

**Geomorphology and Sedimentology of Selected Areas along the Eastern
Margin of Yellowstone Lake, Yellowstone National Park, Wyoming:
Results from the 2010 Field Season**

**SUMMARY REPORT PROVIDED TO ROCKY MOUNTAIN COOPERATIVE ECOSYSTEM
STUDY UNIT**

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1. INTRODUCTION AND MAIN FINDINGS

The main purpose of this project was to provide a geomorphologic and geologic framework for the analysis and interpretation of archaeological sites in selected parts of Yellowstone National Park. The work was undertaken during a one week excursion (08/01/10-08/07/10) along the east shore of Yellowstone Lake, Yellowstone National Park, Wyoming, and up a series of small drainages that empty into the lake.

This report summarizes the preliminary findings of the seven day field excursion and is based mainly on sedimentologic descriptions from outcrops and trenches and geomorphologic measurements from Total Station Surveys. Stratigraphic sections were measured along Columbine Creek/Alluvium Creek (southern portion of field area) and Clear Creek (northern portion of field area, Fig. 1). Total Station surveys were acquired along Alluvium Creek/Columbine Creek, and near Columbine Creek.

The main findings from this field excursion are:

- An extensive, triangular-shaped morphologic bench bounded on the north by Columbine Creek eastward approximately to Brimstone Basin, then southwest to the Yellowstone Lake shoreline is the remnant delta plain/flood plain of a Gilbert-style delta that formed along the margin of ancestral Yellowstone Lake when it had a surface elevation ~22 m above the present day lake level. This Gilbert-style delta, previously mapped as Pinedale age coarse grained lacustrine deposits (Richmond and Pierce, 1972), currently is being incised by Alluvium Creek.
- A radio-carbon date of 10,390 +/-150 cal yr BP from charcoal collected from within coarse gravels of the Gilbert-style delta in one of the measured sections along Columbine Creek indicate that the delta underwent construction at this time, around the Pleistocene-Holocene transition.
- A radiocarbon date of 2795 +/-55 cal yr BP from a sample of charcoal collected in a section measured in an abandoned channel wall ~50m from modern-day Columbine Creek and ~2m above the modern creek surface provides a depositional age constraint for these elevated floodplain deposits.
- A radiocarbon date of 4100 +/- 130 cal yr BP from charcoal recovered from low energy deposits inferred to be floodplain or lacustrine and located ~ 4m above

the present day lake surface and 2 m above present day Clear Creek suggests that lake level was elevated by at least 2 m or as much as 5 m at that time.

- Preliminary geologic/geomorphologic evidence, combined with the results of three radiocarbon ages, suggest that, relative to the modern ground surface, the surface elevation of Yellowstone Lake was significantly higher along its eastern shore than outlined by Pierce et al. (2002, 2007), but in line with a lake level model published by Locke and Meyer (1994). However, other radiocarbon ages and duplicate samples are needed to confirm these findings.

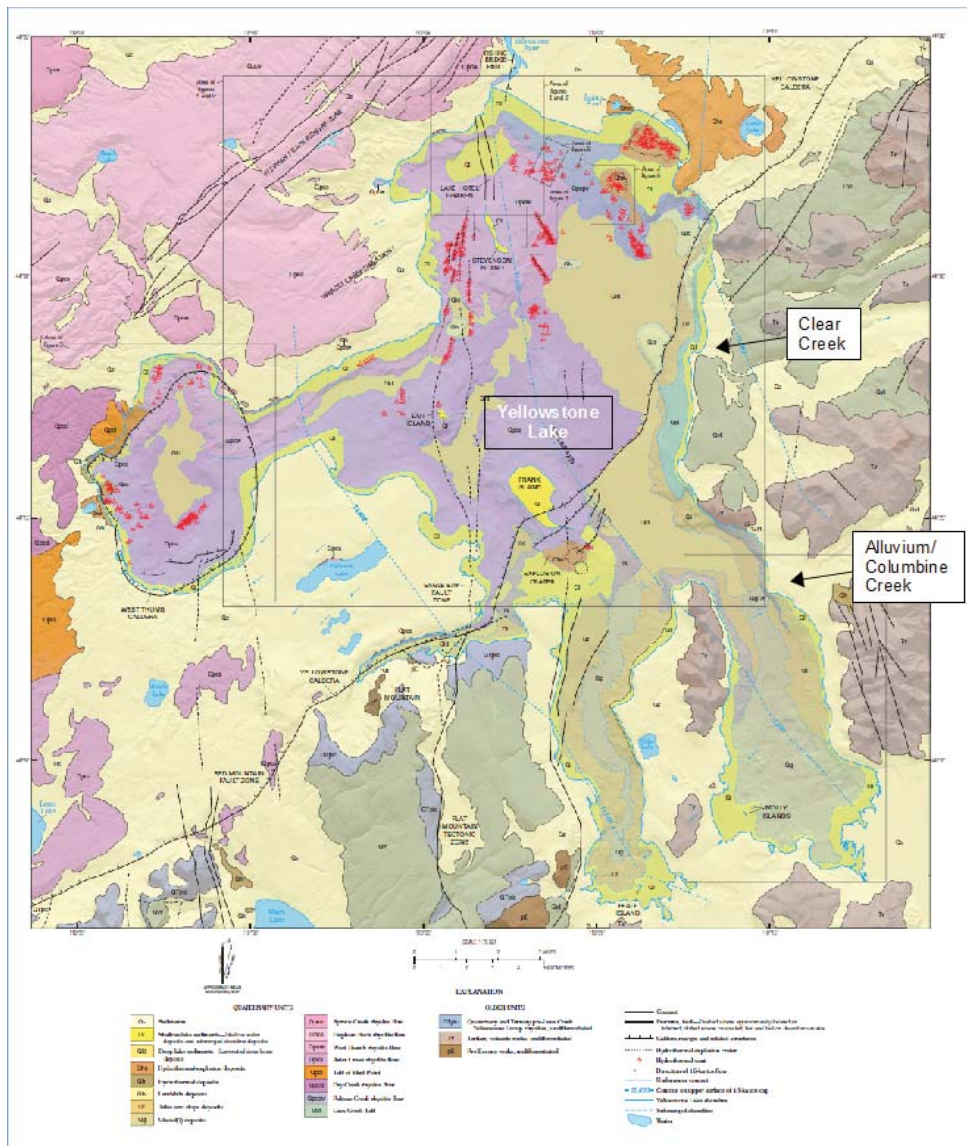


FIGURE 1: Geologic map of Yellowstone Lake and surrounded areas. Study areas along the east shore of the lake are highlighted. Map modified from Morgan et al., 2007.