Evaluation and Refinement of Vegetation Monitoring Methods for the San Diego Multiple Species Conservation Program

2010 Final Report

March 2011

Prepared for: The San Diego Association of Governments
Contract 5001033, Amendment #1
Contract Manager: Keith Greer

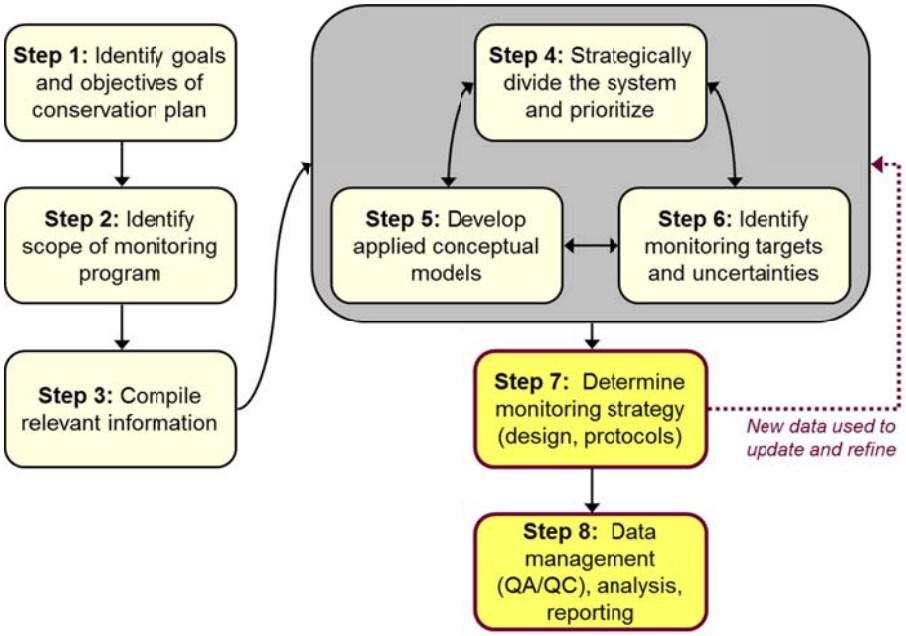
Prepared by: Department of Biology, San Diego State University
Dr. Douglas Deutschman, PI, Spring Strahm

SAN DIEGO STATE UNIVERSITY

Executive Summary

The San Diego MSCP is an ambitious effort to manage economic development and conservation in an area renowned for its natural beauty and enviable quality of life. The two fundamental biological goals of the MSCP are to (1) protect the large suite of covered species and (2) maintain the integrity and function of the ecosystems on which they depend. The plan intends to meet these difficult goals through adaptive management of the network of conserved lands. Monitoring of the conserved lands is necessary to understand the status and trend of an ecological system and provides the high-quality data needed for effective management. Unfortunately, ecological systems are difficult to monitor and manage because they are inherently complex and extremely variable across space and through time. Moreover, the complex relationships among species and the natural and anthropogenic forces that drive them makes effective management extremely difficult.

Over the past six years, SDSU has been deeply involved in applied research that supports monitoring and management in the MSCP. Janet Franklin, Helen Regan and I received a 2-year grant from CA DFG in 2005 to compile and review existing information on the San Diego MSCP Biological Monitoring Plan and its implementation. This review was tied to the critical steps for monitoring program development outlined in the Atkinson et al. (2004) technical report (See Figure 1). This initial effort was modular and included critical assessments and research on (i) prioritization of species based on threat, (ii) prioritization of ecological communities based on extent and representation, (iii) development of conceptual models to aid monitoring and management, and (iv) review of statistical methods and field protocols for accurate and cost-effective monitoring. This initial effort resulted in five presentations, four published technical reports, and three papers published in the peer-reviewed scientific literature.



Steps 4, 5 and 6 were started during the Franklin et al. LAG grant from 2005 to 2007.

Steps 7 and 8 have been addressed through evaluation of field protocols and statistical methods over the past 4 years with significant funding from SANDAG, DFG through an additional LAG grant, and TNC.

Figure 1: *Key steps in development of effective monitoring program for HCP/NCCP plans. Adapted from Atkinson et al. 2004.*

Following this conceptual review, we developed and evaluated a set of protocols for monitoring the integrity and function of CSS and chaparral vegetation communities (Steps 6, 7,and 8). Our initial work allowed us to refine the field protocols and reduce inter-observer variability while reducing total cost. The final protocol is 70% less costly than the initial protocol without losing statistical precision. This cost savings allowed us to double the number of sites we were monitoring and triple the number of plots visited for the same total cost. This protocol has been adopted by other researchers and managers for monitoring vegetation for projects on reptiles (R Fisher, USGS), gnatcatchers (C Winchell, USFWS). We have also collaborated with several consulting firms and NGO's including TAIC, Environmental Conservation and Management, TNC, CBI, and CNLM. We have presented the results of our vegetation monitoring in yearly presentations at Mission Trails. Attendance has averaged around 50 people and includes representatives from the wildlife agencies (US FWS and CA DFG), jurisdictions and landowners (Cities of Carlsbad, Chula Vista and SD, County of SD, BLM, NWR, USFS), consultants and NGOs (CBI, CNLM, CNPS, EDAW, SD Natural History Museum, SD Zoo, TNC). This work is ongoing and evolving. In 2011, we are working with Dr. Doug Stow in the Geography department at SDSU to compare our field data to fine-scale (sub-pixel) measures from satellite imagery. We are working with CBI and TNC in their monitoring and management of grasslands in southern San Diego County. We will be compiling vegetation data collected by R Fisher and C Winchell and merging it with our data. Finally, we will be comparing our plot-level data to the new vegetation classification system being developed for the county.

In 2010, we began a new phase of this work. After several years focused on data collection and analysis, we are working on closing the feedback loop as envisioned in Atkinson et al. 2004. We are (or will soon be) working with a wide array of stakeholders to revise and update the goals and objectives of the monitoring and management plans, develop conceptual models for individual preserves, and adapt and apply management plans on individual preserves. In my opinion, the key to our success will be to leverage our reputation as independent (unbiased) expert scientists to facilitate and guide the multi-stakeholder process of collaborative decision making that is required for effective Ecosystem Based Management. One aspect of this new work was a structured workshop that I held last fall. The workshop, based on the Dahlem model, was the first concrete step in facilitating collaborative decision making.

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Monitoring Vegetation Communities

In December of 2010 we summarized the progress made in the first four years of this on-going project. We presented results from a variance components analysis to develop recommendations for optimizing monitoring.

Semi-arid shrublands in southern California are highly spatial, with different species and functional groups displaying different degrees of affinity for a specific vegetation type or a different degree of patchiness across sites and plots. As a result allocating a significant amount of effort to spatial coverage is appropriate for most response variables. Some species and groups are also dramatically influenced by annual factors such as rainfall, and will require annual monitoring. Team-to-team variability can be minimized with appropriate training and experience. Point-intercept transects provide the most accurate and precise estimates of cover for common species and functional groups. Quadrats provide more information on richness and presence of uncommon or small species, but systematically underestimate cover. Our data demonstrate that response variables vary across natural spatial gradients and temporal variability, and that the two principal field protocols capture different aspects of the ecosystem. The best monitoring approach must be determined based on the objective(s) and response variable(s) of interest for each individual project.

Vegetation Monitoring Workshop Attendees

Table 1: Partial list of vegetation monitoring workshop attendees.

	Last Name	First Name	Affiliation
1	Bennett	Anna	Affinis
2	Brennen	Chris	City of San Diego
3	Burrascano	Cindy	
4	Busby	Darin	Busby Bioligical Services
5	Chinn	Jeanne	
6	Cloud-Hughes	Michelle	SERG
7	Dodero	Mark	Recon Env
8	Fleury	Scott	
9	Forburger	Kristin	City of San Diego
10	Friesen	Tyler	
11	Frost	Nancy	CA DFG
12	Galvin	Jeff	WRMSHCP
13	Garcia	Josh	City of San Diego
14	Goddard	Cheryl	SD County
15	Gordon-Reedy	Patricia	CBI
16	Greer	Keith	SanDAG
17	Grim	Mike	City of Carlsbad

	Last Name	First Name	Affiliation
18	Haines	Jennifer	SD County
19	Hamilton	Megan	SD County
20	Hooker	Craig	City of San Diego
21	Hoshi	Junko	CA DFG
22	Howard	Shelby	
23	Humphrey	Rosanne	TAIC
24	Johnson	Brenda	CA DFG
25	Kilburg	Paul	City of San Diego
26	Klein	Mike	Private Contractor
27	Krosch	Jeanne	
28	Lambert	Julie	
29	Lippitt	Caitlan	
30	Matrone	Jade	
31	McGinnis	Niki	City of San Diego
32	Miller	Betsy	City of San Diego
33	MIller	William	US FWS
34	Mozumder	Kailash	ICF
35	Norton	Jessica	City of San Diego
36	Oberbauer	Tom	SD County/ AECOM
37	Pelley	Sue	
38	Peugh	Jim	SD Audobon
39	Principe	Zach	TNC
40	Rempel	Ron	SD MMP
41	Roderick	Cara	
42	Spears-Lebrum	Linnea	AECOM
43	Stallcup	Jerre	CBI
44	Stephens	John	City of San Diego
45	Stephenson	Bobbie	SD County
46	Terp	Jill	US FWS
47	Uyeda (McFarland)	Kellie	SDSU
48	Valerio	Katrina	
49	Willrick	Lindsay	
50	Winterrowd	Cathy	City of San Diego
N	Numerous others		

Vegetation Workshop Presentation

SOUTHERN CALIFORNIA REGIONAL MONITORING WORKSHOP

Douglas Deutschman
Professor, Department of Biology *and*
Institute for Ecological Monitoring and Management

Spring Strahm,
Senior Research Scientist

Major Project Sponsors and Contributors

Organization	Project Manager(s) and/or Scientist(s)
SANDAG	Keith Greer, SANDAG Ron Rempel, SD MMP
TNC	Trish Smith Zach Principe
NROC	Kris Preston Lyn McAfee
US FWS	Clark Winchell Susan Wynn Mark Pavelka
CA DFG	Brenda Johnson Dave Mayer

And many, many many others

Barbara Kus, Betsy Miller, Bobbie Stephenson, Bryan Endress, Dan Marschalek, Dave Bailey, Diane Menuz, Doug Stow, Genie Fleming, Gina Washington, Jan Beyers, Janet Franklin, Jennifer Haines, Jerre Stallcup, Jill Terp, John Martin, John O'Leary, Junko Hoshi, Karen Miner, Karin Cleary_Rose, Kathryn McEachern, Markus Spiegelberg, Megan Hamilton, Michael Beck, Mike Grim, Niki McGinnis, Patricia Gordon-Reedy, Rosanne Humphrey, Steve Newton-Reed, Terri Stewart, Tim Dillingham, Tom Oberbauer, William Miller, Yuki Hamada, Yvonne Moore

ORGANIZATION

Session 1:

Monitoring. Are you kidding me? Why are we still talking about this?

Biological Monitoring for the MSCP

Vegetation Monitoring for the MSCP

- Response Design: Methods and Teams
- Sampling Design: Variance Components
- The Big Picture: 4 years and counting

Session 2:

Atkinson et al. 2.0

The Dahlem model

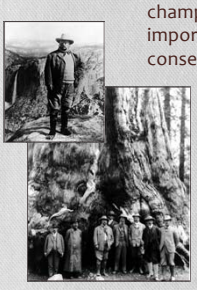
Three Challenges

USGS

Designing Monitoring Programs in an Adaptive Management Context for Regional Multiple Species Conservation Plans

Monitoring. Are you kidding me? Why are we still talking about this?

Theodore Roosevelt was the first president to champion conservation. He recognized the importance of science as a tool for conservation



www.theodoreroosevelt.org/life/biopictures.htm

"We can not defer action until complete accuracy in the estimates can be reached, because before that time many of our resources will be practically gone."

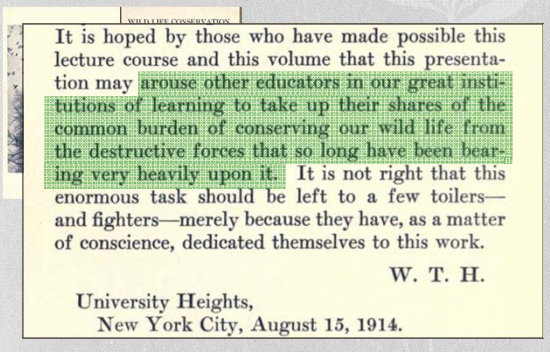
Theodore Roosevelt in 1915!

Monitoring. Are you kidding me? Why are we still talking about this?

- In a 1915 article, Roosevelt praised William T. Hornaday for his book Wild life conservation in theory and practice: lectures delivered before the Forest School of Yale University, 1914
- Roosevelt urged that it "*should be owned and constantly used by every man and woman alive*"
- Roosevelt embraced this scientific text because Hornaday promised to "*avoid the discussion of academic questions, because the business of conservation is replete with urgent practical demands*"

W. T. Hornaday

Monitoring. Are you kidding me? Why are we still talking about this?



It is hoped by those who have made possible this lecture course and this volume that this presentation may arouse other educators in our great institutions of learning to take up their shares of the common burden of conserving our wild life from the destructive forces that so long have been bearing very heavily upon it. It is not right that this enormous task should be left to a few toilers—and fighters—merely because they have, as a matter of conscience, dedicated themselves to this work.

W. T. H.

University Heights,
New York City, August 15, 1914.

Monitoring. Are you kidding me? Why are we still talking about this?

"We can not defer action until complete accuracy in the estimates can be reached, because before that time many of our resources will be practically gone."

The challenge, of course, is getting information that is ***accurate enough*** to make informed management decisions. So …

What is accurate enough? And how do we know if we have achieved it?

www.theodoreroosevelt.org/life/biopictures.htm

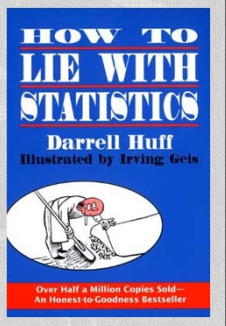
Monitoring. Are you kidding me? Why are we still talking about this?

"In 1954 former *Better Homes and Gardens* editor and active freelance writer Darrell Huff published … the most widely read statistics book in the history of the world."

Steele (2005) "Darrell Huff and Fifty Years of How to Lie with Statistics" Statistical Science 20(3) 205-209.

" If your sample is large enough and selected properly, it will represent the whole well enough for most purposes.

If it is not, it may be far less accurate than an intelligent guess and have nothing to recommend it but a spurious air of scientific precision."



Monitoring. Are you kidding me? Why are we still talking about this?

Peterman, RM. 1990. Statistical power analysis can improve fisheries research and management. CJFAS 47: 2-1 5.
Many monitoring programs mislead agencies because they operate under the delusion that they can detect effects that are statistically significant.

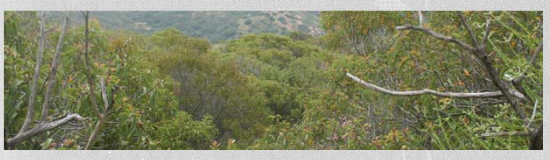
National Research Council. 1995. Review of EPA's Environmental Monitoring and Assessment Program: Overall Evaluation.
EMAP will have little chance of achieving its goals because they sample at too coarse a scale and have not evaluated the statistical power of their designs.

Legg CJ and Nagy L. 2006. Why most conservation monitoring is, but need not be, a waste of time. J Env. Management 78:194–199.
Results from inadequate monitoring are misleading because they create the illusion that something useful has been done.

Lindenmayer DB and GE Likens. 2010. The science and application of ecological monitoring. Biological Conservation 143(6):1317-1328
There is a long history of poorly planned and unfocused monitoring programs that are either ineffective or fail completely.

Monitoring. Are you kidding me? Why are we still talking about this?

The reason we are still talking about this is because it is very difficult to design and implement a monitoring program across multiple ecosystems, species, and jurisdictions that satisfy multiple (often competing) objectives.



ORGANIZATION

Session 1:

Monitoring. Are you kidding me? Why are we still talking about this?

We are where we came from

Vegetation Monitoring Greatest Hits, Volume 1

- Response Design: Methods and Teams
- Sampling Design: Variance Components
- The Big Picture: 4 years and counting

Session 2:

Atkinson et al. 2.0
The Dahlem model
Three Challenges

We are where we came from

RESOURCES AGENCY CALIFORNIA DEPARTMENT FISH&GAME

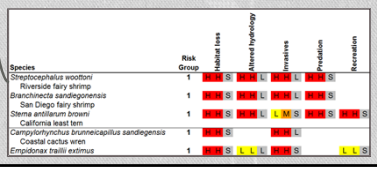
2005. Assessing and Improving the San Diego MSCP Biological Monitoring Plan. LAG Grant P0450009. Franklin, Regan, and Deutschman.

Tasks:

- Strategically divide and prioritize species, communities and the system
- Develop management-oriented conceptual models.
- Identify monitoring recommendations and critical uncertainties.
- Determine strategy for implementing monitoring

We are where we came from


Species prioritization for monitoring and management in regional multiple species conservation plans



We are where we came from

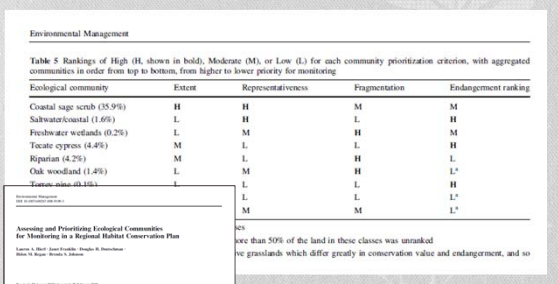
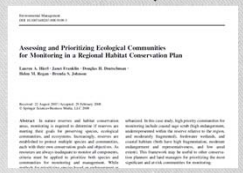

Environmental Management

Table 5 Rankings of High (H, shown in bold), Moderate (M), or Low (L) for each community prioritization criterion, with aggregated communities in order from top to bottom, from higher to lower priority for monitoring

Ecological community	Extent	Representativeness	Fragmentation	Endangerment ranking
Coastal sage scrub (35.9%)	**H**	**H**	M	M
Saltwater/coastal (1.6%)	L	**H**	L	**H**
Freshwater wetlands (0.2%)	L	M	**H**	M
Tecate cypress (4.4%)	M	L	L	**H**
Riparian (4.2%)	M	L	**H**	L
Oak woodland (1.4%)	L	M	**H**	L[a]
Torrey pine (0.1%)	L	L	L	**H**
	L	L	L	L[a]
	M	M	M	L[a]

Assessing and Prioritizing Ecological Communities for Monitoring in a Regional Habitat Conservation Plan

We are where we came from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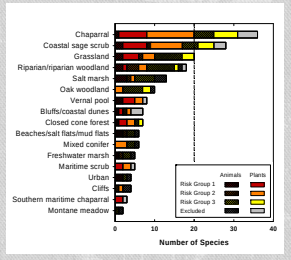
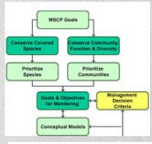


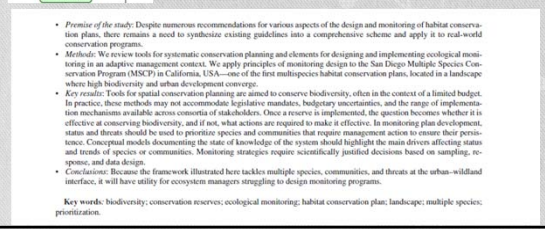
We are where we came from




PLANNING, IMPLEMENTING, AND MONITORING MULTIPLE-SPECIES HABITAT CONSERVATION PLANS[1]

JANET FRANKLIN[2,7], HELEN M. REGAN[3], LAUREN A. HIERL[4], DOUGLAS H. DEUTSCHMAN[4], BRENDA S. JOHNSON[5], AND CLARK S. WINCHELL[6]

American Journal of Botany 98(3): 559–571. 2011.


- *Premise of the study*: Despite numerous recommendations for various aspects of the design and monitoring of habitat conservation plans, there remains a need to synthesize existing guidelines into a comprehensive scheme and apply it to real-world conservation programs.
- *Methods*: We review tools for systematic conservation planning and elements for designing and implementing ecological monitoring in an adaptive management context. We apply principles of monitoring design to the San Diego Multiple Species Conservation Program (MSCP) in California, USA—one of the first multispecies habitat conservation plans, located in a landscape where high biodiversity and urban development converge.
- *Key results*: Tools for spatial conservation planning are aimed to conserve biodiversity, often in the context of a limited budget. In practice, these methods may not accommodate legislative mandates, budgetary uncertainties, and the range of implementation mechanisms available across consortia of stakeholders. Once a reserve is implemented, the question becomes whether it is effective at conserving biodiversity, and if not, what actions are required to make it effective. In monitoring plan development, status and threats should be used to prioritize species and communities that require management action to ensure their persistence. Conceptual models documenting the state of knowledge of the system should highlight the main drivers affecting status and trends of species or communities. Monitoring strategies require scientifically justified decisions based on sampling, response, and data design.
- *Conclusions*: Because the framework illustrated here tackles multiple species, communities, and threats at the urban–wildland interface, it will have utility for ecosystem managers struggling to design monitoring programs.

Key words: biodiversity; conservation reserves; ecological monitoring; habitat conservation plan; landscape; multiple species; prioritization.

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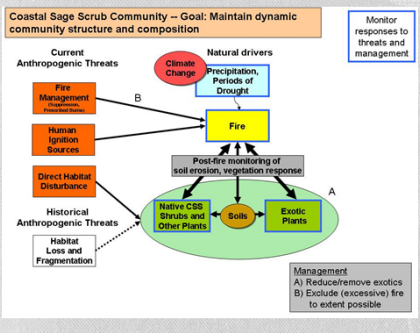
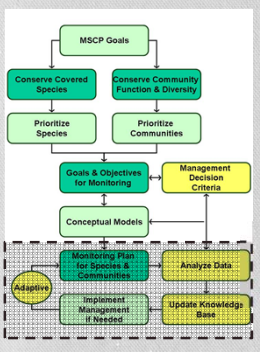
Botany



Franklin et al. (*accepted*). Conceptual model for the coastal sage scrub plant community.

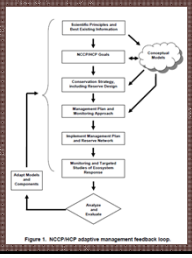
We are where we came from


Botany



Our Monitoring Workshops Started Here:
Designing, implementing, and evaluating monitoring plans for species and communities.

ORGANIZATION



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- Response Design: Methods and Teams
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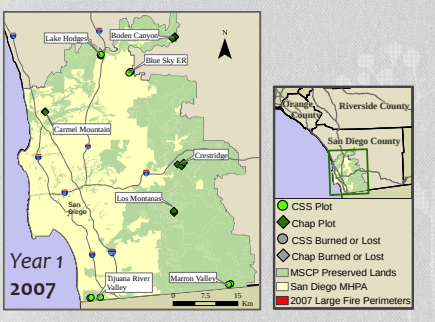
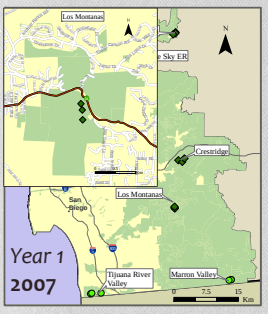
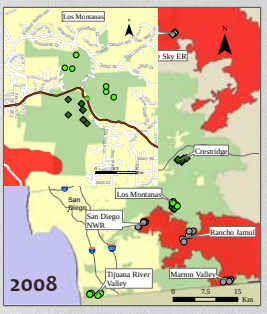


Vegetation Monitoring



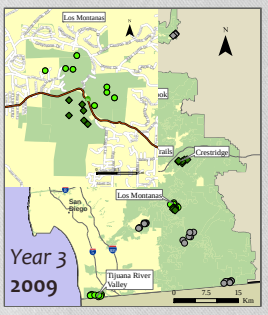
Year	Total Sites	Total Plots	Visits per Plot
2007	8	23	2.9

Vegetation Monitoring



Year	Total Sites	Total Plots	Visits per Plot
2007	8	23	2.65
-> Fire	-4	-12	
2008	7	41	1.30
2009			
2010			

Vegetation Monitoring



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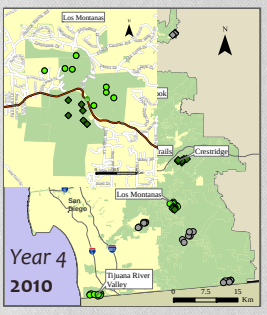
2010			

Vegetation Monitoring



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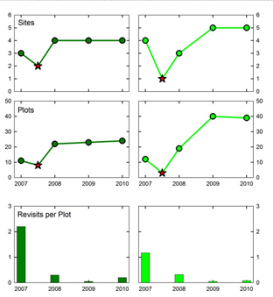
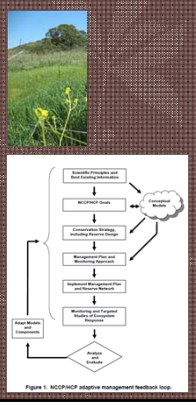


Year	Total Sites	Total Plots	Visits per Plot
2007	8	23	2.9
-> Fire	-4	-12	12
2008	7	41	1.30
2009	9	63	1.00
2010	9	63	1.11

Year	Total Sites	Total Plots	Total Visits
Totals	13	81	247



ORGANIZATION

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- **Response Design: Methods and Teams**
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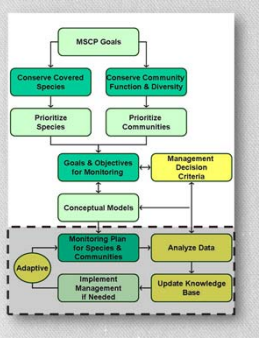
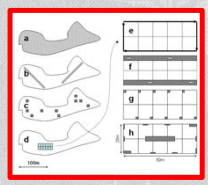
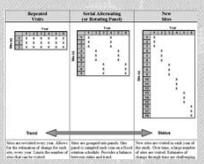
Vegetation Monitoring Greatest Hits, Vol 1:
Response Design, Methods and Teams

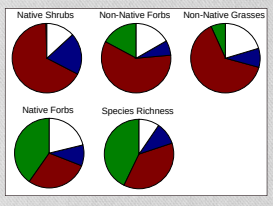


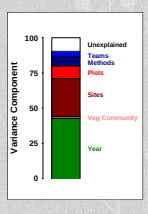




Vegetation Monitoring Greatest Hits, Vol 1:
Response Design, Methods and Teams

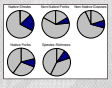
- The variance components analysis showed that methodological variability was modest compared to the large spatial and temporal components.



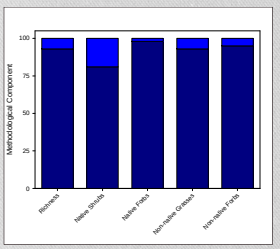


- However, the methodological component of variance is something that can be minimized more easily.

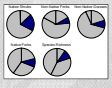
Vegetation Monitoring Greatest Hits,
Response Design, Methods and Teams



- The largest component of methodological variance was attributed to method (Point Intercept vs Quadrat).



Vegetation Monitoring Greatest Hits
Response Design, Methods and Teams



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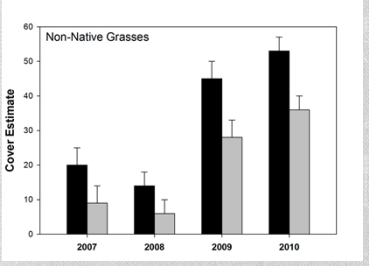
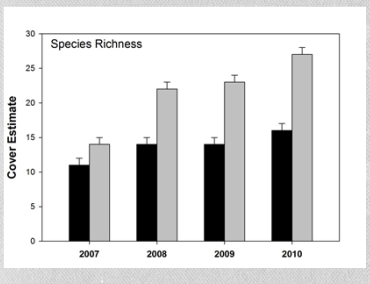


Quadrats lead to a modest underestimation of cover of native shrubs.

The same is true of other functional groups (non-native grasses shown here)

Vegetation Monitoring Greatest Hits
Response Design, Methods and Teams

- The largest component of methodological variance was attributed to method (Point Intercept vs Quadrat).

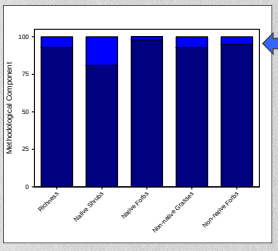


The opposite pattern is seen with species richness.

Point Intercept underestimates richness.

Vegetation Monitoring Greatest Hits,
Response Design, Methods and Teams

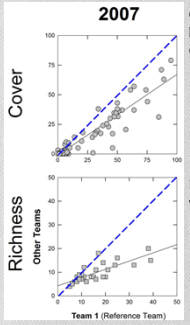
- The methods are complementary. The PI method is very stable for estimates of cover. The QD method detects more of the species present in the system.



The team-to-team variability was also interesting.

Vegetation Monitoring Greatest Hits
Response Design, Methods and Teams

- Variability among teams was larger in 2007 (our first year)

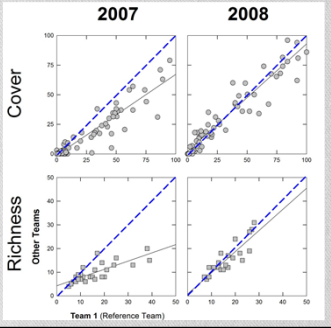


Cover tended to be lower for less experienced teams

Richness was even worse.

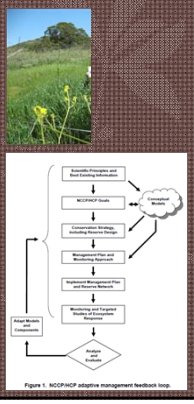
Vegetation Monitoring Greatest Hits
Response Design, Methods and Teams

- Variability among teams was much smaller in 2008



Cover was unbiased among teams.

Richness was about the same.



ORGANIZATION

Session 1:

Monitoring. Are you kidding me? Why are we still talking about this?

We are where we came from

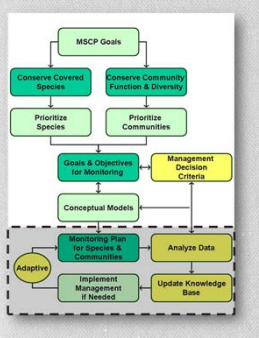
Vegetation Monitoring Greatest Hits, Volume 1

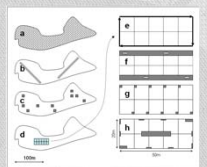
- Response Design: Methods and Teams
- **Sampling Design: Variance Components**
- The Big Picture: 4 years and counting

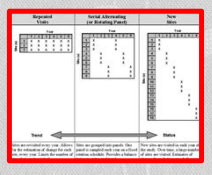
Session 2:

Atkinson et al. 2.0
The Dahlem model
Three Challenges

Vegetation Monitoring Greatest Hits, Vol 1:
Sampling Design: Variance Components

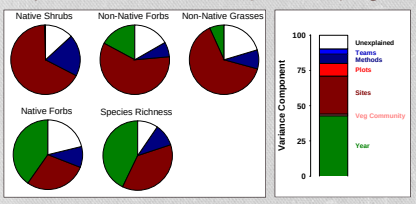






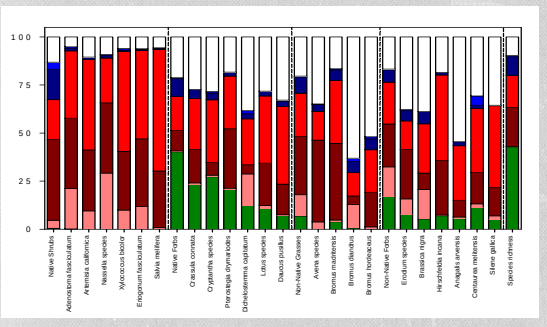
Vegetation Monitoring Greatest Hits, Vol 1:
Sampling Design: Variance Components

- The variance components analysis showed that spatial and temporal sources of variability were very high.

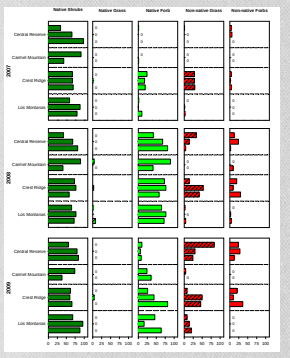


- However, thee components differ for the major functional groups and response variables.

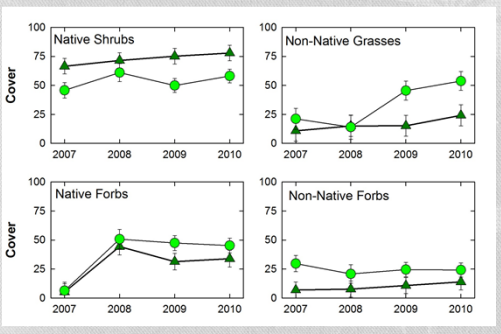
Vegetation Monitoring Greatest Hits,
Sampling Design: Variance Components

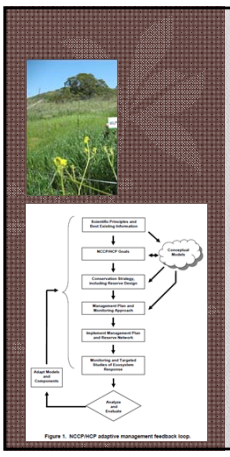


Vegetation Monitoring Greatest Hits,
Sampling Design: Variance Components



Vegetation Monitoring Greatest Hits, Vol 1:
Sampling Design, Variance Components





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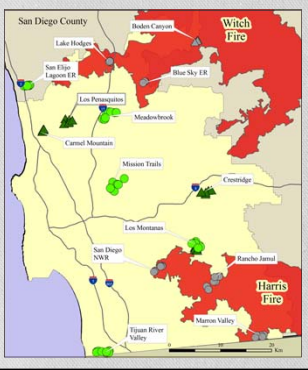
The Big Picture - 4 years and counting

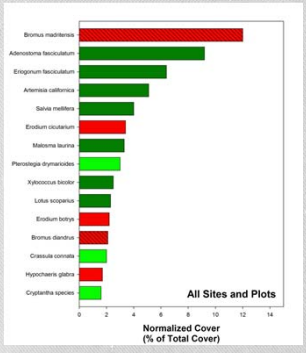


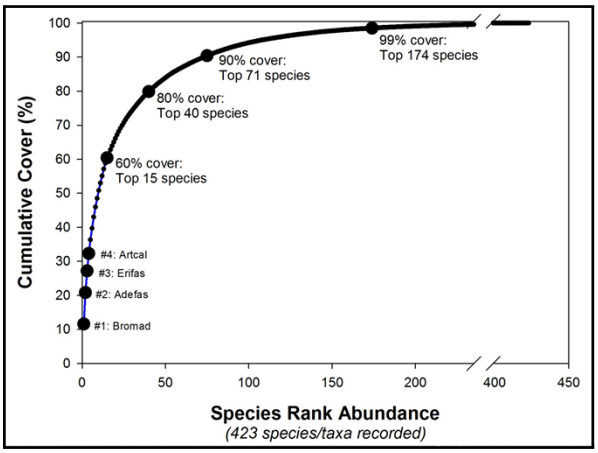
Chaparral

CSS

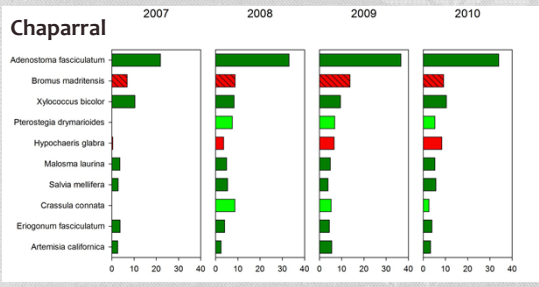
Burned in 2007 fires

The Big Picture - 4 years and counting

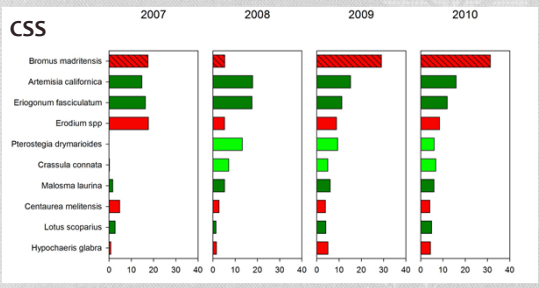




The Big Picture – 4 years and counting



The Big Picture – 4 years and counting



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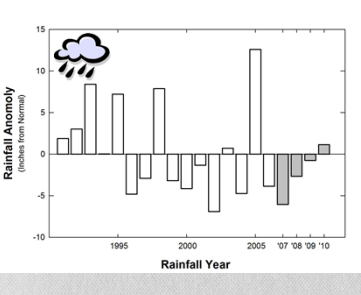

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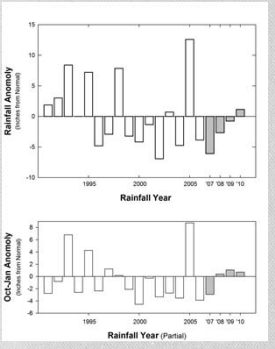
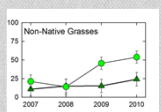
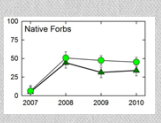
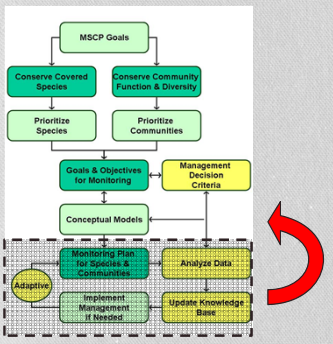






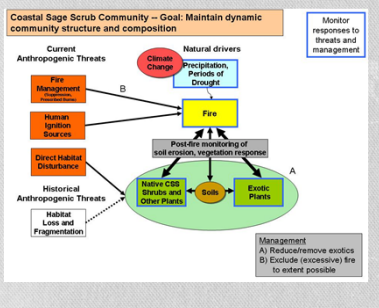
The Big Picture – 4 years and counting



The Big Picture – 4 years and counting

Critical Habitat Component	Species/ Taxa	Solution
Cover of a specific woody species	• Gnatcatcher • Cactus Wren • Hermes copper • Thorne's hairstreak	PI (Vis)
Cover of a Specific Herb	• Quino Checkerspot	QD (Special)
Bare ground/ mineral substrate	• Arroyo toad • Burrowing Owl • Reptiles • Burrowing animals	PI
Fuels	• Oaks • Tecate Cypress	PI
Non-native grass/ forb cover	• Stephen's Kangaroo Rat • Other small mammals	PI
Woody: Non-woody Ratio	• Birds	PI
Woody Structure and Cover	• Least Bell's Viero • Southwestern Willow Flycatcher	PI (Special)

The Big Picture – 4 years and counting



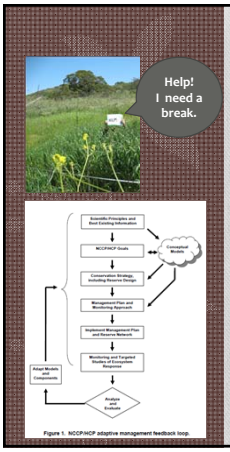
Rainfall is a direct driver as well as indirect through fire…

Native herbs and shrubs may respond differently.

Exotic grasses and forbs are different.

Vegetation structure is an important supplement to composition.

The role of diversity and rare plants needs to be more explicit.



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Session 2:

Atkinson et al. 2.0

The Dahlem model

Three Challenges

Dahlem Conference

The development of an accurate and efficient monitoring program will requires a renewed discussion of the specific goals and objectives of the overall monitoring program. During the 2010 Dahlem conference we facilitated a discussion about the scientific, social and political challenges to coordinated monitoring and management of a multiple species HCP/NCCP. We hosted a series of structured workshops with key stakeholders from the wildlife agencies, multiple jurisdictions, and scientists. In this report we present the initial summary of that work.

The goal of the Dahlem workshop was to create a roadmap for what amounts to an MSCP Biological Monitoring Plan 2.0. (or maybe 3.0). The structure of the workshop was designed to identify areas of consensus, identify and explore areas of disagreement, and to prioritize next steps that will ultimately lead to improved monitoring and management of MSCP lands. We used a structured workshop based on a model first developed in the 1970s at the Free University in Berlin, Germany. Dahlem Workshops are a structured way to foster scientific creativity, the exchange of information and ideas, and the development of new theses. Dahlem workshops are comprised on three or four working groups, each exploring a different (though related) topic. Topics for each group and background materials are assembled ahead of time. Through these intensive preparations the workshop can begin where regular conferences usually end: with discussions, the debate of questions, and collective thinking. Participants assess the current state of the field by reading background papers prepared for the workshop. The themes of the workshop are discussed in order to identify gaps in research, finding possibilities for convergence in disputed issues, and influencing the direction of future research.

The topics for the Dahlem conference were developed and refined over several planning meetings by a 10-member steering committee. The three topics were (See Figure 2):

1. Spatial scale: Individual preserves to the region
2. Species and ecosystems
3. Inter-organizational dynamics: Impediments and solutions

Topic 1: Preserve to Region (Spatial Scale)

What is the **definition of a Reserve/ Preserve**?

How or what **defines the region**?

Is it species specific? Plan specific? Jurisdiction specific?

What questions should be addressed:

On the regional level? On the reserve level? Spatial scale matters.

How do you find the intersection between **biologically meaningful scales and jurisdictional scales**?

Topic 2: Species and Ecosystems

What kind of **proxies** can be used to assess/ monitor ecosystem health?

Sentinel or Indicator species
Threats (large mammal for connectivity)
Natural processes (fire, rainfall, etc for climate change)

Do we know what "healthy" is?

Can we put a metric on a judgment? Can it be quantified?

How do you **prioritize species** for monitoring

Degree of threat
Regulatory requirement
If we can really help the species

Topic 3: Inter-organizational Dynamics: Impediments and Solutions

Cross jurisdictional communication:

Stakeholders have different expertise, interests, and viewpoints.

Institutionalize the process

How do we achieve broad cooperation and collaborative decision making without hiccups? How will it be funded?

Uncertainty and Fear

What will the data show? Cost effective? Is a lot of money being spent for little return? Fear of change.

Personality conflicts

They happen. Need to build relationships that are robust to staff turnover and reluctance to risk.

Figure 2: *Three topic areas from the Dahlem conference, Fall 2010.*

The Dahlem workshop consisted of a diverse group of 26 participants from a wide range of agencies/organizations including ten land managers, seven representatives from government agencies, six academic scientists, and three monitoring experts. Participants were assigned one of the three topics in an attempt to balance expertise and interests within each group. The groups worked both within the structured workshop and between sessions to draft a report that addresses their particular topic. I am in the process of editing and revising the 70-page draft report. In the final paragraphs of this summary, I will present the main points of each chapter and discuss the next steps in this process.

Results from the Dahlem Workshop:

Spatial scale: Individual preserves to the region: The use of spatial and temporal sampling strategies for collecting monitoring data on most ecological variables often improves the data quality while reducing costs and use of limited resources. Inventories of covered species populations will be based primarily on space-time sampling frameworks. The spatial coverage and density of sampling will be based on cost, inherent spatial variability of the process or species being monitored and power requirements based on decision-making needs. The temporal frequency of sampling will be based on cost, power analysis and the temporal dynamics of the species or process being monitored. Our understanding of spatial variability and temporal dynamics are limited. Studies such as the Deutschman team's assessment of floristic variability/dynamics provide insights into sampling requirements. Similar empirical and meta-analysis studies are needed to determine space-time sampling requirements for priority covered species and threats/stressors. In addition, maps, GIS data layers, such as the vegetation layer commissioned by SANDAG, which are derived through a combination of field sampling and interpretation of remote sensing imagery, can provide information on spatial and temporal variability that can inform spatial sampling designs.

The San Diego region should continue to move towards a fully functional regional management and monitoring entity that works with preserve managers and others in designing and implementing monitoring (including data analysis). To accomplish this unified approach monitoring would likely require funding agencies to pool resources or apply them in a coordinated fashion. This approach would help:

- Identify the spatial scale of monitoring by looking at the scale of threats and natural processes relative to the spatial distribution of the species or natural community targeted for monitoring
- Ensure monitoring is question driven
- Ensure monitoring efforts across jurisdictions are driven by the spatial scale of the organism and habitat
- Prioritize species and habitats for management, similar to the process undertaken for monitoring
- Use and refine conceptual models of target biological communities as a basis for recommending and prioritizing specific management actions for individual preserve areas.
- Ensure data from monitoring programs are analyzed in a timely manner so that insights into emerging trends can be used to alter management actions, funding agencies and management decision-makers can make timely decisions affecting conservation outcomes, and timely feedback is provided on the consequence of management actions.

Species and ecosystems: The Multiple Species Conservation Program covers a diverse range of taxa. The species in the MSCP utilize all habitats found within the Multi-habitat Planning Area, and although each species has a unique set of adaptations and habitat requirements, some similarities exist. Single species monitoring is an integral part of successfully implementing a Habitat Conservation Plan. Most plans, if not all plans, specifically direct monitoring efforts toward understanding the status and/or trend of individual species. Adequate data sets collected about single species using appropriate methodology is a tool to evaluate the success of a plan. However, monitoring all 85 species covered in the MSCP, at every location, is impractical and inefficient. As a result, it is critical to develop implementable goals and objectives, and to prioritize which species and sites should be monitored.

Prioritization should be based on the following factors:

- Species 'threatened-ness'
- Ability of land manager to effect change (i.e. minimize threats, expend population)
- The ability to answer management questions
- The ability to assess MSCP objectives
- The ability to extract information about the ecosystem based on a few measurable factors (such as species presence or success)

In addition to direct monitoring of prioritized species, indicators can provide a good platform for gauging the status, or trend of a system. A wide variety of indicators are used in ecological studies and biological monitoring programs. A successful indicator measures characteristics of the biological system, generating information directly tied to management decisions. In monitoring programs, the explicit link between an indicator and variables of management interest should be transparent and based on management objectives.

Once robust data has been collected, reviewed and summarized, it is imperative that it is distributed to land managers. Some of the fundamental challenges to designing effective management and monitoring program are how data are archived and analyzed, and whether results from these analyses are fed back into the process to inform and improve future monitoring and management. Completing the circle between monitoring, data analysis, and management strategy assessment creates an iterative feedback loop that allows for critical review of each component of the process.

This iterative, feedback loop may require resources (technical, personnel, etc.) that are not currently available to most MSCP reserve managers. Partnerships that pair reserves with institutions with the capacity and expertise may be one solution to these resource limitations. To ensure that limited resources for monitoring and management are used most effectively, we suggest that this integrated process is a priority for the MSCP. This need may be partially met by coordinated working groups which exist in formal structures such as regular intra- and interagency meetings and the Transnet-funded Environmental Mitigation Program. We believe the current working group model contributes to effective and efficient monitoring and management, and recommend updated MSCP monitoring methods/plans that increase the capacity of working groups to form, to exchange information among and outside the group, and to sustain the group so that it remains useful to the participants.

Inter-organizational dynamics: Impediments and solutions: Creation, monitoring, and management of reserve systems for the protection of native species and ecosystems requires collaboration among multiple stakeholders from a wide range of government, non-government, academic, and private organizations. Differences among these participants in how they influence or are influenced by group decisions can both enhance collective efforts and impede them. We identified a list of impediments to implementation of a reserve-wide monitoring and management strategy based on experience with current practices.

A partial list of impediments includes:

1. Lack of an approved strategic plan, based on science, for reserve-wide monitoring and management.
2. Lack of a centralized database and information system that allows access to data and products that can inform MSCP monitoring and management.
3. Funding challenges, such as inadequate funding levels, systems by which funding is allocated internally and externally to management organizations, and restrictions on uses imposed by funders.
4. Poorly defined roles and responsibilities of participants in a leaderless, de-centralized cooperative network, which leads to poorly-defined decision-making processes.
5. The dual focus of many agencies on both land acquisition and management, which hinders their ability to advance development and implementation of a strategic plan.
6. Turnover of staff/participants, which may result in loss of institutional memory and expertise and affect the levels of executive support in Sacramento and Washington D.C. for regional conservation planning and implementation processes.

Although it is clear that some impediments will be amenable to straightforward mechanistic solutions, we recognize that even the simplest solutions will require a great deal of time and effort. We further acknowledge that other impediments will require solutions that are outside this group's ability to conceptualize and perhaps any group's ability to implement. Nevertheless, we feel the identified impediments accurately represent the existing challenges to MSCP implementation, while the recommendations provide workable solutions that can be accomplished within a reasonable timeframe.

We view the following components as necessary to successful implementation of regional monitoring and management within the MSCP:

- A science-based, stakeholder-informed Strategic Monitoring and Adaptive Plan (MMP).
- A centralized database to allow more complete and timely information flow between the parties regulating and implementing the MSCP.
- A funding process that is transparent and promotes sub-regional collaboration.
- Clearly defined roles and responsibilities of plan participants, resulting in streamlined approval processes and assurances to stakeholders that funded actions are achieving their objectives.

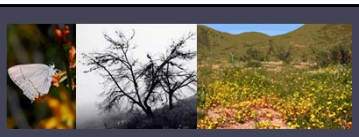
Dahlem Conference Attendees

Table 2: List of Dahlem Attendees

First	Last	Group	Group (1st)	Leadership positions
Markus	Spiegelberg	Land Manager	1	Facilitator
Nicole	McGinnis	Land Manager	1	Reminder
Susan	Wynn	Agencies	1	Reporter
Doug	Stow	Academic	1	

First	Last	Group	Group (1st)	Leadership positions
Ron	Swaisgood	Academic	1	
Ron	Rempel	Agencies	1	
Dave	Mayer	Agencies	1	
Bruce	April	Land Manager	1	
Joyce	Schlachter	Land Manager	1	
Kris	Preston	Monitoring Expert	1	
Rebecca	Lewison	Academic	2	Facilitator
Mike	Grim	Land Manager	2	Reminder
Betsy	Miller	Land Manager	2	Reporter
Jay	Diffendorfer	Academic	2	
Brenda	Johnson	Agencies	2	
Jared	Underwood	Agencies	2	
Jill	Terp	Land Manager	2	
Clark	Winchell	Monitoring Expert	2	
Barb	Kus	Monitoring Expert	3	Facilitator
Mark	Pavelka	Agencies	3	Reminder 1
Patricia	Gordon-Reedy	Land Manager	3	Reminder 2
Trish	Smith	Land Manager	3	Reporter
Jeff	Crooks	Academic	3	
Winston	Vickers	Academic	3	
Keith	Greer	Agencies	3	
Tom	Oberbauer	Agencies	3	
John	Martin	Land Manager	3	
Karen	Miner	Land Manager	3	

Dahlem Conference Summary Power Point to EMP Working Group



Monitoring and Management in the MSCP

Presentation to the
EMP Working Group
May 27, 2011

Douglas Deutschman
Professor of Biology and
Institute for Ecological Monitoring and Management
San Diego State University

SAN DIEGO STATE UNIVERSITY

Outline

- Monitoring in Adaptive Management
  - Introduction
  - Franklin, Regan and Deutschman (CA DFG LAG project)
  - Deutschman and Strahm (LAG, SANDAG, and TNC projects)
  - Lewison, Deutschman and the IEMM (LAG, SANDAG projects)
- Monitoring and Management in the MSCP
  - Atkinson et al. v2.0
  - Structured Workshops – The Dahlem Model
- Topic 1: Spatial and Temporal Scale
- Topic 2: Species and Ecosystems
- Topic 3: Impediments and Solutions

Monitoring in Adaptive Management: Introduction

Adaptive Management

- Management under uncertainty
- A flexible and self-correcting feedback loop
  - Implementation, experimentation and adjustment
  - Fueled by data collection and analysis
- Monitoring is hard
  - Expertise
  - Expensive

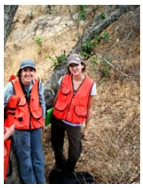
Monitoring in Adaptive Management: Introduction

Good Monitoring Saves Money

- Ensures the data is useable
  - Enables deeper analysis and understanding
- Optimizes the amount of meaningful information gleaned from a program
  - Establishes end game before data collection
  - Links goals and objectives to metrics
  - Keeps an eye on **power** and **variability**
- Data analysis is the link between monitoring and information useful for managers

Monitoring in Adaptive Management: Introduction

Monitoring is one of the core activities of conservation biology. Monitoring data are used to:



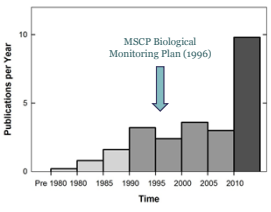
- identify species in decline or at risk of extinction
- evaluating response to disturbances like fire
- provides baseline data to evaluate change
- detecting changes in ecosystem structure and function
- track the spread of invasive species
- evaluate management actions

Marsh, DM and PC Trenham. 2008. Current trends in plant and animal population monitoring. Conservation Biology 22:647-655.

Lindenmayer DB and GE Likens. 2009. Adaptive monitoring: a new paradigm for long-term research and monitoring. TREE 24(9) 482-486

Monitoring in Adaptive Management: Introduction

In the past 30 years, there has been an explosion of research articles on monitoring for ecology, conservation, and management



Web of Science Search, 2011

Monitoring in Adaptive Management: Introduction

Unfortunately, monitoring often fails to meet the needs of conservation and management

"Results from inadequate monitoring are misleading for their information quality and are dangerous because they create the illusion that something useful has been done"

Lindenmayer DB and GE Likens. 2009. Adaptive monitoring: a new paradigm for long-term research and monitoring. TREE 24(9) 482-486

Legg C and L Nagy. 2006. Why most conservation monitoring is, but need not be, a waste of time. J. Env. Management. 78: 194-199

Monitoring in Adaptive Management: Introduction

Monitoring Succeeds when:

- Clearly defined (and flexible) goals and objectives,
  - address new questions as initial questions are answered
- Collection of high-quality data through sound statistical design, validated protocols, and data analysis
  - periodic program evaluation (external peer review)
- Well-developed collaborative partnerships among scientists, resource managers, and key stakeholders
  - Access to ongoing funding
  - Strong and enduring leadership

Lindenmayer DB and GE Likens. 2009. Adaptive monitoring: a new paradigm for long-term research and monitoring. TREE 24(9) 482-486

Legg C and L Nagy. 2006. Why most conservation monitoring is, but need not be, a waste of time. J. Env. Management. 78: 194-199

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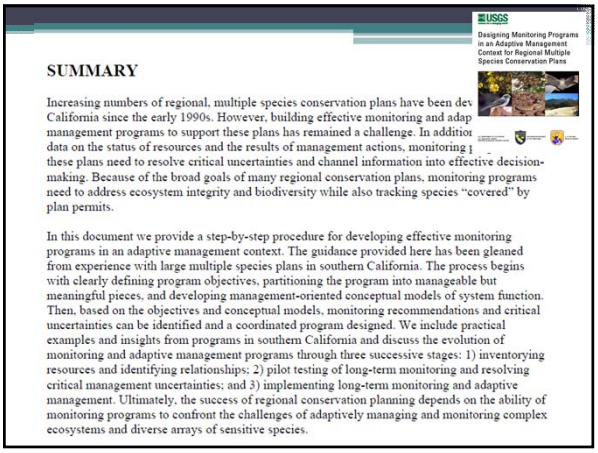
Monitoring and Management

- SDSU's involvement in conservation monitoring and management really began with the 2005 DFG LAG grant.
- The initial project (Franklin, Regan and Deutschman) was a broad review of the Biological Monitoring Plan (Ogden 1996) and subsequent work (CBI 2001, Annual Reports).

Monitoring and Management

The Franklin et al. project used the Atkinson et al. (2004) technical report as a structure for the review.

Dr. Janet Franklin
Vegetation Monitoring
2007



USGS
Designing Monitoring Programs in an Adaptive Management Context for Regional Multiple Species Conservation Plans

SUMMARY

Increasing numbers of regional, multiple species conservation plans have been dev
California since the early 1990s. However, building effective monitoring and adap
management programs to support these plans has remained a challenge. In additio
data on the status of resources and the results of management actions, monitoring
these plans need to resolve critical uncertainties and channel information into effective decision-making. Because of the broad goals of many regional conservation plans, monitoring programs need to address ecosystem integrity and biodiversity while also tracking species "covered" by plan permits.

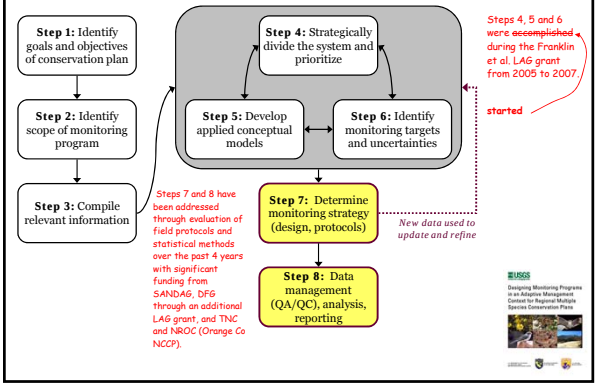
In this document we provide a step-by-step procedure for developing effective monitoring programs in an adaptive management context. The guidance provided here has been gleaned from experience with large multiple species plans in southern California. The process begins with clearly defining program objectives, partitioning the program into manageable but meaningful pieces, and developing management-oriented conceptual models of system function. Then, based on the objectives and conceptual models, monitoring recommendations and critical uncertainties can be identified and a coordinated program designed. We include practical examples and insights from programs in southern California and discuss the evolution of monitoring and adaptive management programs through three successive stages: 1) inventorying resources and identifying relationships; 2) pilot testing of long-term monitoring and resolving critical management uncertainties; and 3) implementing long-term monitoring and adaptive management. Ultimately, the success of regional conservation planning depends on the ability of monitoring programs to confront the challenges of adaptively managing and monitoring complex ecosystems and diverse arrays of sensitive species.

SUMMARY

Building effective monitoring and adaptive management programs to support multiple species conservation remains a challenge.

We provide a step-by-step procedure for developing effective monitoring programs in an adaptive management context.

Ultimately, the success of regional conservation planning depends on the ability of monitoring programs to confront the challenges of adaptively managing and monitoring complex ecosystems and diverse arrays of sensitive species.



Monitoring and Management

1. Four technical reports (online at DFG): http://www.dfg.ca.gov/habcon/nccp/publications.html
2. Hierl LA, J Franklin, DH Deutschman, HM Regan, BS Johnson. **2008.** *Assessing and prioritizing ecological communities for monitoring in a regional habitat conservation plan.* Env. Management 42(1) 165-179.
3. Regan HM, LA Hierl, J Franklin, DH Deutschman, HL Schmalbach, CS Winchell, and BS Johnson. **2008.** *Species prioritization for monitoring and management in regional multiple species conservation plans.* Diversity and Distributions 14:462–471.
4. Franklin J, HM Regan, LA Hierl, DH Deutschman, BS Johnson, and CS Winchell. 2011. Planning, implementing, and monitoring multiple-species habitat conservation plans. Am. J. Botany 98(3)559-571.

Monitoring and Management

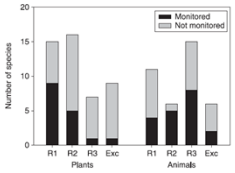


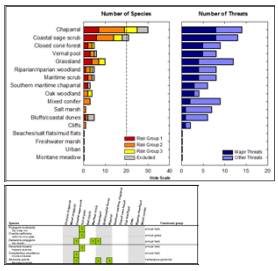
Figure 1 Number of Multiple Species Conservation Plan (MSCP) covered plants and animals that have been monitored over 1995–2005, as a function of risk group. R1 refers to the number of species monitored and not monitored in Risk Group 1, etc. Exc. refers to covered species that were excluded from the prioritization due to taxonomic debate or because their occurrence is not confirmed within the MSCP preserve.

Species Prioritization:

Problem: Poor match between a species priority and previous monitoring efforts.

Regan HM, LA Hierl, J Franklin, DH Deutschman, HL Schmalbach, CS Winchell, and BS Johnson. **2008.** *Species prioritization for monitoring and management in regional multiple species conservation plans.* Diversity and Distributions 14:462–471.

Monitoring and Management

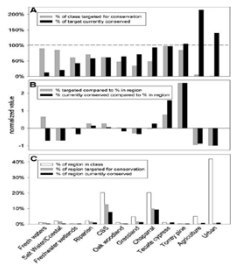


Species Prioritization:

Solution: Prioritize based on best available information on threats to species and re-align monitoring effort..

Regan HM, LA Hierl, J Franklin, DH Deutschman, HL Schmalbach, CS Winchell, and BS Johnson. **2008.** *Species prioritization for monitoring and management in regional multiple species conservation plans.* Diversity and Distributions 14:462–471.

Monitoring and Management



Community Prioritization:

Problem: Little thought paid to monitoring communities themselves based on extent, fragmentation, amount conserved.

Hierl LA, J Franklin, DH Deutschman, HM Regan, BS Johnson. **2008.** *Assessing and prioritizing ecological communities for monitoring in a regional habitat conservation plan. Env. Management 42(1) 165-179.*

Monitoring and Management

Community	Extent	Frag?	Risk
Chaparral (43.1%)	H	L	L
CSS (35.9%)	H	M	M
…	•••	•••	•••
Freshwater Wetlands (0.2%)	L	H	M
Torrey Pine (0.1%)	L	L	H

Community Prioritization:

Solution: Evaluate communities and rank them on several metrics.

*Hierl LA, J Franklin, DH Deutschman, HM Regan, BS Johnson. **2008.** Assessing and prioritizing ecological communities for monitoring in a regional habitat conservation plan. Env. Management 42(1) 165-179.*

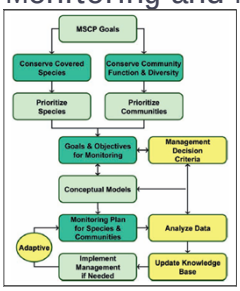
Monitoring and Management

Developing a Monitoring Program:

Problem: It is difficult to develop a robust monitoring program. Requires explicit statements of how the system works and what to monitor.

Franklin J, HM Regan, LA Hierl, DH Deutschman, BS Johnson, and CS Winchell. 2011. Planning, implementing, and monitoring multiple-species habitat conservation plans. Am. J. Botany 98(3)559-571.

Monitoring and Management



Developing a Monitoring Program:

Solution: Use Atkinson et al. stepwise approach.

Franklin J, HM Regan, LA Hierl, DH Deutschman, BS Johnson, and CS Winchell. 2011. Planning, implementing, and monitoring multiple-species habitat conservation plans. Am. J. Botany 98(3)559-571.

Monitoring and Management

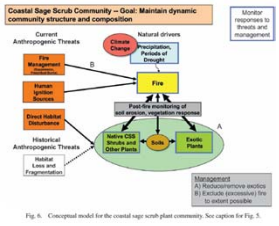


Fig. 8. Conceptual model for the coastal sage scrub plant community. See caption for Fig. 5.

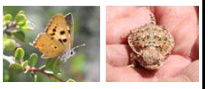
Developing a Monitoring Program:

Solution: Use Atkinson et al. stepwise approach.

Develop a conceptual model of the system to link goals and objectives of monitoring and management to the design, collection, and analysis of monitoring data.

Franklin J, HM Regan, LA Hierl, DH Deutschman, BS Johnson, and CS Winchell. 2011. Planning, implementing, and monitoring multiple-species habitat conservation plans. Am. J. Botany 98(3)559-571.

Outline



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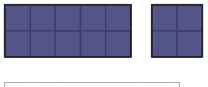
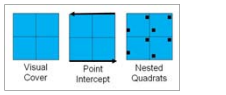
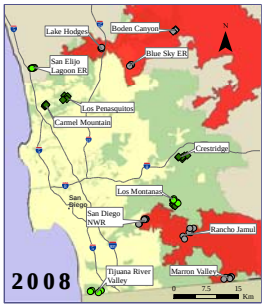
Vegetation Monitoring





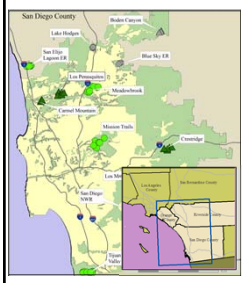
- We evaluated three common methods on a large (1000 m²) plot
  - Visual Cover
  - Point Intercept (Transects)
  - Quadrats
- Statistical analysis of data from multiple teams revealed
  - Visual cover did not add information and was the most variable among teams
  - Plots could be reduced in size by 50% without sacrificing precision
  - Point Intercept was the most precise method for estimating cover
  - Quadrats were best for tracking diversity

Vegetation Monitoring



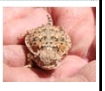
Year	Total Sites	Total Plots	Visits per Plot
2007	8	23	2.9
-> Fire	-4	-12	
2008	7	41	1.30
2009, 2010	9	63	1.10

Vegetation Monitoring



- Spatial and Temporal Variability among MSCP preserves
- Similar data collected in Orange Co. (TNC, NROC)
- Coordinated with Riverside Co.
- Adopted by other regional monitoring efforts
  - USGS Herp Arrays (R Fisher)
  - US FWS Gnatcatcher (Winchell)
  - SDSU/IEMM Burrowing Owl project

Outline



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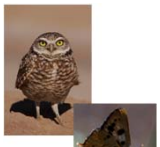
Ongoing Activities

Institute for Ecological Monitoring and Management

- Coordination with SD MMP on monitoring and management
- Burrowing Owl management experiment (with ICR)
- Hermes copper surveys and population genetics
- Quino checkerspot larval sensitivity study
- Scaling vegetation monitoring (with Doug Stow, Geography)
- Rare plant surveys with TNC and CBI



TransNet SANDAG | The Nature Conservancy | Nature Reserve of Orange County

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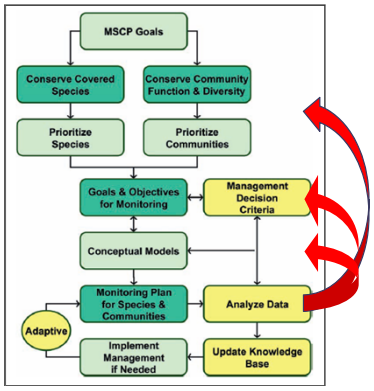
Atkinson 2.0 (BMP 3.0?)



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Dahlem Conference

- Originally hosted at the Free University of Berlin starting in the mid 1970's
- Dahlem Workshops are designed to foster scientific creativity, the exchange of information and ideas, and the development of new theses. At the same time the workshops are designed to help set future research agendas.
- Participants assess the current state of the field by reading background papers prepared for the workshop. The themes of the workshop are discussed in order to identify gaps in research, finding possibilities for convergence in disputed issues, and influencing the direction of future work.

Dahlem Conference

- **3** groups
  - Preserve to Region (Spatial Scale)
  - Species and Ecosystems (Ecological Level)
  - Impediments and Solutions (Inter-Organizational dynamics)
- **3** workshops

  ½ day – *2 weeks* – **Full day** – *4 weeks* – **½ day**

  Prep *reading* *Discussion* *writing* *Presentation*
- **3** leaders in each group
  - Facilitator – Helps run the discussions
  - Rapporteur – Group secretary/reporter and "historian"
  - Reminder(er) – "Reminds" people to keep on schedule and on task

Dahlem Conference

Need Progress in three critical areas
- Preserve to Region (Spatial Scale)
- Species and Ecosystems (Organizational Level)
- Impediments and Solutions (Inter-organizational Structures)

Dahlem Conference

- 26 participants from a wide range of agencies/organizations including
  - 10 land managers
  - 7 representatives from gov. agencies
  - 6 academic scientists
  - 3 monitoring experts.
- Participants were assigned one of the three topics in an attempt to balance expertise and interests within each group
- The groups worked both within the structured workshop and between sessions to draft a report that addresses their topic.

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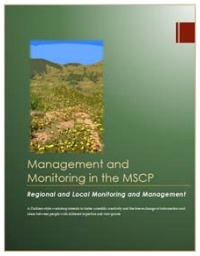
Group 1: Preserve to Region (Spatial Scale)



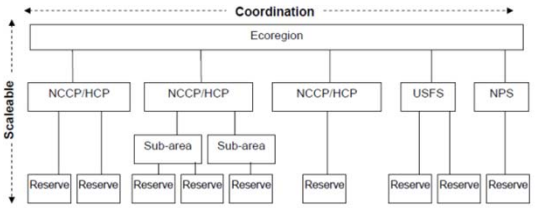
What is the **definition of a Reserve/ Preserve**?

How or what **defines the region**?
Is it species specific? Plan specific? Jurisdiction specific?

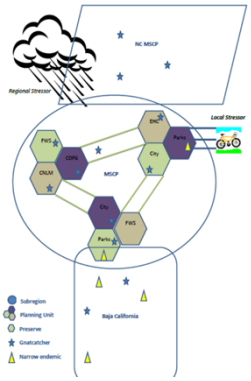
What questions should be addressed:
On the regional level? On the reserve level? Spatial scale matters.

How do you find the intersection between **biologically meaningful scales and jurisdictional scales**?

Group 1: Preserve to Region (Spatial Scale)



From Atkinson et al. 2004



Group 1: Preserve to Region (Spatial Scale)

- Identify the spatial scale of monitoring
- Ensure monitoring efforts across jurisdictions are driven by the spatial scale of the organism and habitat
- Prioritize species and habitats for management, similar to the process undertaken for monitoring
- Use and refine conceptual models of target biological communities as a basis for recommending and prioritizing specific management actions for individual preserve areas.
- Analyze data in a timely manner
- Funding agencies and management decision-makers make timely decisions

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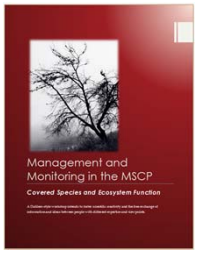
Group 2: Species and Ecosystems



What kind of **proxies** can be used to assess/ monitor ecosystem health?
- Sentinel or Indicator species
- Threats (large mammal for connectivity)
- Natural processes (fire, rainfall, etc)

Do we know what "healthy" is?
- Can we put a metric on a judgment?
- Can it be quantified?

How do you **prioritize species** for monitoring?
- Degree of threat
- Regulatory requirement
- If we can really help the species

Group 2: Species and Ecosystems

Most plans direct monitoring efforts toward understanding the status and/or trend of individual species.

However, monitoring all 85 species covered in the MSCP, at every location, is impractical and inefficient.

It is critical to develop implementable goals and objectives, and to prioritize which species and sites should be monitored.

Indicators can provide a good platform for gauging the status, or trend of a system.

A wide variety of indicators are used in ecological studies and biological monitoring programs.

A successful indicator measures characteristics of the biological system that provide an explicit link between an indicator and variables of management interest.

Outline


- Monitoring in Adaptive Management
  - Introduction
  - Franklin, Regan and Deutschman (CA DFG LAG project)
  - Deutschman and Strahm (LAG, SANDAG, and TNC projects)
  - Lewison, Deutschman and the IEMM (LAG, SANDAG projects)
- Monitoring and Management in the MSCP
  - Atkinson et al. v2.0
  - Structured Workshops – The Dahlem Model
- Topic 1: Spatial and Temporal Scale
- Topic 2: Species and Ecosystems
- Topic 3: Impediments and Solutions

Group 3: Impediments and Solutions

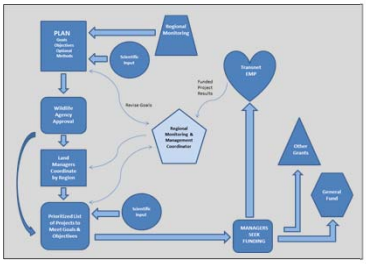
Cross jurisdictional communication
- Stakeholders have different expertise, interests, and viewpoints.

Institutionalize the process
- How do we achieve broad cooperation and collaborative decision making?

Uncertainty and fear
- What will the data show?
- Is money being spent for little return?

Personality conflicts. They happen.
- Need to build relationships that are robust to staff turnover and reluctance to change.

Group 3: Impediments and Solutions




Group 3: Impediments and Solutions

A partial list of impediments includes:

- Lack of an approved strategic plan, based on science, for reserve-wide monitoring and management.
- Lack of a centralized database and information system
- Funding challenges, such as inadequate funding levels or restrictions on use
- Poorly defined roles and responsibilities in a leaderless cooperative network
- The dual focus of many agencies on both land acquisition and management,
- Turnover of staff/participants

Group 3: Impediments and Solutions

Recommendations:

- •A science-based, stakeholder-informed Strategic Monitoring and Adaptive Plan
- A centralized database to allow more complete and timely information flow between the parties regulating and implementing the MSCP.
- A funding process that is transparent and promotes sub-regional collaboration.
- Clearly defined roles and responsibilities of plan participants, resulting in streamlined approval processes and assurances to stakeholders that funded actions are achieving their objectives.

Dahlem Conference – Next Steps

- Editing Dahlem Conference report
- Presentation of results and peer review
- Complete the feedback loop. Use this as a guide for near-term projects.

Questions?

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