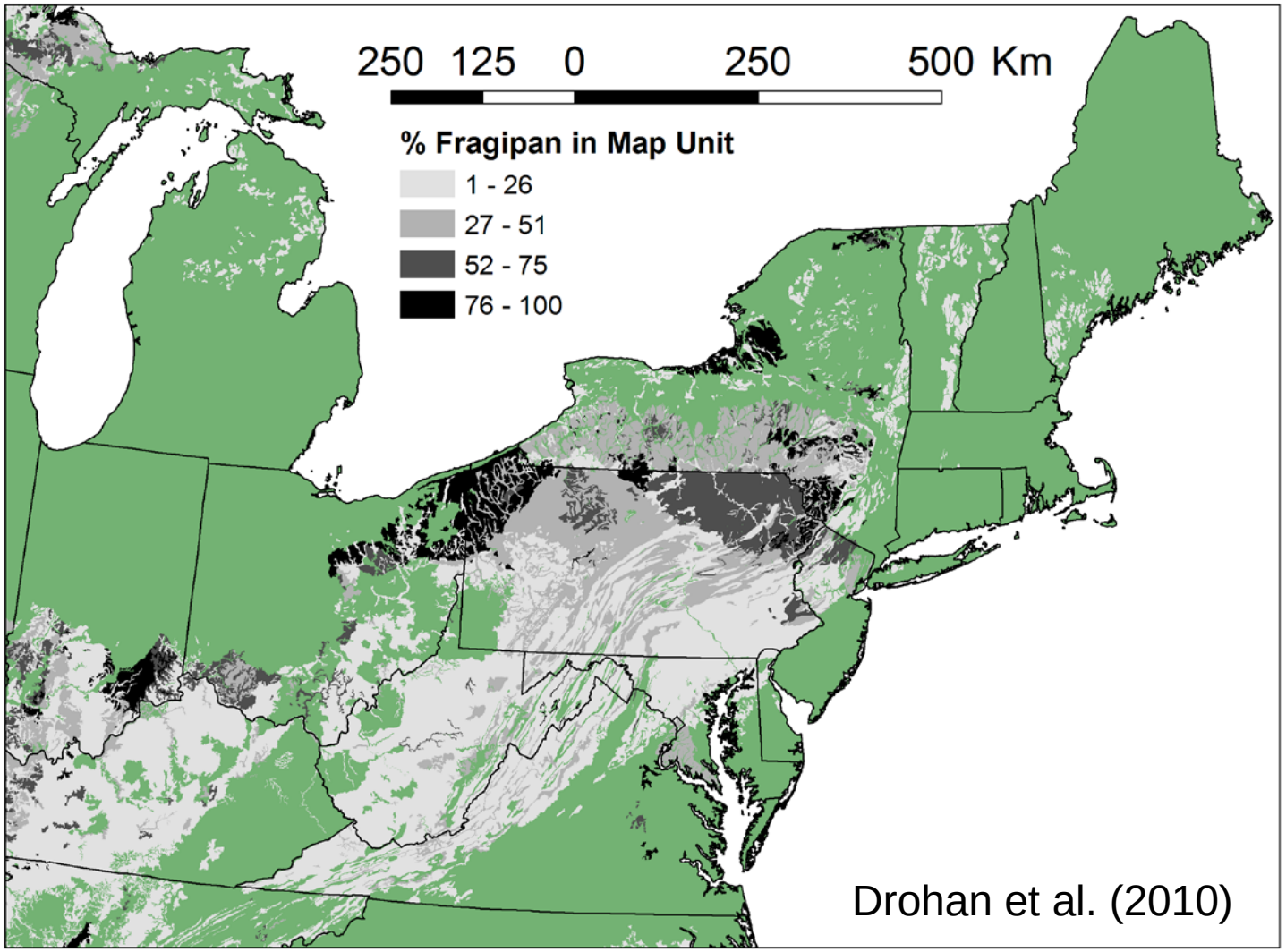






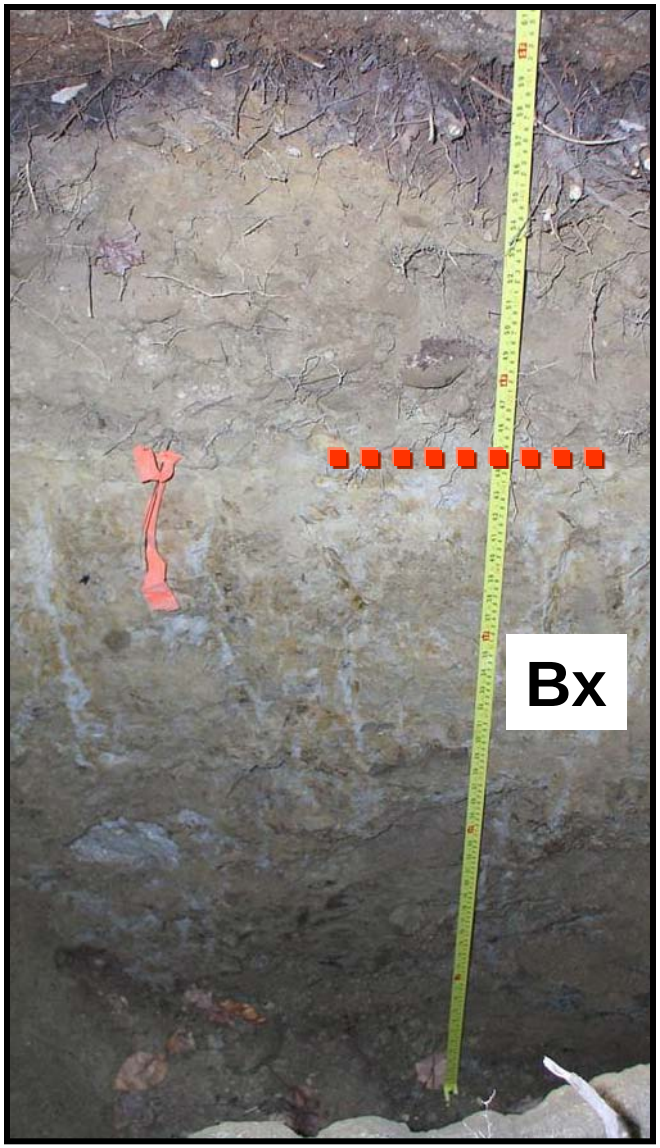


Analysis expanded into NE Region



Drohan et al. (2010)

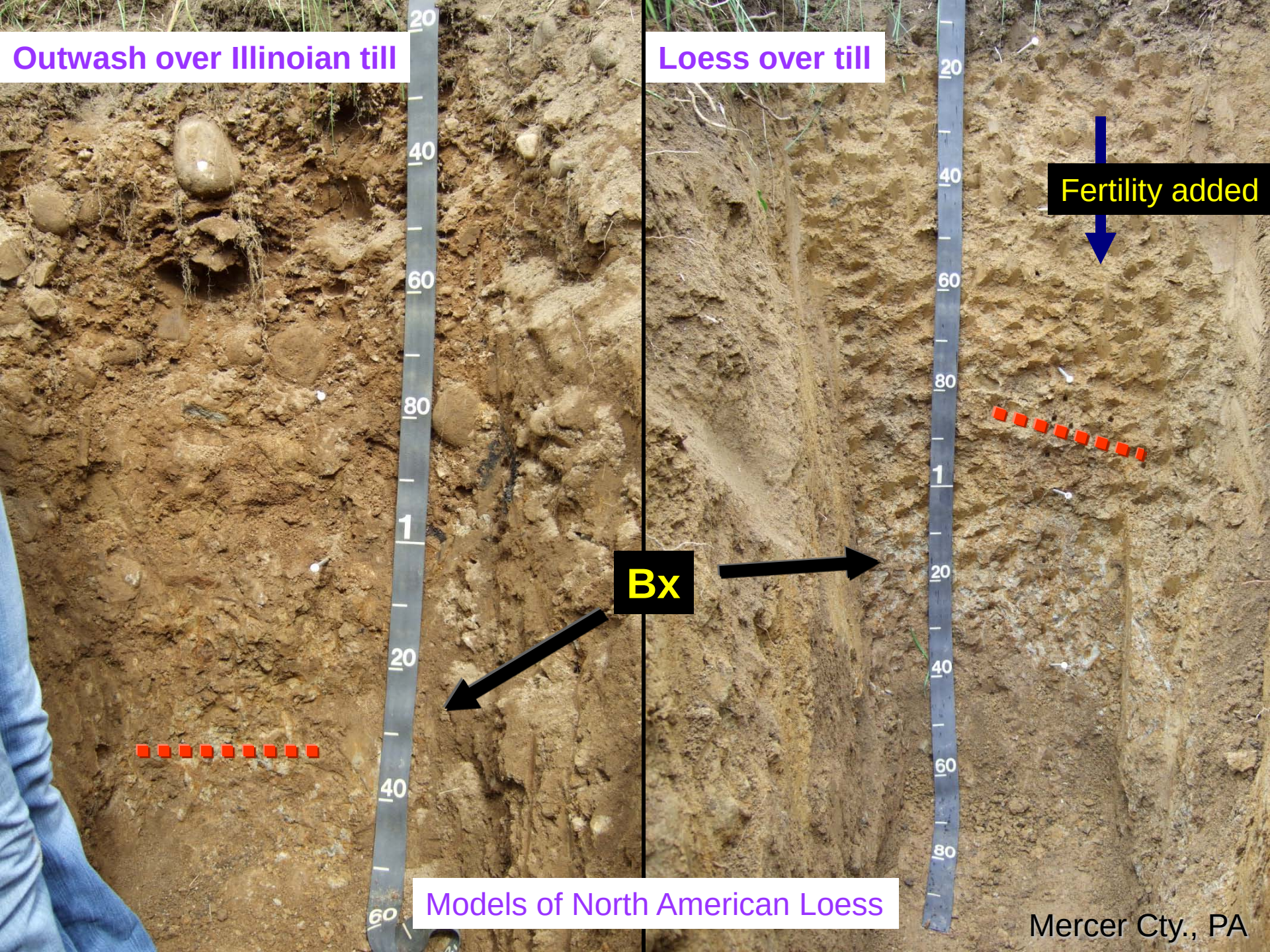
"*Effective Soil Depth*" and Bx



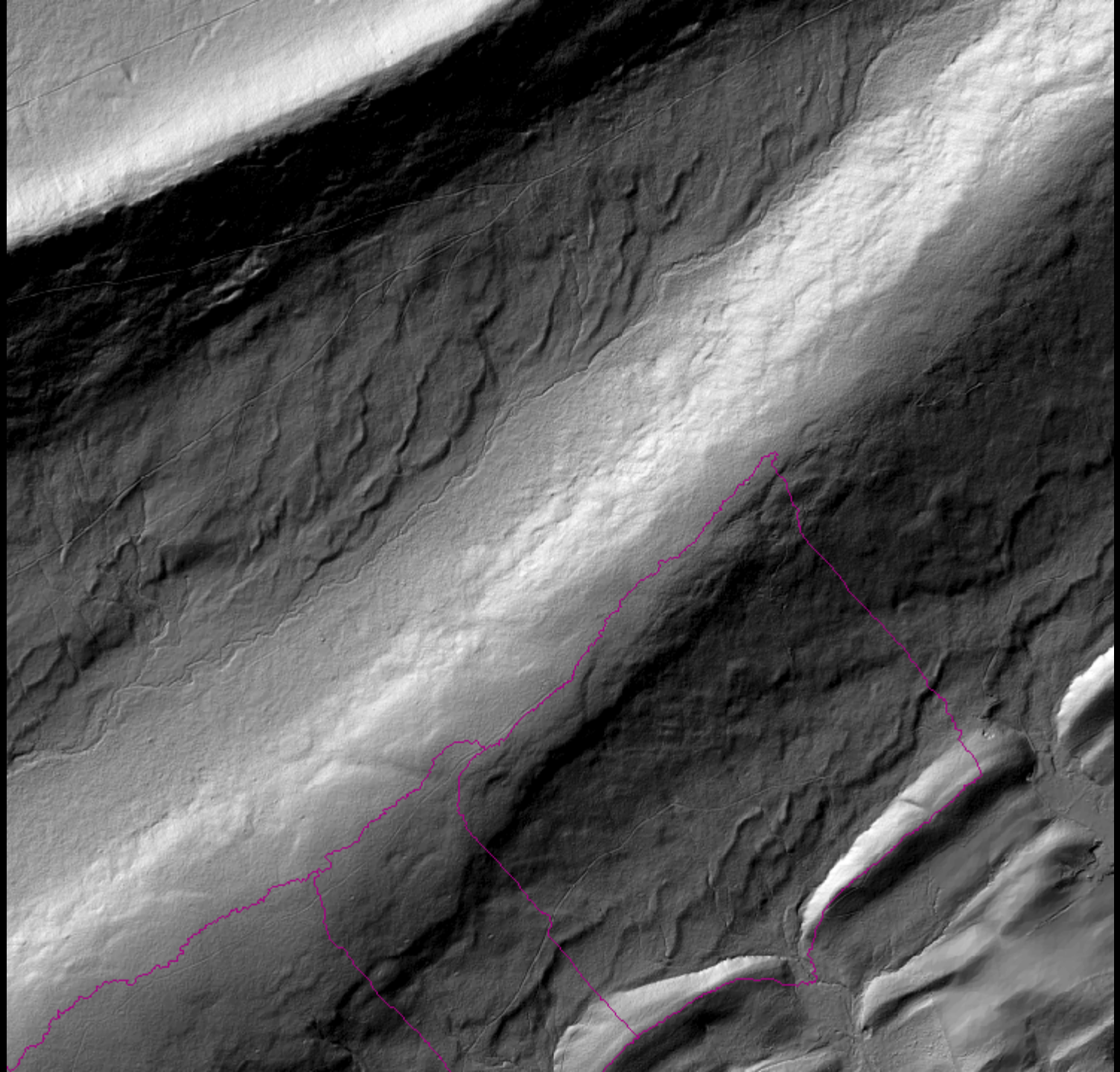
Limited soil depth available for crop production

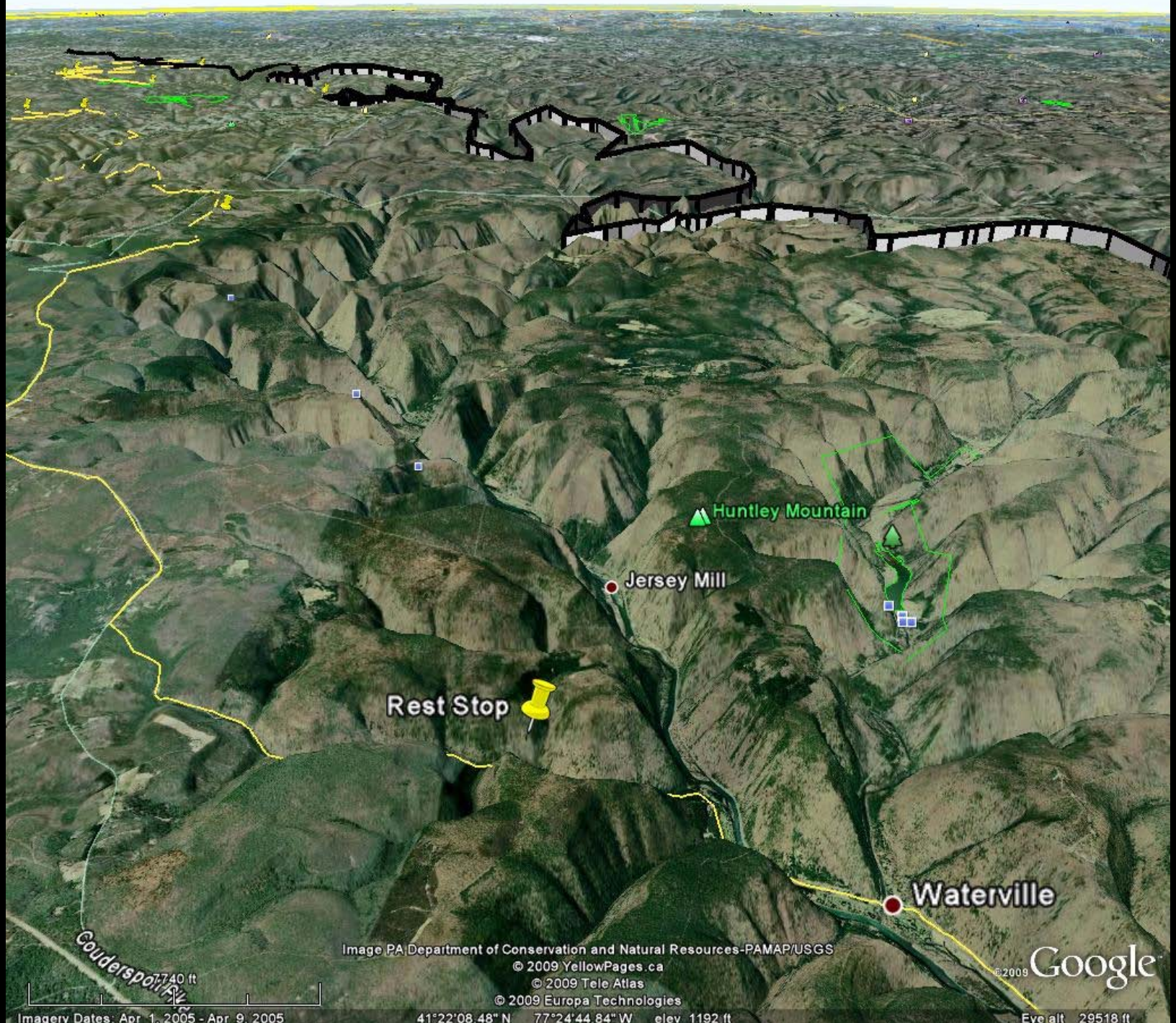
- Too wet in spring, too dry by early summer
- Less available nutrients due to less potential soil
- Less potential soil for root growth

NRCS photo, Chris Fabian

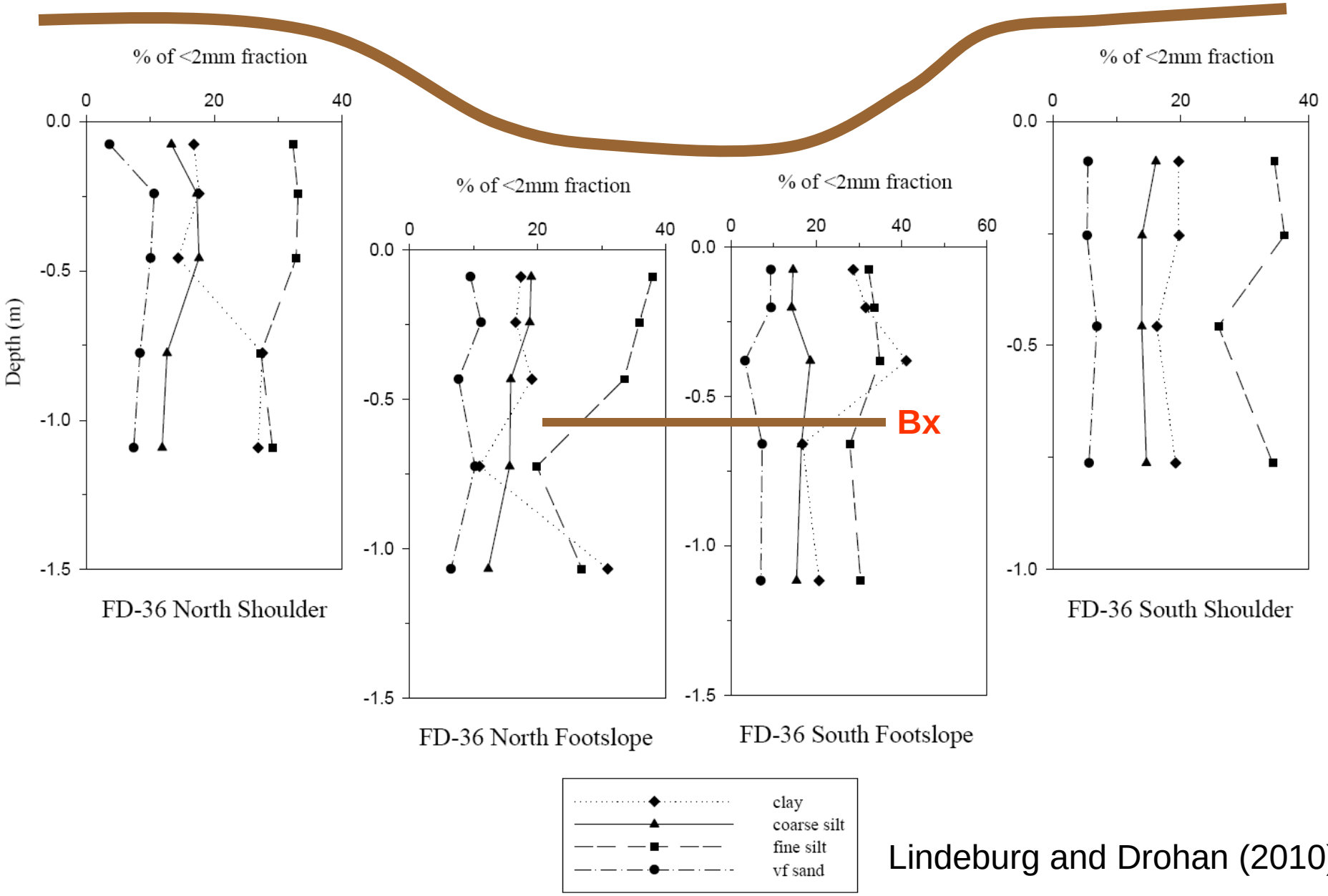

Outwash over Illinoian till
Loess over till
Fertility added
Bx
Models of North American Loess
Mercer Cty., PA

Giplin series, Blackberry Meadows Farm



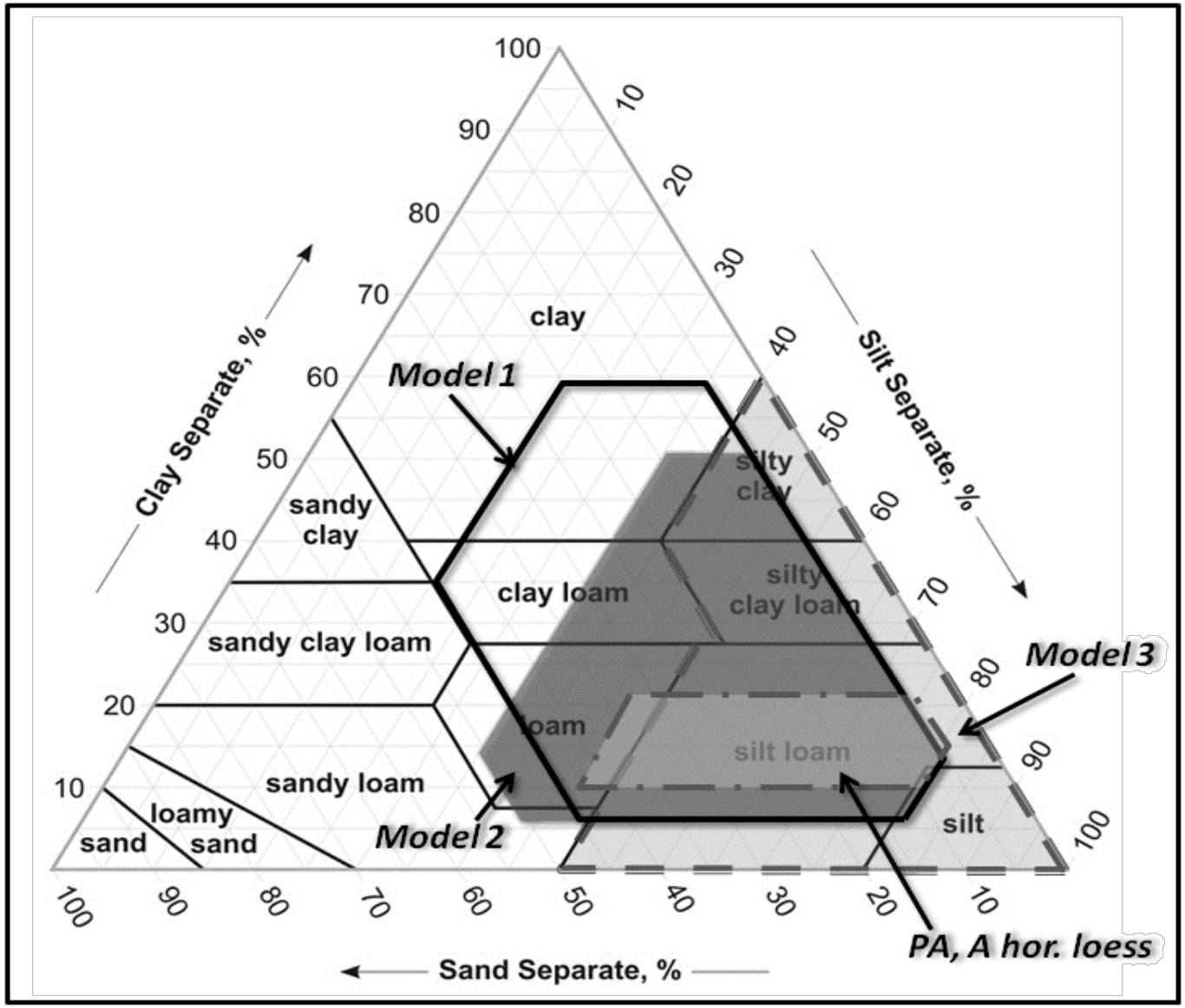

Huntley Mountain
Jersey Mill
Rest Stop
Waterville
Couderspoil Fk
740 ft
Image PA Department of Conservation and Natural Resources-PAMAP/USGS
© 2009 YellowPages.ca
© 2009 Tele Atlas
© 2009 Europa Technologies
©2009 Google
Imagery Dates: Apr 1, 2005 - Apr 9, 2005
41°22'08.48" N 77°24'44.84" W elev 1192 ft
Eye alt 29518 ft

Mahantango Creek Fragipan Study, USDA ARS/NRCS

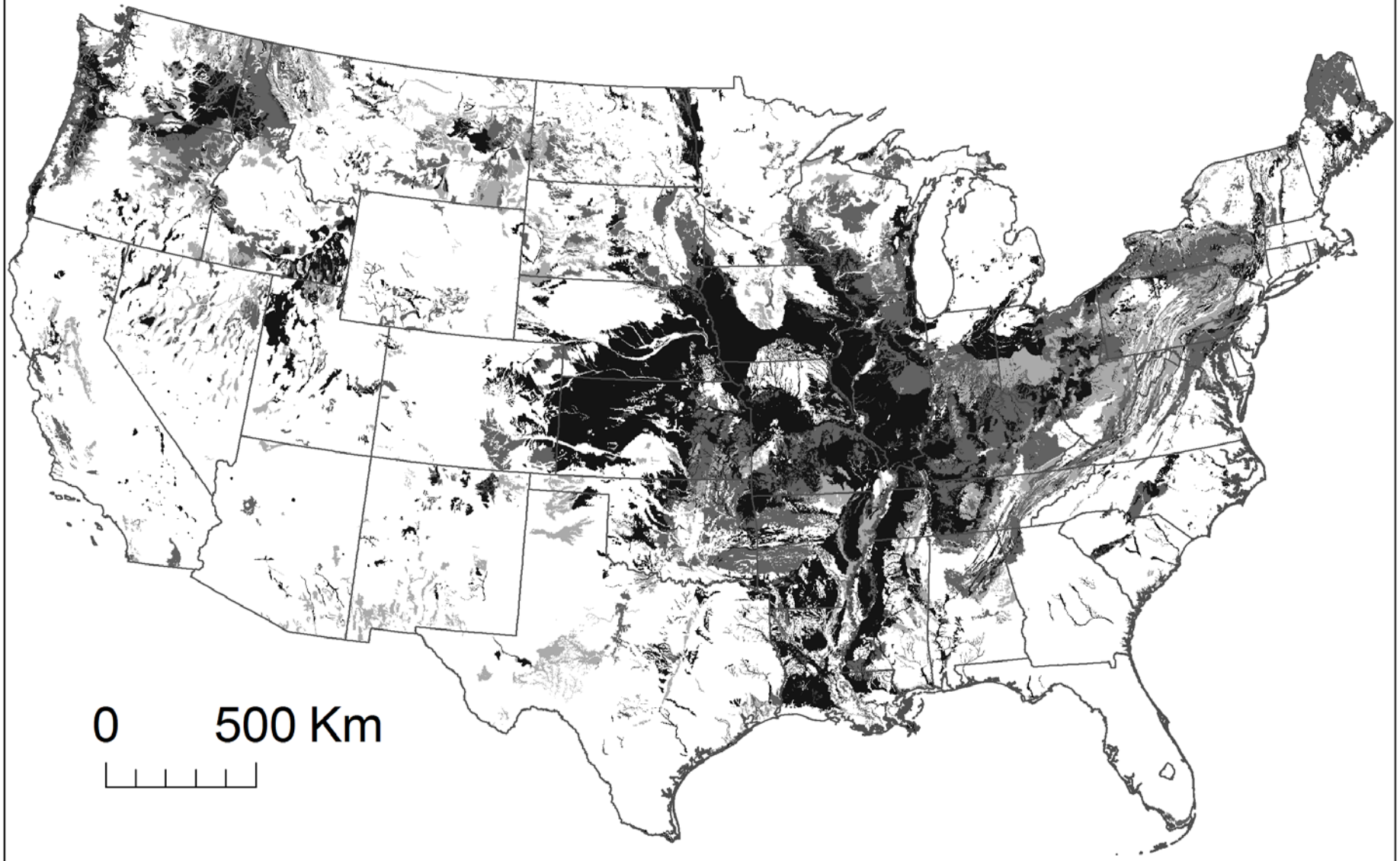


Lindeburg and Drohan (2010)

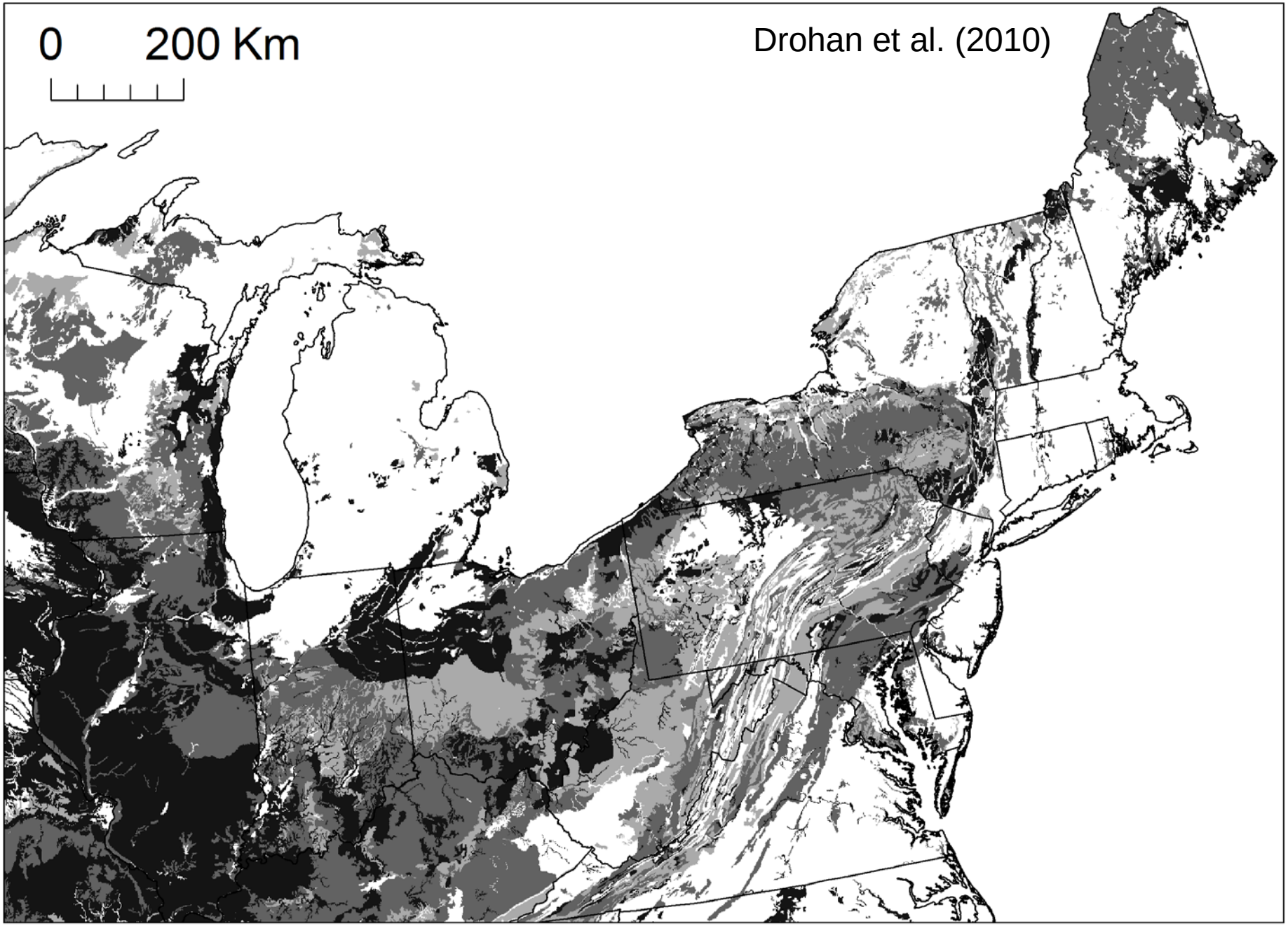
CONUS-SOIL Loess Models



Depth of eolian materials across the conterminous U.S.



Drohan, Ciolkosz, Waltman, Dadio, Lindeburg (2010)


0 200 Km
Drohan et al. (2010)

Sulfate Wet Deposition

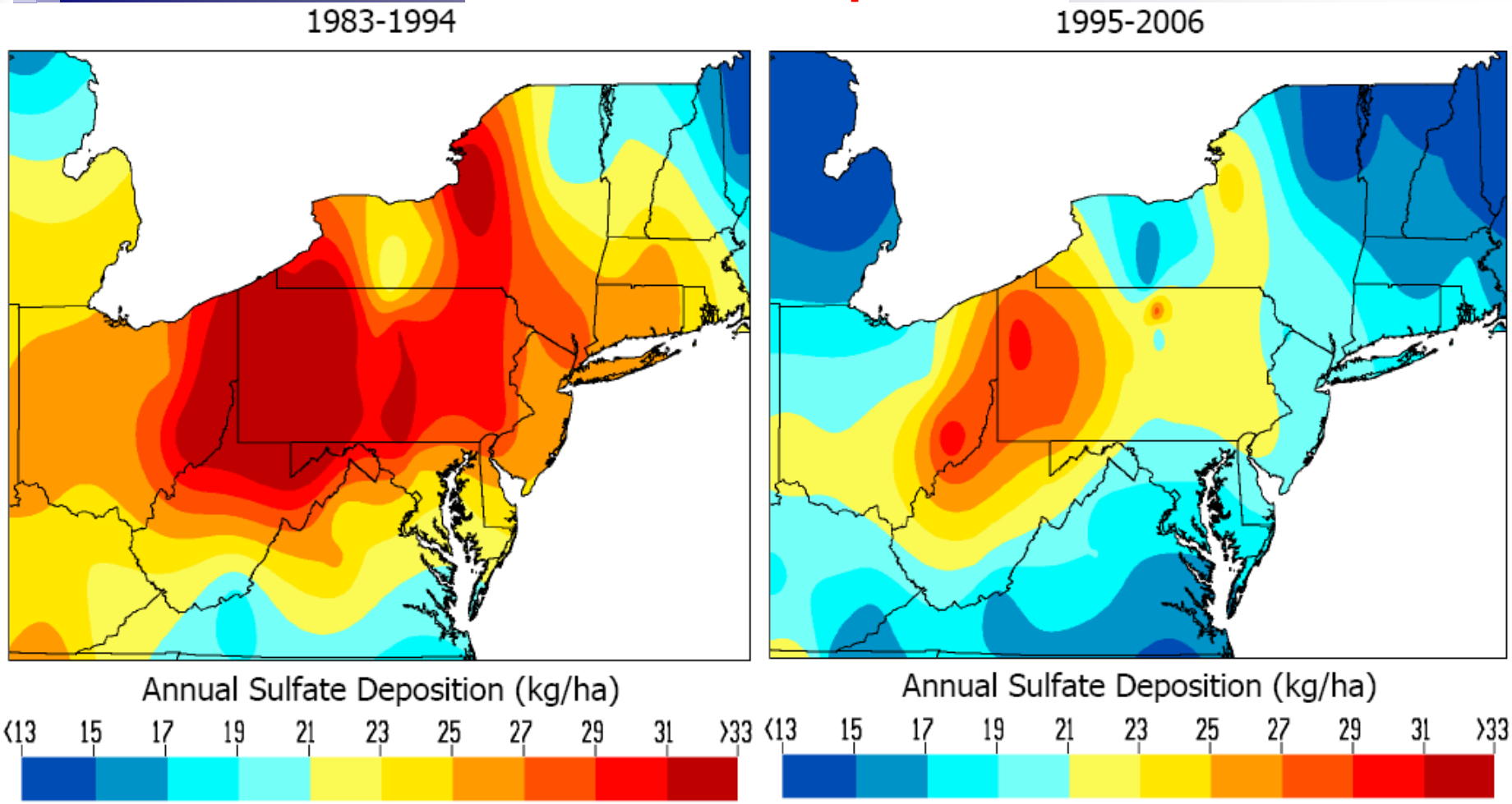
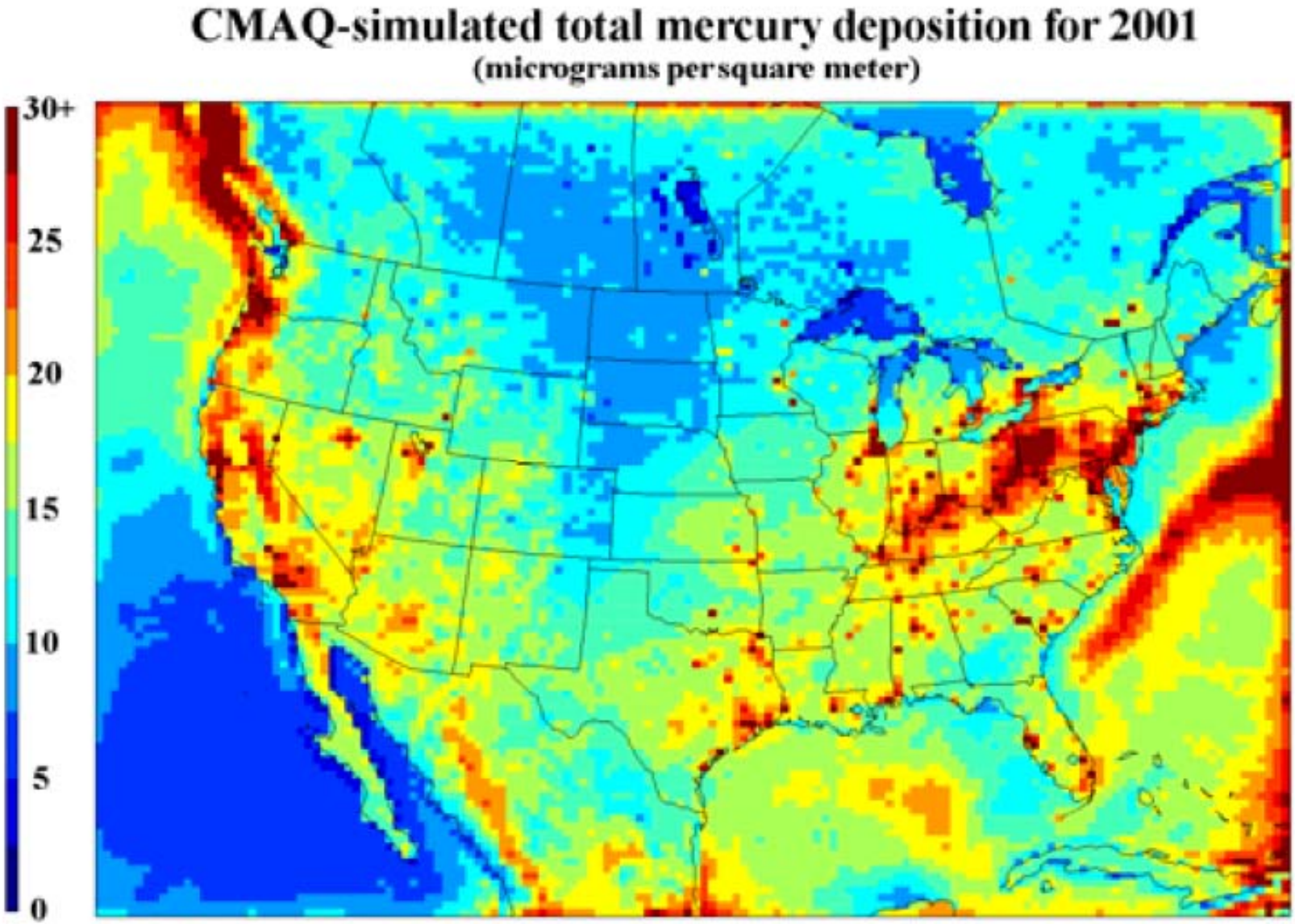
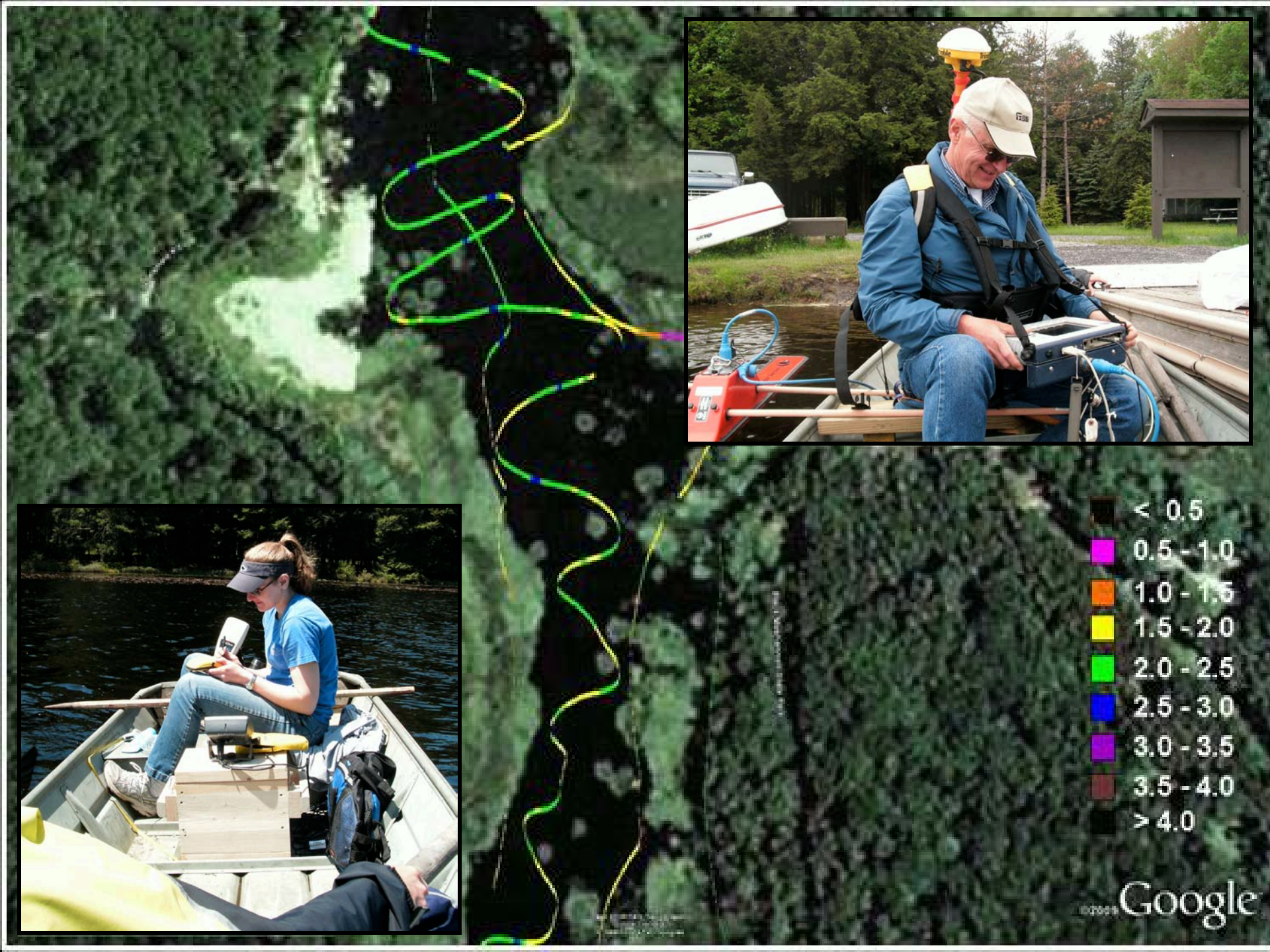


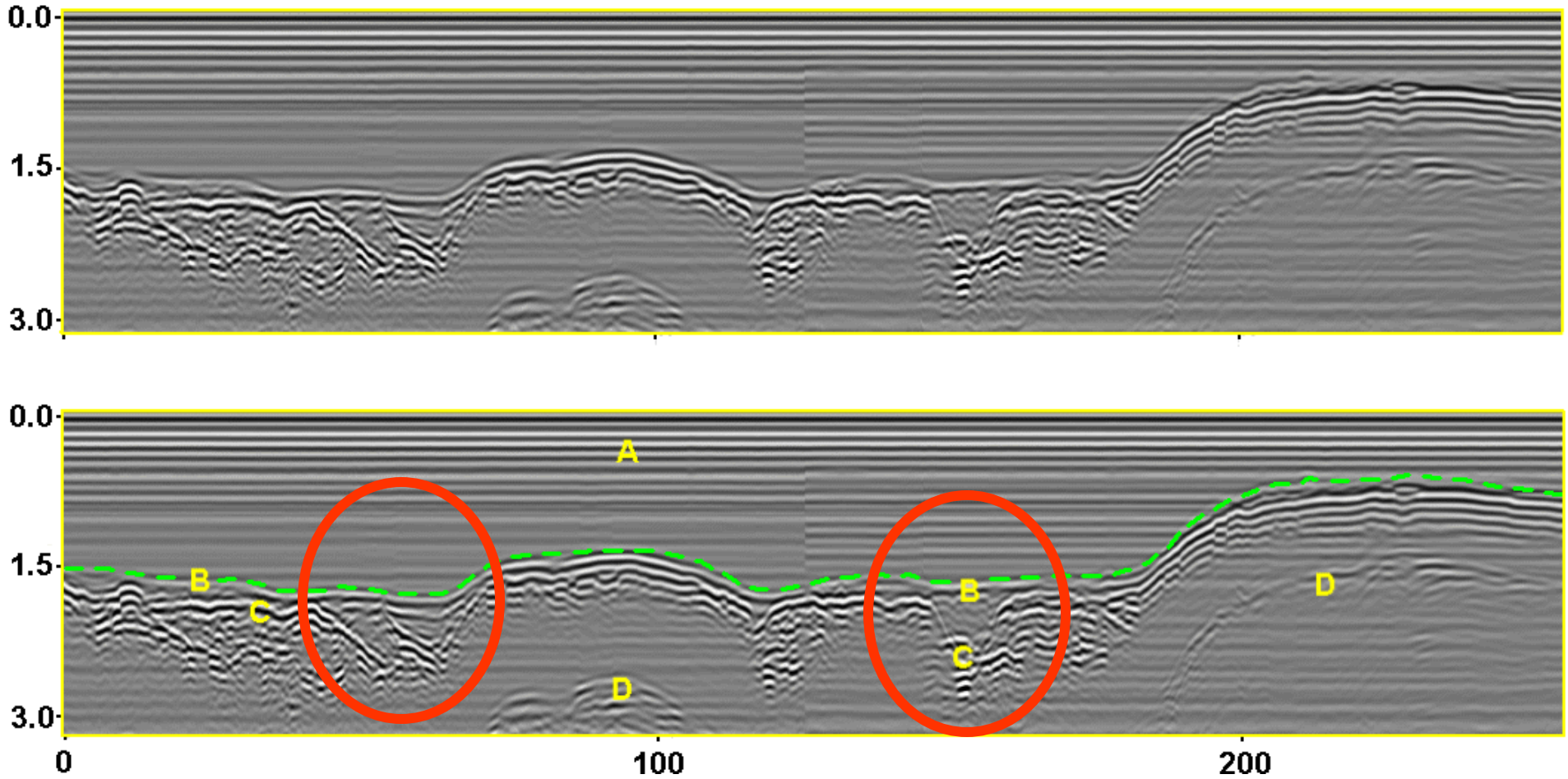
Figure 7. Mean annual sulfate wet deposition across Pennsylvania and neighboring states before (1983-1994) and after (1995-2006) implementation of Title IV of the Clean Air Act Amendments of 1990.

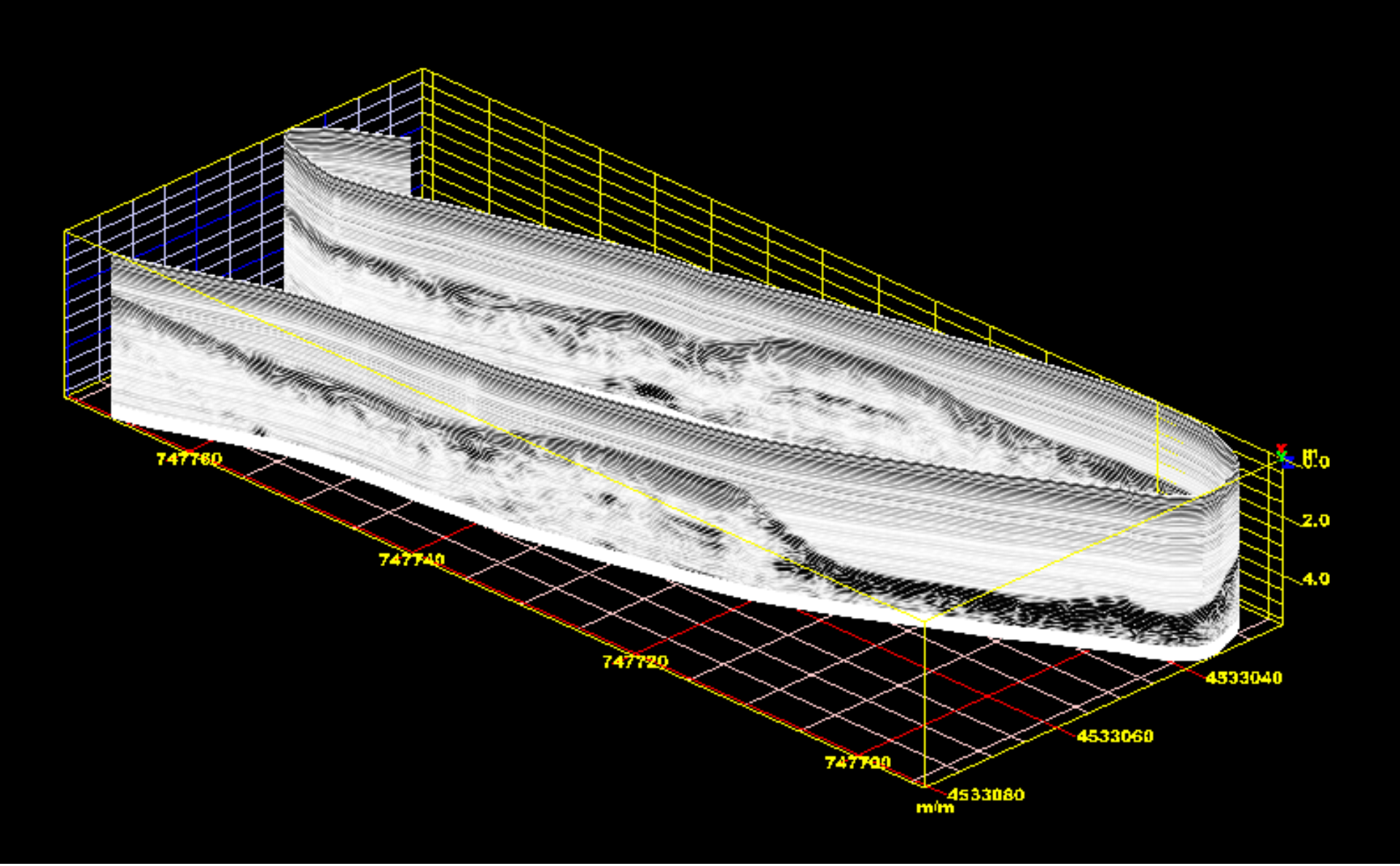
Frpm, Reductions in Acidic Wet Deposition Following Implementation of the Clean Air Act Amendments of 1990: 1995-2006
Authors: James A. Lynch, Hunter C. Carrick, Kevin S. Horner, Jeffrey W. Grimm

Interpolated Wet Hg Deposition



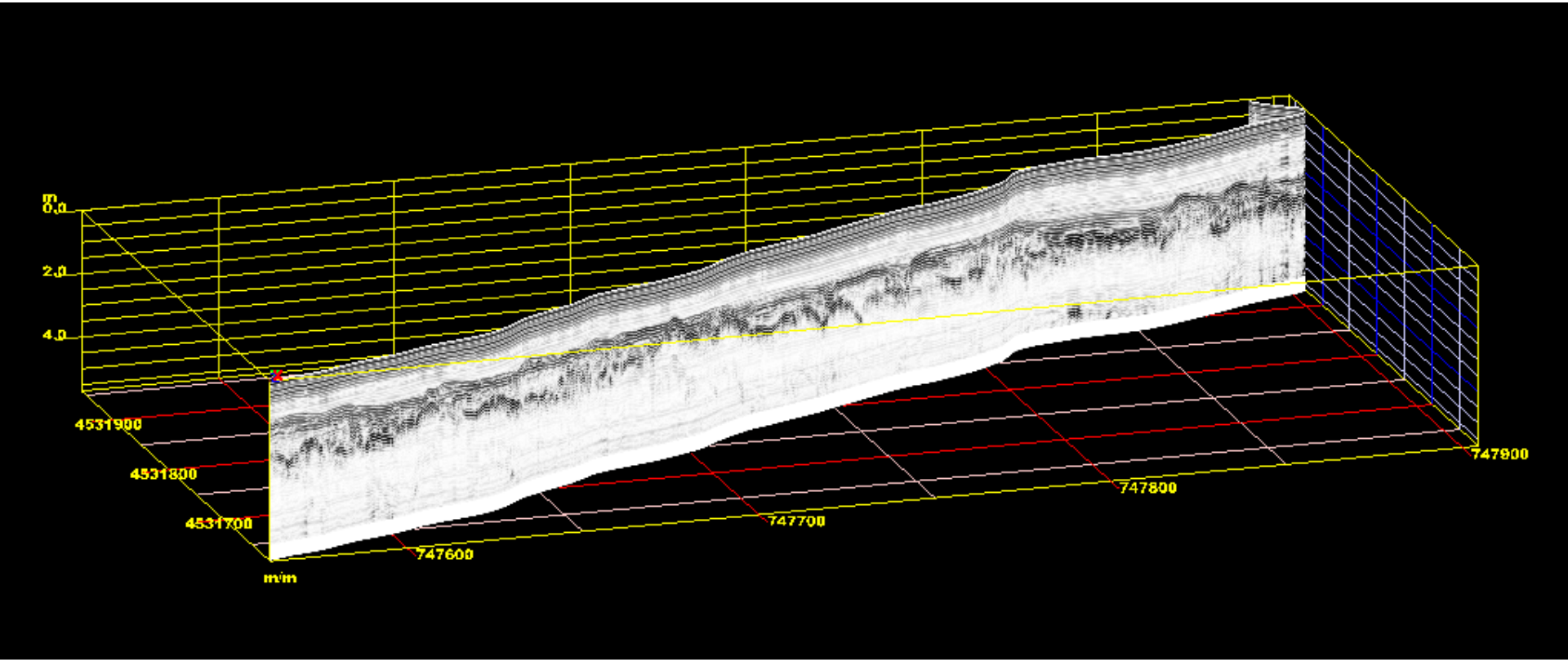

< 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
2.5 - 3.0
3.0 - 3.5
3.5 - 4.0
> 4.0
Google


0.0
1.5
3.0
0.0
1.5
3.0
A
B
C
D
B
C
D
0
100
200



Deeper Water Section

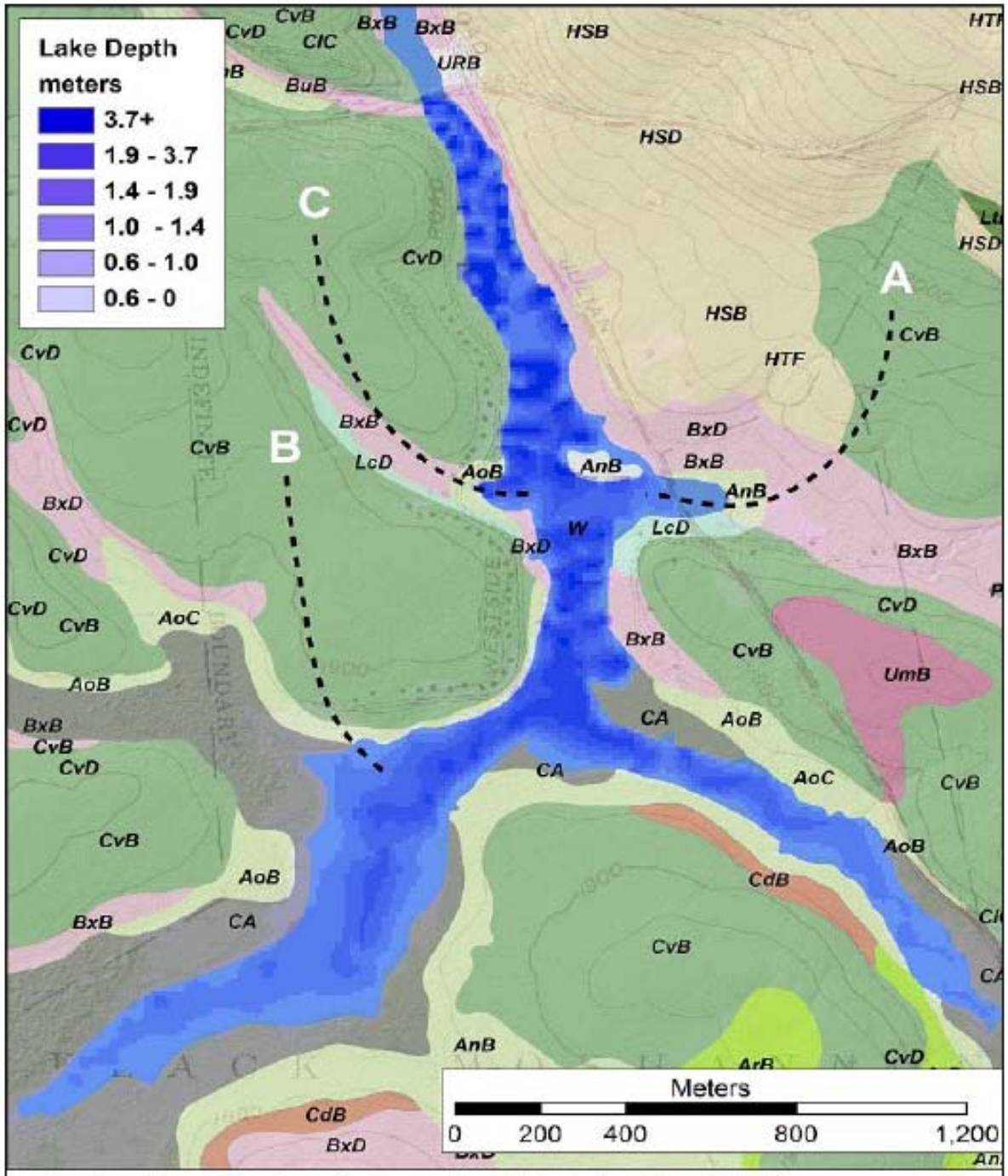
Less silt and organic carbon, Wassents



Shallow Water Section

More silt and organic carbon, Wassists

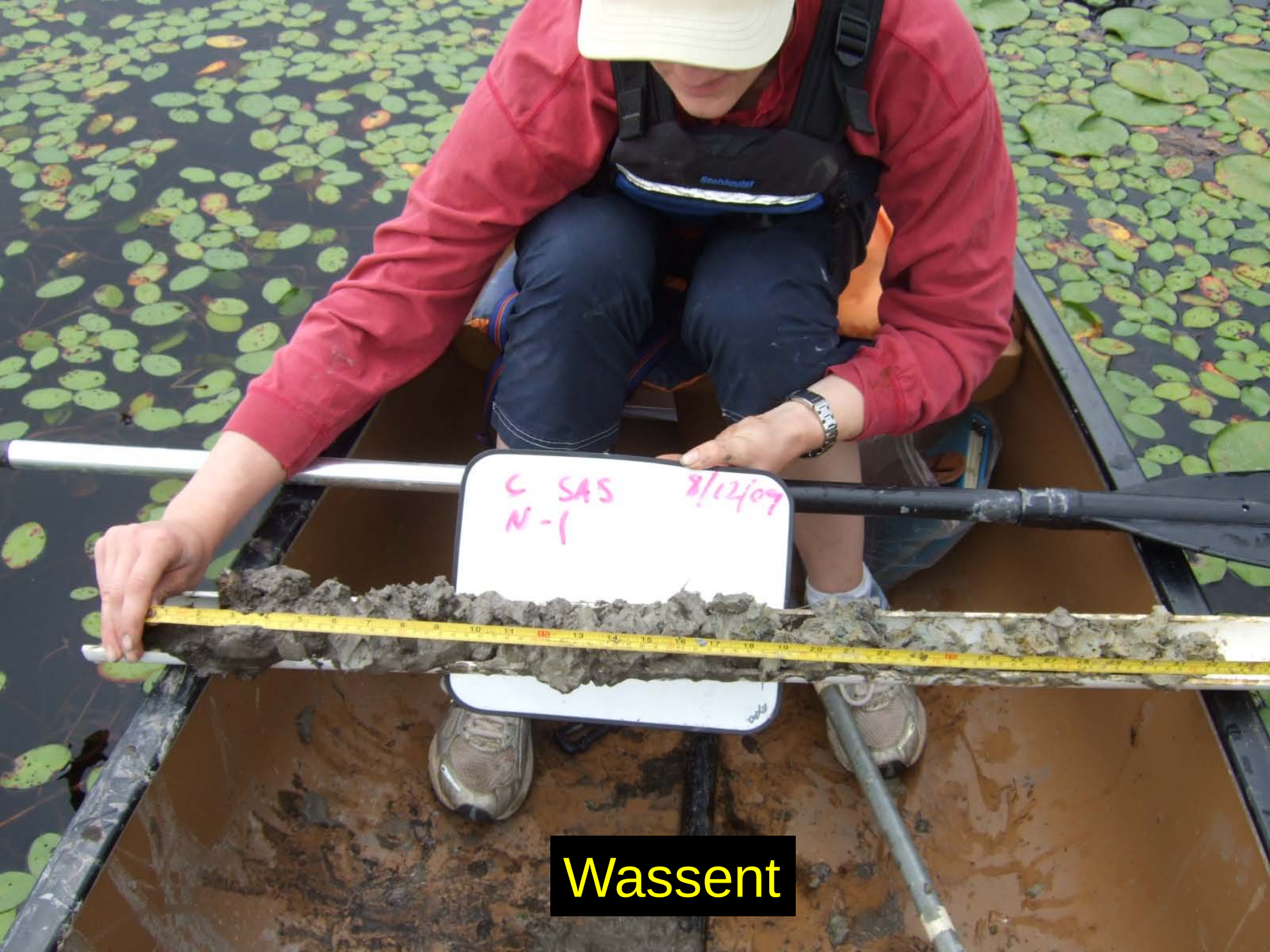
Black Moshannon Lake



Lake depth derived using a natural breaks classification.

2. Landscape Legacy

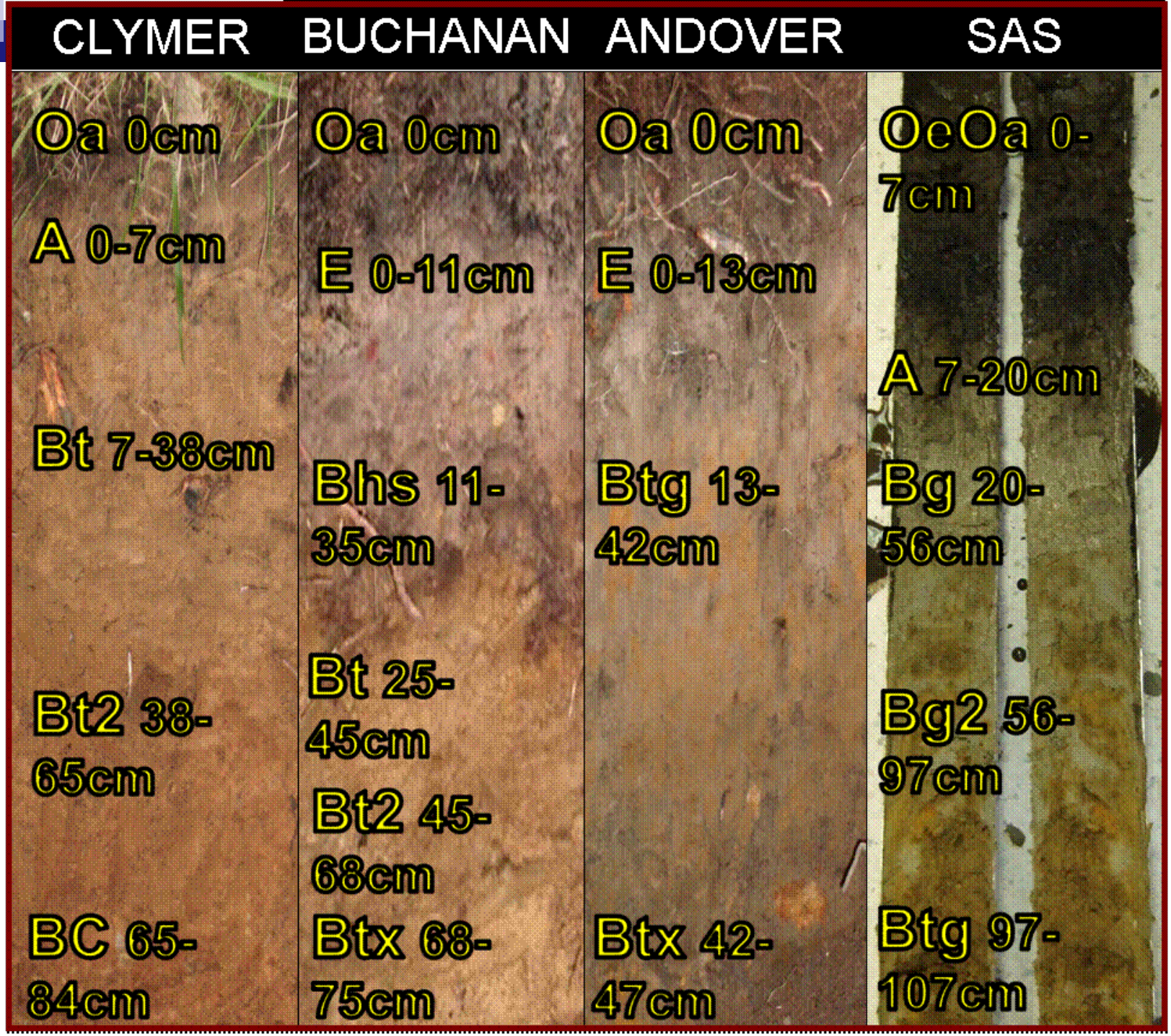
Figure 2-3. Cutting a large American chestnut tree on the Fernow at Fork Mountain circa 1905. (Courtesy William Pennington)

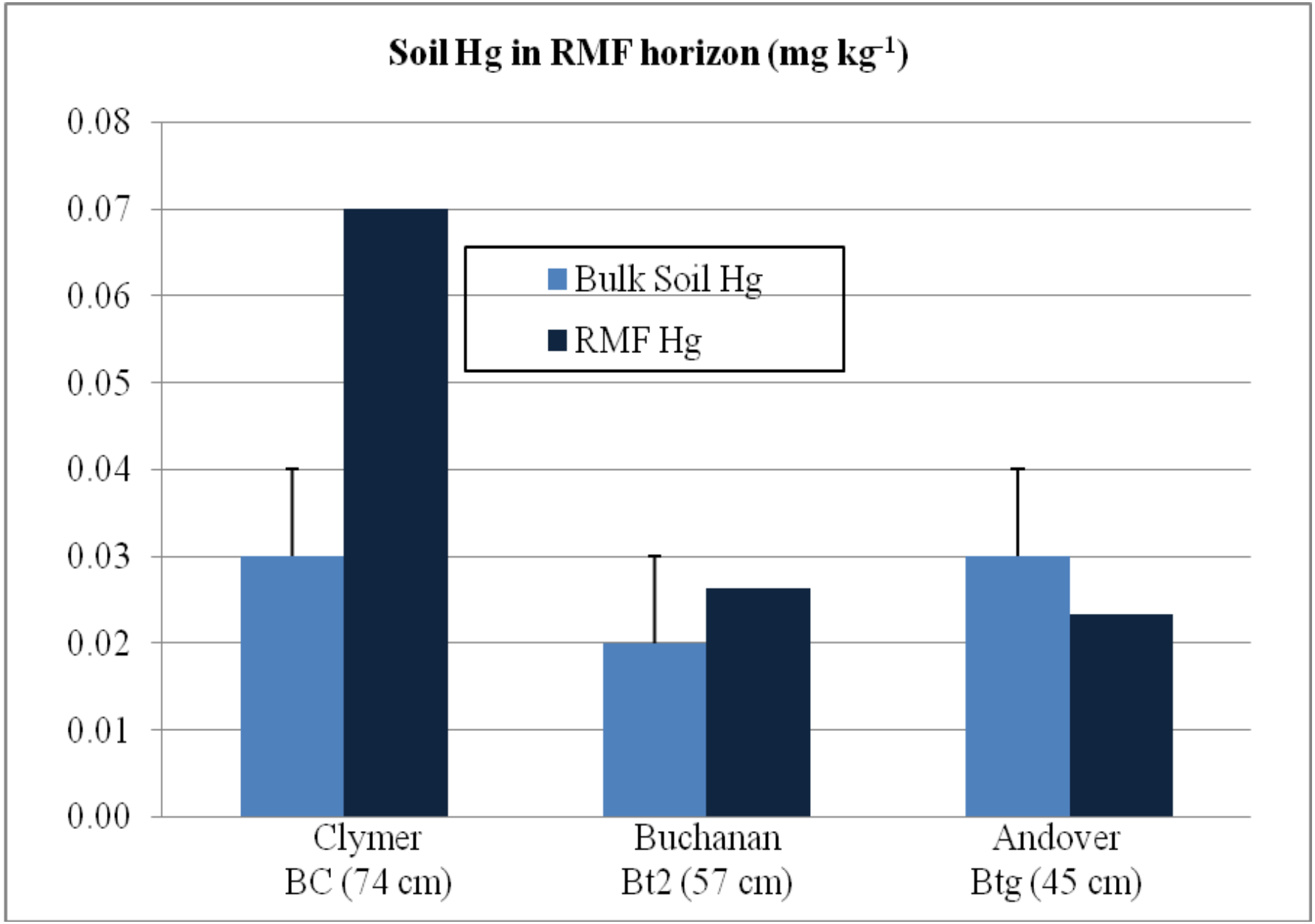


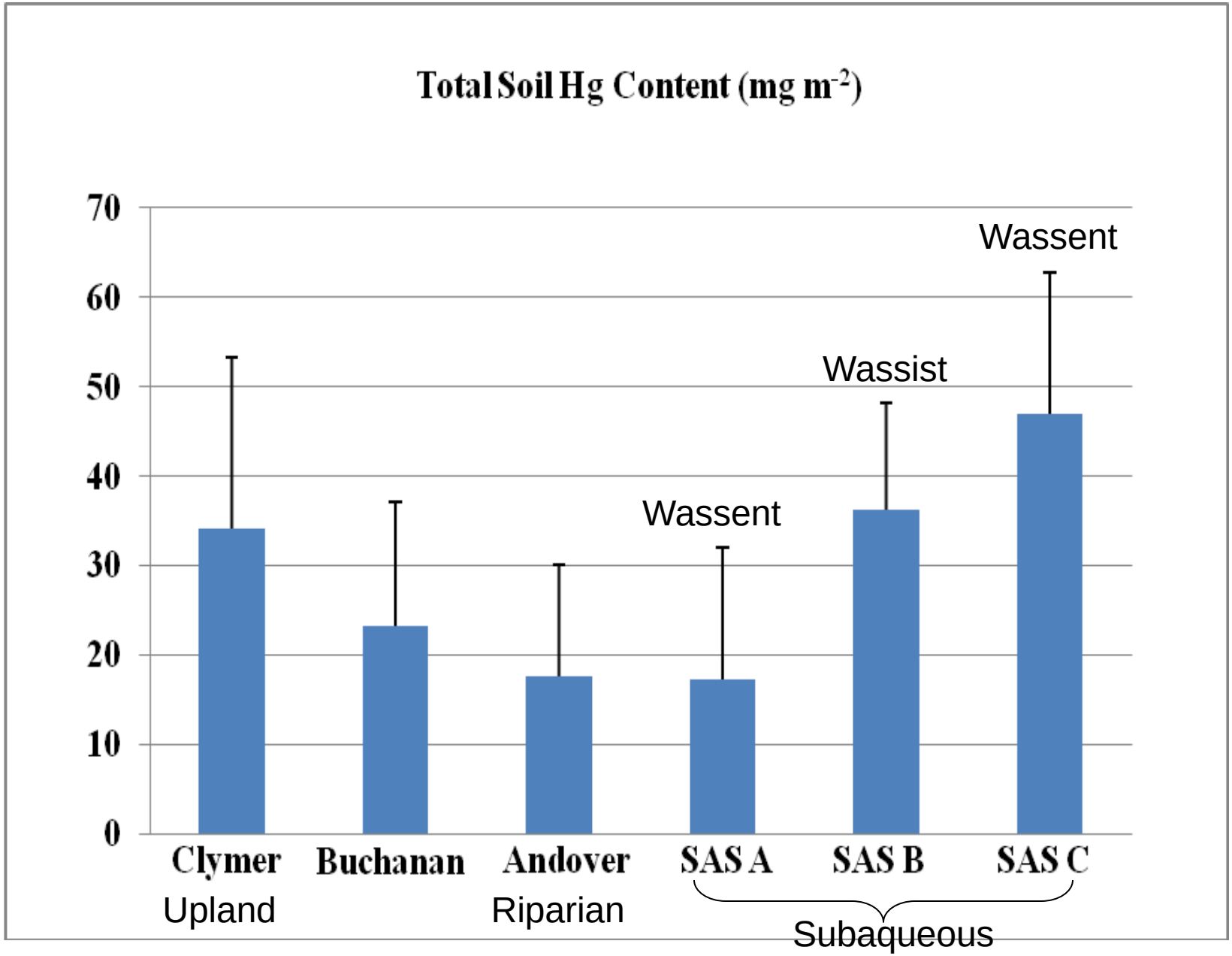
Wassent

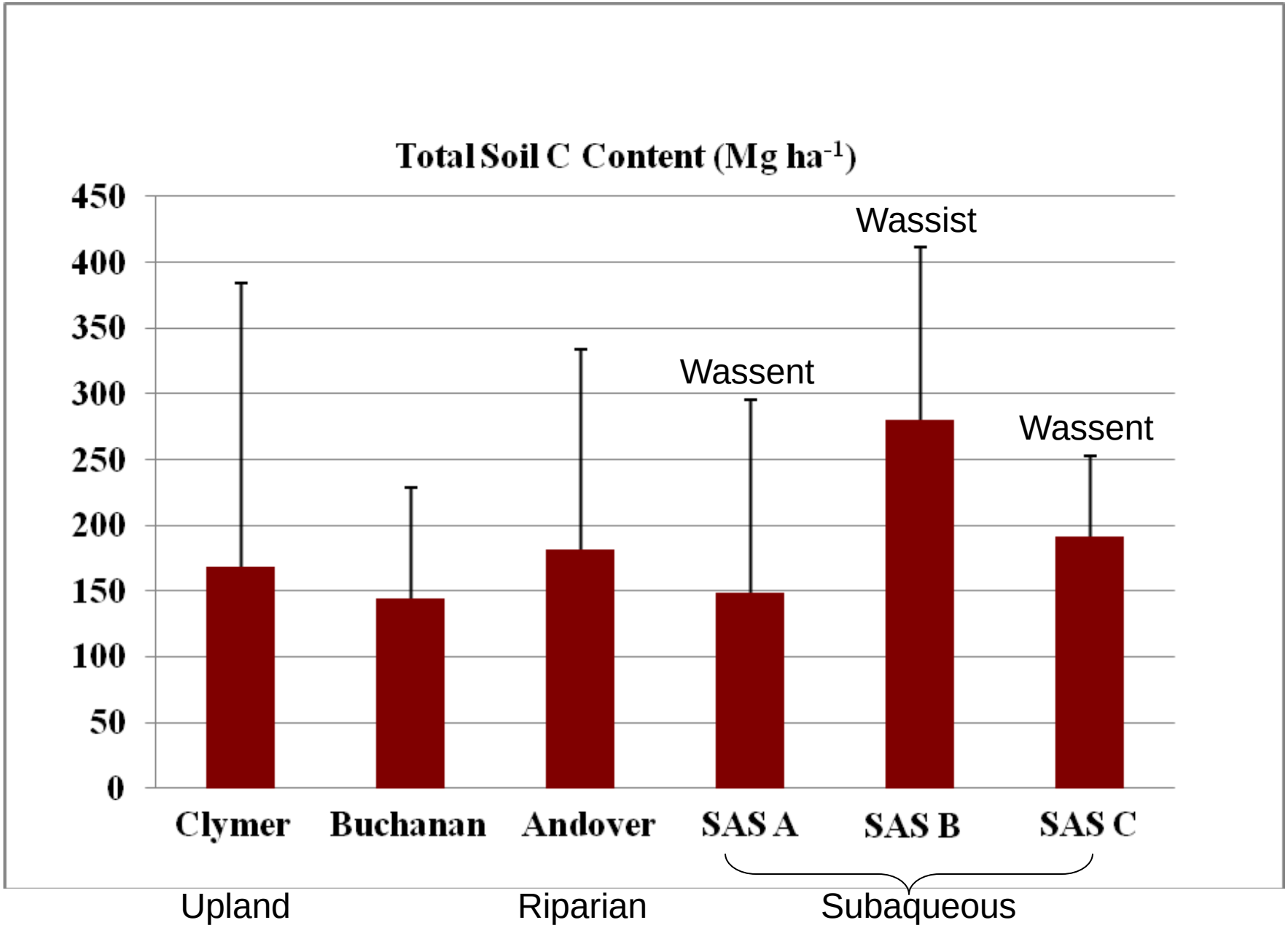
Wassist

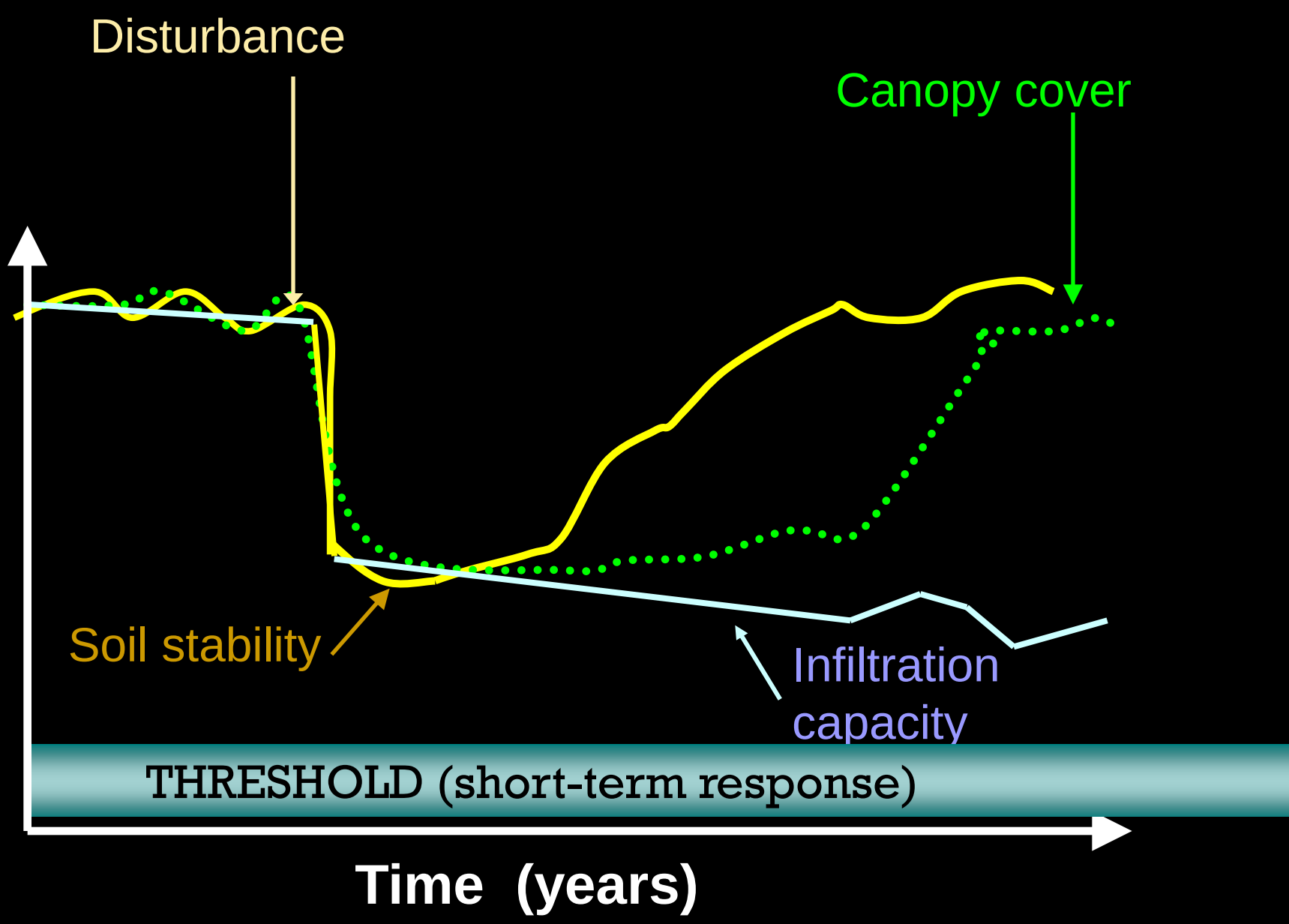
B. SAS 3
Bx formed in Andover series
Wassent


CLYMER
BUCHANAN
ANDOVER
SAS
Oa 0cm
A 0-7cm
Bt 7-38cm
Bt2 38-65cm
BC 65-84cm
Oa 0cm
E 0-11cm
Bhs 11-35cm
Bt 25-45cm
Bt2 45-68cm
Btx 68-75cm
Oa 0cm
E 0-13cm
Btg 13-42cm
Btx 42-47cm
OeOa 0-7cm
A 7-20cm
Bg 20-56cm
Bg2 56-97cm
Btg 97-107cm

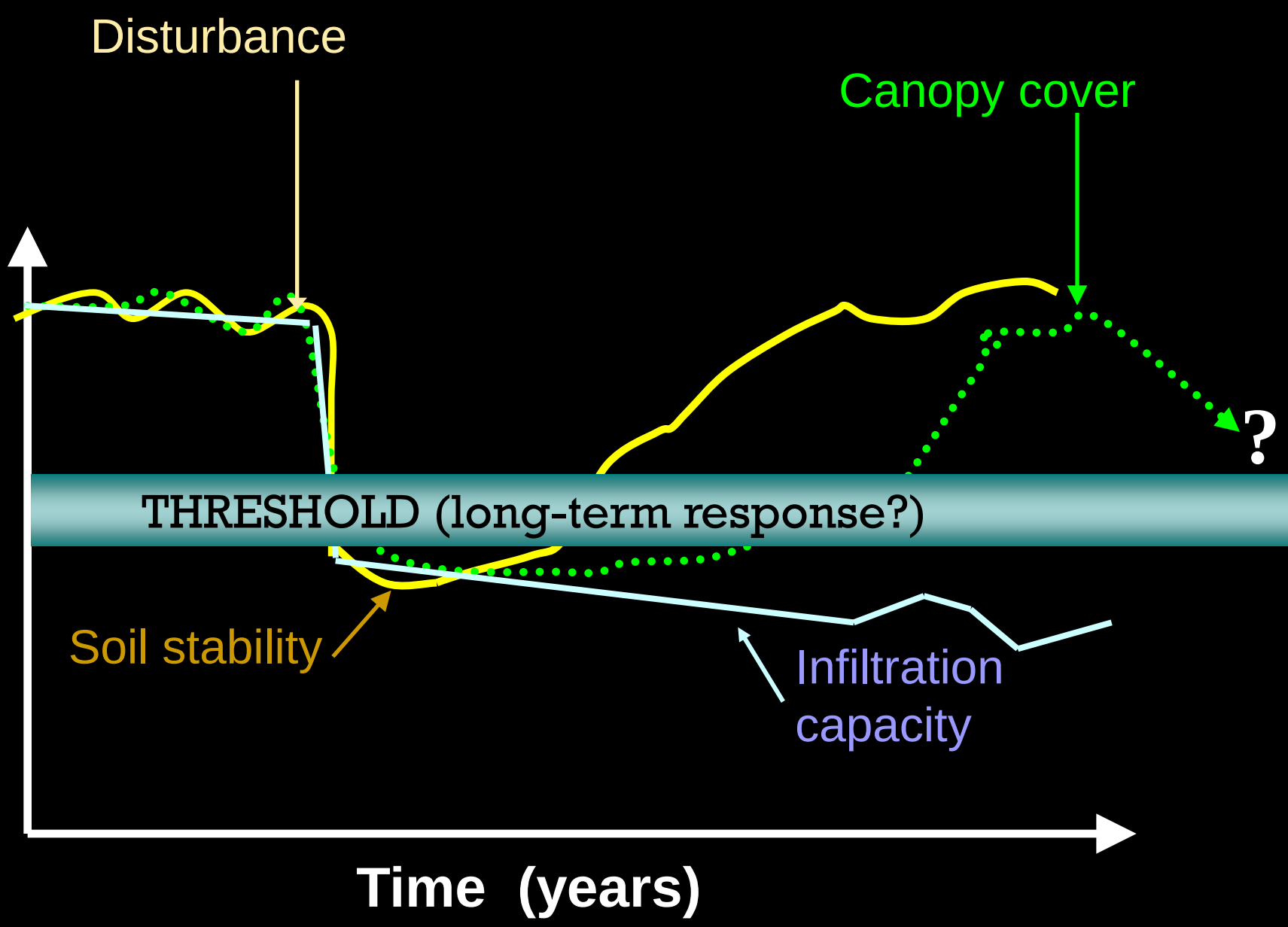

Soil Hg in RMF horizon (mg kg-1)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Bulk Soil Hg
RMF Hg
Clymer
BC (74 cm)
Buchanan
Bt2 (57 cm)
Andover
Btg (45 cm)


Total Soil Hg Content (mg m-2)
70
60
50
40
30
20
10
0
Wassent
Wassist
Wassent
Clymer
Buchanan
Andover
SAS A
SAS B
SAS C
Upland
Riparian
Subaqueous

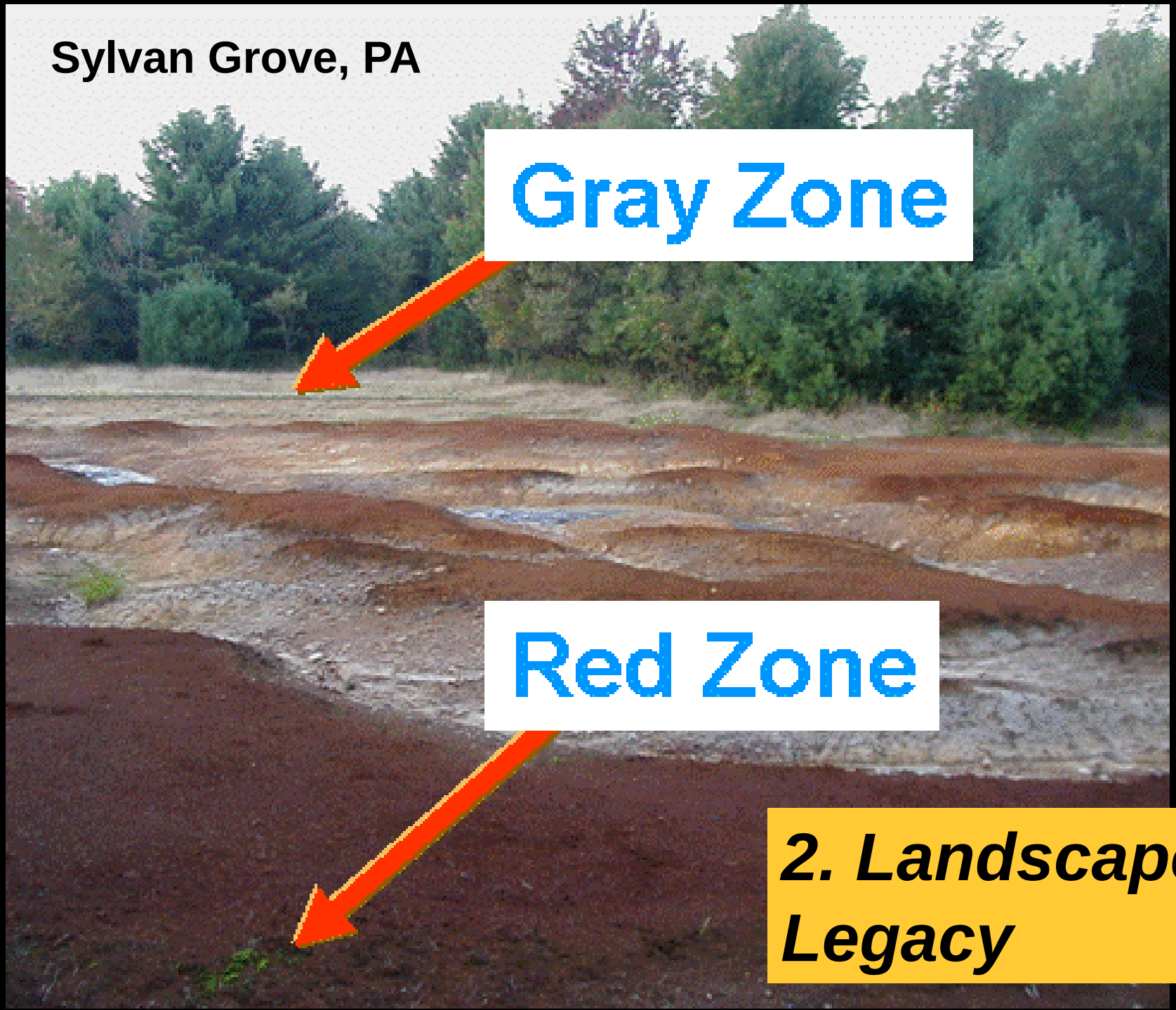

Total Soil C Content (Mg ha-1)
450
400
350
300
250
200
150
100
50
0
Wassist
Wassent
Wassent
Clymer
Buchanan
Andover
SAS A
SAS B
SAS C
Upland
Riparian
Subaqueous



Jeff Herrick
USDA-ARS Jornada Experimental Range



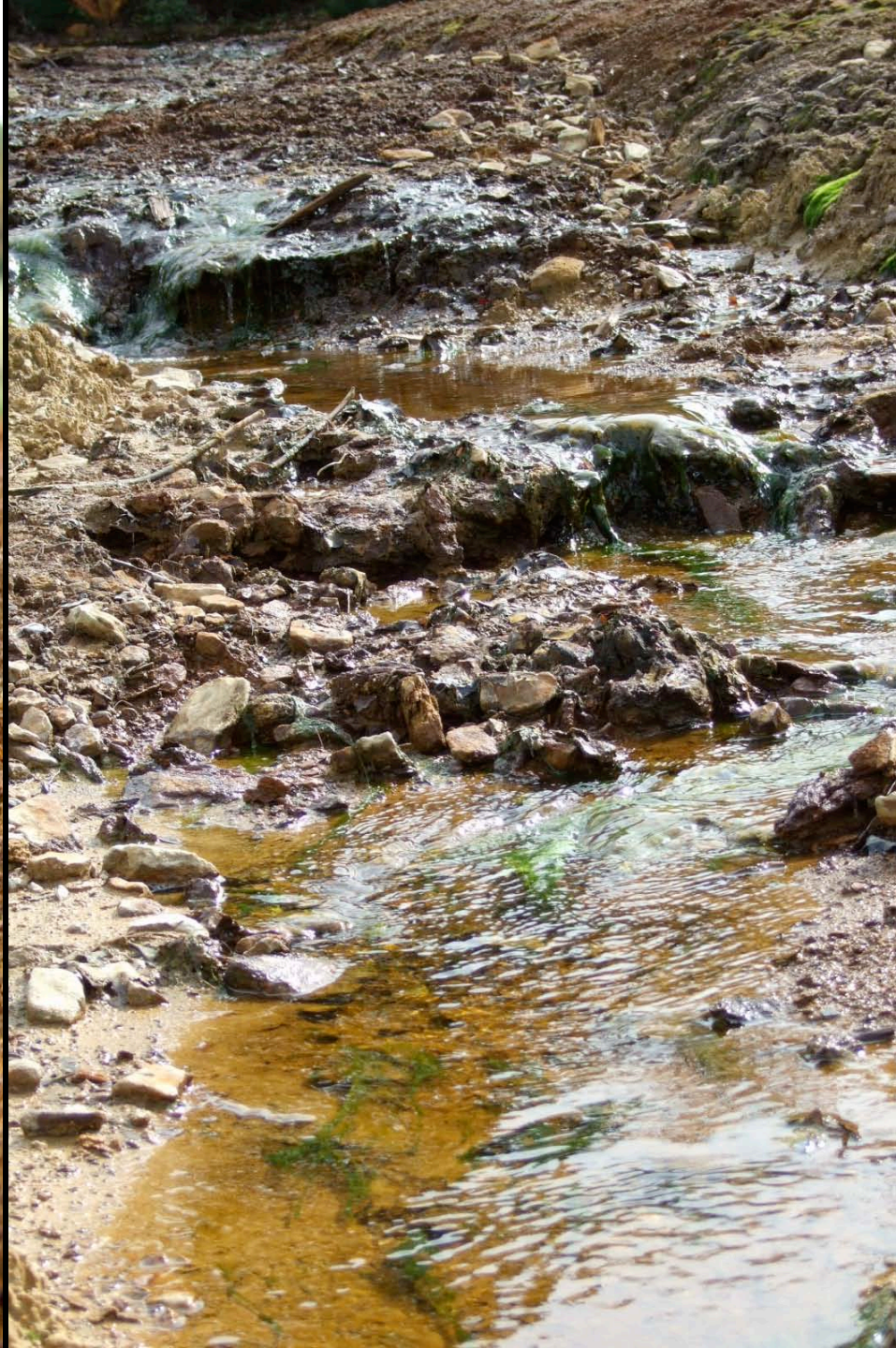
Jeff Herrick
USDA-ARS Jornada Experimental Range

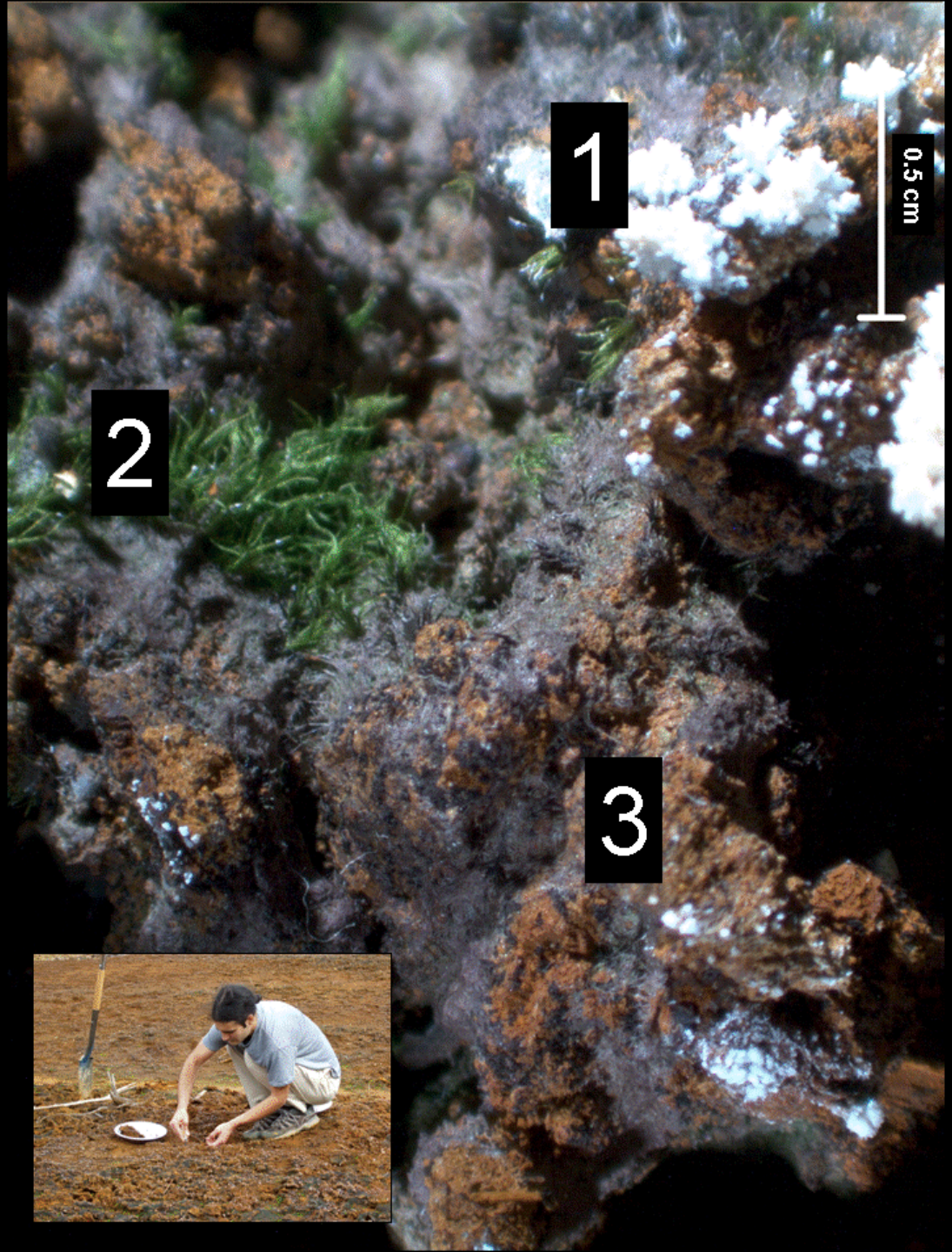


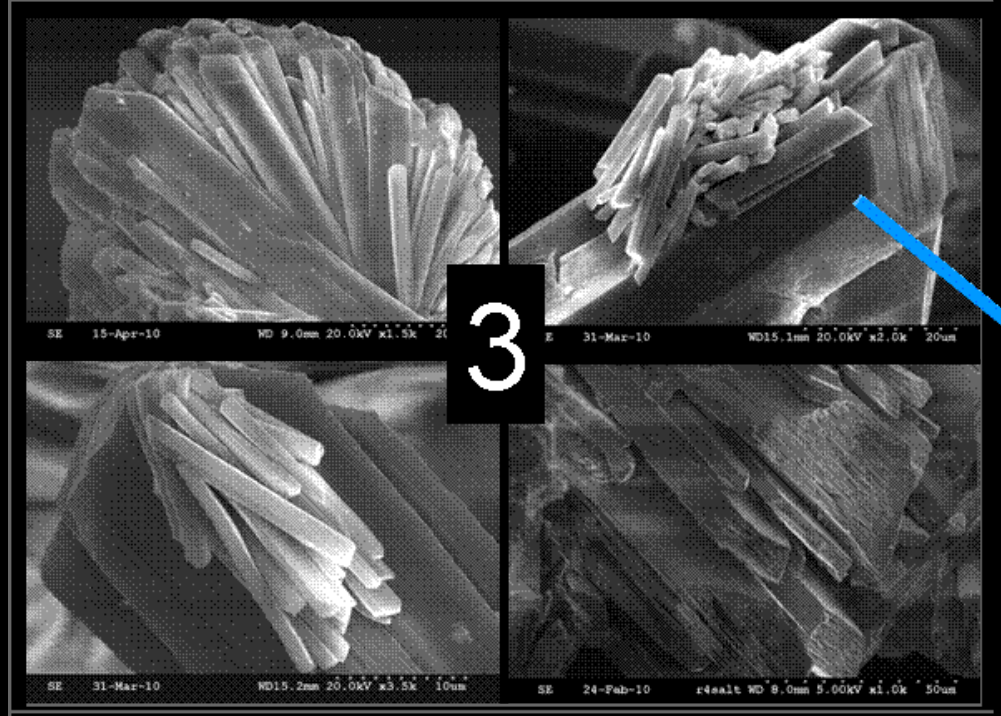
2. Landscape Legacy

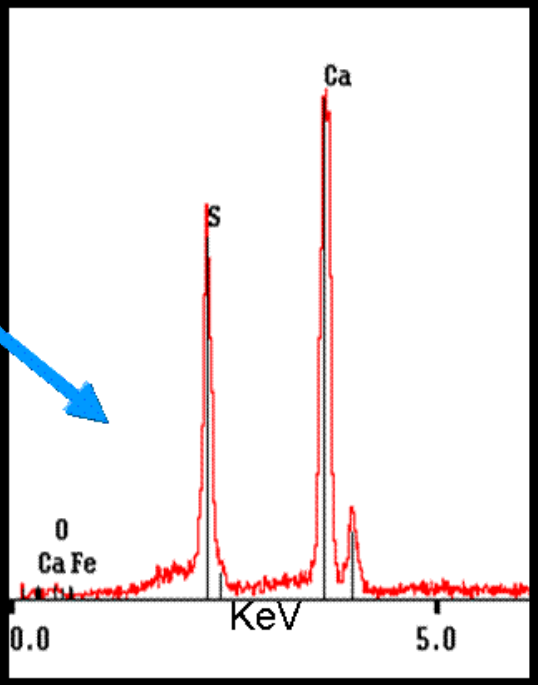
Appropriate for State and
Transition Modeling and
Ecological Site Description?

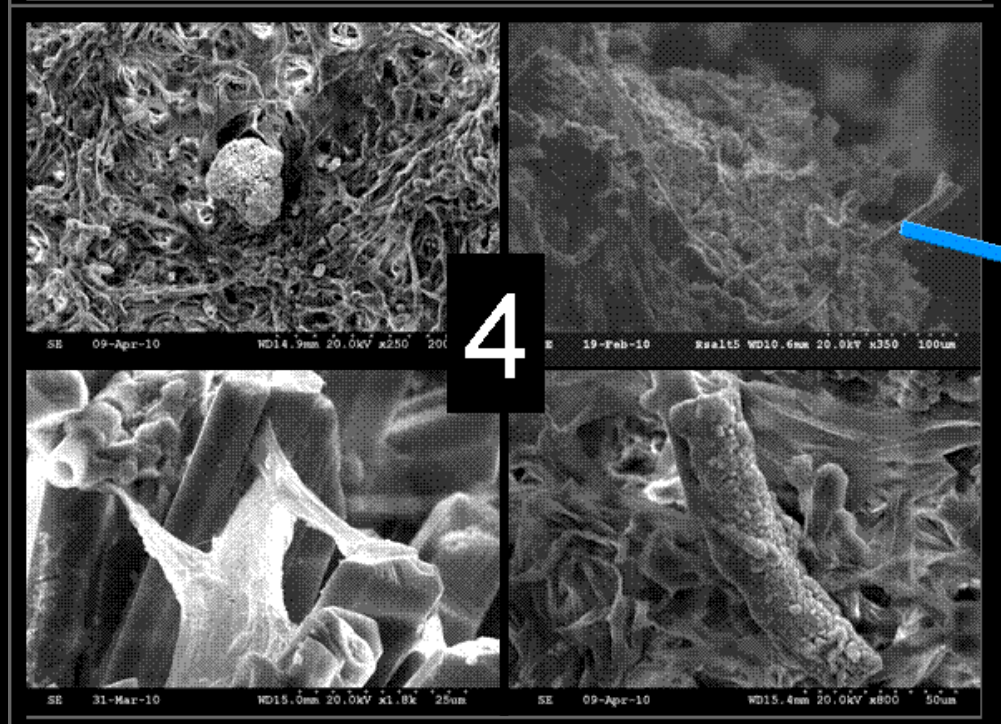
AMD Surface Crusts

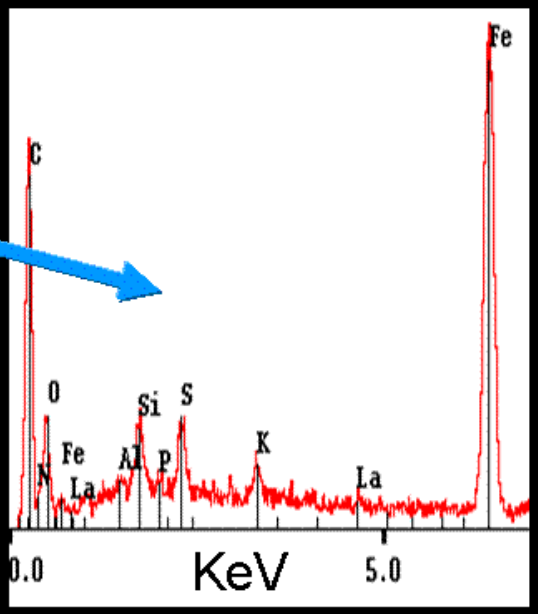


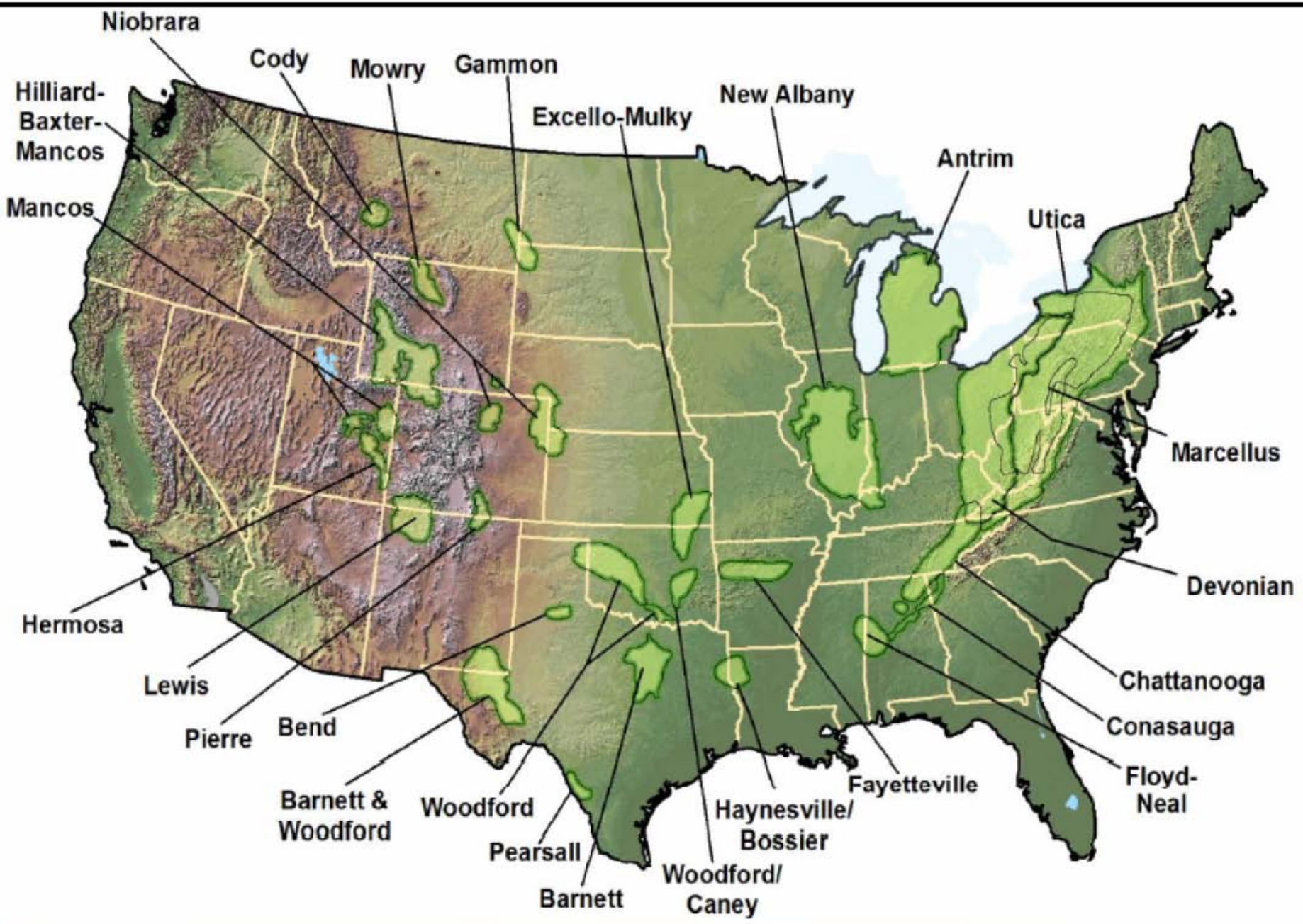

1
2
3
0.5 cm


3


Ca
S
O
Ca Fe
0.0
KeV
5.0


4

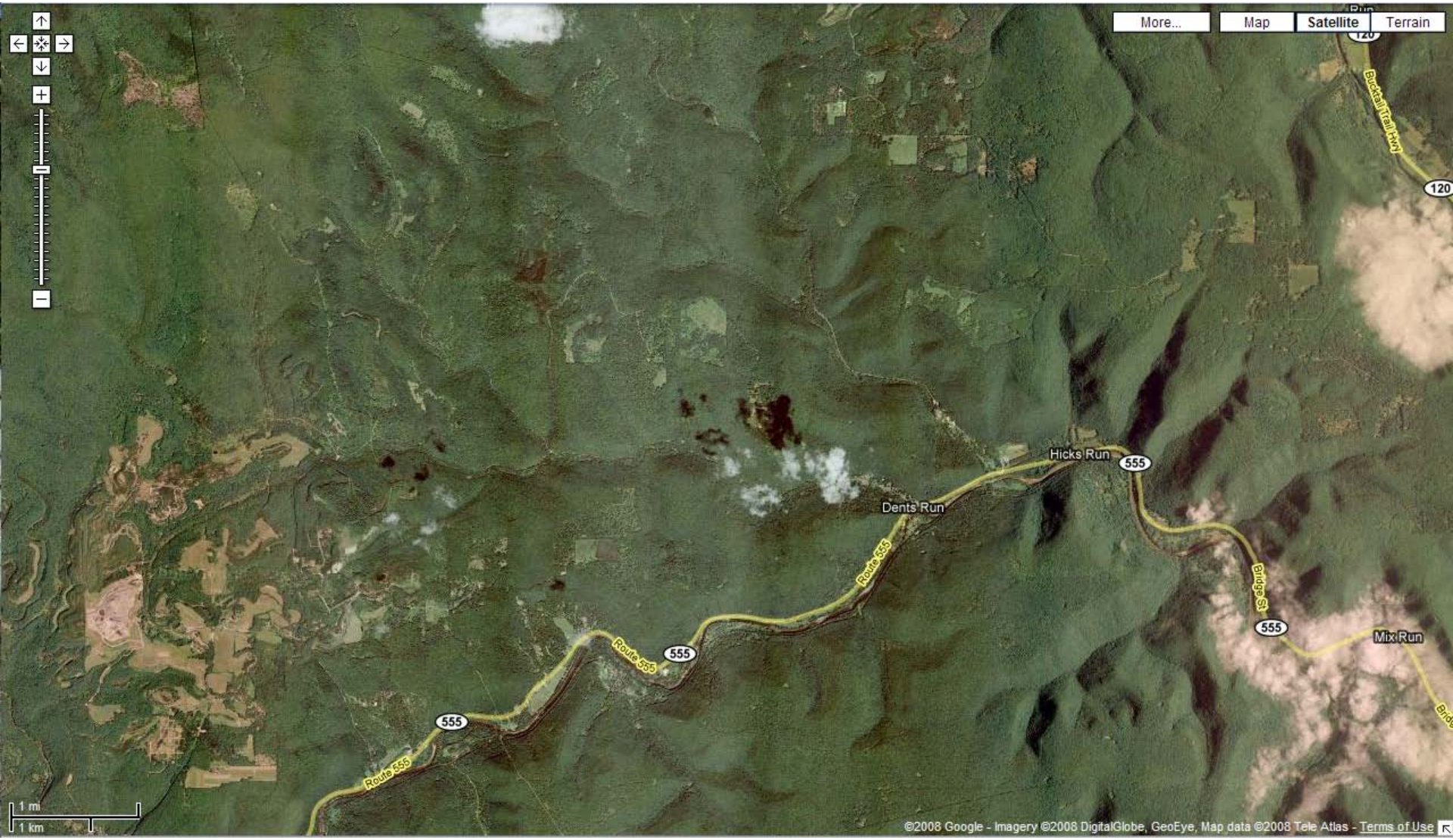

Fe
C
O
Si
S
Fe
La
Al
P
K
La
0.0
KeV
5.0



U.S. Department of Energy, U.S. Shale Basins

RANGE RESOURCES

Current Landscape

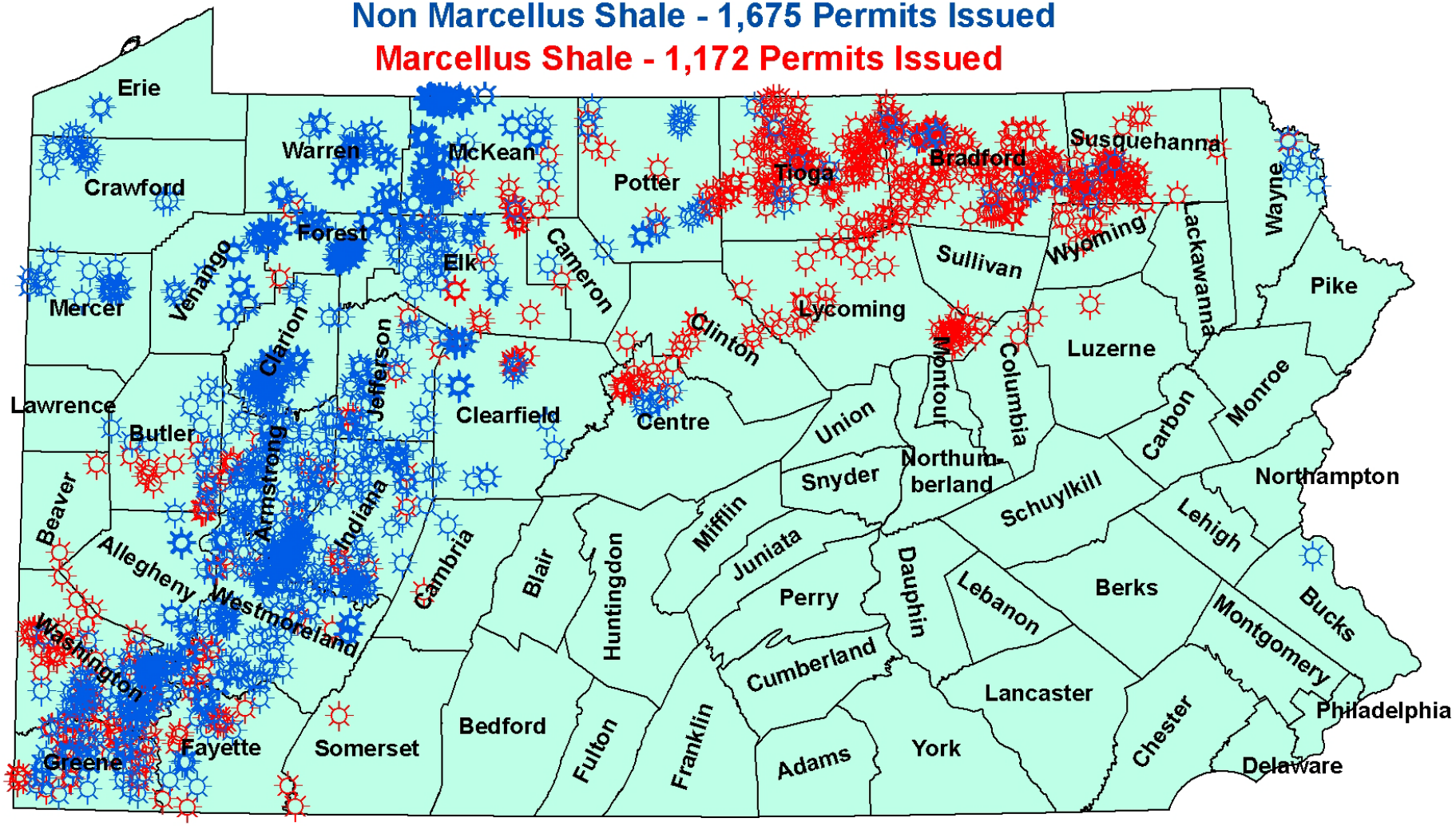


Department of Environmental Protection
Bureau of Oil and Gas Management
Well Permits Issued

Total Permits Issued January thru May 2010 - 2,847

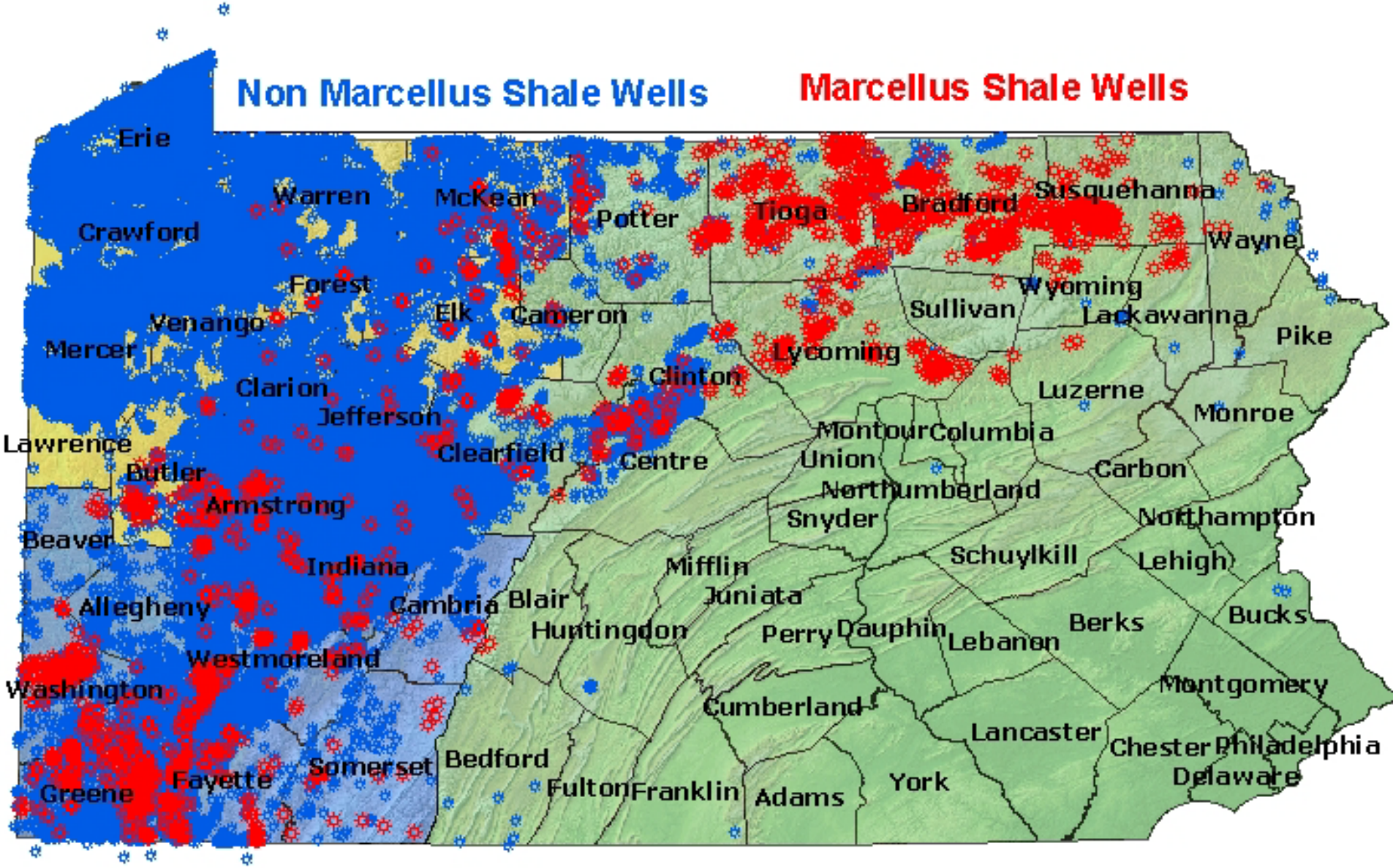
Non Marcellus Shale - 1,675 Permits Issued

Marcellus Shale - 1,172 Permits Issued

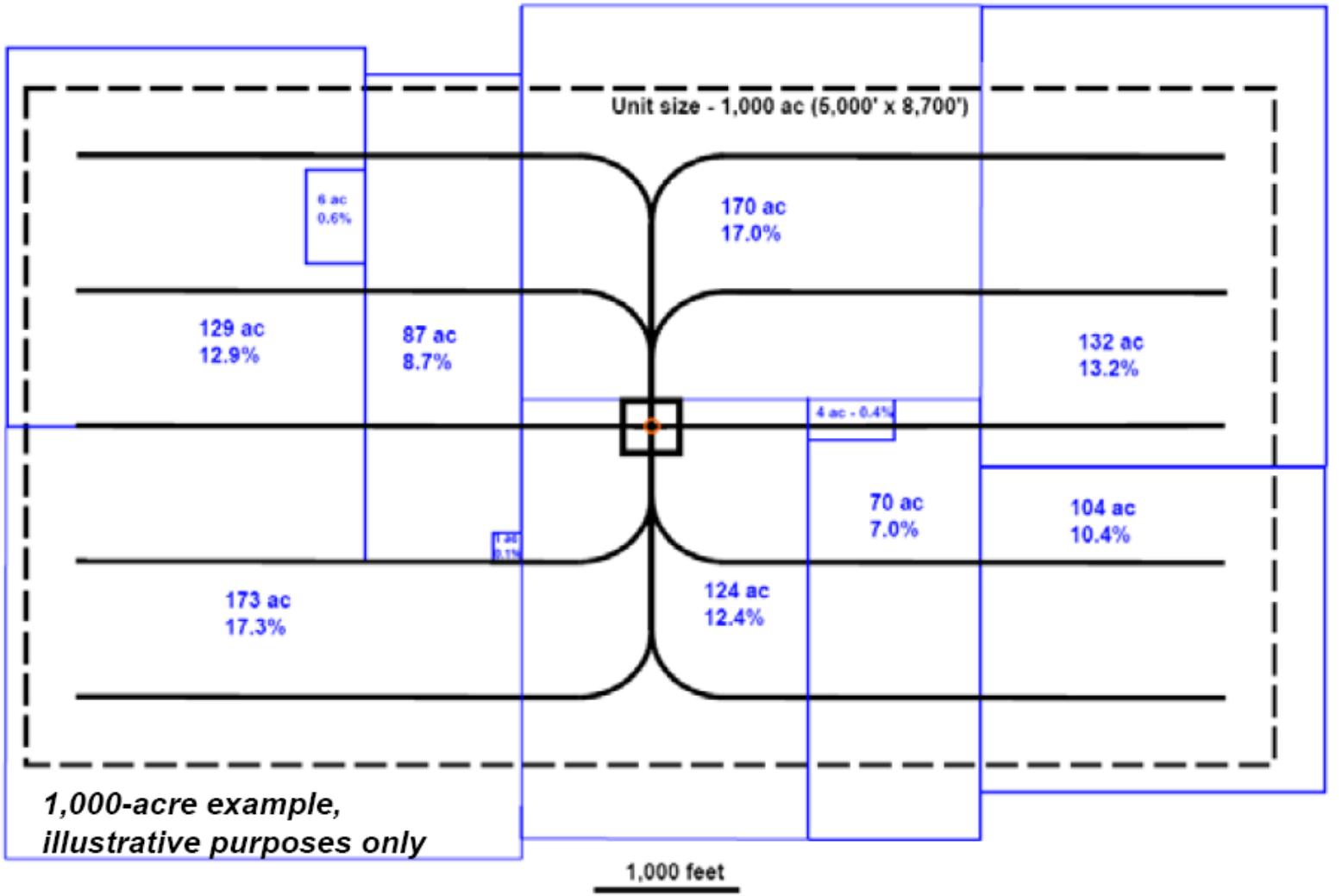


Updated 06/03/2010

Active Non Marcellus & Marcellus Shale Wells



Pooling Leases



Royalties are divided in proportion to the percentage of land that each land tract contributes to the total unit

RANGE RESOURCES

Dust

3 Disturbance Components to Well Drilling

1. Land clearing
2. Road shaping
3. Pad Shaping
4. Removal and rehabilitation

3 weeks
Native siltstone
Soil pH change
Limestone cover rock

3 weeks
CASE
CASE

Staging area, 1.5 football fields could fit here.

4 m

Soil sealing

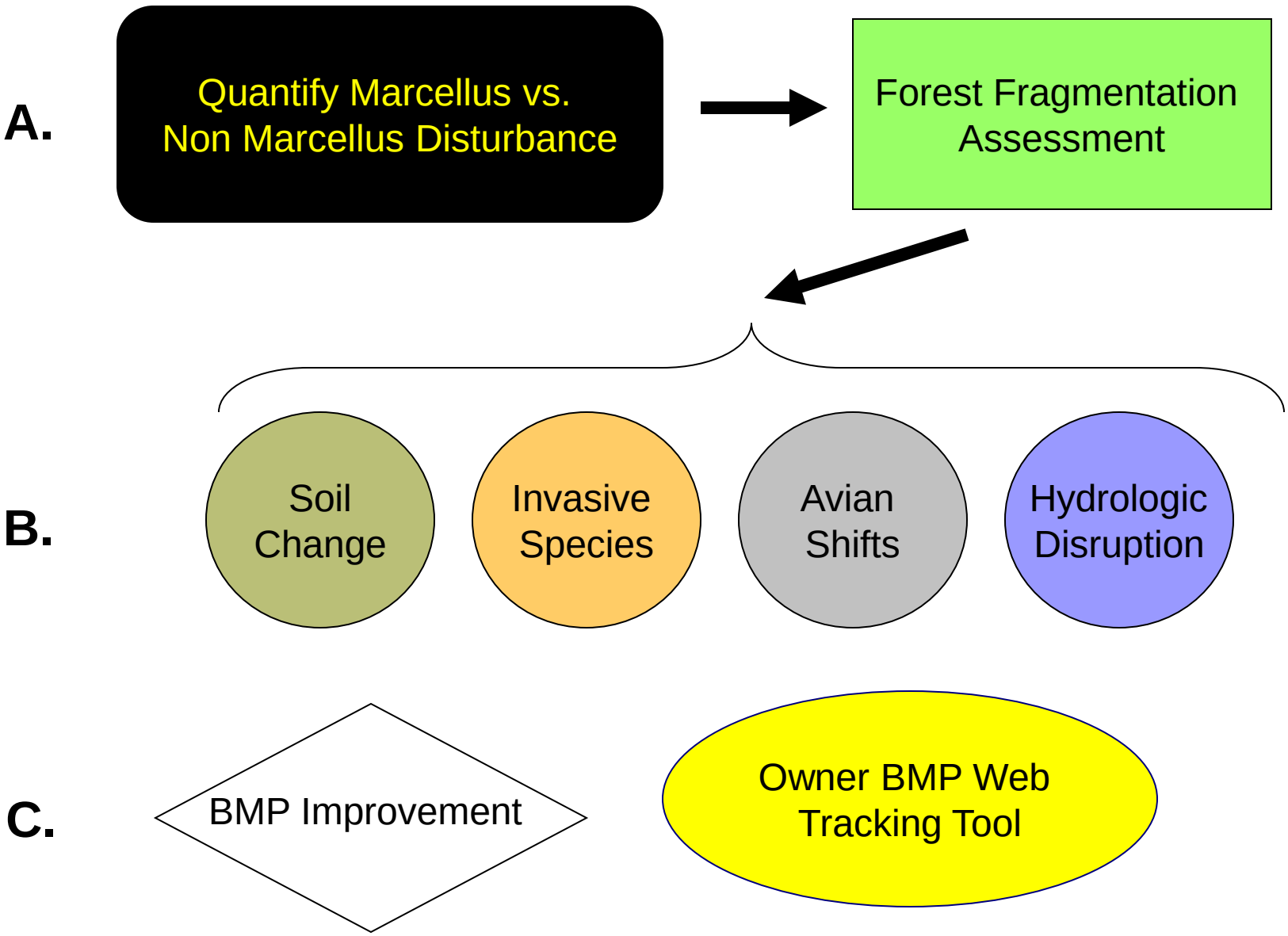
Water ferrying pond

Appropriate for State and Transition Modeling and Ecological Site Description?

Edge Effects

Landscape Change Study;
Improvement of BMPS

- Carbon, 5 cm and 30 cm
- Infiltration
- Surface bulk density
- Penetration resistance
- Downslope hydrologic changes
- Avian population survey
- Forest fragmentation


A.
Quantify Marcellus vs. Non Marcellus Disturbance
Forest Fragmentation Assessment
B.
Soil Change
Invasive Species
Avian Shifts
Hydrologic Disruption
C.
BMP Improvement
Owner BMP Web Tracking Tool

Questions?