





# N245: Sedimentology and Stratigraphy of Lacustrine Systems: Reservoir and Source Rocks, Great Salt Lake and Green River Formation (*Utah and Colorado, USA*)

Instructor(s): Rick Sarg and Paul Wright

6 Days	Competence Level: Skilled
 Field Course	
 Classroom Elements	
<b>MODERATE</b>	Moderate Physical Demand

## Summary

This course evaluates the lacustrine deposits of the modern Great Salt Lake and the Eocene Green River Formation. Themes are improved subsurface characterization of lacustrine deposits through utilization of outcrop analogs (carbonate, mixed carbonate/clastic and oil shale) and examination of the Green River Formation petroleum system (clastic and carbonate gas reservoirs and shale source at Altamont-Bluebell, Bakken-like oil shale exploitation in the Uinta Basin).

## Learning Outcomes

Participants will learn to:

1. Evaluate lithofacies and their distribution in lake center, distal lake margin, and proximal lake margin in a freshwater to saline lake system of Eocene age in the Piceance Basin and construct a depositional model.
2. Perform a comparison of these lithofacies with other Eocene-aged lake systems in the region (Utah and Wyoming).
3. Evaluate features present in these ancient lake systems based on observations of a modern lake system in a similar tectonic setting.
4. Evaluate features in subsurface cores based upon the lithofacies observed in the modern Great Salt Lake and Piceance Basin outcrops.
5. Perform field observations of stratal patterns, depositional geometries and lithofacies distribution, and apply to reservoir modeling of lacustrine reservoirs.
6. Evaluate the processes and products involved in microbial carbonate deposition in lacustrine environments.
7. Assess the source characteristics of the regional Green River paleo-lake system.
8. Assess shale oil prospectivity and the maturation/migration potential of a mature oil shale system.
9. Rate their projects by comparison to global analogs, including several field examples from the nearby Uinta Basin (W. Willow and Blue Bell fields) where both siliciclastics and microbialites are reservoirs.

## Duration and Training Method

This is a 6-day field course to the Great Salt Lake of Utah and the Piceance Basin of eastern Utah and western Colorado. Approximately 70% of the course time is spent in the field, with the balance split equally between core viewing and classroom lectures.




## Physical Demand

The physical demands for this class are MODERATE according to the Nautilus Training Alliance field course grading system. Fieldwork is in eastern Utah and western Colorado, where conditions can vary from cold and wet to warm and dry. Participants will be taking short to moderate walks of up to 0.8 km (0.5 miles) with ascents of 30-60 m (100-200 ft). The field area is in elevations of 1200-2400 m (4000-



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8000 ft) which may lead to unexpected fatigue or shortness of breath for some participants. Transport is by SUVs. Most driving is on blacktop roads, with some locations being reached by well marked dirt and gravel roads.

## Who Should Attend

Members of integrated exploration and asset teams charged with working conventional and unconventional plays in lacustrine systems. The course is designed to bring together geologists, geophysicists, and reservoir engineers.

## Prerequisites and Linking Courses

Participants with familiarity of lacustrine systems, carbonate and siliciclastic depositional systems and oil shales will gain the most from attendance in this class. These are offered in Basic Application Level classes N020 (Carbonate Depositional Systems), N155 (Clastic Depositional Systems) and N184 (Unconventional Resources: The Main Oil Systems). There are no formal prerequisites.

## Course Content

This course provides the tools and approaches needed to identify and differentiate the diverse depositional environments encountered in lacustrine systems. Emphasis is placed on economic application of key concepts to predict reservoir and source occurrence and probable reservoir behavior, all placed within a stratigraphic framework.

## Itinerary

### Day 0

- Introductory lectures on lacustrine systems and microbialite carbonates
- Overnight in Salt Lake City, Utah

### Day 1

- Field excursion to modern Great Salt Lake sediments at Bridger Bay and Rozel Point
- Overnight in Salt Lake City, Utah




### Day 2

- Lectures on lacustrine systems and microbialite carbonates, Green River Formation, and ephemeral lake deposits
- Core workshop at Utah Geologic Survey core store in Salt Lake City
- Drive to Vernal, Utah



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- Overnight in Vernal, Utah

## Day 3

- Evacuation Creek and Hell's Hole Canyon field stops: Lake center and distal lake margin
- Overnight in Rangely, Colorado

## Day 4

- Douglas Pass traverse: Lake margin mixed siliciclastic and carbonate lithofacies
- Overnight in Rangely, Colorado

## Day 5

- Yellow Creek field stop: Lake margin siliciclastic deltaic and shoreline systems
- Drive to Glenwood Springs, Colorado
- Lectures on Green River carbonates, the South Atlantic and the expression of lacustrine stratigraphy and facies on seismic
- Overnight in Glenwood Springs, Colorado

## Day 6

- Travel to USGS Core Lab at Lakewood, Colorado, for core workshop and wrap-up session
- Overnight in Golden, Colorado

## Day 7

- Travel home