

Yosemite National Park Research Preferences

Updated 12/9/2016

Dear Potential Researcher,

Yosemite National Park has updated their Research Preferences in conjunction with the NPS Centennial. We encourage you to review our new our list below. The new list emphasizes important topics of scientific inquiry especially in relation the Yosemite National Park management needs. It includes many more specific questions related to both Landscape Scale and Discipline Scale research than the previous list. Please consider collaborating with Yosemite National Park on our most important scientific questions.

LANDSCAPE SCALE

Drivers of Ecological Change - Drought

- What are the impacts of the on-going drought, in particular tree mortality?
 - What are the patterns of the impacts?
 - What are the ecological effects stemming from changes in forest canopy?

Drivers of Ecological Change - Fire

- How does fire affect forest structure and snow retention?
- What are the differences in recovery in high-severity burn areas of the 2013 Rim Fire, under the different land management approaches on NFS and NPS lands?
- Does drought-related mortality vary by fire history?
- Does fire build drought/insect resilience in forests?
- What are the tradeoffs of spring burning? (i.e. terms of nesting birds, denning mammals, fuel reduction, forest restoration)
- How will climate change affect fire in Yosemite?
- What are the costs and benefits to wildlife and their habitat associated with spring burning?
- How has the implementation of the Fire Management Plan affected the landscape?

Ecological Change - General

- What are the secondary effects of exotic plant invasions, including modification of habitat, fire regimes and nutrient cycling/biochemical processes?
- How will regional landscape change affect the implementation of restoration practices?
- Causality of ecosystem change (species assemblages)?
 - What are the drivers and what are the proper measurements of these drivers

- Where are the edges of the shifted or new assemblages?
- Where are we seeing the biggest changes?

Keystone Species

- What are the foundational species in the landscape?
- How do we identify keystone species?
- Are there appropriate substitutes as species ranges changes?

Models Needed

- What are the current models for predicting change in the Sierra?
- How do we incorporate the data from these models into management actions and plans?
- As the type of model or data changes, how do we continually incorporate these changes into our management plans?

Refugia/Biodiversity hotspots

- How do we define a refugia/biodiversity hotspot?
- Where are they located?
- What processes support these conditions?
- Is there data to support management for refugia?

Atmospheric/Climate

- What are the types, sources, and effects of contaminants in aquatic ecosystems?
- What are the major factors related to transport of organic contaminants (organochlorine) and what are the ecological effects?
- What are the emission characteristics for smoke/air quality modeling purposes?
- What are the additional physical measurements (i.e. weather/climate, snow, groundwater, surface water) necessary to permit rigorous scientific investigation of ecosystem change?
- What are critical loads for nitrogen, sulfur, ozone, mercury, and other atmospheric pollutants, particularly for sensitive resources such as alpine habitats, lakes and other water bodies, and wetlands?
- What are the levels of local NO_x emissions? Regional?
- What NO_x emissions are associated with different kinds of fires, different intensities, and different fuel types?

Hydrologic Processes

- What are the reference conditions for aquatic ecosystems?

- What are the linkages between atmospheric deposition and surface water chemistry and potentially impacted areas?
- What are the downstream ecological effects of diminishing water flows in creeks/rivers fed by the Lyell and MacClure glaciers?
- What is the nature and extent of soil water reservoir(s) as it relates to forest resilience and climate change?
- What is the vulnerability of streams (not major rivers) to changes in snowpack as a result of climate change? What biological/physical processes are potentially affected?

DISCIPLINE-SCALE: NATURAL

Earth Sciences

- What is the depth and morphology of the subsurface component of Yosemite Valley? How does that affect groundwater occurrence?
- What is the sedimentological history of the Valley and is there a tie to soil development and groundwater hydraulics?

Vegetation

- What is the range of natural variability for healthy forests in the Sierra Nevada for variables including energy flow, insect, nutrient cycles, and water?
- What is the presence and distribution of nonvascular taxa and their species-specific habitats?
- What is the current vegetation distribution in Yosemite?
 - How can we anticipate this to change based on current climate change models for this area? What does this mean for rare taxa?
 - How will climate change affect Yosemite's old growth forests? How will climate change affect Yosemite's giant trees?
- How closely does remote sensing data match the current vegetation distribution within Yosemite?
- What is the susceptibility of Yosemite's vegetation to pathogens, such as *Phytophthora ramorum* (Sudden Oak Death)?
 - Is genetic resistance to *P. ramorum* similar to other areas of California?
 - What will *Phytophthora ramorum*'s impact and distribution be in 10 years, 50 years, and beyond in Yosemite.
 - Where will the pathogen become established? Where could it become established if it was introduced and in what geographic areas and climates would it cause unacceptable damage? In Yosemite, does this predicted change match current state and national models?

- What is the effectiveness of restoration projects focused on vegetation?
- Is black oak distribution and phenotype the result of past human manipulations?
- How will habitat type conversion and disturbance affect gene flow and connectivity?
- What is the presence of rare plants in the landscape and what is their biology? Is their biology different from outside of Yosemite?
- What is the vulnerability of riparian habitat to climate change?
- Are there unnaturally high levels of herbivory, because of predator exclusion (i.e. trophic cascades)?
- What is the vulnerability of riparian habitat to herbivory/predator exclusion?
- How are long-term ponderosa pine and white fir vegetation plots changing over time?
- What is the current extent of old growth forests in Yosemite?
 - Has old growth been lost to vegetation succession and/or high intensity fires?

Wildlife

- How will climate change impact the spread of disease? (wildlife/climate change)
- How do we best offset risk of disease transmission among populations with the need for connectivity?
- How have landscape-scale fires impacted species distributions?
- How does the heat from fire impact denning wildlife species?
- What is the minimum viable population needed for species recovery of our targeted recovery programs? What is the elevational and geographic distribution needed?
- What is the available prey-base / forage-base for species targeted for restoration?
- What is the productivity and survivorship of young produced from restored species?
- How will climate change impact the distribution of wildlife (temporally and spatially) in the landscape and from that, both forage availability and predator-prey dynamics? (wildlife/climate change/carrying capacity)
- How much have human food subsidies increased the numbers and distribution of raccoons, ravens, and other predators, and how much are these subsidized species impacting other species?
- How much are native predators impacting the chance of success for species recoveries?
- What is the species assemblage at Ackerson Meadow?
- Which are the highest priority meadows for Yosemite toads?
- How much have competitors of priority species expanded their range into the park?
- What is the status of deer populations in the park and how can we study them in relation to their movement and management outside the park boundaries?
- What is the current balance of the aquatic system in the Yosemite Valley?

- What ecosystem subsidies can be measured in conjunction with our bullfrog and trout removals?
- Where are there elevational refugia that can be used to harbor rare species?
- How can we change both wildlife and human behavior to reduce roadkill? (social science / wildlife)
- What processes maintain corridors for species movement/shifts?
- Is it reasonable to facilitate migration?

DISCIPLINE – SCALE: HUMAN DIMENSIONS

Anthropology

- What Traditional Ecological Knowledge can be compiled and documented for Yosemite and specific areas such as Yosemite Valley, Wawona, Crane Flat, Hetch Hetchy, Sequoia Groves, Tuolumne Meadows?
- What is the TEK related to all tribal groups on both the west and east side of the Sierra?
- What is the related traditional use of park areas especially meadows, oak woodlands, etc?
- What are the critical Ethnographic Research Domains to focus upon for Yosemite?
- What is the correlation between ethnographic information, ethnographic site locations, and known archeological sites?
- What specific Traditional Cultural Properties can be define and documented in Yosemite?
- What properties associated with traditionally associated tribes?
- What properties associated with non-tribal groups?
- What ethnographic sites critical to tribes/groups can be defined, especially as related to meadows?
- What are the interdisciplinary links between Anthropological/Ethnographic research and Natural Resource Stewardship in Yosemite?
- What are the links between Ethnographic Data and Black Oak distribution and genetic makeup in Yosemite?
- What are the cultural links with possible horticultural/"orchard" use of oak groves?
- What information can be derived that might explain tribal family/band/clan relationships to various oak stands?

Archeology

- What data exist to formulate a revised Yosemite Cultural Chronology?
 - Site types/functions?

- What are changes in Climate/Vegetation Communities and correspondence with changes in site distribution, types?
- Where do sites exist not currently visible on the surface due to vegetation change, ground cover, fire, etc.?
- What data links exist between Paleo-Vegetation/Climatic modeling and archeological site data?
 - Especially as relates to meadows?
- What is the Chemical Characterization/Dating of Park pictographs and pigments?
- What preservation methods for pictographs can be derived?
- What are the links between American Indian History and archeological site data?
- What is the spatial distribution (geographically and topographically (elevation)) of prehistoric sites in Yosemite?
- What is the cultural land use through time, especially meadow areas?
- What patterns can be discerned between changes to vegetation and faunal distribution and the relation to archeological site locations?
- What archeological site data (soils, chronology, pollen, etc.) can be used to develop site specific and park-wide paleo-climatic modeling?
- What data exist to formulate a revised projectile point typology specific to Yosemite and the Southern Sierra?
- What data exist to develop a Prehistoric Site Predictive Model for research in land use/climatic modelling and other topics?

History, Architecture and Cultural Landscapes

- What are the documentable facts for the Park's Administrative History?
- What is the history of Yosemite trails during prehistoric and historic periods?
- What are the contributing features, structures, and sites related to trails?
- What changes in trail routes and corridors can be documented through time?
- What historic trails have been abandoned and what are their histories?
- What are the significant Cultural Landscapes in Yosemite?
- What are the multi-disciplinary links related to Cultural Landscapes?
Ethnographic<>Archeological<>Historical<>Vegetation<>Wildlife Links
- What is the Genetic Characterization and Historical Development of Yosemite Apple Orchards?

Social Science/Recreation/Interdisciplinary (Mitigate Human-Resource Interaction)

- Throughout the park, we need basic data on human use including numbers, activities, and destinations. These data are needed temporally and spatially. Further, we need data on visitors as well as administrative use. (social science – visitation)
- How can we improve the visitation experience (perceived and actual) to increase visitation to Yosemite by underrepresented ethnic groups? (social science – diversity)
- Throughout the park, we need basic data on causality between human use and resource condition. For example, how does human activity relate to spatial and temporal patterns of fire, the introduction of invasive plants, or the erosion of streambanks? (social science/general resources)
- What level of management activity is the public willing to accept to maintain the processes and communities in Yosemite NP?
- What are the causal factors for detected changes in ORVs (context monitoring)? (resource impacts)?
- What remedial designs will facilitate the passage of species and water across transportation networks, roads in particular?
- To what extent do recreational impacts reduce ecological integrity?
- What levels/types of resource and social impacts are caused by types of visitor uses/recreation activities?
- What factors are most relevant to a search and rescue (SAR) predictive model?