

The Andrew Whitham CASP Fieldwork Award – 2019 Winner

Applicant: Elson, Amy

Project title: Source heterogeneity in the Mahogany Oil Shale Zone through eastern Utah and western Colorado, USA

Award: £2,500

Specific objectives and deliverables:

This study will quantify the source variability of *the* quintessential oil shale, the Mahogany Oil Shale of the Eocene Green River Formation, whilst elucidating the controls on deposition and preservation. Detailed fieldwork comprising a transect stratigraphically through the prolific hydrocarbon bearing oil shale and across multiple basins, during the highstand of a widespread lacustrine system (5320 miles sq. in areal extent), will allow the first high resolution and basinal-wide study of the world's largest oil shale. A key problem arising in the unconventional sector is an uncertainty on controls in the heterogeneity of oil shales, which is becoming increasingly pertinent due to an increasing interest as an energy resource. The Mahogany Zone of the Green River Formation provides an excellent outcrop analogue for important lacustrine source rocks and plays in subsurface systems (e.g. pre-salt offshore Brazil.)

Detailed mapping of the oil shale section and marker beds in the basin centre and basin margin and flanks will support exploration efforts, help quantify variation in lacustrine source rocks and contribute knowledge to the pre-existing USGS data. This will help improve modelling of lacustrine source rocks and will also support the development of the U.S unconventional hydrocarbon industry, energy security and petroleum independence in the region.

Proposed work plan:

-A high resolution sedimentary study of accessible outcrops across the Uinta Basin, Douglas Creek Arch (a structural high flooded during deposition of the Mahogany Zone) and adjacent Piceance Creek Basin.

-During late August to Early September 2019, basecamps will be moved across the basins from Price (UT), Vernal (UT), Dinosaur (CO) and Rangely (CO) to conduct four weeks of fieldwork in remote sites where accessible Mahogany Zone sections crop out. -Collection of geological data including detailed sedimentary logging, sampling for geochemistry (when appropriate), structural and bedding measurements and correlation panels through sections from the basin-margin to the lake depocentre will allow for identification of marker beds and cycles in the heterogeneous oil shale. Photogrammetry of the outcrops will allow for assessment of large scale geometries in concert with the detailed logging through the section.

Week 1: Using published geological maps and GPS coordinates of already identified outcrops, assess suitable outcrops in the western part of the Uinta Basin and visit the basin margin outcrops.

Week 2: Move to central and eastern part of Uinta Basin, visiting the basin centre and eastern flank of the lacustrine oil shale. Once again assessing and visiting suitable outcrops. Initial permission has been secured by the grant applicant to visit previously unvisited Mahogany Zone sections which crop out on privately owned land.

Week 3: Sedimentological and structural data will be taken across the Douglas Creek Arch, which separates the basins but was flooded during deposition of the Mahogany Zone.

Week 4: Identification/ visiting of outcrops in the Piceance Creek Basin, and revisiting of previous complex locations if needed.

Proposed expenditure, including details of any other sources of funding:

Estimated expenditure (including field assistant):

Car Hire: £615 for 29 days, pick up and return to Salt Lake City Airport, lowest price obtained from car rental comparison website for economy vehicle.

Fuel: ~£350 (estimated ~ 1500 miles to and from different outcrops and travel from Salt Lake City)

Accommodation: ~£400 (camping at various sites across basins, mostly KOA campsites and BLM campsite designated land across Utah and Colorado)

Food: £348 (£12 per day)

Materials (notebooks, miscellaneous field kit etc.): £50

Flights: £1300, including baggage (searched through comparison website for economy airline)

Total: £3063

Excess to be made up with Grant applicant's NERC CDT RTSG fund