

Carbon farming – facts and fiction

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- Management practices modify decomposition rates e.g. tillage, grazing, crop selection

Options for Mitigating Global Warming

- **Soil carbon sequestration**
 - Soils = 2-4 x atmospheric C
 - Soils = 4 x vegetation C
 - 3rd largest sink (after oceans & geological sinks)
 - Co-benefits – improved soil structure & nutrition, less erosion
 - WIN-WIN

Soil Carbon Sequestration

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 - Protect ecosystems – e.g. US Conservation Reserve Program (CRP)
 - Manipulate ecosystem – e.g. reduce tillage, improved pastures

Options for Mitigating Global Warming

- Soil carbon sequestration +
- **Increase nitrogen use efficiency**
 - Only 20-70% of N is used
 - 1.25% of N applied = N₂O

Greenhouse Gas Accounting

Global Warming Potential

- A relative scale which integrates the contribution of all greenhouse gases to global warming
- $\text{CO}_2 = 1$
- $\text{CH}_4 = 23$
- $\text{N}_2\text{O} = 296$

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- $\text{CH}_4 = 23$
- $\text{N}_2\text{O} = 296$
- $\text{CO}_2\text{-e} = 1 * \text{CO}_2 + 23 * \text{CH}_4 + 296 * \text{N}_2\text{O}$
- $\text{C} = \text{CO}_2\text{-e} * 12/44$

Carbon Sequestration Calculation*

1. Soil carbon change (Gross C sequestration)

*IPCC methodology

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Net carbon sequestration = 1 - (2+3+4+5)

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Assessment of the Costs and Enhanced Global Potential for Carbon Sequestration in Soils

funded by

International Energy Agency

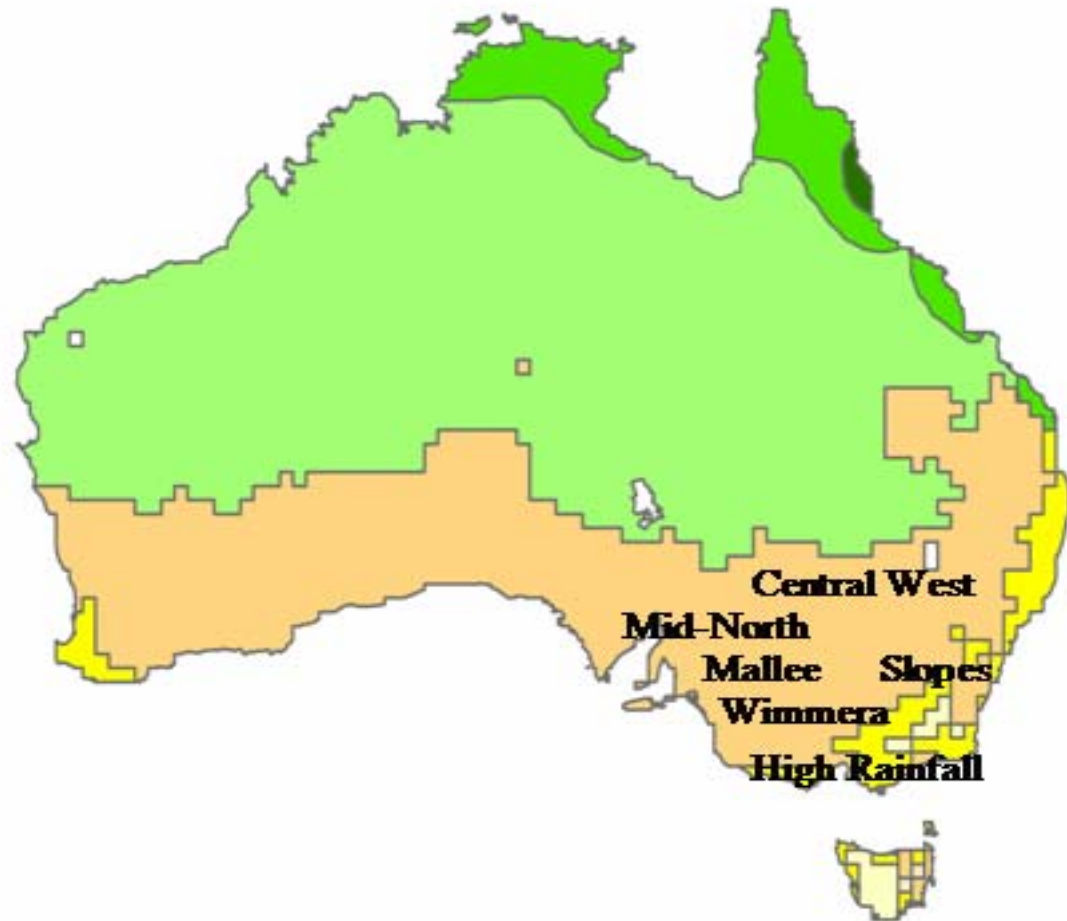
Grace, Antle, Paustian, Andren, Aggarwal et al. (2005)

Global Sequestration Study

- Five regions representing cross-section of global agro-ecologies
 - Indo-Gangetic Plain
 - Sweden
 - Kazakhstan
 - **South-Eastern Australia**
 - Uruguay

Australian Carbon Sequestration Assessment

IPCC Climate Zones

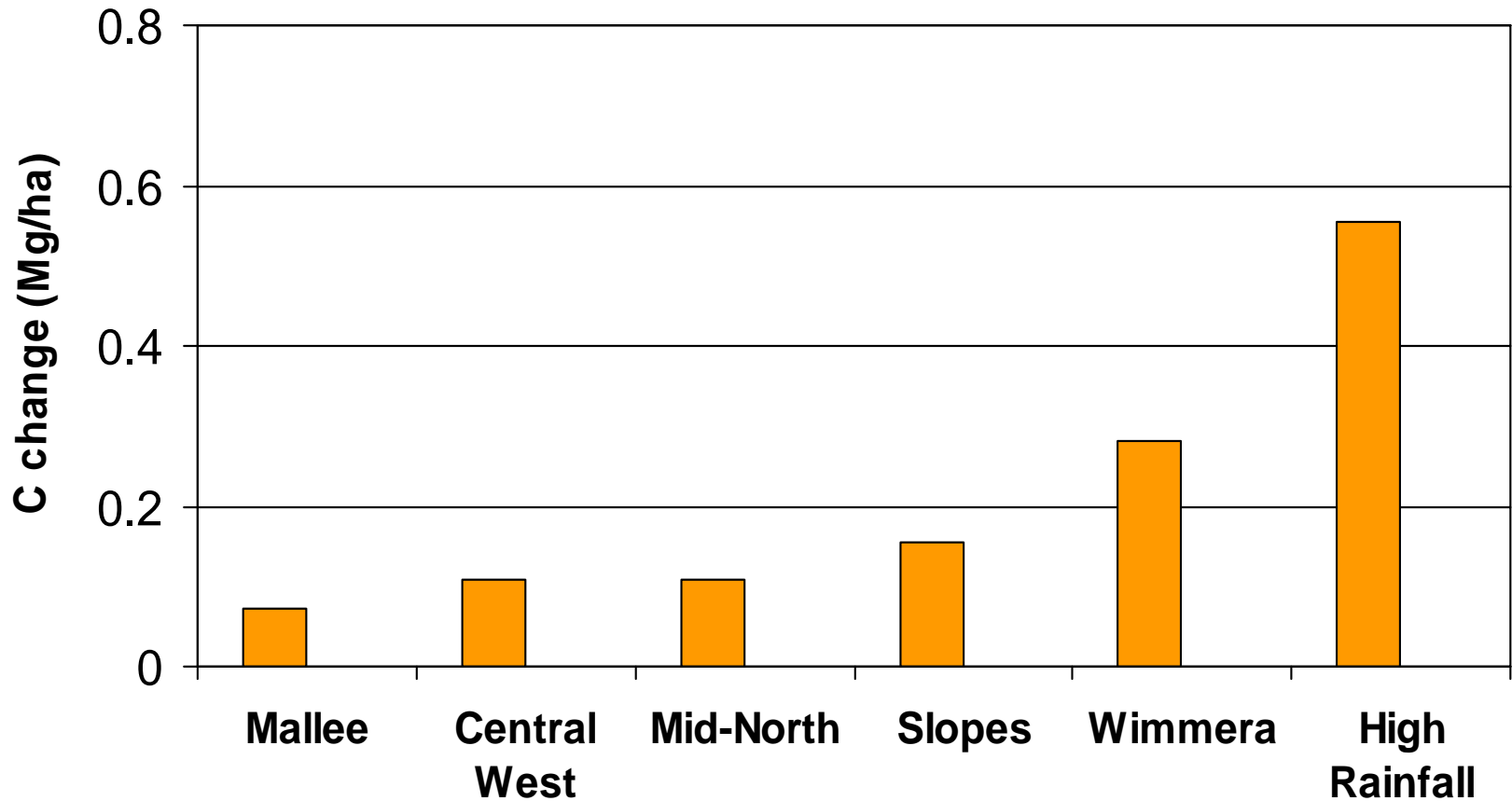


Farming Practices

Region	Rotation		Technology	
Mallee	WPLf	CONV	MIN	NOT
Wimmera	WWBCG	CONV	MIN	NOT
High Rainfall	WBCW10P	CONV	MIN	NOT
Mid-North	WCBG	CONV	MIN	NOT
Central West	WWC6PLf	CONV	MIN	
	WWBC5PLf			NOT
Slopes	WWB5PLf	CONV*		
	WWBC4PLf		MIN	
	WWBCG3PLf			NOT

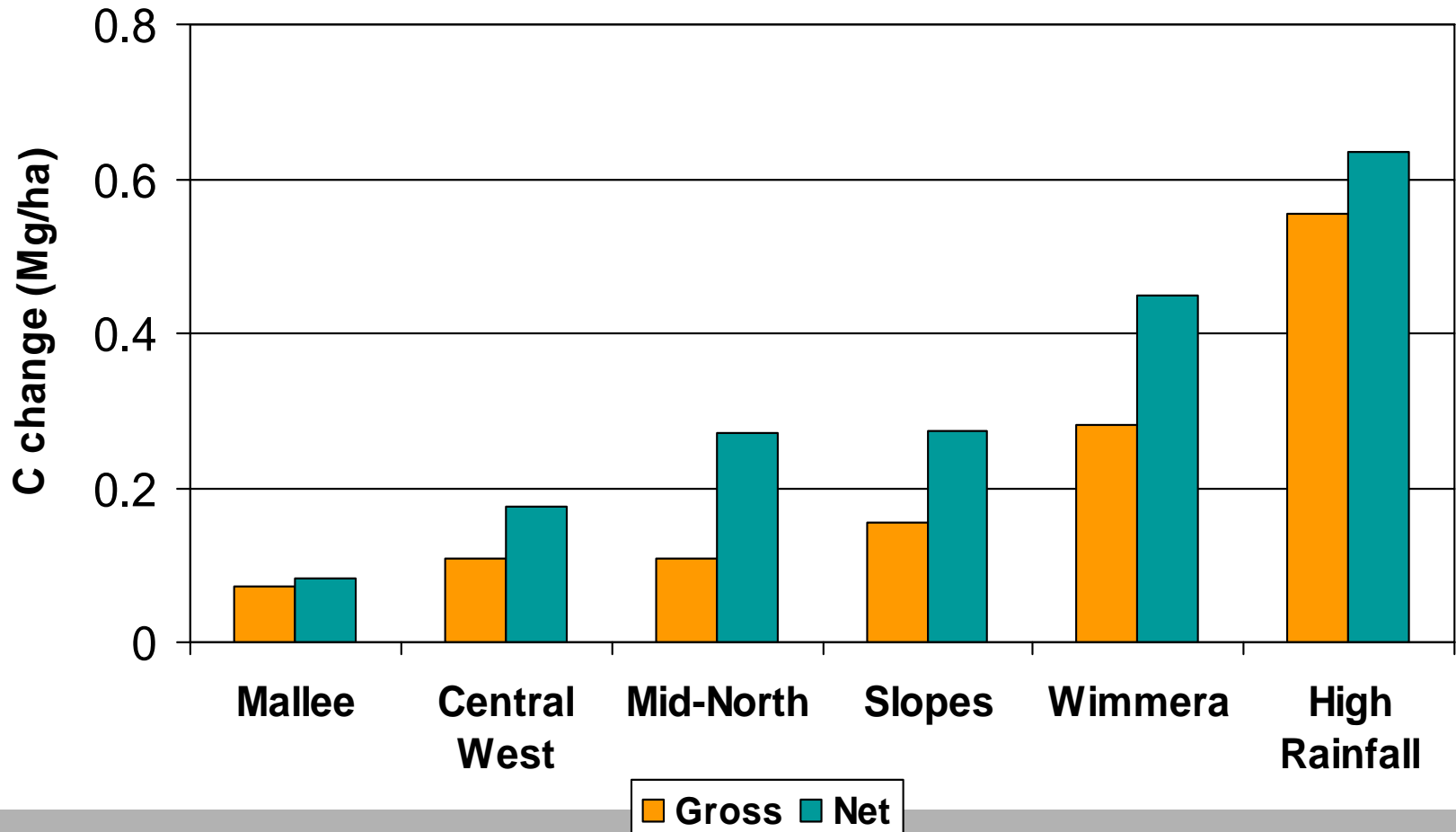
Gross Carbon Sequestration (No-till)

South-East Australia



Gross vs Net Carbon Sequestration (No-till)

South-East Australia



Carbon Supply Calculation

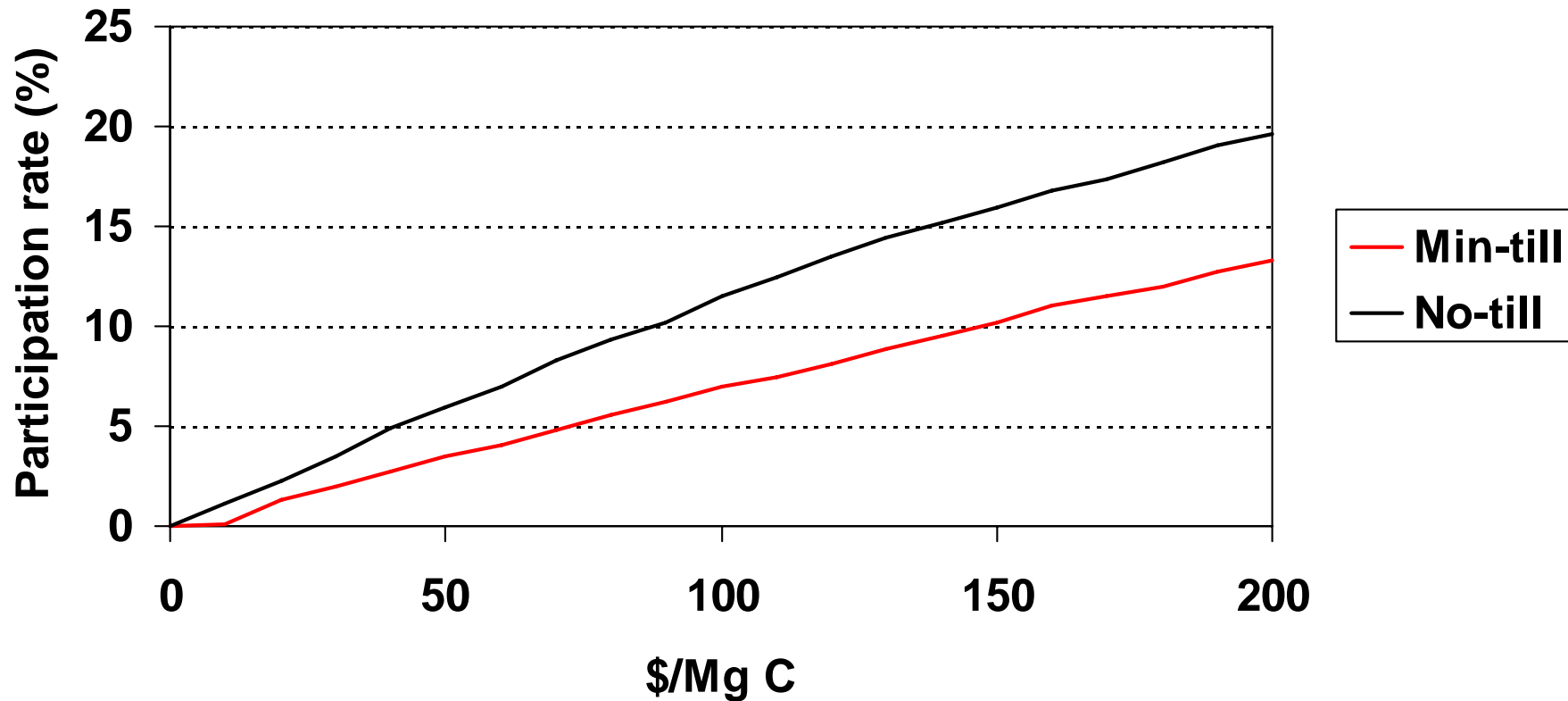
- Carbon sequestration rate
- Farmer participation rate
- Available area
- Farming costs
- Transaction costs
- Co-benefits – NOT FACTORED IN

Transaction costs e.g. Verification

- Spatial variability
- Bulk density considerations
- 1-20 soil samples/ha
- \$10/sample

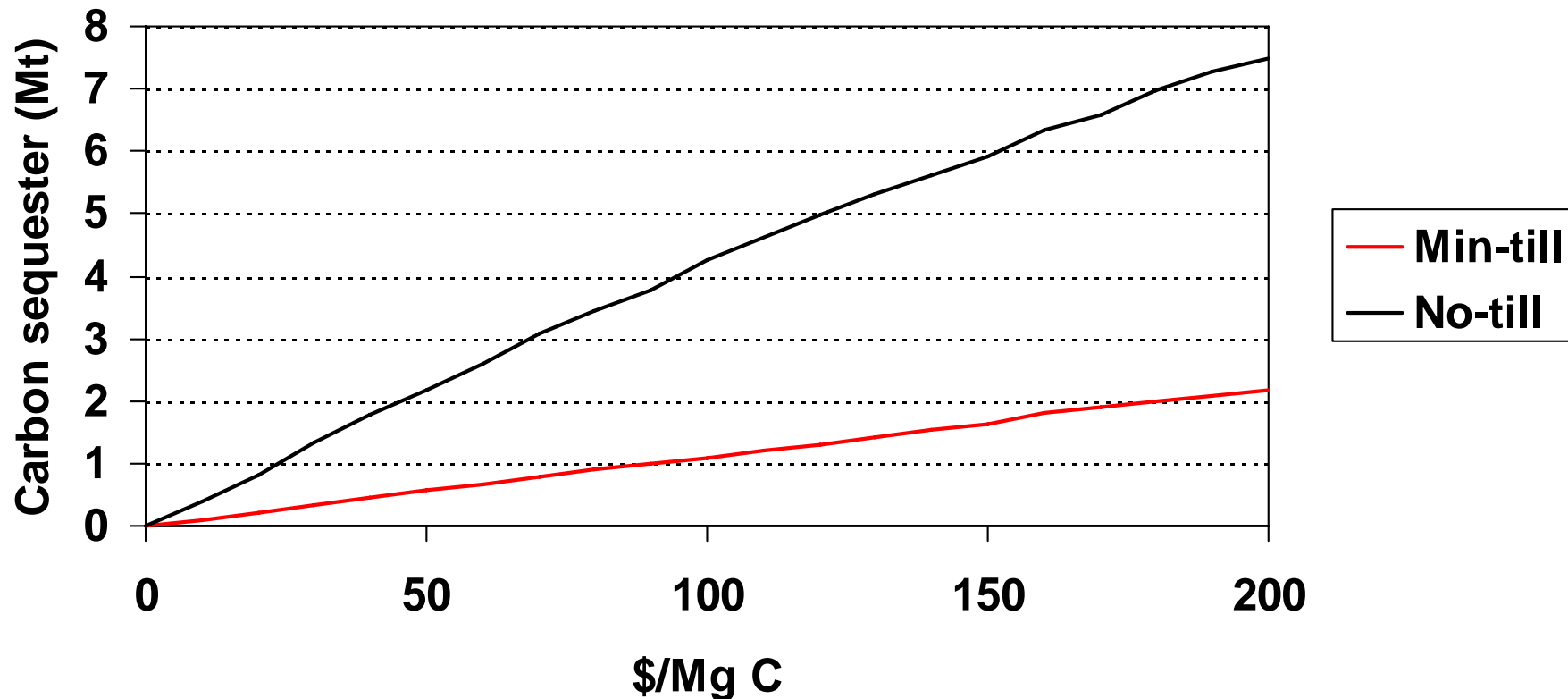
Participation rate vs \$/Mg C

20 years



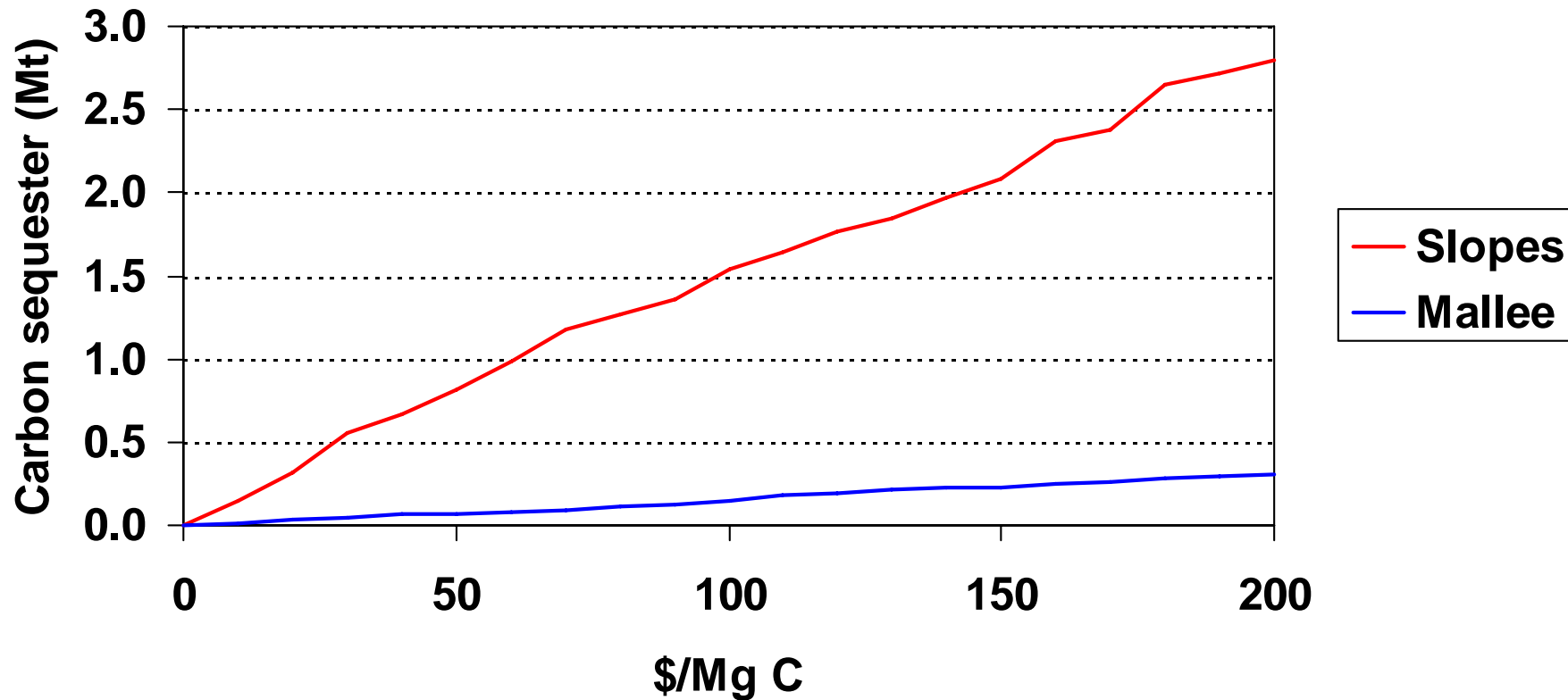
Carbon Sequestered vs \$/Mg C

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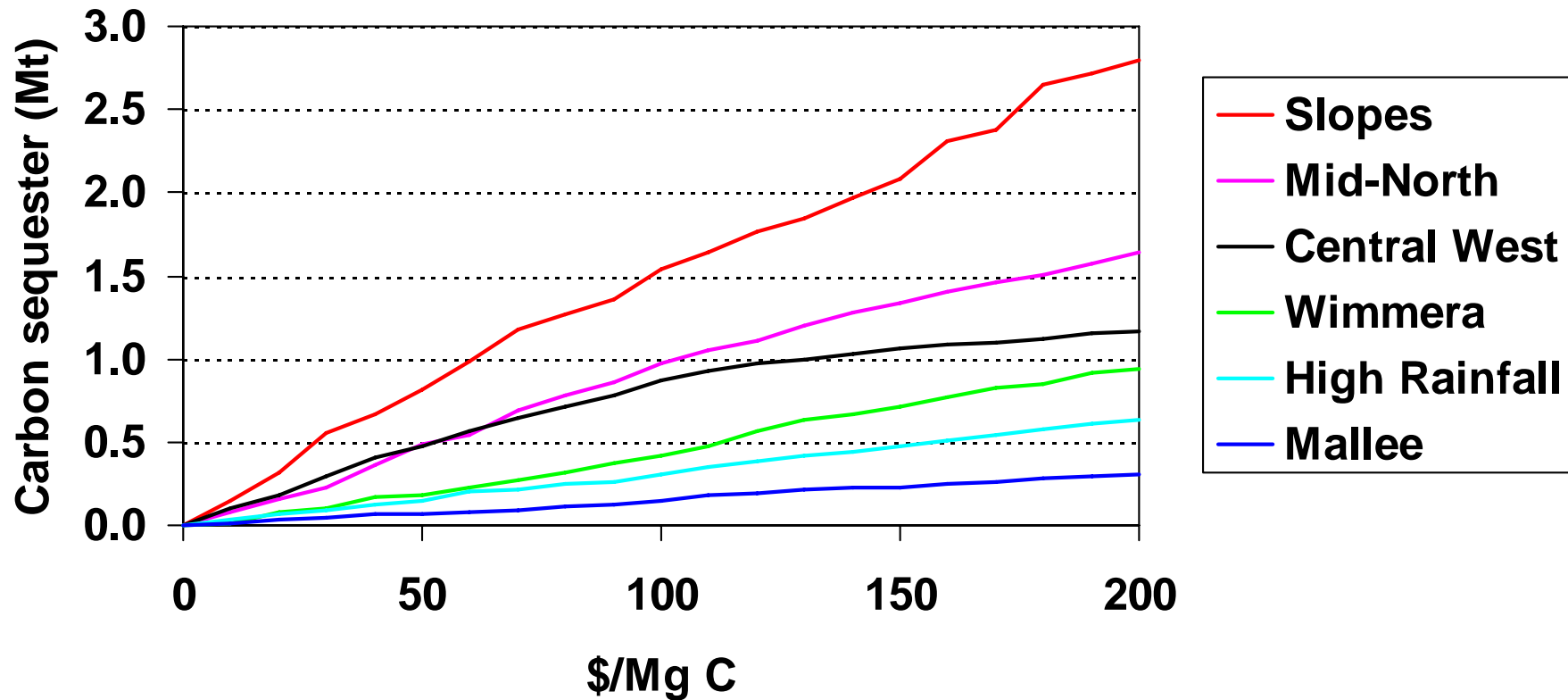
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Carbon Sequestration via No-till

In Perspective

- Australia's annual emissions = 150 Mt C
- Carbon sequestered (20 yrs) SE Aust
 - Soil C only = 2.3 Mt C
 - **All gases = 7.5 Mt C**

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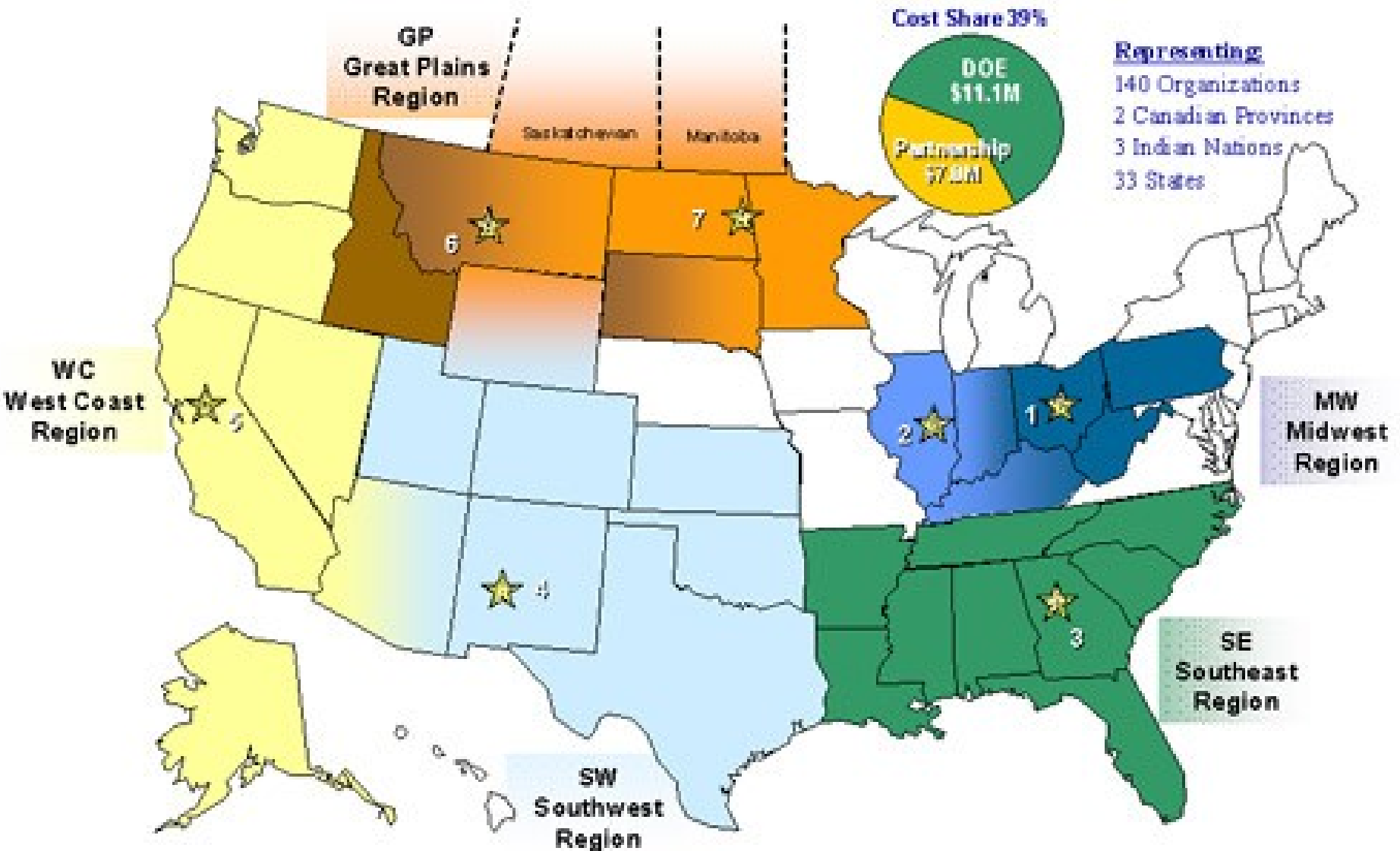
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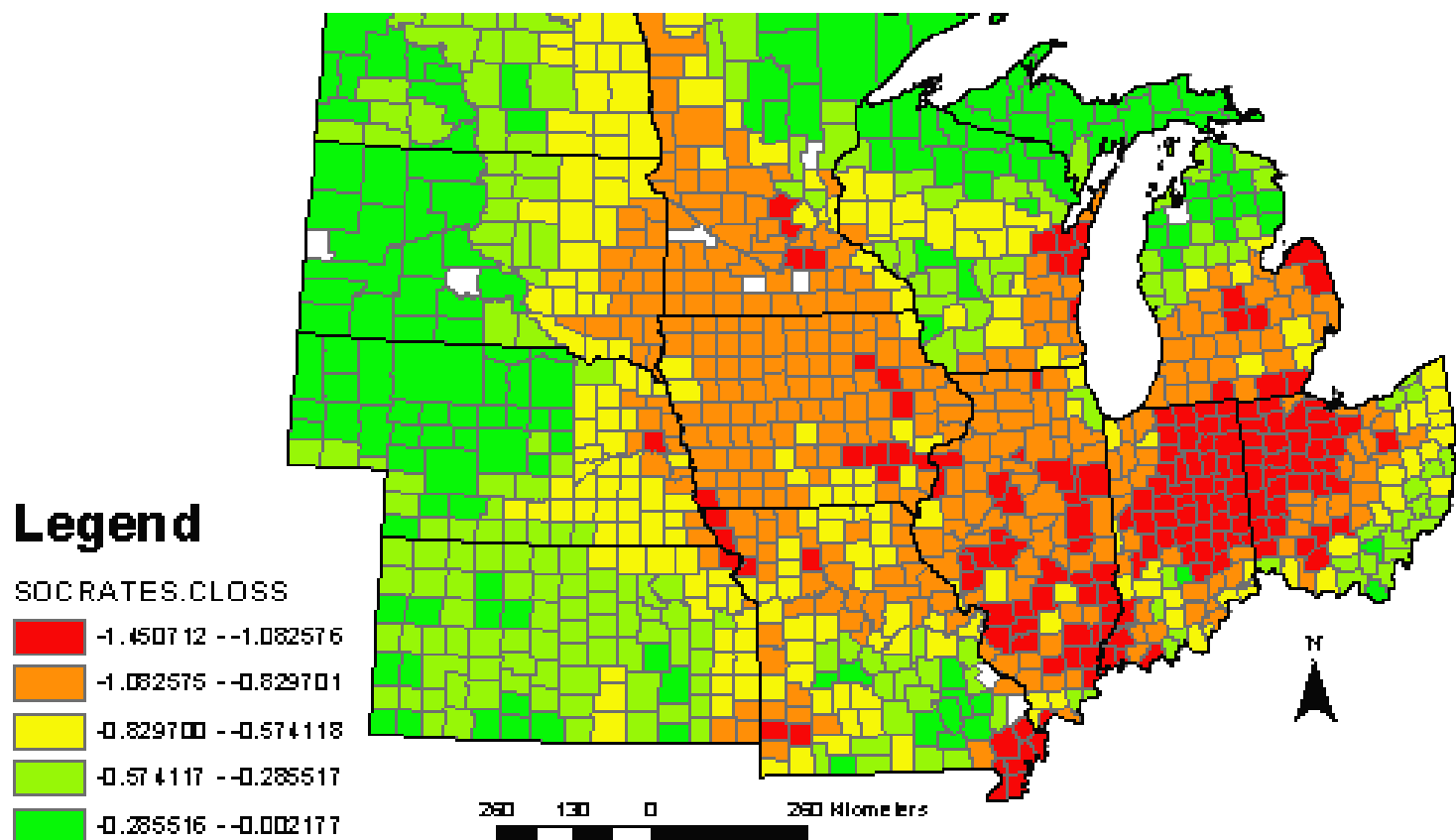
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PERMANENCE!!

The Global Market Place

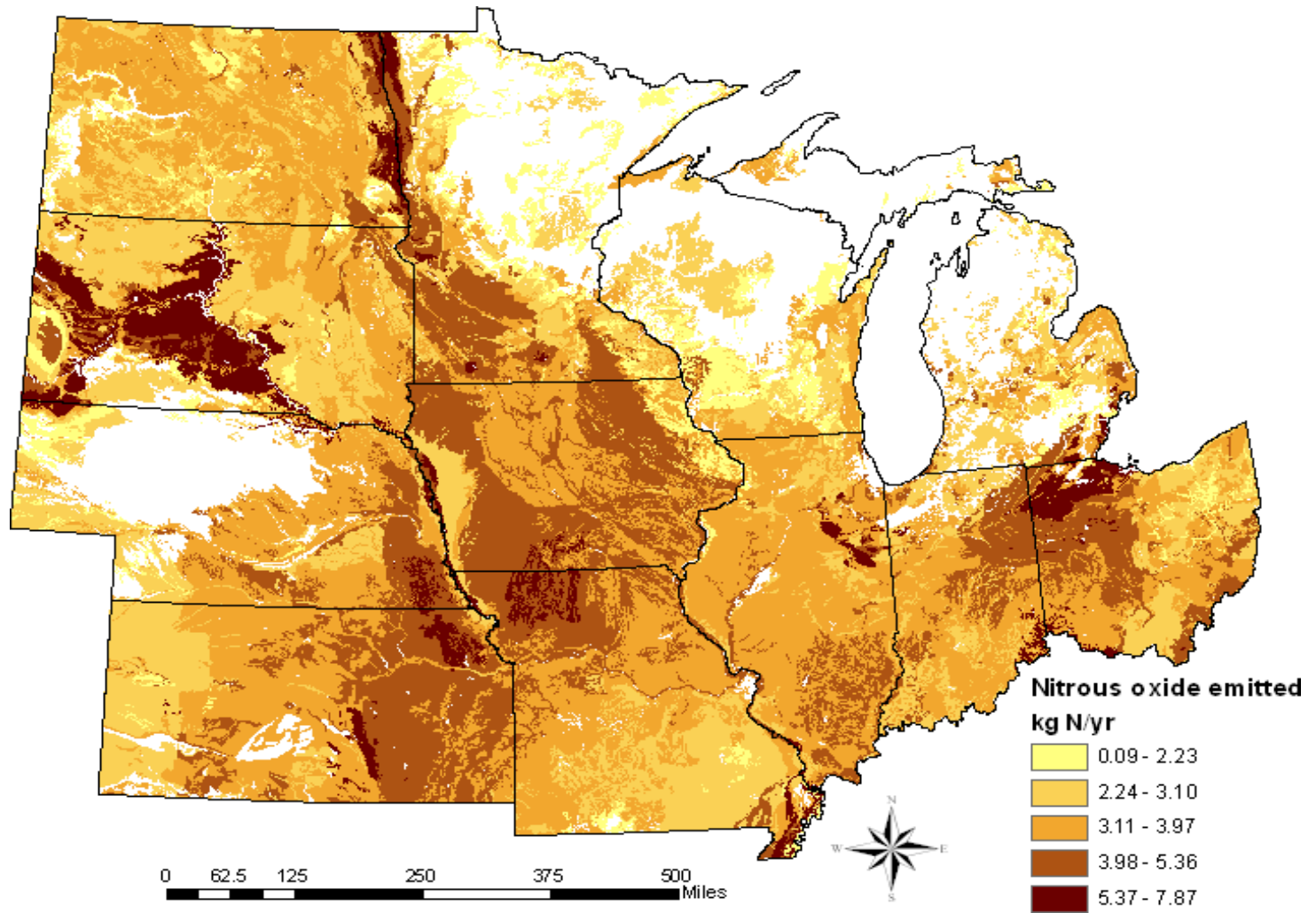


US Greenhouse Gas Reduction Hotspots



Grace et al., 2005

US Regional N₂O production



The screenshot displays the ArcMap interface with the following components:

- Layers Panel:**
 - Country Boundaries
 - Common Land Units
 - Shoolcraft
 - Sanilac** (highlighted)
 - Roscommon
 - Presque Isle
 - Ottawa
 - Ossego
 - Ontonagon
 - Montmorency
 - Marquette
 - Keweenaw
 - Kalkaska
 - Isabella
 - Gogebuc
 - Emmet
 - Delta
 - Crawford
 - Charlevoix
 - Antrim
 - Alger
 - Alcona
 - Lakes
 - Cities
 - Roads
 - County Imagery
 - Wexford
 - Wayne
 - Washtenaw
 - Van Buren
 - Tuscola
 - St. Joseph
 - St. Clair
 - Shiawassee
 - Schoolcraft
 - Sanilac** (checked)
 - Saginaw
 - Presque Isle
 - Roscommon
 - Ottawa** (checked)
 - Ossego
 - Oscoda
 - Osceola
- Identify Results Window:**
 - Layers: <Top-most layer>
 - Sanilac
 - 155.81

Field	Value
FID	27906
Shape	Polygon
CALCARES	155.81
CARBON	77.905
 - Location: [352848 532694]
- Status Bar:** 352853.00 4806504.76 Meters

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