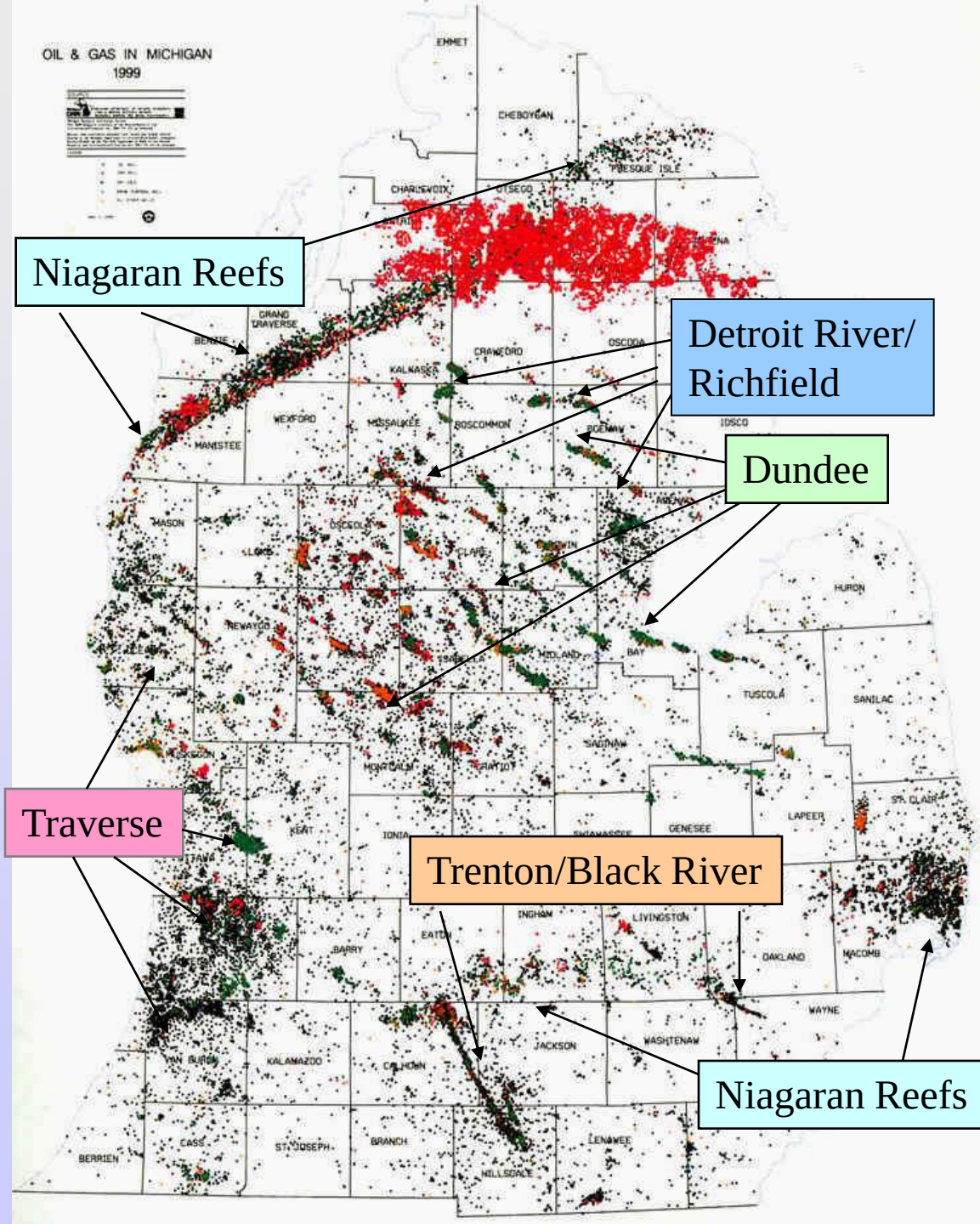


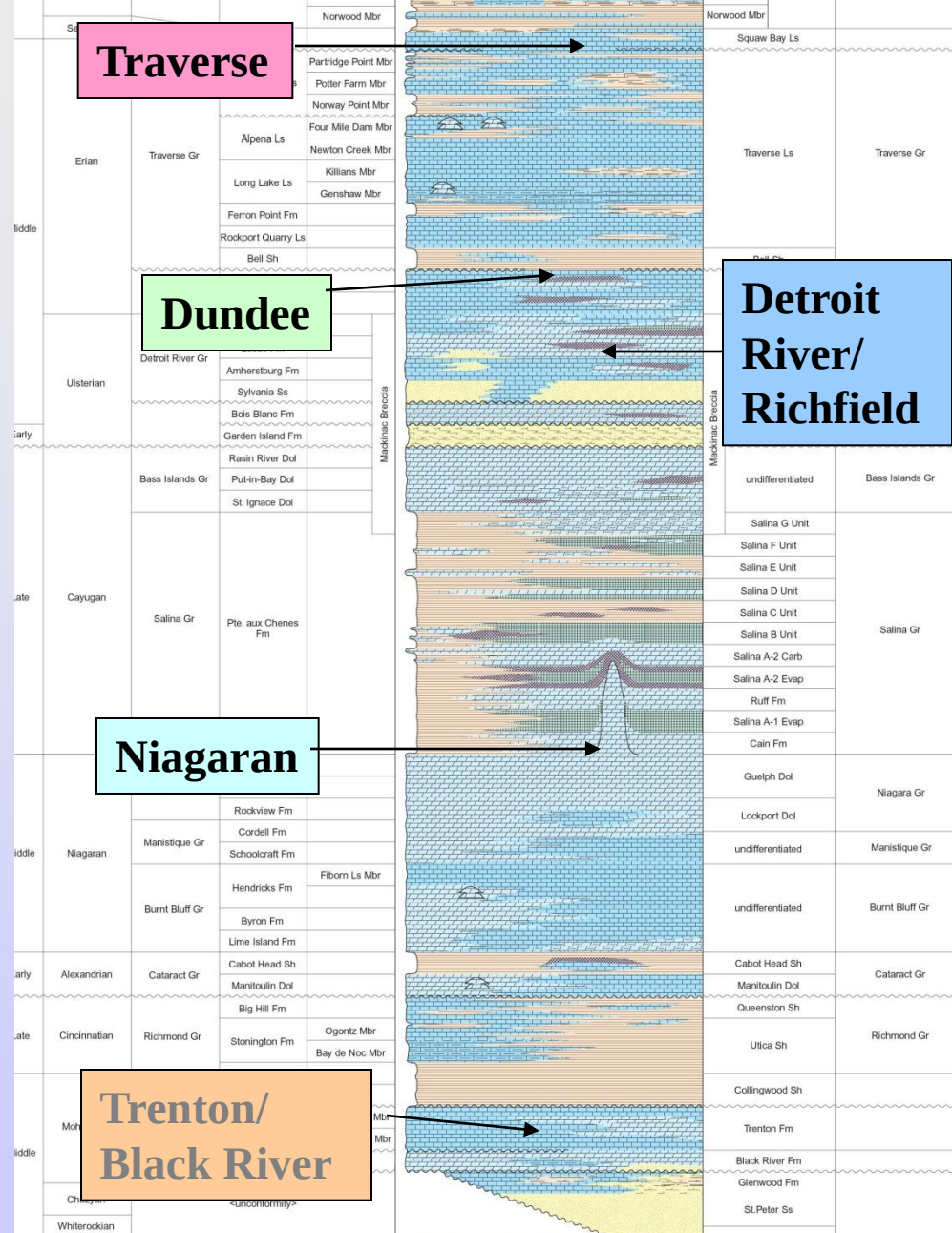
Lithologic Properties and Facies Characteristics of Devonian Producing Formations in the Michigan Basin

William B. Harrison, III
Michigan Basin Core Research Laboratory
Western Michigan University

From State of Michigan Geological
Survey, 2003



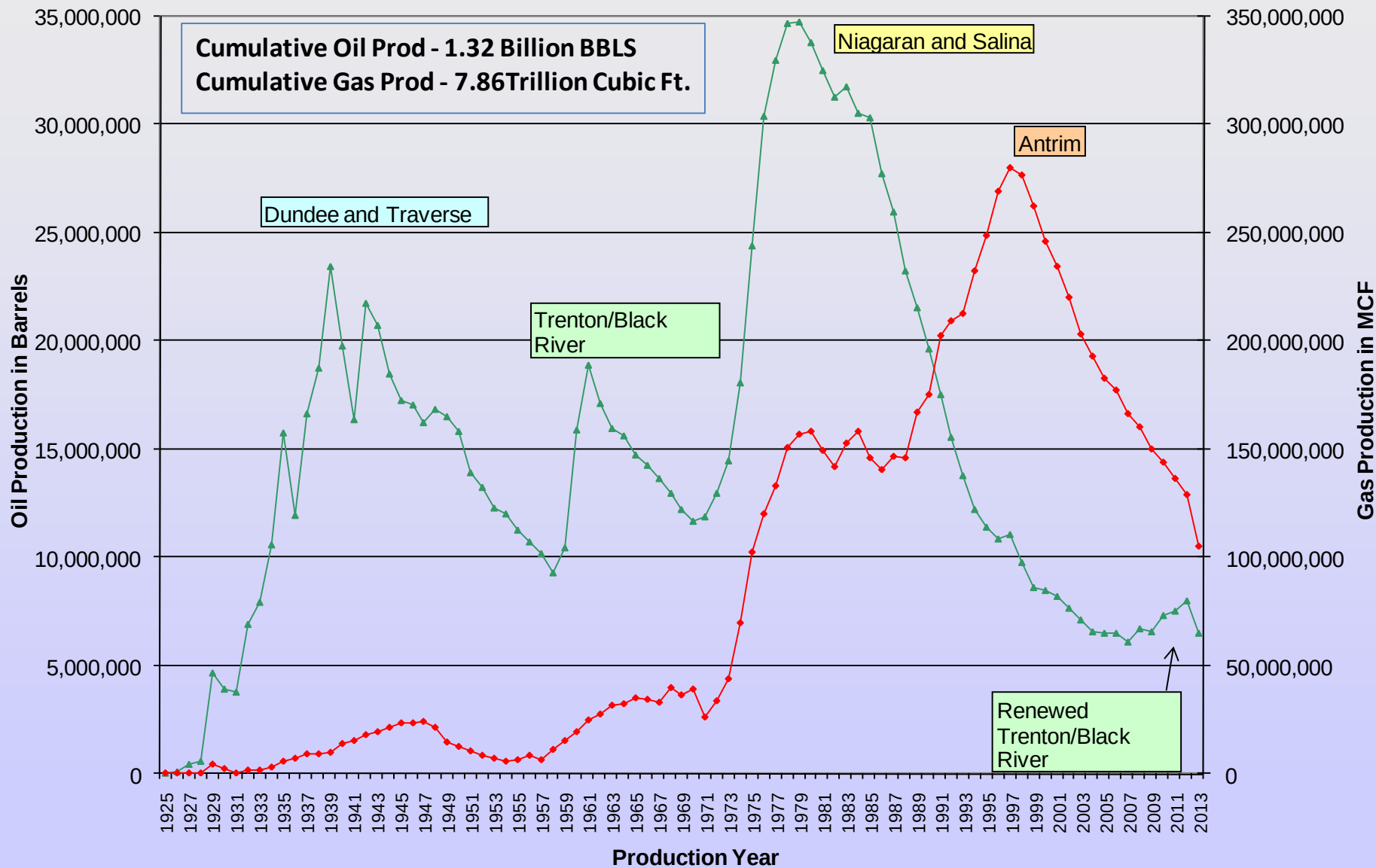
Major Carbonate Reservoir Intervals in Michigan Basin



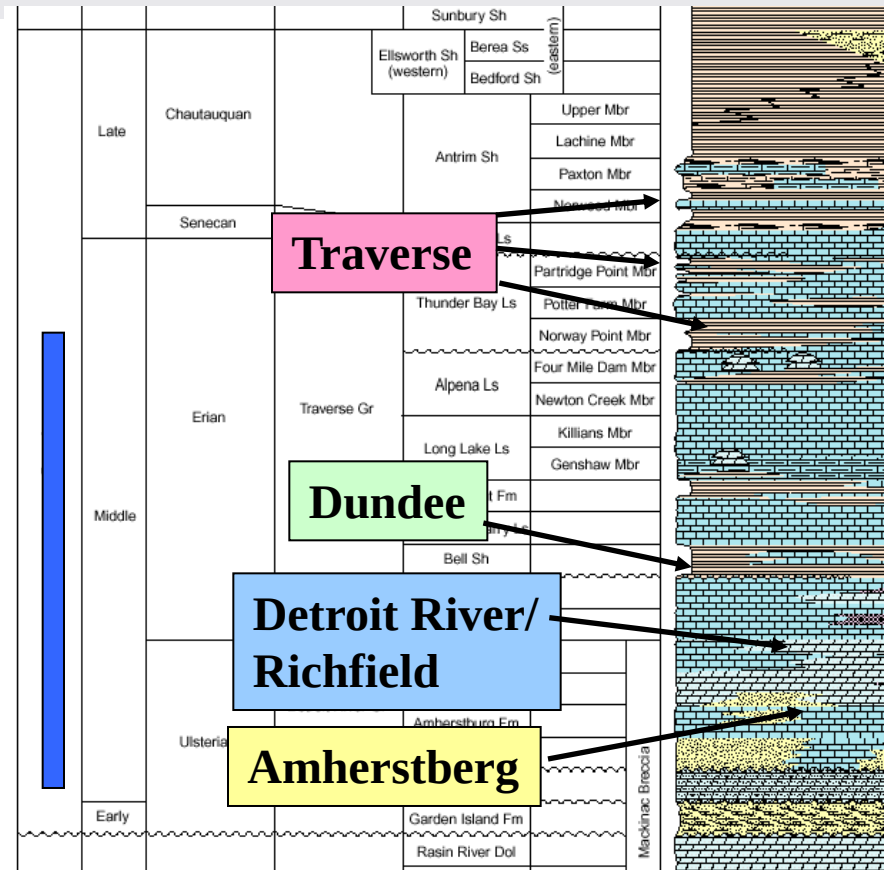
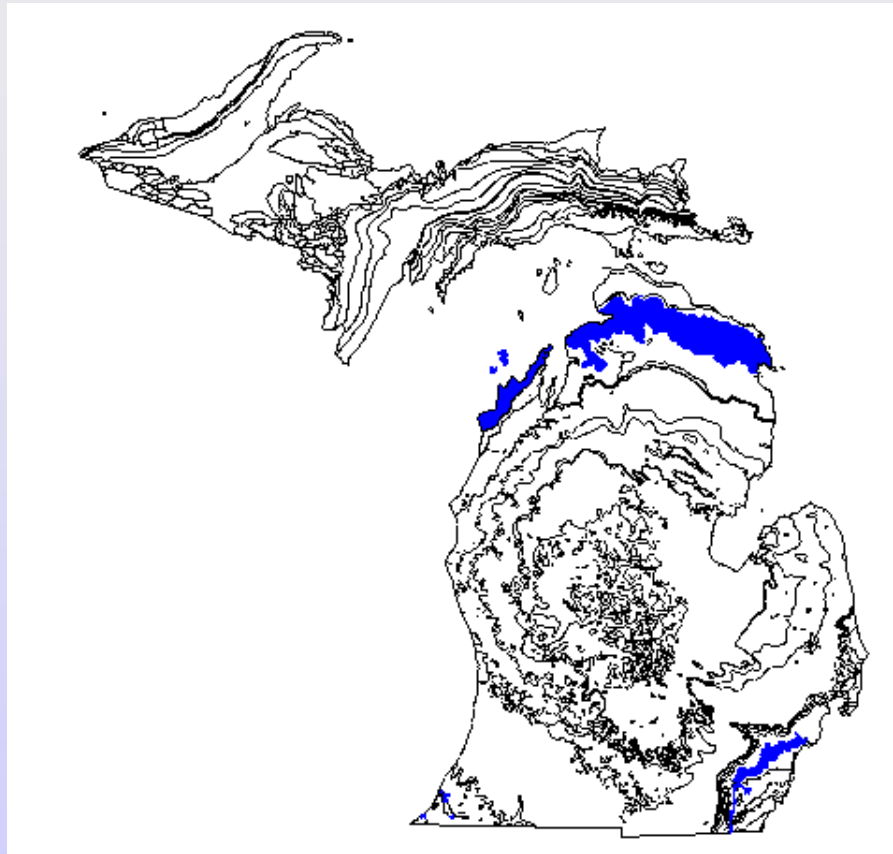
Oil and Gas Fields Production History Michigan Carbonate Reservoirs

<u>Formation</u>	<u>Number of Fields Reporting Production</u>	<u>Cumulative Oil Produced</u>	<u>Cumulative Gas Produced</u>
Traverse	260	110 Million BBLS	13 BCF
Dundee	144	352 Million BBLS	42 BCF
Detroit River/ Richfield	92	100 Million BBLS	120 BCF
Niagaran	1187	450 Million BBLS	2500 BCF
Trenton/Black River	19	140 Million BBLS	250 BCF

Michigan Oil and Gas Annual Production through Nov. 2013



Middle Devonian Rocks in Michigan



Middle Devonian reservoirs include Traverse Limestone, Dundee Formation, Detroit River Group and Amherstberg Fm. Subcrop of these rocks shown in blue.

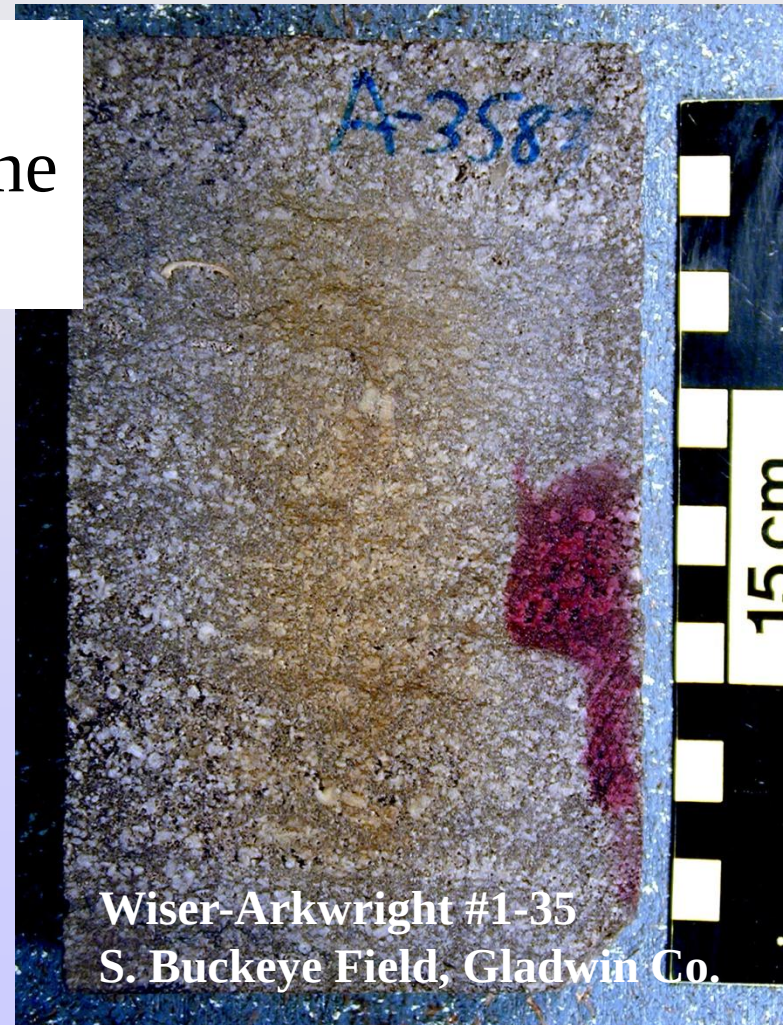
Intrepreted Original Carbonate Depositional Facies for Michigan Devonian Reservoirs

- **Traverse** – Shallow Marine Shelf, Skeletal Grainstone Shoals, Reefs
- **Dundee** – Shallow Marine Shelf and Restricted Peritidal, Skeletal Grainstone Shoals, Reefs, Laminated and Fenestral Tidal Flat Wackestone and Mudstone
- **Detroit River/Richfield** – Restricted Peritidal, Laminated, Stromatolitic Tidal Flat Wackestone and Mudstone

Dundee Reservoir Core Samples



Skeletal
Grainstone
shoals



Traverse Limestone – Bangor Field

Skeletal
Grainstone
shoals



Modern Shallow Shelf Skeletal Sand, Florida Keys



Dundee Reservoir Core Samples

Reef and Reef Skeletal Debris

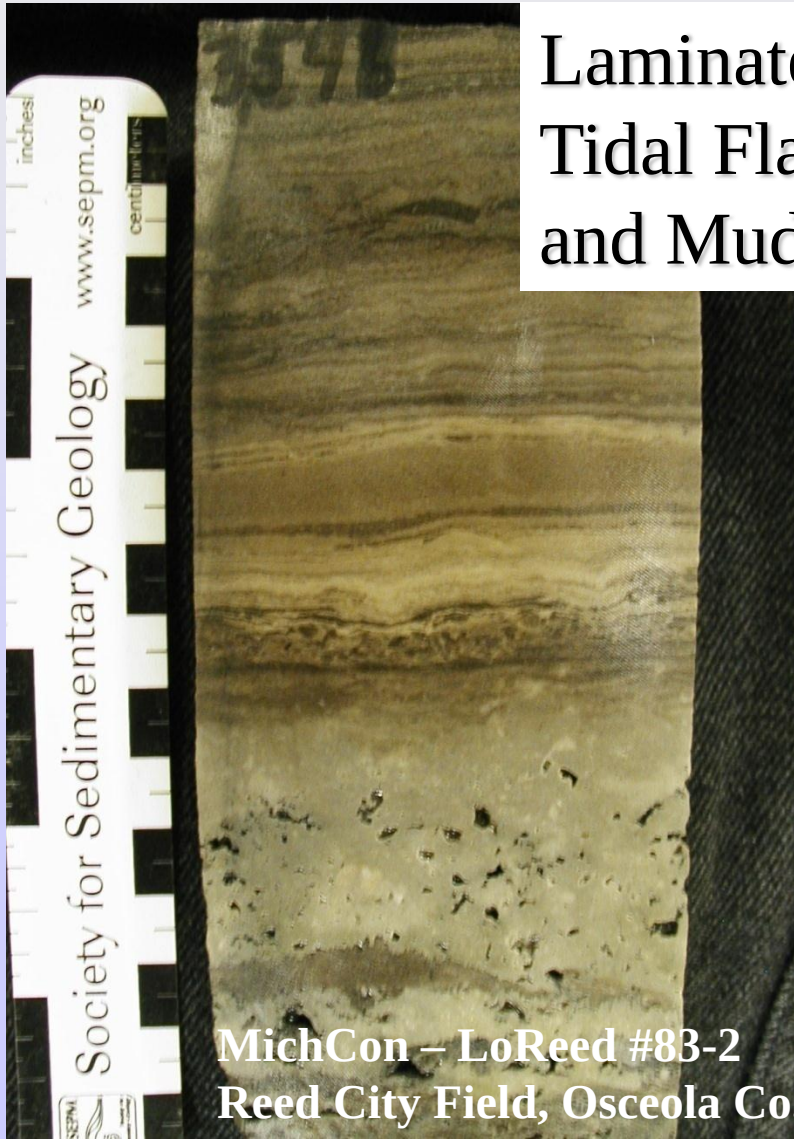


Modern Reef and Sediment Shed from Reef – Florida Keys



Dundee Reservoir Core Samples

Laminated and Fenestral
Tidal Flat Wackestone
and Mudstone



MichCon – LoReed #83-2
Reed City Field, Osceola Co.



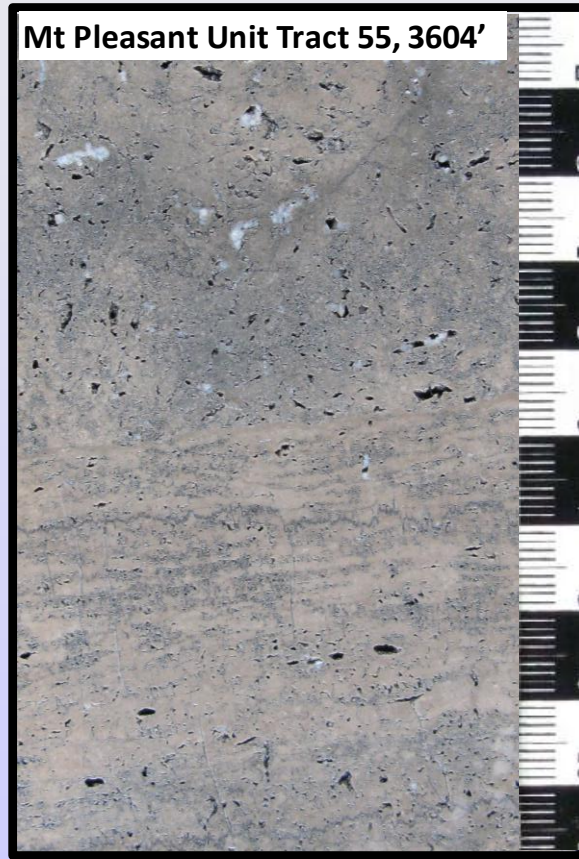
Wiser - State B-6
N. Buckeye Field, Gladwin Co.

Modern Tidal Flat Carbonates with Organic Mats – Florida Keys



Dundee Reservoir from Wise, Mt. Pleasant and North Buckeye Fields

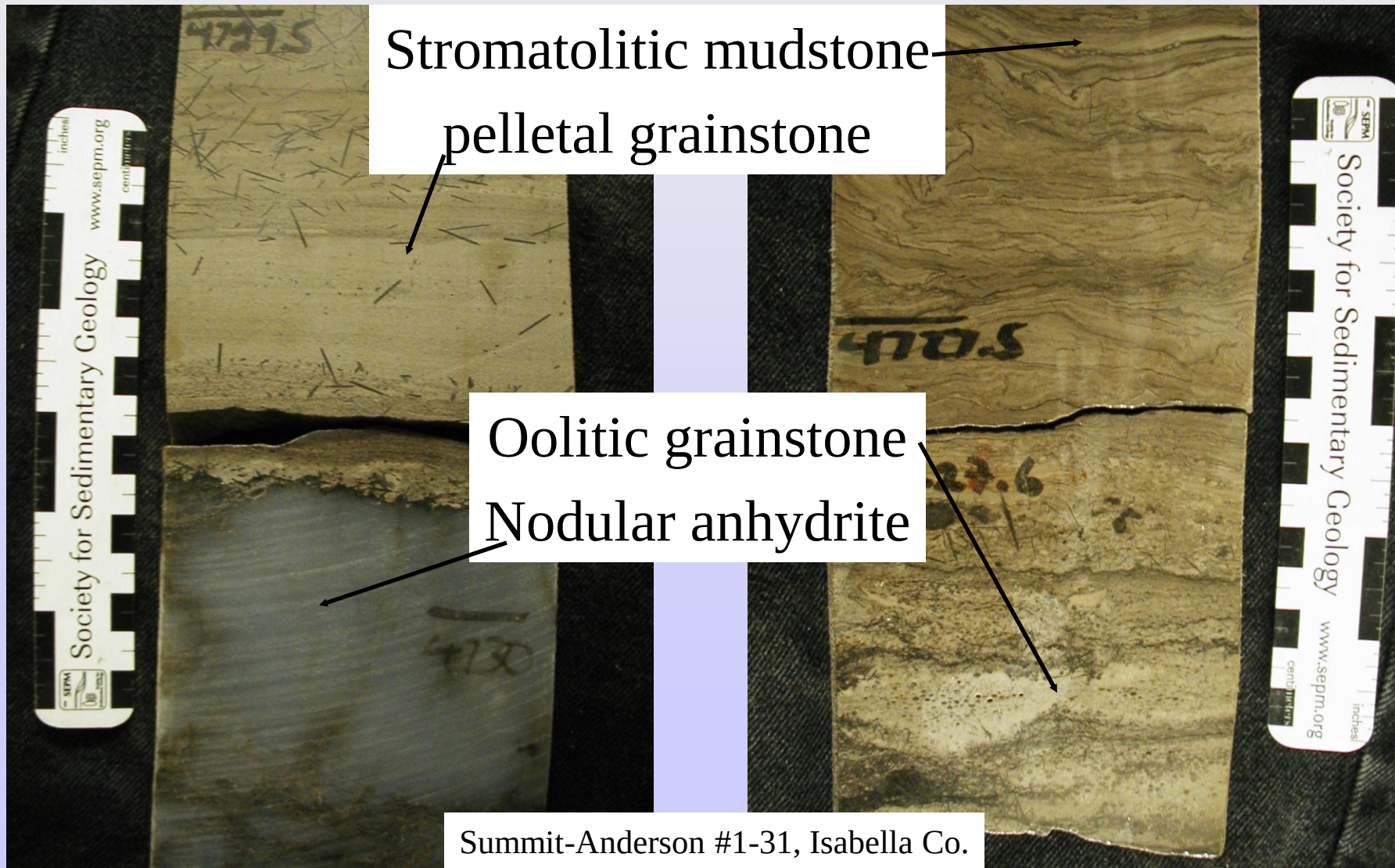
Vuggy and Fenestral Porosity in Intertidal Facies



Modern Shallow Subtidal and Intertidal Mudflats – Florida Keys



Detroit River/Richfield Core Samples



Stromatolitic mudstone
pelletal grainstone

Oolitic grainstone
Nodular anhydrite

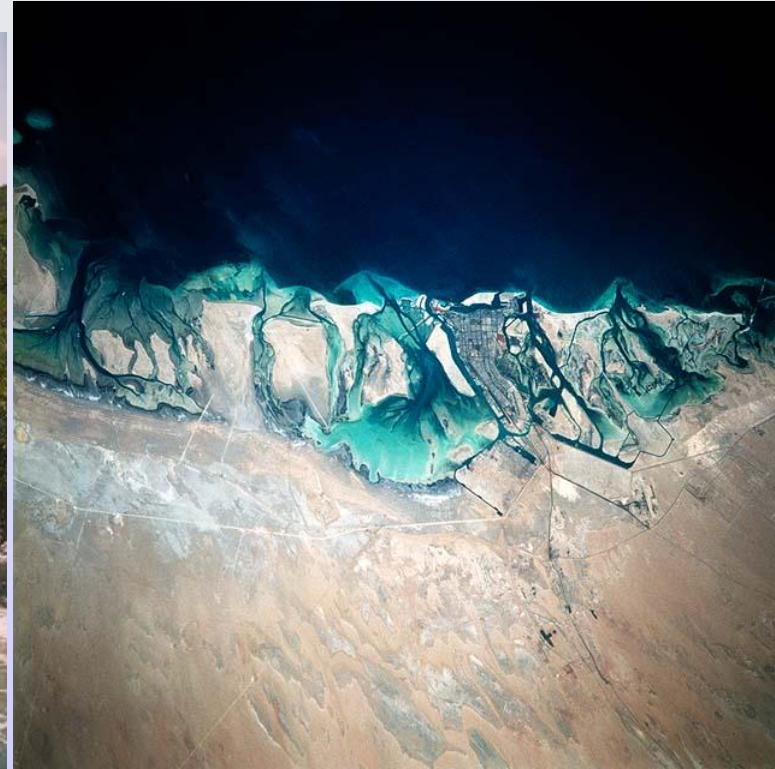
Summit-Anderson #1-31, Isabella Co.

Modern Tidal Flat Environments – Florida Keys and Persian Gulf



Photo by Roger Suthren
Virtual Florida Keys Field Trip

<http://www.virtual-geology.info/vft/fl-keys/triphome.html>



<http://www.parstimes.com/spaceimages/mideast/>

Conclusions

- Facies characteristics of productive carbonate and siliciclastic reservoirs in the Michigan basin can be interpreted from core samples.
- Ancient lithofacies can be compared to modern sediment analogues and depositional environments can be interpreted.
- Comparison to modern analogues improves 3-D understanding of facies distribution for prediction of reservoir trends.