

**Project Summary**  
**Rocky Mountains Cooperative Ecosystem Studies Unit**

**Project Title:** Developing Approaches for Restoring the Vegetation of Tuolumne Meadows, Yosemite National Park, California

**Discipline:** Natural  
**Type of Project:** Research  
**Funding Agency:** National Park Service  
**Other Partners/Cooperators:** Colorado State University  
**Effective Dates:** 5/15/2011 - 12/31/2014  
**Funding Amount:** \$204,819

**Investigators and Agency Representative:**

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**Project Abstract:** Mountain meadows physically, hydrologically, chemically, and biologically link the terrestrial and aquatic environments, playing a critical role in supporting very high levels of biodiversity, habitat, attenuation of flood peaks (i.e. less downstream flooding), critical water storage, water cleansing functions, and highly desired esthetic values (Loheide & Gorelick, 2007). However, the ecological and hydrologic condition of Sierra meadows has been in question for more than a century. An obvious sign of meadow degradation is lodgepole pine invasion, which threatens to convert many meadows into forests. Another sign of degradation is the alteration of meadow herbaceous vegetation, which in its natural condition is dominated by long-lived clonal sedges and grasses that have high above and below ground biomass production and formed organic-rich soils. A third sign of degradation is that stream channels have widened, banks have eroded, and little riparian vegetation occurs.

Today short-lived plants with poorly developed root systems dominate the vegetation in much of Tuolumne Meadows, lodgepole pine invasion is a continuous process, and the vegetation appears to have little similarity to that described by early settlers. The intensity of sheep grazing of the late 1800's in mountain meadows may have been so intensive that no Sierra meadow would have been unaffected. The more than half-century of unregulated grazing is reported to have severely impacted meadow vegetation, soils and watershed hydrology by creating unvegetated patches and erosion, altered plant composition and reduced plant production, and destabilization of streams (Vankat and Major 1972, Ratliff 1985a,b, Dull 1999). Odion et al. (1988) found that 50-80% of meadows now dominated by dry meadow plants were formerly wet meadows and are in need of restoration.

NPS staff have identified Tuolumne Meadows as a priority for ecological restoration. However, it is critical to address determine the causal factors and to understand: (1) the current ecological and hydrologic condition of Tuolumne Meadows, and whether Tuolumne Meadows is recovering from the legacy grazing or whether it now exists in an ecologically and hydrologically altered stable state, (2) develop restoration approaches that can be used for Tuolumne Meadow as well as the riparian zone along the Tuolumne River. This information will be used to guide meadow restoration planning.

**Outcomes with Completion Dates:** Final report with all associated databases and metadata due on June 1, 2014

**Keywords:** mountain meadows, restoration, lodgepole pine invasion, Tuolumne Meadows, Yosemite National Park, Colorado State University