Pacific Coast Science and Learning Center Research Priorities for the San Francisco Bay Area Network of Parks

Updated December 21, 2010
Pacific Coast Science and Learning Center
San Francisco Bay Area Network of Parks
National Park Service

Index

Biological Resources

Wildlife

Topic / Question	Park*		
	GOGA	PORE	PINN
Birds			
Wildlife inventory and habitat relationship work on GOGA new lands in San Mateo County: landbirds.	x		
Study waterbird use of major wetlands at GOGA.	x		
Evaluate the effectiveness of buffers and other methods in deterring nest abandonment during vegetation clearing activities.	x		
Raven management and implications for sensitive bird resources.	x	x	
Comparison of raven numbers and behavior under various livestock feeding designs, i.e., use of covered cattle feeding troughs to decrease supplemental feeding of ravens in PORE pastoral areas (Kehoe and McClure). This project would entail observation of control and covered troughs, measuring raven densities and documenting raven behavior.		x	
Corvid population and West Nile virus			x
Does the use of covered dairy feeding troughs result in fewer Ravens near Snowy Plover breeding grounds?		x	
Evaluate western snowy plover use of beaches in relation to beach morphology.	x		
Identify key limiting factors on snowy plover population; evaluate habitat use and characterize habitats used and not used at PORE; determine abundance of predators in areas used vs. not used. Evaluate effectiveness of exclosures for increasing productivity.		x	
Habitat improvements for western snowy plovers - European beach grass removal		x	
Wild turkey inventory and development of management strategy	x		
Dietary analysis of wild turkeys – we have 3-4 years of stored crop and gizzard contents from birds collected within the park. There is a need for analysis of the composition of turkey diets in order to predict impacts to native plant and animal species and to build predictive models or impacts and range of turkeys in the future.		x	
What is the health of raptors and ravens related to successful reproduction?			x
Owl inventory, including habitat (incl. burrowing owls)			x
Barred owls - inventory, impacts on Spotted Owls	x	x	
Northern spotted owls—movement patterns	x	x	
Northern spotted owls - habitat quality study	x	x	
Distribution and breeding success of accipiters related to trail use			x
Compilation of regional data sets on prairie falcon trends to evaluate potential larger-scale environmental controls on prairie falcon abundance as well as the possible influence of immigration on population dynamics in PINN.			x

Color-banding of entire PINN prairie falcon breeding population and banding-age nestlings over a 3-year period to ascertain site fidelity, pair fidelity, and degree of genetic insularity of local population			x
Identify the severity of limiting factors on condor nesting success			x
Evaluate the impact of proffering lead-free food to condors; evaluate condor food sources and nutrition.			x
Elucidate the secondary immunological effects of contaminant exposures in condors.			x
Condor RNA biomarker study			x
What is the health of California Thrasher, Sage Sparrow, Wrentit, Blue-grey gnatcatcher, Spotted Towhee related to successful reproduction?			x
Marbled murrelet inventory at Phleger Estate and Corral de Tierra, San Mateo County.	x		
Mammals			
How does wildlife respond to habitat structure and changes in structure through time?	x		x
Wildlife inventory and habitat relationship work on GOGA new lands in San Mateo County: mammals.	x		
Study river otter ecology and movement patterns. What are the home ranges and movement corridors for river otters in an urban setting?	x		
Urban carnivores - coyote management, aversive conditioning, effects of public outreach. Coyote ecology and movement patterns at the urban interface.	x		
Study gray fox abundance and habitat relationships at GOGA	x		
Mountain lions			x
Study deer population at GOGA.	x		
Elk exclosures Tomales Point: Repeat protocols established by USGS for monitoring vegetation cover and type inside and outside twelve 30 X 30 m. exclosures at Tomales Point elk reserve. We have data since 1998 (not every year).		x	
The extent to which the pig fence acts as a barrier to native wildlife (e.g., American badger), and methods to allow passage of affected species.			x
Study raccoon ecology, density, and movement patterns at GOGA.	x		
Anything related to bats -- foraging ecology, roosting, fire effects, etc.	x		x
Assess spatial/temporal distribution of sycamores and willows and the effects on Western Red Bats			x
Where do Townsend’s big-eared bats go in transition seasons (spring/fall)?			x
Distribution of crack/crevice roosting bats and potential impacts of rock climbing.			x
Effects of sudden oak death on food source of woodrat. Significant changes in the food source will likely affect spotted owl populations.	x	x	

Fish			
Evaluate body burden of resident fish (and/or macrocrustaceans) in Crissy Field marsh for contaminants (especially methylmercury and chemicals of emerging concern)	x		
Effect of algal biotoxins (anatoxin and microcystin) on native lagoon fish (Rodeo Lagoon)	x		
Evaluate major decline in coho returns. Current thought indicates change in ocean conditions as major culprit. NPS has extensive information that could be used as basis for analysis.	x	x	
Comparison of coho and steelhead fisheries data with collected habitat data	x	x	
Can a model be developed that predicts the frequency, depth, and location of coho and steelhead redd scour?	x	x	
What is the adult residence time of coho at the beginning and end of the spawning season?	x	x	
Does smolt trap monitoring delay outmigration of juvenile coho and steelhead?	x	x	
What is the age of freshwater entry and age of returning coho adults based on scale analyses?	x	x	
Reptiles & Amphibians			
Wildlife inventory and habitat relationship work on GOGA new lands in San Mateo County: herptofauna.	x		
Surfactants (used with glyphosate) and their effects on frogs and fish			x
What is the current distribution and abundance of western toads?	x		
Re-establishment of Foothill Yellow Legged Frog	x		x
Re-establishment of Western Spade-foot Toad			x
Radio-tracking study of California red-legged frogs at reintroduction sites	x		
Radio-tracking of California red-legged frogs at Mori Point to assess travel patterns between Sharp Park and Quarry	x		
Are egg mass counts an accurate measurement of the effective population of California red-legged frogs and if not, are the biases known and accountable?	x		
What is the age class structure of California red-legged frogs at a sustainable site?	x		
Reintroduction of western pond turtle to a restored lagoon-creek complex- when, whom, and how?	x		
Invertebrates			
Non-native insects: abundance, distribution, impacts, watch-out list, preventative measures, management recommendations			x
Inventory of invertebrates (and plants?) in desert-like habitat. Initial findings suggest a strong affiliation with Southern California deserts.			x
Wildlife inventory and habitat relationship on GOGA lands: invertebrates.	x		
Tarantulas and arachnids	x		x
Ants	x		x
Earthworms	x		x
Long term data analysis for existing Mission blue butterfly data.	x		
Studies on mission blue butterfly use of *Lupinus arboreus* at Wolfback Ridge	x		

Create comprehensive map of Mission Blue Butterfly Habitat in the Marin Headlands	x		
Spring surveys of areas idenitified as 'suitable' Mission Blue butterfly habitat to determine use	x		
Develop long term monitoring protocol for Mission blue butterflies.	x		
Study habitat isolation effects on Mission blue butterflies.	x		
Butterfly monitoring and habitat enhancement - Mission blue butterflies	x		
Bee faunal associations with fire-following plant flora			x
Impacts of fire on the bee fauna related to vegetation composition change.			x
Floral relations of bee fauna	x		x
Investigate groundwater-associated aquatic invertebrates. Initial findings suggest a specially adapted endemic fauna.			x
Are annual trends in population of California freshwater shrimp associated with measurable environmental conditions such as streamflow and water temperature?	x		
Investigate the high diversity of congeneric caddisflies. How are they partitioning the habitat?			x
Miscellaneous			
Climate impacts on wildlife species abundance, distribution and ecology	x		
Evaluate effects of visitor use on wildlife			x
Evaluate effects of trail closures and openings on wildlife	x		
Study effects of pending new dog regulations on wildlife	x		
Effects of fire on wildlife			x
Impacts of pesticide (incl. rodenticide) use outside the park on park wildlife.			x
Habituation of wildlife (coyotes, ravens, etc.) to condor feeding sites, and possible secondary effects on other species.			x
Evaluate landscape connectivity and wildlife corridors, identify critical breaks in habitat connectivity and areas with excessive roadkill mortalities.	x		x
Evaluate wildlife use under elevated trail at Mori Point (e.g., through use of cameras, tracking boards, etc.)	x		
What kind of habitat do the pinnacles formations provide and for which species over time?			x
Develop a web based wildlife observation reporting system for GOGA	x		
Develop community science monitoring program for GOGA.	x		

***GOGA** = Golden Gate National Recreation Area, **PORE** = Point Reyes National Seashore, **PINN**= Pinnacles National Monument

Vegetation

Topic / Question	Park*		
	GOGA	PORE	PINN
Responses to Climate Change			
Overview: Models of future climate change in California predict warmer and drier conditions. In light of these projections, many spatial models depicting species or vegetation type responses to a changing climate have been generated. Most, if not all of these models appear highly simplistic (based on climate envelope, topography, and maybe only a few other variables; all at coarse scales). Consequently, the shifts in species or vegetation type distributions that are generated often show dramatic changes. While such changes may very well happen in the near future, and these types of models are useful and worth refining, other types of efforts towards understanding climate change should be pursued. Non-spatial models, experimental approaches, literature reviews, and other creative endeavors are also needed for Park staff to make better informed decisions regarding vegetation management in response to climate change in the San Francisco Bay Area Network (SFAN).			
Creating site-specific models of climate induced vegetation change. Contemporary species and vegetation type response models to future climate scenarios are coarse in scale. Instead of models that focus on the movement of species climatic envelopes, models of vegetation change involving multiple species based on site-specific conditions seem more realistic and useful to land managers. Land managers may better benefit from vegetation change models that are focused on a specific piece of land where detailed information on: species composition, vegetation structure, successional trajectories, species growth rates, fire response traits, herbivory response, functional traits, competitive interactions, edaphic conditions, seedbanks, surrounding propagule sources, etc… can all be incorporated to produce different models of vegetation trajectories. Models based on site-specific conditions can be combined with projected climate change scenarios and disturbance regime models to create a more realistic understanding of how vegetation would be expected to change as the climate warms. Understanding what changes might occur at a particular site and why they are occurring based on site-specific factors appears to be a more practical modeling approach than the contemporary spatial climatic envelope paradigm.	x	x	x
How does climate affect successional trends among the vegetation types of coastal California? In the absence of disturbances, general successional processes in Bay Area vegetation mosaics suggest that grasslands can be colonized by shrubs, which can then be colonized by trees. In contrast, similar vegetation types, like exotic annual grasslands, coastal scrub, and chaparral of southern California, do not undergo succession as described above, or do so relatively slowly. In other words, in drier portions of the state, mature stands of grassland, scrub, and chaparral appear relatively static.	x	x	x

First, is it true that drier areas along the coast undergo succession slower than relatively wetter areas? Does water availability determine successional rates? Second, if more mesic locales undergo successional processes relatively rapidly, then which parts of the Bay Area, or which Parks or portions of Parks would we expect successional processes to be relatively rapid or slow? For example, in places that are relatively dry, like PINN (mean annual precipitation is approximately 38 cm), vegetation succession from shrubland to woodland is not apparent or is extremely slow in relation to the life span of humans. In places like PORE (mean annual precipitation is approximately 81 cm) successional processes appear to be relatively rapid and obvious. Among similar vegetation types, will the future change in climate have a different effect in dry (e.g. PINN) versus wet (e.g. PORE) locales? As the climate dries, will successional rates in PORE begin to resemble those in PINN? If successional rates are already very low in PINN, will future climate change cause species die-offs? In other words, among similar vegetation types, will successional rates slow down in places that currently exhibit relatively mesic conditions and will species die-off in places that currently exhibit relatively xeric conditions? How do physiological and other functional traits between species in PINN chaparral versus PORE chaparral, for example, alter their susceptibility to climate change?			
Existing climatic gradients and potential change along those gradients. Are there any strong climatic gradients in the Parks or across the greater Bay Area and how would we expect to see changes in vegetation along those climatic gradients as warmer, drier conditions become more prevalent?	x	x	x
Will climate change be equal across the Bay Area? Do local-scale climatic models predict that interior locations will experience greater temperature increases than coastal ones? If so, how will this affect vegetation across the SFAN Parks?	x	x	x
Changes in species distributions. Which species are currently at their outer distributional limit in each SFAN Park and how would climate change affect the future distribution of each of these species? For example, *Phleum alpinum* L. currently is at its southernmost station along the coast in PORE. Will climate change push this species further north, out of this Park's jurisdictional boundary? What might be the consequences for each Park as different components of the vegetation are removed and others are gained? Are there constraints on plant dispersal and how would those affect the ratio of gains to losses? Can we assume that species loss is more likely than species gain (excluding species not native to California)?	x	x	x

Resistance, resilience, and persistence of different vegetation types. Vegetation types in the SFAN Parks are numerous. Which plant communities would we expect to be resilient and/or resistant to climate change? Which vegetation types do we think will be buffered by change and persist? Which vegetation types will show low resistance and/or resiliency?	x	x	x
Species life histories. What is the mean life span of the different perennial plants that dominate the various vegetation types in the Parks? For each species, what types of disturbance, disease, or biological processes typically ends the life of an individual? Would we expect communities dominated by species with a short life span to be less resistant and/or resilient to climate change? For vegetation types dominated by long-lived species, will the ability to detect the effects of climate change be delayed versus vegetation types dominated by short-lived species? Which communities typically have even-aged stands and which communities have mixed-aged stands and how will the mean life span of the dominant plants in those communities influence their respective vulnerability to climate change or the time we would expect to see changes in that community?	x	x	x
Synthesis of historic vegetation response to past climate shifts. The past climate of California has been dynamic and previous warming periods in the Quaternary during the Aftonian, Yarmouth, and Sangoman interglacials, and during the Xerothermic, have shifted plant species distributions in California. Can the numerous studies on past climate and paleobotany be synthesized and used to generate expected shifts in current distributions? What novel factors exist that would change the way vegetation types and species respond to future warming compared to the past?	x	x	x
Other climate change related projects. There are numerous investigations that could be done within the SFAN Parks that would help park staff better manage vegetation in the face of climate change. Please consider pursuing the questions above or any variation of them, or entirely different questions that you think will benefit our SFAN National Parks in the face of future climate change or other interrelated processes.	x	x	x
Are there any precipitation gradients or other broad climatic gradient across a large portion of the park that can be utilized to help infer causation regarding future change in vegetation?	x	x	x
Local-scale water availability gradients. Can we identify hill-tops, ridgelines, or other local scale topographic features that capture relatively high amounts of fog-drip? Is the vegetation present in those areas indicative of species or vegetation types that are known to be dependent on supplemental water inputs from fog (e.g. coastal redwood forests, coastal prairies, etc…)? Would vegetation in these places be more sensitive or resistant to alterations in fog regime? Do vegetation patterns track fog-drip inputs along these topographically mediated gradients?	x	x	

Vegetation changes in and around seeps. For example, the Presidio contains serpentine seeps that are habitat for rare plants. Will changes in future precipitation reduce outflow in seeps and alter the habitat quality for the current suite of species that occupy them?	x	x	
What vegetation types would we expect to be relatively resistant and/or resilient to climate change effects?	x	x	
Which species and vegetation types are currently at their outer distributional limit within the PORE/GOGA jurisdictional boundary and how would climate change affect their future distribution?	x	x	
Will the ability to detect the effects of climate change be delayed in vegetation types dominated by long-lived species as opposed to relatively short-lived species? Which communities typically have even-aged stands and which communities have mixed-aged stands and how will the mean life span of the dominant plants in those communities influence their respective vulnerability to climate change or the time we would expect to see them change in response to climate alterations?	x	x	
The past climate of California has been dynamic and previous warming periods in the Quaternary during the Aftonian, Yarmouth, and Sangoman interglacials, and during the Xerothermic, have shifted plant species distributions along the coast in California. **Can the numerous studies on past climate and paleobotany be synthesized and used to generate expected shifts in current distributions?**	x	x	
Moist, closed cone pine forests and *Sequoia sempervirens* were present in La Brea (Los Angeles County) and Carpinteria (Santa Barbara County) earlier in the quaternary (14,000 to 38,000 years ago) (Johnson 1977). Currently, *S. sempervirens* reaches its southernmost distribution in Monterey County, near the border of San Luis Obispo County. Likewise, *Picea stichensis* was formerly present around Tomales Bay in the Pleistocene (approximately 30, 000 years ago) (Johnson 1977) but its current southern-most station is now at Fort Bragg, Mendocino County. While many of the species found in the southern Californian paleobotanic sites have present-day distributions in locales much further away, many of the other species that were discovered with *Picea stichensis* at the Tomales Bay site still occur naturally in this vicinity. **Has vegetation change during the Pleistocene and Holocene been much more dramatic in southern California compared to the San Francisco Bay Area?** Would future climate change cause Bay Area vegetation to more resemble that of the southern California coast? In other words, would we expect future vegetation patterns to shift northward along the coast as the climate becomes warmer?	x	x	
What novel factors exist that would change the way vegetation types and species respond to future warming compared to the past? What vegetation types or species are just outside the boundaries of PORE/GOGA and would we expect them to shift into our jurisdiction? Will invasive species restrict colonization success of native species? Will barriers to dispersal like human development prevent species from expanding into more favorable areas?	x	x	

Are vegetation features, like cover and species composition, more constrained by edaphic factors rather than climatic ones? Vegetation mosaics characterize much of POGO's landscape. Why can such dramatically different vegetation types integrate so closely within a small area? Is the spatial distribution of vegetation types edaphically controlled? Certainly this is true for some vegetation types. If the spatial distribution of vegetation types is edaphically controlled, how will this influence the potential for alternative vegetation types to establish when the climate changes? • How does structure and species composition vary among the different soil types found in POGO? • When a vegetation types is found in multiple soil types or soil conditions, what are the differences between the stands that occur in the different soil conditions?	x	x	
Exotic Plants			
What is the impact of exotic species on vegetation? a. Where has the greatest displacement of native species taken place? Where might we expect other large-scale displacements to take place? b. Which communities have the greatest proportion of non-native species in terms of relative frequency and spatial extent? c. In areas that have been invaded, what might be the reasons for invasive plant success? d. Are invasive plant spatial patterns associated with proximity to roads or human habituated properties? Should vegetation sampling units be placed at set distances away from propagule sources to document invasions?	x	x	
Conduct herbicide and other treatment trials on oblong spurge. Conduct grassland restoration trials to follow oblong spurge control.	x		
Test an aster-specific herbicide to treat Cape Ivy	x		
Develop control techniques matrix for *Oxalis pes-caprae.* This recent invader is expanding rapidly into many coastal areas including dune and upland habitats. Effective control methods are needed.	x	x	
In riparian areas, can cape ivy be effectively eradicated with heavy machinery immediately prior to slope regrading? Is resprout occurrence any worse than our currently methods of clearing all vegetation to the ground?	x	x	
Broom Control: evaluate the use of fire, herbicides, and mechanical removal (weed wrenches, mowers, chainsaws) to reduce or eliminate French/Scotch broom		x	
Evaluate the use of fire to control invasive nonnative plants	x	x	x
Create potential expansion model for two new wind dispersed invaders in coastal habitat, *Helichrysum petiolatum* and *Erigeron karvinskianus*.	x		
Develop expansion and colonization models for invasive perennial grasses to identify priority areas to prevent invasion	x		
Early detection-- analyze utility of program and effectiveness	x	x	x
Identify the seed viability of *Helichrysum petiolatum* under a variety of conditions	x		

Identify factors related to species-specific rates of spread.	x	x	x
Do non-native grasses in riparian areas need to be controlled and/or reseeded with native grasses to foster native re-establishment?	x	x	
Develop expansion models for invasive perennial grasses, specifically tall fescue, *Festuca arundinacea* and Harding grass, *Phalaris aquatica* and South African veldt grasses (*Ehrharta* sp.).	x	x	
Evaluate the rate of spread for *Rubus armeniacus* (formerly known as R. discolor) across bioregions (Coastal California [North and South] and Sierra Nevadas – California EPMT)	x	x	
Evaluate the rate of spread for *Eucalyptus globulus* across bioregions in Northern and Southern California	x	x	
Evaluate the effects of select thinning of Eucalpytus on understory species. (in collaboration with Network Fire Program)	x	x	
Of species identified by the California Invasive Plant Council - what species most effectively exclude native recruitment and establishment? Of those that are most dominant; are there acceptable or tolerable levels and at what threshold should control be implemented?	x		
What monitoring do we need beyond effectiveness monitoring	x		
Examine rate of spread: mode-based vs. field data base	x		
Native community response to treatments	x		
What are benefits to rare species vs. impacts/damage to rarities from restoration actions?	x		
What is a streamlined way to answer basic questions such as what works best, what is the change in spp. composition over time, etc.	x		
Determination of most detrimental invasive competitors at newly restored sites	x	x	
Evaluate the effects of invasive plant removal on the restoration of native habitat and natural processes in coastal dune systems (Limantour Beach)		x	
Evaluate the effects of invasive plant removal on the restoration of native habitat and natural processes in coastal bluff systems (Point Reyes Headlands)		x	
Monitor spread of invasive plant species by remote sensing			x
Development of compelling materials for visitors about the topic of invasive plants			x
Is the distribution and abundance (both actual and relative) of non-native species changing within the Monument? Are there areas where change is happening more quickly? (fence, roads, trails, burned areas, grazed lands, flooded areas, specific habitats)			x
Vegetation Management			
Use of LiDAR to revise NWI Maps	x		
What is the best monitoring design to use for monitoring select endangered plant species? (Sonoma alopecurus and beach layia) Design should meet USFWS recovery objectives.	x	x	

Develop a long term management strategy for Point Reyes rein orchid		x	
Can vegetation maps be refined by using accuracy assessment plots? (PORE-GOGA has 1,600 vegetation plots that were not used in the generation of the final vegetation association/alliance map).	x	x	
Environmental history of PORE- what have long term patterns of vegetation been?		x	
Disturbance and grassland ecology	x	x	
Sudden Oak Death: a. Wildlife impacts b. Impacts on veg; weeds c. Impacts on fuel loading and potential fire behavior	x	x	
Emerging infectious plant diseases			x
Effects of sudden oak death on food source of woodrat. Significant changes in the food source will likely affect spotted owl populations.	x	x	
Pitch Canker—impact on bishop pine forest structure, weeds	x	x	
Develop competitive seed mixes for restoration work			x
Rare plant abundance and distribution. Prioritizing plant species of management concern (rare or sensitive plants).			x
Fire Ecology			
Model fire behavior in eucalyptus forests before and after thinning treatment	x	x	
Fire and rare plant management in chaparral: Can fire or fuels management successfully increase recruitment and survival of rare chaparral species? a. Mason's ceanothus b. Marin manzanita	x	x	
What is the natural fire return interval for each of the main vegetation types in PORE/GOGA? What signal (snags, coarse woody debris, recruitment of certain species, etc…) in each vegetation type indicates that a particular stand has departed from a natural fire return interval? Is departure a good thing, bad thing, or not important for management?	x	x	
Which specific vegetation stands have experienced the greatest departure from their supposed natural fire regime? Which portions of PORE/GOGA have experienced the greatest departure from a natural fire regime?	x	x	
What are the consequences of fire suppression to certain species and vegetation types?	x	x	
If there are significant precipitation gradients in PORE/GOGA, will there be a difference in the rate of recovery between the wetter vs. drier parts of the park? How much of this difference in recovery rate will be a function of species traits?	x	x	
What is the interaction between climate change and fire suppression? Will lack of disturbances like fire, have a greater influence on vegetation than changing climatic conditions? In other words, will changes associated with fire suppression over-ride or blur any effect or signal associated with climate change?	x	x	

Range Ecology			
Can seasonal/rotational grazing increase coastal prairie native species diversity?	x	x	
Many ranches use nonnative grass seed on their pastures. Can native grass seed be used in pasture improvement to increase native species cover, richness, and biomass?	x	x	
How effective is mowing at controlling nonnative thistles? Research should result in site specific prescriptions for thistle control that can be implemented by local ranchers	x	x	
What species occur in the absence of cattle grazing?	x	x	
Miscellaneous			
What is the structure and species composition of the vegetation types in PORE/GOGA? a. Can stands representing certain PORE/GOGA vegetation types be used as references for similar sites within or outside the park that have experienced greater land-use intensity and/or more invasive species success? b. Inventory/Sample communities of interest to establish baseline conditions: • Serpentine communities • Muir Woods/Phleger Estates Redwood Forests • Decomposed Granite Outcrops • Coastal Dunes • Coastal Bluff Scrub • Coastal Prairies • Bishop Pine Forest • Special Status Plant Communities (for example, there are several chaparral associations that are considered rare and/or composed by rare plants)	x	x	
What is the spatial coverage of vegetation types in PORE/GOGA? This can be addressed using the vegetation map.	x	x	
Use of LiDAR to map forest stands	x		
Develop Historic Land-Use Maps for Point Reyes NS.		x	
Phenology – including correlate long-term data sets	x		x
Determine the makeup of historic coastal wetland communities and inundation/salinity regimes through use of phytolith and diatom analyses.	x		
Lichen Inventory	x		
Evaluate the California Exotic Plant Management Team's system for data collection and tracking to better understand site trends.	x	x	
What is the role of fog on species composition: anticipated effects of possible fog reduction associated with climate change.	x	x	
Examine effects of CYSC in soil dynamics and develop RX for restoration options matrix.		x	
Can 1' color imagery at the bloom stage of CYSC be used to map/inventory entire PORE population		x	

The causes of "pygmy" chamise. (Chamise chaparral that is >40 years old, but only 2-3 feet tall)			x
Impacts of high ozone on indicator plant species as well as general plant flora.			x
Document the recovery of the landscape after the removal of feral pigs both vegetation and soil stability			x
Assess the viability of Valley Oaks, are they a remnant Pleistocene species?			x
Is oak recruitment and mortality within the natural range of variation within the coastal range?			x
Regeneration of Blue Oaks related to fire and grazing (one year work done)			x
Natural succession after natural disasters			x
What is mortality, recruitment and general demography of gray pine in and outside the Monument?			x
How is the gross vegetation community within and adjacent to the park changing? (aerial photos every 5-10 years)			x
Are there changes in the native bulb species distribution and abundance as a result of pigs, both inside and outside fence?			x
Are the distribution and abundance of riparian species changing as a result of changes in watertable, flooding etc.?			x
Are there changes in the distribution and abundance of native bunchgrasses, and can areas at Pinnacles be used as reference areas for more disturbed sites?			x
Is the distribution and abundance of plant species from southern California and northern California at the edge of their range changing?			x
Is the distribution and abundance of plant species becoming rare outside of the park changing within the park?			x

***GOGA** = Golden Gate National Recreation Area, **PORE** = Point Reyes National Seashore, **PINN**= Pinnacles National Monument

Marine Environment

Topic / Question	Park*		
	GOGA	PORE	
How dynamic are eelgrass beds within GOGA in San Francisco Bay?	x		
What are the trends in crab and fish species catch and size at designated fishing piers?	x		
Studies that improve our knowledge and understanding of marine resources	x		

***GOGA** = Golden Gate National Recreation Area, **PORE** = Point Reyes National Seashore, **PINN**= Pinnacles National Monument

Cultural Resources

Topic / Question	Park*		
	GOGA	**PORE**	**PINN**
Ethnography of land use by Ohlone and Salinan peoples			x
Analysis of how park could better invite, interest and communicate with the west side communities, largely Mexican or of Mexican descent			x

***GOGA** = Golden Gate National Recreation Area, **PORE** = Point Reyes National Seashore, **PINN**= Pinnacles National Monument

Physical Processes

Topic / Question	Park*		
	GOGA	PORE	PINN
Air/Climate			
Analysis of long-term air quality data			x
Lichen response to air quality			x
Determine the source of pollution causing PINN to exceed National standards of ozone (air distribution/movement map)			x
How can internal park air pollution sources be reduced to improve the park's impact on regional air quality?			x
Cave temperature/humidity modeling			x
Impacts of climate change on Bay Area National Park ecosystems, communities, infrastructure, and species.	x	x	x
Analysis of central California Climate based upon floodplain sediments, tree rings, and woodrat middens at Pinnacles NM			x
Reconstruct past climates, esp. El Nino Phenomenon			x
PINN's air monitoring program provides information on ozone, nitrogen, and sulfur trends but there is little data on the ecological effects of these trends. Air quality—the effects of low but chronic levels of nitrogen deposition on the diverse assemblage of lichens are not well-understood.			x
Ozone: is air quality station representative of hiking areas in park?			x
Water			
What are the percentages of culverts (and where) causing erosion on park lands?	x		
What is the influence of fog on diurnal fluctuations of streamflow and what are implications in terms of climate change?	x		
What is the extent of diurnal streamflow depletion of different riparian communities during the summer-fall low flow period?	x		
Are groundwater withdrawals in the West Union Creek basin (San Mateo Co.) affecting summer baseflows?	x		
Use of remote technology to evaluate floodplain flow velocities, flooding depths and inundation extent at Lower Redwood Creek (Muir Beach) under a range of flow conditions	x		
Use of LiDAR to map shallow subtidal areas	x		
Use of LiDAR to Identify flood hazards	x		
Hydrology of newly acquired lands, especially in relation to amphibians, turkey vultures, vegetation, invasive plants.			x
Assess ecosystem consequences of restoring bottomlands vegetation/hydrology.			x
Hydrologic functioning of abandoned logging roads and impacts on watersheds	x	x	
Coastal Water Quality and circulation patterns. Integrating results of baseline study in winter 2006 -07/spring 07	x	x	
Land use history of the Chalone Creek Watershed			x

Long-term monitoring of geomorphic change of Chalone Creek			x
Response of creeks to fire and climate change			x
Run-off from parking lots after first rain			x
How are park roads, trails and parking lots and restoration activities, modifying sediment load, nutrient flow, hydrology, groundwater recharge?			x
Effects on water table and water quality of in-park activities as well as vineyards, other agriculture, and other activities on surrounding lands.			x
Fluvial geomorphic survey of the primary creeks, assess the impacts of human development and the health of the creeks.			x
What is the hydrologic pattern of the park including drying patterns?			x
How are activities altering the park's quality and quantity of water entering the park?			x
Fire			
What is the frequency, spatial distribution, intensity and source of fires that occur in the Monument?			x
What are the frequency, intensity, size and seasonality of fires and floods in the park?			x
What is the natural range of variability of sediment flow as related to fire and flood?			x
Miscellaneous			
Determine extent of historic wetlands through Coast Geodetic Survey maps	x		
Expand and build on regional LiDAR mapping projects underway by NOAA/USGS to address park-specific resources and locations. Examples include: tracking beach erosion/accretion dynamics; assessing vulnerability of coastal habitats to SLR and winter storms; analysis of historic shoreline changes; produce detailed topographic and/or bathymetric of restoration sites/watersheds/projects; produce maps of park infrastructure; baseline maps of infrastructure, geologic features, etc.	x		
Monitor bluff erosion	x		
Fault Mapping	x		
Paleontological resources (inventories, condition assessments)	x	x	x
Coastal processes studies throughout the park building on USGS work (e.g., nearshore wave and current measurements, beach dynamics, evaluate sediment transport rates and pathways, etc.)	x		
Monitoring of beach morphology to evaluate storm effects, seasonal changes and long-term trends	x		
Focused studies on beach and lagoon dynamics at Muir Beach to evaluate processes affecting tidal lagoon opening/closing, sediment sources affecting timing of beach berm build-up and breaching)	x		
Bedload and suspended sediment yield monitoring in Redwood Creek, repeat surveys conducted in 2003-04; evaluate sediment yield to restoration area; update sediment rating curve	x		
Sea cave research (including physical and biological inventories)	x	x	
Soundscape Monitoring and Research (e.g. social science studies, ecological questions, wildlife disturbance ,marine soundscapes)	x		

Night sky studies (quality assessment, improvement plans)	x		
What makes the green rock at Pinnacles green? It's not so simple!			x
Monitoring of restored floodplain after road removal			x
What impact is climbing having on the park's number one resource: the Rock? How does chalk and bolting affect the rock?			x
Anything related to climbing and its impacts on the natural system			x
Assess the Chalone Creek Fault as the Ancestor of the San Andreas Fault			x
Distribution of Soil Types and Surficial Geology (entire park, not just new lands)			x
Night Sky Darkness Monitoring (Light Pollution)			x
To what extent is Pinnacles National Monument connected to surrounding open space and how is this changing over time?			x
Where are the hydrophobic soils?			x
How are human sanitation issues, both above and below ground, affecting park resources?			x
Determine the human carrying capacity of PINN			x
What levels, timing and numbers, spatial distribution, of visitor activities are occurring in park?			x
Do we know where all of the social trails and other areas of soil compaction/erosion activities? Are they getting better or worse?			x
What are the changes of land use zoning, and development within 250km of park which effect viewsheds, air, water and light pollution in the park?			x
The NPS Night Sky Team (http://www.nature.nps.gov/air/lightscapes/team.cfm) was formed in 1999 by PINN employee, Chad Moore. This team collects field measurements of light pollution and identifies sources (Moore 2001). Data have been collected for many national park units, but none is available online (http://www.nature.nps.gov/air/lightscapes/monitorData/index.cfm) yet for PINN. For animals that avoid bright lights, light pollution can disrupt their movement patterns. Nocturnal predators such as owls can lose their night vision and be forced to hunt elsewhere. Very little is known about the ecological impacts of sky glow and direct lighting on the species and communities that inhabit PINN.			x

***GOGA** = Golden Gate National Recreation Area, **PORE** = Point Reyes National Seashore, **PINN**= Pinnacles National Monument