Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Yosemite's Melting Glaciers

Discipline: Natural
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: University of Colorado at Boulder
Effective Dates: 4/1/09 – 12/31/2012
Funding Amount: $77,153[FY11: $13,592; FY10: $30,958; FY09: $32,603]

Investigators and Agency Representative:
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Project Abstract: Yosemite National Park's remaining glaciers are rapidly retreating, with consequences for ecosystem health and visitor experience. This project is a three year study of the Lyell and McClure glaciers, the largest glaciers in Yosemite, to understand the climate patterns forcing their retreat. Melting glaciers are a critical source of late-season cold water, and the impending loss of these glaciers will have profound impacts on ecosystems in and around the upper Tuolumne River. The project combines traditional field-based glacier measurements with new techniques such as computer modeling of glacier mass balance to evaluate the future health of these glaciers.

The primary goals of this project are to:

- Determine the retreat rate of the Lyell and Maclure glaciers
- Predict when these glaciers will disappear entirely given future climate scenarios
- Quantify the impacts of glacier loss on water delivery to the upper Tuolumne River

A large part of this project is field-based, requiring extensive time (2-3 weeks per year) in remote backcountry locations. Field tasks for this project include:

- Characterize the present area and thickness (volume) of both glaciers using GPS and/or total station surveys, and possibly ice-penetrating radar.
- Document winter snowfall accumulation and summer melt patterns of both glaciers using meteorological instrumentation (measuring temperature, insolation, wind speed, and snow surface elevation) on and adjacent to the glaciers and in the streams discharging from the glaciers
- Measure flow and sliding velocity of both glaciers by repeat GPS and/or total station surveys of stakes placed in the ice.
- Determine the amount of water discharged from the glaciers into the upper Lyell Fork of the Tuolumne River using in-stream instrumentation (pressure transducers).

The final results will help inform future management of downstream riverine ecosystems that are dependent on glacier meltwater. Ultimately, the fate of the glaciers will be tested against the range of future climate scenarios to determine if they stand a chance of persisting through this century.

This project will be funded over three years and will support a graduate student at the University of Colorado at Boulder

Outcomes with Completion Dates: 2009 Status Report, 2010 Status Report, 2011 Status Report, December 31, 2012 Status Report. A final report of all data, analyses, conclusions, and recommendations for future study will be delivered by December 31, 2013.

Keywords: glaciers, Yosemite National Park, Global Change, University of Colorado at Boulder