



February 12, 2002

**To:** Interested Parties

**From:** John Hamill, Department of the Interior

**Subject:** Summary: Coordinated Natural Resource Monitoring Workshop, Jan 30-Feb 1, 2002, Palm Spring California

Attached is the summary of the presentations that were given at the subject workshop. In addition, the Power Point slides for many of the presentations are posted on the DMG website.

A goal of the DMG is to coordinate/integrate monitoring efforts in the California deserts. The recommendations of the ad hoc group which met following the Workshop are included in the meeting summary. These recommendations will be discussed at the DMG meeting in Borrego Springs on April 10-11.

I want to thank all of you who attended the workshop. Special thanks are due to the workshop presenters and facilitators. The workshop could not have been a success without you help and participation.

Attachment



**Workshop Summary**  
**Coordinated Natural Resources & Monitoring**  
**Inventory in the California Deserts**  
**30-31 Jan 02**  
**Palm Springs, CA**

\***John Hamill** (Department of the Interior, Barstow, CA) provided introductory comments. Identified future challenges: increased population; increased development; increased demand for consumptive and resource protection; increased T&E species listing; increased restrictions; increased litigation. Explained why we monitor, and that it is a good and essential investment. Emphasized that monitoring must be done in the right way. Outlined elements of monitoring programs; attributes of a good monitoring program. Displayed the DMGs Area of Interest map to show variety of jurisdictions and interests. Questioned whether all the groups involved would continue to evolve independently or work together for a common goal. Expressed workshop goals.

\***Bob Alverts** (BLM, Portland, OR) discussed monitoring the Northwest Forest Plan. Methods, factors, criteria (handout – Monitoring Considerations). Results of direction from President Clinton in 1994, implemented FY95 and going ever since. Involves many agencies, three states (CA, OR, WA) and multiple tribes. Huge scale, from Canadian border to Bay area, involving many forest types and ecosystems. Challenge is getting the monitoring done in spite of all the interests involved. Identified 3 types: Implementation monitoring; effectiveness monitoring; validation monitoring. Showed manuals they use for monitoring and management.

Adaptive management experiences changes as people move, as politics shift. Things evaluated were: Kinds of monitoring; Scales of monitoring; Management issues/Concerns driving monitoring; Political/Legal/Other commitments already made; Cooperators/Partners of interest; Development of indicators and monitoring protocols; Timeline; Budget needs/ Cost commitments; Monitoring roles/Responsibilities.

**Dick Crowe** (BLM, Riverside, CA) discussed planning aspects of monitoring plans. Showed map of planning efforts in the California deserts. Discussed how the plans tie together as a cooperative effort, and that if everyone goes their separate way it won't be

effective or affordable. Desert Tortoise Critical Habitat ties many of the plans together, or how the plans cross. Discussed which plans were just getting started, or in draft. Spoke extensively about the NECO Preferred Alternative.

Emphasized the need for cooperation with DMG; USGS/Academia; and whether to have a long/short list of things to monitor.

Showed maps of Existing Routes Inventory; Existing Water Sources; Plan Boundaries; Bendire's Thrasher (a species of concern for many plans); same with Big Horn Sheep; Chuckwalla; CA Leaf-Nosed Bat; Burros and Wild Horses; Plant richness.

Ernie Quintana (NPS) questioned the idea of just using a long-term list, as being too general and not having any priorities. He feels prioritizing is what directs management decisions, and there are lessons to be learned from the folks who put together the Northwest Forest Plan.

Question about how monitoring ecosystem health is done. BLM has established standards that provide some indicators which are written up in regulations. Easy to monitor impacts, but not easy to monitor health. Still trying to determine the criteria of "health". Another difficulty, is how broad an area to look at.

**\*Kris Heister** (NPS, Great Basin NP) discussed NPS Inventory & Monitoring Program, the purpose of which is to revitalize and expand NPS's natural resource program within the park service and improve park management through greater reliance on scientific knowledge. NPS wants to monitor to protect resources; make better strategies and practices to meet threats before they happen. National Parks Omnibus Management Act of 1998 was passed and requires them to work in coordination with others. They have 12 Basic Inventory Datasets which are required. Service is divided into different Vital Signs Inventory Networks, including the Mojave Inventory and Monitoring Network. Talked about inventory objectives and the funding they have. Data mining was extremely useful and effective, worth the effort and cost. NPS is concentrating on Amphibians; Birds; Mammals; Reptiles; and Plants between 2002 and 2005 in various locations.

Addressed Goals of Vital Signs Monitoring and emphasized having clear goals and objectives.

Discussed NPS organization/management structure for the program: Board of Directors; Science Advisory (Technical) Committee. The WASO will provide coordination; develop guidance documents; provide technical assistance; assist regional staff in helping to coordinate scoping workshops.

Showed schematic of Integrated Natural Resource Data Management Framework and template for Natural Resource Database. NPSpecies is database system to manage species lists for each park. NPBib is card catalog. Also have a Protocol Database.

NPS Inventory and Monitoring Program is at: [www.nature.nps.gov/im/monitor](http://www.nature.nps.gov/im/monitor).

**\*Jim Weigand** (BLM, Sacramento, CA) discussed Monitoring OHV Recreation in California Deserts. Main components include: baseline inventory methods; monitoring protocols; institutional collaboration; and database management. The Management Objectives are to: establish thresholds for action; meet OHV trail maintenance needs; and restore habitats.

The pathways to meet objective: partnerships; interdisciplinary monitoring teams; technology investments; information access.

Interagency Partnerships include: Baseline Surveys NRCS, USGS; Monitoring protocols USGS, CA Parks; Restoration NPS; Training USGS, NGOs. Interdisciplinary Monitoring Team has been assembled with expertise in: GIS; soils; botany; wildlife biology; and recreation sociology.

Information Management: website information access; cross-agency data sharing; standardize data collection; documentation and analysis.

Baseline Surveys: Soils: Jawbone-Butterbrecht ACEC; Johnson Valley OHV Area; Chemueva ? something; Species: Desert tortoise, bats; Cultural resources: Jawbone-Butterbrecht ACEC.

Monitoring Protocols (for this year): T&E/Sensitive Species; Biological diversity, ecosystem functions; habitat fragmentation; restoration techniques. T&E/Sensitive Species: Pierson's Milkvetch; Mojave Monk flower; Mohave Ground Squirrel; Burrowing owls.

Biological diversity: Ants; herps and small mammals; raptors.

Ecosystem functions: air quality; surficial geology; downstream effects; natural vegetation restoration.

Habitat Fragmentation: route proliferation; seed eating birds; noxious weeds. This year will focus just on the first two, hope for funds for weeds.

OHV Trail inventory & monitoring: Statewide protocol to GIS Cadastral Expertise; Dove Springs OHV area, Eagle Lake FO, Ukiah FO.

Restoration: Two desert teams, three plant communities: creosote scrub; Joshua tree woodland, riparian woodland.

Needs: diverse funding sources; establish BLM monitoring teams Palm Springs and El Centro; coordinate with BLM monitoring efforts in Nevada and Arizona.

BLM does comparison of wilderness areas and OHV use areas, including time comparison. Monitoring helps to understand the different scales and what is being compared.

**Dave Miller** (USGS, Menlo Park, CA) discussed USGS work in Delta Springs and monitoring for OHV impacts (soils). Believe that to institute a scientifically and legally viable system, there is a need to understand the entire ecosystem. Trying to isolate the effects of different vehicle impacts.

Developed two base-line data sets: surficial geology and map, using digital techniques, camp and trail data. The entire study is designed to generate methods exportable to all the California Desert OHV areas.

\***Dave Sjaastad** (BLM, Ridgecrest, CA) discussed Range health and wild burros. Showed what is being done for burro management in BLM areas. Monitoring geared to burro impacts. Showed slide of Burro Herd Areas; transects sampled for browsing by burros; and the Extensive Browse Utilization transact/protocol for establishing utilization thresholds. Results indicated moderate and severe grazing impacts and that there were too many burros. Burros and deer still utilizing same areas. Found tremendous regrowth in forage from having less burros present. Very pleased with results. Showed key species and percent utilization between 1996 and 2002, as well as percent composition by age class for each species.

Showed DMG wetland inventory form, and how they are monitoring riparian areas. Showed photograph of healthy spring. Will follow spring over time to determine whether burros need to be removed.

Showed Burrow Spring, not so healthy as of 11-20-01. Question of whether the burros have much impact, or whether there is enough water to support vegetation.

Advocates top-down monitoring as the best way to make plans and get funding support. Too big a program will collapse under it's own weight and be well out of funding range. Recommended not to lose sight of short term, practical goals.

**Gary Davis** (NPS, Channel Islands, CA) discussed Environmental Vital Signs: An Interagency Approach to Monitoring the California Coast. Emphasized that as daunting as monitoring can be, it's doable and cost effective. Developed pilot program beginning in 1980.

NPS mission is to: conserve the parks; provide for their enjoyment; leave them unimpaired for future generations. Need to know and understand resources to know how to protect and restore. 4 main objectives: Know; Restore; Protect; Connect. Emphasized that no one group can do it alone. Requires teamwork and collaboration.

Vital Signs Monitoring. Hardest task is asking the right questions, and a good monitoring program will help with that. Four-Step design process: set goals; conceptual model; protocol development; implementation plan.

First in the design process is to ask “Why?” Determines everything else. Early 19<sup>th</sup> and 20<sup>th</sup> century park managers relied on beliefs and made decisions based on that. Fires were put out and predators killed. Today we say, “What were they thinking?” because we have the science to know better.

Factors driving the need to monitor – stressors: habitat fragmentation; unsustainable uses; altered air, water, soil; alien species. Goals of monitoring vital signs: identify status and trends in ecosystem health; define normal limits of variation; provide early warnings to reduce costs and increase treatment success; suggest remedial treatments; frame research hypotheses; determine compliance with law/regulation.

Conservation is health care for the environment and ecosystems. Ecology is still in the 17<sup>th</sup> century relative to medicine. Just on the edge of beginning to understand how systems function and are put together.

A healthy ecosystem: has all its parts; has no extra parts; responds normally to perturbation; is resilient, resists alien species invasion.

Approaches to monitoring: energetics; nutrients or constituents; biodiversity; population dynamics. Looking at population dynamics has been most helpful to predict future systems.

Start with Step-down Plan. Relied on expert opinion. Philosophy: Do something, even if it's wrong, evaluate it and make it better. Make the decision and don't look back. Move on.

Use stressors to: cross check comprehensive identification of potential vital signs; set priorities on which vital signs to develop and monitor first. If you know the functioning of the system, you can check against it. But you don't know what the stressors of tomorrow will be.

Protocol design study objectives: select taxa and environmental factor; develop and test sampling techniques; develop and test analytical procedure; develop reporting formats — print and other; provide implementation protocols. Set priorities, usually using the stressors to decide what to do first.

Biological vital signs selection criteria: representative, broad ecological array; common, dominant, structural element; special legal status; endemics; exploited; aliens; charismatic; practical.

Implementation Plan: obtain funding; implement protocols; obtain and sustain personnel;; apply results to issues.

The Channel Islands National Park vital sign monitoring program: structure follows function; integrated with other stewardship function; three legged stool: info management; island ecosystems; marine ecosystems. Many agencies contribute and benefit: CA F&G; USGS; USFWS; U of CA; MMS; etc.

Information management: need three people to maintain continuity. Do it by partnerships or within the organization, but do it. Showed two slides of protocols for ecosystems.

Example of how monitoring info can be used to provide early warnings: 1) DDT contaminated marine food webs reduced brown pelican, bald eagle, and peregrine falcon reproduction. DDT has been banned and pelicans have recovered. Peregrines are doing all right, but the bald eagles have not recovered at all. 2) Sewer pipe broke next to Cabrillo Nat'l Monument, San Diego, CA; 11 billion gallons treated effluent spilled; monument tide pools closed to visitors Feb – Apr 92. Respite from visitor trampling, with nutrients and sediment from effluent, benefited intertidal ecosystem. Dramatic demonstration of the impact of visitors.

Learned a lot about fisheries from monitoring. When we looked we found they weren't being sustained. Monitoring shows ecosystem collapsed, resulting from over-fishing. Also showed effects of El Nino. Monitoring helps to know when we're doing the right thing, and how to fix problems. One difficulty is that no one likes to change. Keep pushing to get beyond the anger and depression to get to a workable solution.

**Roy Woodward** (CA State Parks, Sacramento, CA) discussed monitoring efforts in State Parks in the CA desert. State Parks consist of 266 units in CA. About 180-190 have a resource base, about half have any great size. The State Park system is extremely decentralized, very much controlled at a local level: they make their own decisions, have their own legislation and funding.

Realized several years ago that monitoring must be ongoing. Parks never had a systematic program for inventorying and monitoring. Inventory, Management and Assessment Program is what developed. Have a couple of teams working on this in Sacramento and San Diego, but haven't done anything in the desert yet.

First thing done in the monitoring program was to go out physically and see what's happening, who's doing what, where and to what effect. Have technical committees to decide protocols, and will freely use what everyone else is doing. You must budget for doing long-term monitoring, plan to have someone in the field doing the work.

Don't yet have database for environmental data. Very interested in cooperating with someone to add to a database. Have had to go back and do the boundaries to update the maps, to include polygons, in holdings, etc. Database adds a lot of valuable information, and all of this stuff comes out of monitoring programs.

DPR will provide money to the extent they can. However, the state budget is very tight.

Most of the push for State Parks acquisition has been along the coast and in urban areas. There are no plans to add much in the desert.

California Native Plant Society has developed a manual they hope to become standard on vegetation series. They have various committees, for things like Vegetation and Rare Plants to come up with standard rating for plants. They have found that about half a dozen plants listed as extinct were actually still out there when someone went out to see.

**Eric Hollenbeck** talked about OHV issues at Ocotillo Wells and the legal issues the off-road community confronted. Developed a portable program to monitor impacts of OHV use. Simple program. Have different plots at each OHV area. Impacts are monitored on vertebrates, vegetation and soils. Will compare different years to see what changes occur over time. The idea is to have enough data to give management the ability to make informed decisions.

\***Phil Medica** (USFWS, Las Vegas, NV) discussed Desert Tortoise Monitoring which involves implementation of line distance sampling method throughout the range of the tortoise.

In FY2001 all recovery units (RU's) were sampled.

Determined encounter rates for each RU; established first year of population baseline; developed a centralized Data Management System; and determined  $g_{(0)}$  within each RU.

Results of the 2001 Sampling were that the Mojave, East Mojave, Northeast Mojave, Upper Virgin River rangewide mean encounter rate was very low (0.13).

Kilometers sampled in 2002 will be doubled 5,499 km. Impossible without all the assistance gained in cooperation with various agencies.

LDS training at Jean, NV March 25-31, 2002.

Sampling areas include: randomly selected transects in desert tortoise critical habitat and ACECs; greater than 1,250 meters elevation; areas greater than 30% slope, private land and playas are excluded.

The system has worked well. Funding is problematic. To continue, funding needs to increase, but right now looks pretty stable. Hopeful in the next 2-3 years for good baseline, then do it again a few years later. This should continue for 25 years – one generation of tortoises.

\***Barbara Washburn** (Cal/EPA, Sacramento, CA) discussed Environmental Protection Indicators for California. Overview and Ecosystem Health Indicators.

An environmental indicator is scientifically based information on the status of and trends in environmentally related parameters; example: water clarity an indicator of the trophic status of Lake Tahoe.

EPIC project: launched Jan 02 as a joint effort to Cal/EPA and Resources Agency – complementary to Legacy Project; purpose: develop meaningful objective measure for the outcomes of programs and work of agencies involved in protection of the environment; move away from counting issues and move to results data.

General indicators: land cover: showed graph of CA land cover, acreage, ecosystems; land management: showed another graph of reserve, rural residential, agriculture, urban, working landscape; CA threatened and endangered species: showed graph of status.

Desert ecosystems: status of Desert Tortoise (type I) have declined substantially in the past decade due to a wide variety of causes.

Impacts of OHVs on the Desert (type II) graph showing creosote bush habitat used by OHVs, plant biodiversity is reduced compared to non-OHV sites. Additional indicators are needed for the desert: indicator of exotic desert plants, and others.

Asked for feedback on the desert indicators.

USGS is starting a program that will study amphibians nationwide. There might be some long-term data from that. Suggestion to clearly define “health” for indicators because that could mean a lot of things to different people. Suggestion to monitor migratory bird species, but what happens to them might be an indication of what happened to them somewhere else rather than in CA; Morongo Basin is monitoring migratory birds. Suggestion to look at grazing and that Kristin Berry has a lot of information on that in relation to desert tortoise. Suggestion to look at water sources, aquifers, springs, etc.; the function of the springs, vegetation, erosion. Within the next few years the FWS will complete Wetlands Habitat study, GIS based. Suggestion to look at exotics as possible cause of increased wildfires in CA desert. Suggestion to look at desert bighorn sheep as indicators.

Future plans for EPIC: improve process of finding and developing indicators; develop policy-related indicators; build new and strengthen existing partnerships; update biannually. First official report will come out in a month and a half.

For more info: [www.oehha.ca.gov](http://www.oehha.ca.gov); [bwashburn@oehha.ca.gov](mailto:bwashburn@oehha.ca.gov), 916-324-6430; information on status & trends report: [rainer.hoenicke@resources.ca.gov](mailto:rainer.hoenicke@resources.ca.gov)

**Larry Norris** (NPS, Tuscon, AZ) discussed Cooperative Ecosystem Studies Unit. The CESU program is 4 years old, with 10 units existing across the nation. Interagency in scope. Desert SW Ecosystem hosted by U of AZ that covers Mojave, Sonoran and Chihuahuan Desert. National website: [www.cesu.org/cesu](http://www.cesu.org/cesu).

**\*Todd Esque** (USGS, Las Vegas, NV) discussed Monitoring Invasive Plants and Other Vegetation in the Mojave Desert. Seven steps to design a monitoring program: specify goals and objective; characterize stressors and disturbances; develop conceptual models that outline pathways from stressors to the ecological effects on one or more resources; select indicators to detect how stressors are acting on resources; determine detection limits for indicators to guide sampling design; establish trigger points for mgt intervention; establish clear connections to the management decision process.

Categories of monitoring programs: systems programs – vital signs versus topical programs – particular resources. Probably will require both types given adequate funding and logistics.

Systems monitoring should be integrated monitoring: hydrologic, edaphic, atmospheric, biologic. Scale is important. Temporal: important questions now and 10, 25 or 50+ years from now. Spatial: what is the appropriate spatial scale, local, regional or continental.

Current Monitoring Questions: what is the status of representative plant communities; status of flagship populations; status of invasive species, what are thresholds; how will livestock removal affect vegetation; will fuels/fires increase due to livestock removal; what is the role of climate in vegetation change; how well does re-vegetation work; is erosion more severe than should be expected, how will invasive species affect natives.

Explore examples, what worked, didn't work, what was learned.

Inventory established plots: are there existing monitoring plots with information to offer? Yes and no. Can we find the plots/ are we sure? Can plots be fully reproduced; are plots confounded by design, shape, habitat type, equal size, paired plots, recent disturbances, soils; are methods comparable through time.

Invasive plants: monitoring, containment, eradication. Resources: park protocols, CalEPPC, Weed Mgt Areas. Invasives: Other vegetation monitoring won't work; when invasives show up in random sample it's too late; identify at the gate (points of entry) prioritize (partnerships), contain (partnerships), eradicate (partnerships).

Gripe list on yet another monitoring project: missing boundary markers; erroneous compass bearings; which side of line transects to use; basic rules (include/exclude bases of shrubs); use published standards or note differences; provide definitions (e.g., bare ground); what data were included/excluded (seedlings); Dbh 1.5 versus 1.0 meters follow protocol; inconsistent reference to individual plots.

Are representative plant communities stable – NO. Can we distinguish change caused by our activities vs. climate.

The Beatley Plots; future value (est 40 ybp); simple, quantitative, accurate and replicated; transfer of responsibility (but no field notes); protected sites. This appears to have worked, incredible detail on perennial and annuals.

Cover, Density, Richness: community and species data; standing dry biomass; species composition; longevity of species.

We can do this! Good study design, get it reviewed by experts; protected sites; photos with good horizons; T-posts for corners (or subtle marker) groups locations, maps; have methods reviewed (1-2 y, not 10); supply field notes, archive them; transfer across generations.

**\*Robert Fisher** (USGS, San Diego, CA) discussed Monitoring Programs for Aquatic and Terrestrial Ecosystems of the CA Deserts. Monitor: To watch, observe, or check, especially for a special purpose. Emphasized the need to archive data to go back and test hypothesis and indicators over time.

Current established programs: Desert Tortoise, bighorn sheep, burros. Are we done? Not yet.

Overview of USGS Desert Study Areas: 29 Palms/BLM/Joshua Tree NM; Salton Sea Enhanced evaporation test site; Amphibian Research Monitoring Initiative (ARMI); spring/wetlands in Anza Borrego; OHV Dove Springs; night driving surveys in JT and Anza Borrego SP.

Showed DMG area of interest map with USGS Focal Sites. Showed table of 5 different forms in CA of red racer snakes, where and what form. A lot of diversity. Red racers at Joshua Tree NP won't be the same as red racers in Edwards AFB.

29 Palms/BLM/JT: pitfall traps for herps and small mammals; funding from SERDP, MCAGCC; began work in 1998 survey for 2+ years, completed; Study 1 impact of low level urbanization on desert biodiversity (29 vs. BLM disposable lands); Study 2 biogeography across Sonoran to Mojave deserts in JT, across elevation gradient.

Salton Sea enhanced Evaporative test site: test impacts of salt evaporation on biodiversity; funding from USGS, BOR; began work in 2001 for 1-2 years; Study 1 impact of the sea on the terrestrial ecosystem; Study 2 impact of enhanced evaporation system on terrestrial ecosystem.

ARMI Surveys (USGS): initiative to determine status/trends for amphibians across DOI lands nationally using percent Area Occupied statistics; funding USGS, USFS; began work in 2000.

Spring/wetlands in Anza Borrego State park: recovery of creek closure, impact of horses; funding from CA state parks; began in 2000.

Study protocols: vertebrates; herps: pit-fall traps; night driving surveys; stream/spring area searches; bats: acoustic; visual (roosting or foraging: capture techniques; birds: point

counts; carnivores: track and scat transect; remotely triggered cameras. Invertebrates: ants, beetles.

Showed data for lizards and snakes from pit-fall traps 29, BLM, Salton Sea; also mammals. Bat detections at three different sites.

**Cameron Barrows** (Center for Natural Land Management, Palm Springs, CA) spoke about Coachella Valley Center for Natural Land Management. Discussed the sand dunes, the Fringe-toed Lizard, and the Coachella Valley habitat conservation plan. The Fringe-toed Lizard was listed as endangered in 1980, and the HCP conservation plan, signed in 1986, resulted in three separate preserves being created in the Coachella Valley.

Since then there have been many plants and animals that need to be preserved. The conservation plan is starting to be a multiple species plan, instead of being focused on just one. Hasn't quite happened yet, but it's going that way, nearing finalization. Showed natural communities of the Coachella Valley Multiple Species Habitat Conservation Plan Map. The plan includes 30 different species.

Adaptive management and monitoring plan is part and parcel for this conservation plan. A monitoring plan has been submitted, but haven't heard any comments or direction yet. Wildlife agency said there must be quantitative monitoring for all 30 species.

Showed a graph of Annual Fringe-toed Lizard Fluctuations. This shows their numbers go up and go down, but doesn't give any indication of why, whether this is a healthy or normal event, or what causes it. The species responds to a changing environment, having more numbers during rainy years. The lizards are very cryptic (difficult to see) so are difficult to monitor. Mark and recapture work is too impractical since it would need 200 plots and more than 50 people to do the work.

Most of the stressors affect the lizards, making them a good indicator of what affects the other species.

Showed Sand Sources & Sand Transport System for a Desert Sand Dune Ecosystem diagram. Explained about the land they need to purchase to preserve. 95% of the dunes are gone. Only 5 square miles are left. Showed picture of a sand starved area, where the lizard can't live. There's also been an invasion of weeds, especially Russian Thistle. But the fringe-toed lizard loves it. There are a couple of other alien weeds that are an increasing problem, but many only occur when it rains (every few years), so it's difficult to say what the impact is.

Off-road vehicle use creates a significant impact. Showed graph of the compaction of sand in relation to the lizard. When the ground is too compacted the lizard can't live there. Sand penetration monitoring is a good indicator for the species.

Monitoring plan looks at trophic levels. There are a group of beetles highly selective to sand dunes and not found anywhere else.

Studying lizard scats is an excellent way to find out what a lizard is eating. Showed graph of Lizard Reproduction vs. Diet. If they're eating lots of ants they don't breed well, but if they have other things, like beetles, to eat they reproduce well. Showed graph of Reproduction Success vs. Rainfall.

Scale is a critical component of a monitoring plan. Using GIS image software a map will tell you a lot about the habitat. Showed map highlighting different areas for the species, which gives a good idea of where to monitor and the overall abundance of the habitat. We don't manage the species, we manage their habitat so understanding that habitat aids in conservation.

Cleared an area of grape vines and left it to see what happened. Within that area there was a 900% increase in habitat suitable for the fringe-toed lizard and 125% increase for flat-tailed horned toad habitat, vs. 9% and 11% for the control area.

Following tracks is an effective way of monitoring a population. Only works if you can track them, which is not the case in all of their habitat. Set up 8 hectare plots, and over the past year marked 122 in one plot. Exceed density of anywhere else. One of the problems is that at any given point there were probably only 30 lizards, and the rest on walkabout. Their ranges can be a kilometer or more.

So this is a pretty ambitious monitoring plan. Not as ambitious as it could be. You can do the long list and have everything on the table, or the short list and do each thing really well. So rather than have 200 plots for the lizards, have a few model plots as models to work with. If we do everything it would cost \$100 mil, and that's not doable.

Ask the right questions. Not just how many, but what's affecting them. There needs to be a balance between ecological studies and statistics in a database.

**\*Danny Reinke** (Edwards Air Force Base, Lancaster, CA) discussed Environmental Monitoring at Edwards AFB.

Types of monitoring: Compliance; Efficacy; Validation. There are a lot of things, like NEPA and Sikes Act, to comply with, and we must show efficiency. Groundwork has been laid to validate what's been done. There is an internal enforcement program as check and balance to be sure the job is being done.

Edwards has a fairly mature program. Has been in work for a little over 10 years. Looking at how things fit together, get smarter, get data that will give information to use for management. Showed map of Edwards AFB, a little over 300,000 acres.

One of the issues with INRMP is that bases have historically been fenced. Sikes Act directed bases to look beyond their boundaries and work with others. Monitoring data is critical to good management and decisions. Showed diagram of EAFB Approach.

Showed map of Desert Tortoise Critical Habitat. EAFB has a fair amount of tortoise habitat. Showed maps of Regional Vegetation, and Plant Species of Concern. Have a book with pictures of every plant that grows/flowers on the base. Nice, but really need a forensic botany book, since flowering doesn't happen that often. Showed maps of Rare Habitat, Flood prone Areas, Surface Water Drainage Basins (Watersheds), 20 ft Contour Interval.

Showed map of Desert Tortoise Corrected Sign Density. Tortoise is driving a lot of the monitoring work. Line distance sampling isn't going to work for the base management. Need more detail, something to be comparable with information from 1992.

Showed Aerial Photographs of Edwards AFB. There are places that were disturbed before the AF showed up: old homesteads, agriculture sites, etc. The fields are still fallow. GIS is the only scale to work with to get that information.

Have done many surveys, terrestrial vertebrates, bats and so forth. Not on ants yet. Showed map of Long-term Monitoring Plots. Ground truth is being backtracked to the aerial photographs.

EAFB is changing the way we look at things because of the data and what it tells us for decisions. Good data that's helpful to the mission means more funding. Showed maps Slope Analysis, Viable Population Areas, Management Areas.

Currently doing a data scrub of all the data layers to determine whether we keep or archive them, or use it to take the next step up. Better to keep moving onward. EAFB has long-term plots (60), project driven monitoring, restoration/exotic species removal program (but nothing listed for removal), newcomers/contractor briefing required for all.

**\*Ruth Sparks** (Nation Training Center, Fort Irwin, CA) talked about the DOD US Army NTC in Ft Irwin, CA. Refer to handout.

**\*Rhys Evans** (Marine Corp Base, Twentynine Palms, CA) Inventory and Monitoring Programs, USMCAGCC 29 Palms. MCAGCC has 598,178 acres; primary USMC base for live fire & weapons. Mission support live fire military training; combined arms exercise; 22 day rotation, ten times annually.

Inventories completed: vertebrates; soils; vegetation; rare plants; bats; bighorn sheep.

Desert Tortoise Research completed: base wide relative density; high elevation; mortality/predation; home range; disease.

Line Distance Sampling: Multi-agency approach.

Inventories ongoing: fairy shrimp; invertebrates; Mojave fringe-toed lizard; reptiles.

Recent and Current Projects: bighorn sheep guzzlers; bat gates; free-roaming dog trapping; tamarisk eradication.

Monitoring: Land condition trend analysis; land use contingency model; land management system: ecological Dynamics simulation; erosion; change detection/remote sensing in progress review, 21 February 2002.

MCAGCC has a good handle on their natural resources. Sustainability must be linked to ecosystem management.

**\*Nina Chambers** (Sonoran Institute, Tucson, AZ) discussed the Relevance of Social Indicators in Ecosystem Monitoring. Showed map of Sonoran Desert Ecoregion: where we are and how we got here. The ecological analysis showed over 100 sites that need conservation. Looking at collaborative management across borders and jurisdictions. Also working on collaborating to work a strategy on invasive plants. Monitoring is a long way off yet, but want to take steps in that direction.

Social Indicators: are a set of social, economic, and ecological measures that are useful to ecosystem mgt decision making; allow for comparison over an extended period of time and include the identification of long-term trend, periodic change; fluctuations in rate of change; are practical.

Characteristics of Human Communities at Different Spatial Scale. Scale matters. Trends in social indicators may be examined at different spatial scales. Showed graph of Population Change at Various Spatial Scales: Regional; sub-regional; community.

Contextual Indicators that Describe the Characteristics of Human Communities: population; economy; education; health and safety; recreation; land use and land tenure.

Example of Stress-based Use of Integrated Social and Biological Indicators: Valley Bottom Floor Plain: roads; recreation; UDA traffic; invasive species; surrounding farmland; livestock grazing.

How social information may inform issue-specific management decisions identifies who will be directly and indirectly affected by the decision; identifies what the characteristics and attitudes of these groups are; identifies how they are likely to react to the decisions; identifies how the message of the decision can be communicated in a way more likely to be accepted.

Benefits of Social Indicators in Ecosystem Monitoring: provide a more complete description of the Sonoran Desert human ecosystem; provide a baseline description and helps monitor trends in social conditions affecting resources; describe the conditions of human communities; and their impacts on national lands; involve a range of institutions and communities.

**\*Clarence Everly** (DOD - MDEP, Barstow, CA) Spoke about how to share data to facilitate land management decision making. MDEP was developed for use by all land managers in the desert. Collaboration is necessary; try to eliminate duplication of effort to save funds and resources; design a spatial data clearing house.

Updated website for MDEP will be finished by the end of February. Described the site, showed front page, explained some things that can be done within the site. Also described the information MDEP needs to expand the database.

**\*Robert Fisher** (USGS, San Diego, CA) talked about Integrated Data Management, and how data can go from the field directly to the database using Palm Pilots. Showed a protocol/draft/vision for what can be done.

Discussed the confusion between data, data sets, databases, etc. Gave definitions for database and SQL. Showed Data Flow Diagram: Field Observation to Standard/shared data forms (data definitions) if different to Any program QA/QA to Data Set library; if same to Standardized ACCESS/SQL Database – QA-QC to Queryable database. Displayed how data could go to their respective regional databases, but also to MDEP.

Talked through the first step in using palm pilots.

Displayed paper data form to highlight specific points and show things that are standard, that can be easily entered and accessed as a form on palm pilot. Showed Handheld Data Form Diagram.

Showed how to manage multiple forms and multiple people, all from one computer. Created a schema for the Palm Pilot that has everything you might possibly need, but the user can use just what s/he needs. Items can be added as necessary without affecting the base. The database is standard nationally. Data entered can be validated before being sent to regional database (or wherever).

**Breakout Groups. The participants were separated into 3 groups and asked to address 5 questions:**

1. Identify the top three questions that you think your agency/group is/should be trying to address through monitoring.
2. Group questions & identify common questions among agencies/groups.
3. Identify the questions that are most important.
4. Identify new opportunities to collaborate and how to effect that collaboration.
5. Identify major barriers to collaboration and how to overcome those barriers.

## Group 1 Report (Todd Esque):

1) Identify the top 3 questions you think your agency/ group is/should try to address through monitoring.

Are current management techniques helping us meet objectives, or is it business as usual.

Are they experiencing unresponsiveness

Are present management prescriptions contributing to success or failure of

Is the monitoring program sensitive to change (how sensitive can you measure)

Does monitoring help you determine sources of change (natural versus human), is it accurate enough

What are the most relevant questions to monitor

Should we focus on monitoring stressors rather than counting animals

Should we use monitoring in a more efficient way (precipitation instead of counting lizards)

Are you looking at the right ecological scale.

Are managers prepared to use monitoring information – will it be used, how will it be included into the bureaucratic system

Core Elements – fundamental to the big picture

Corporate/Compliance

Site Specific Things

Ecological trend, weeds, tortoise

Tortoise , weeds, and fire

What do we have, where is it (distribution), what are their characteristics in the way of natural resources, what is significant

Fire, desert tortoise disease, desert tortoise density, exotic species, Africanized honey bees, education,

Downstream effects (down-gradient effects) of disturbance

Upstream effects (power plants)

Ecological trend – soil/vegetation units based on NRCS

Plant community vigor and composition, cover, structure

Sustainability (OHV, grazing, military training, current uses in general)

Water issue

Meteorological data,

**5) ID major barriers to collaboration and how to overcome these barriers**

fear of sharing information - lack of information by neighbors (i.e. military installations)

so sharing information can be a liability

so, this is a problem of scale

solution – share expertise and funding to help neighbors

Funding – Congress is the barrier

Funding structure is not conducive to working on ecosystem approaches

The color of money – can you spend money off site

Trust – education of the public about what is going on, increase awareness

Tortoises – money pit and the way we do funding

Agencies respond to compliance issues and therefore never get to ecosystem issues -

**Group 2 Report (Jeff Lovich, USGS, Sacramento, CA):**

Top questions:

What is the current status and impact of exotic species across space and time?

What are the long- and short-term effects of management strategies?

-removal of exotics

-restoration

-closures (carrying capacity/visitation)

What are the patterns of resource change over time with respect to environmental factors (abiotic and human)?

Opportunities for collaboration

Common databases

Common datasheets

Common protocols across agencies

Saving data from being “retired”

Barriers to collaboration

Funding

Time

Management priorities

Bureaucracy/politics

*Lack of vision*

Communication (solve with regional clearinghouses like mojavedata {MDEP})

Agency culture/regulatory mandates

**Group 3 Report** Rob Fisher, USGS, San Diego, CA):

Facilitator: Robert Fisher

Note-takers: Andrea Atkinson & Stacie Hathaway

1. Identify the top 3 questions you think your agency/group is/should be trying to address through monitoring. (Numbers below indicate groupings of questions)

Data Management

1 Carrying capacity - are visitor users impacting , can you monitor and establish what these thresholds are

2 Impairment- Is there impairment of natural resources  
of ecosystem function  
of cultural resources

3 Connectivity- can monitoring tell you something about functionality for example gene flow ...geographically between reserves, landscapes etc.  
What should be thresholds for monitoring?

2 Alien Invasions – Detection of new species invasions, extent, rate of spread (may go under Impairment)

2 How do we assess habitat quality and ecosystem function?

2 Do we have functionality? is there integrity in the system?

4 adjacent areas- What are the effects of extrinsic factors –effects of adjacent urbanization- that may be driving biodiversity in the park/reserve by biodiversity stressors, air quality, light effects (may be more important in the future)

Global change effects?

5 site specific Research into interrelationships, cause and effect

6 site specific Effectiveness of actions (did it work)

Change through time – Trends in resources condition

## East Mojave monitoring

- 2 Do we have functionality? is there integrity in the system?
- 6 What do we do about species we know are in trouble --> identify actions i.e., will be extinct in 50 years then need to revisit actions and modify design of monitoring plan.

2. Group Questions and identify common questions among the different agencies/groups.  
**(Issues in step #1 that are similar were grouped together, i.e. impairment, effectiveness of actions)**

1 Carrying capacity - are visitor users impacting , can you monitor and establish what these thresholds are

2 Impairment- Is there impairment of natural resources  
of ecosystem function  
of cultural resources

2 Alien Invasions – Detection of new species invasions, extent, rate of spread (may go under Impairment)

2 How do we assess habitat quality and ecosystem function?

2 Do we have functionality? is there integrity in the system?

3 Connectivity- can monitoring tell you something about functionality for example gene flow ...geographically between reserves, landscapes etc.  
What should be thresholds for monitoring?

4 **adjacent areas**- What are the effects of extrinsic factors –effects of adjacent urbanization- that may be driving biodiversity in the park/reserve by biodiversity stressors, air quality, light effects (may be more important in the future)

Global change effects?

5 **site specific** Research into interrelationships, cause and effect

6 **site specific** Effectiveness of actions (did it work)

6 What do we do about species we know are in trouble --> identify actions i.e., will be extinct in 50 years then need to revisit actions and modify design of monitoring plan.

3. From those groups, identify the most important questions.

**(The group looked at the questions in step 2 and then took a big picture look and identified the following 5 "most important" questions. Questions a, d are not really monitoring. However the group felt all 5 questions are critical. The group then tried to identify the most critical assistance needed under these 5 "most important" questions.)**

a What resources do we have and where are they (varies among agencies – some have done this?)

- b. What is the condition of the resources?  
*need to define resource quality*  
*need help in making link between science and management; getting data/info to management*  
*need protocols and data management*  
*needs to be institutionalized*
- c. What are the trends in resource condition?  
 Comment-- are we monitoring natural processes? not just things?  
*need help with interpretation and relating to regional and linking to changes in other resource issues*
- d. if the resource is declining what can we do?  
*need cause/effect relationships*  
*need communication/networking*
- e. How effective are our actions in influencing resource conditions  
*need protocol development*

4. Identify new opportunities to collaborate and how to effect that collaboration.

&

5. Identify major barriers to collaborations and how those barriers might be overcome.

**(Breakout group questions # 4 and #5 were combined in this section)**

Meetings like this are important

Need multi-agency planning

Need within-agency information sharing for effective multi-agency planning

Websites/computers critical for increasing collaboration

Money- Sometimes easier to generate funding by partnerships (this meets some agency objectives)

Economy of scale –collaborations may bring costs down.

Opportunities for resource sharing (trading resources such as office space, horses, etc. for monitoring people and assistance)

General public – we need greater outreach to generate interest by providing information and incorporate into collaborative process – this gets you volunteers and public support can get you money from government

Data Management Committee for DMB already exists. Each group must make sure it has someone involved to coordinate data management among agencies

Money flow across agencies is a barrier

Land access can be an issue/barrier – inaccessibility of some sites because of geography, water etc. (really this issue is under sampling design)

Collaboration on training would help  
post protocol & other training sessions on DMG website

Write down and making available protocols and data forms

**Management Recommendation (John Hamill):** Following is a summary of an open discussion of recommendations/conclusions:

Suggestion that the question that will come up is “What will it cost?” and there should be an answer for that as far as funds necessary, people to do the work and timeframe.

From a business standpoint, it’s all very inefficient. We should work on creating better efficiency, work together more.

From a recovery standpoint the tortoise issue is driving a lot. But there needs to be a standardization of methods and protocols in the work, something everyone can use. However, it will be difficult to get things changed. Everyone’s got their own plans and techniques although they’re looking for the same answers.

Suggestion that the Northwest Forest Plan might be a good model to work with. They managed the collaboration and funding.

Rather than crying about all the inefficiencies, we should identify what they are specifically. At this point there is not enough solid to take to managers, everything is still too general. Suggestion to work out why things should be done differently, why things should be done on an over-arching, desert-wide scale.

Suggestion to sit down together, get a common protocol draft together, send it out and get responses. Try to reach an agreement on what drives everyone across agency boundaries. Set policies that will help the people on the ground do their job.

One way to get it going is to have a group of stakeholders provide support. That’s what happened with the Forest Service model. Gave them direction. The agencies then went after funding, legislation to do that.

There was a regional, grass-roots program in the Appalachians to do an assessment. Has led to an approach to monitoring for the region. NW Forest Plan was driven by having to come up with something, and they took a scientific approach – got the science and made the decisions. Suggest doing an assessment, State of the Desert; could be a driving force.

In the Appalachians it generated data sets and mobilized the community. They have annual meetings. More than monitoring. There are other models for regional ecosystem initiatives. So the question becomes, what is the driving force? Problem is, there is such a mix of driving forces.

Find a common goal that crosses boundaries, that everyone has in common, and do the analysis and data collecting across the large scale, over the ecosystem. Let the ecology set the scale, not the jurisdictions.

Too good at reporting what's bad. Report on what's good as well, if you're looking at the big picture.

Everyone seems to agree that protocols for monitoring and data collection should be standardized. That can help across boundaries, and help with correlation. But there is the consideration of temporal disconnect – what's already done and what is collected in future under standardized methods. Need to overlap the systems.

### **Ad Hoc Monitoring Work Group Meeting (February 1, 2002)**

Purpose: Discuss/draft recommendations for integrating/coordinating monitoring efforts for presentation to the DMG on April 10-11, 2002.

Group members:

- Jim Kenna (BLM) (Chair)
- Roy Woodward (Cal State Parks)
- Kris Heister (NPS)
- Debra Hughson (NPS)
- James Weigand (BLM)
- Phil Medica (FWS)
- Craig Palmer (UNLV)
- Richard Wood (Edwards AFB)
- Danny Rienke (Edwards AFB)
- Bruce Soderberg (Marine Corp)
- Andrea Atkinson (USGS)
- John Hamill (DOI)
- Clarence Everly (DOD)

Results:

1. The group identified the following principles related to monitoring in the California deserts:
  - The purpose of monitoring should be to accumulate useful knowledge to help managers make decisions
  - A framework is needed to tie various agency monitoring efforts together
  - Standard (interagency) protocols should be established for collecting data
  - Agencies should cooperate to improve efficiency and effectiveness
  - Start small
  
2. The group recommended that the following be presented to the DMG:
  - Jim Kenna will present the workshop results, management implications and recommendations
    - Hamill will provide a summary of the Workshop to Kenna for distribution to the Managers
  - Kris Heister will discuss the purpose and value of developing a conceptual framework for monitoring (Kris Heister)
    - Kris identify the schedule and process for NPS's developing a conceptual framework and recommend that the effort look at the entire desert.
    - Phil Medica will develop and present a preliminary conceptual framework for the desert tortoise (John Hamill will assist).
  - Debra Hughson will report on the status of her assignment to identify current research and monitoring efforts in the desert
  - John Hamill will request that Rob Fisher make a 20 minute presentation on the use of Palm Pilots to standardize data collection
  - Hamill and Everly will develop and present a proposal for developing a network of weather stations in the Cal deserts