CAMNet

Annual Rendezvous

March 7- 9, 2010
Doubletree Hotel Tucson at Reid Park

Photo by Tahnee Robertson, Southwest Decision Resources

SUMMARY

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Executive Summary

On March 7-9, 2010, the Collaborative Adaptive Management Network (CAMNet) and local hosts the Las Cienegas National Conservation Area (LCNCA), The Nature Conservancy, and U.S. Institute for Environmental Conflict Resolution convened the fourth annual Rendezvous in Tucson, Arizona. This gathering was designed to provide a forum for innovative natural resource managers, scientists, policy makers, academics, and citizens to:

- hear about collaborative and adaptive management projects in the arid Southwestern U.S.;
- learn about the collaborative approach to adaptive management of the Las Cienegas National Conservation Area;
- discuss the implications of climate change for natural resources management and how CAM can help address the challenges of a changing climate.

The 2010 Rendezvous was made possible by the support of The Nature Conservancy http://azconservation.org/ , PBS&J http://www.pbsj.com/ ,and participant registration fees. The Program for the event was developed by a local organizing committee in coordination with CAMNet. Participants came from the Florida Everglades, Glen Canyon, Missouri River Basin, New England, Upper Mississippi River, Platte River Basin, Rogue River Basin, Salton Sea, and included adaptive management (AM) and collaboration practitioners, scientists, academics, students, natural resource managers, and policy makers from state and federal agencies, non-governmental organizations, universities, and the private sector. A list of participants is included in Appendix A.

The event began with keynote addresses by Kit Batten, U.S. Department of Interior, Jim Kenna, U.S. Bureau of Land Management (BLM), and Lynn Scarlett, Environmental Researcher and Writer. Following this, a panel provided an overview of collaboration and adaptive management activities in grassland, forest, and aquatic ecosystems in the Southwest.

BLM and their partners shared how they began working together and how they continue to take a collaborative, science-based approach to management of the LCNCA. On Monday, participants spent a full day in the field, visiting four sites where the partners are working to restore historic grassland and riparian conditions while sustaining grazing and recreational use. Participants learned about and discussed the variety of treatments being applied and monitored.

On the final day of the event, participants heard talks by Jonathan Overpeck, Coordinating Lead Author of the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment and Director of the University of Arizona's Department of Geosciences Environmental Studies Laboratory; and Robin Craig, Professor of Law at the Florida State University College of Law and author of "Stationarity is Dead" - Long Live Transformation: Five Principles for Climate Change Adaptation Law. Following this, a panel offered responses

and participants engaged in discussion with all of the speakers. Attendees then participated in breakout group discussions and offered recommendations on the following topics:

- incorporating climate information into the steps of collaborative adaptive management,
- policy and legal opportunities and barriers executing CAM, and
- education and outreach.

Key points from the presentations and discussions are documented below, and presentations made at the Rendezvous are available at http://www.adaptivemanagement.net/rendezvous/2010-schedule

Keynote Addresses

Kit Batten, Science Advisor to the Deputy Secretary, U.S. Department of Interior (DOI)
Kit shared how the Department of Interior's Secretarial Order #3289 established an Energy and Climate Change Council to oversee and coordinate several initiatives to respond to the impacts of climate change, including:

- National Climate Change and Wildlife Science Center at USGS
- 8 DOI Regional Climate Science Centers
- Landscape Conservation Cooperatives

She said that the Climate Science Centers (CSCs) will provide scientific information, tools, and techniques for resource managers to adapt to climate change; deliver basic climate-change-impact science to Landscape Conservation Cooperatives (LCCs); and, work with the LCCs to develop adaptive management and other decision-support tools for managers. The first CSC will be formed in Alaska.

The Landscape Conservation Cooperatives (LCCs) were described as partnerships formed and directed by resource managers, scientists, and other stakeholders who are implementing conservation & adaptive management on the ground. LCCs will link science and conservation delivery. Each LCC functions within a specific landscape, but is also part of a national and international network. DOI invites federal, state, tribal, local government and non-governmental management organizations to become partners. In addition, DOI continues to look for examples of success in the field to share in Washington, DC.

Additional information about DOI's work related to climate change and adaptive management can be found at www.doi.gov

Jim Kenna, Arizona State Director, U.S. Bureau of Land Management
Jim opened by saying that restoration is about problem-solving and prioritization. He suggested that problem-solving requires involvement by the following four groups: citizens, government, scientists, and business. Jim proposed several characteristics of successful projects, and referred to adaptive management as a management decision model that fosters many of these characteristics.

Lynn Scarlett, Environmental Researcher/Writer, Former Deputy Secretary USDOI
Lynn opened by stating that science, collaboration, and a focus on results are essential to conservation and resource management because issues in this arena are characterized by uncertainty and complexity. She suggested that these factors present challenges in the areas of communication, information, coordination, and taking action, and that collaboration and adaptive management are, in part, responses to these challenges.

She then identified and raised questions about monitoring, performance metrics, and the following issues associated with adaptive management and the intersection of science and decision making:

- Policy makers and scientists use different criteria for what level of certainty is acceptable in their respective fields. ***How can policy makers and scientists find the right balance between rigor and taking action in a timely manner?***;
- Scientists and managers are faced with a different set of tasks/responsibilities related to complexity in natural resource management (finding out how the world works and making decisions about actions to achieve priorities). ***How can scientists and managers work together to gather meaningful data that is useful in a context of time and resource constraints?***;
- The enterprise of metrics development and reporting is often disconnected from the enterprise of management and policy making. ***How can performance metrics best be linked to actual decision options faced by the policy makers and land managers?***; and,
- Many landscape-scale initiatives across the Nation are tangled in procedures designed for piecemeal, one-project-at-a-time implementation. ***Can we evolve governing institutions and develop procedural tools to allow for holistic decision making about intersecting, integrated collections of actions that comprise the restoration whole?***

Lynn also explored the larger question of what should be the relationship between science and decision-making, and shared the following continuum from *Advocacy and Credibility of Ecological Scientists in Resource Decision-making* by Denise Lach et al, as a framework for thinking about how scientists should be involved in decision making:

← Reporting —— Interpreting —— Articulation of options —— Helping select among options →

She concluded by saying that adaptive management is fundamentally about shaping the questions and generating knowledge that address key management needs, and therefore requires mechanisms for managers and scientists to work together to identify the questions for which decision makers most acutely need scientific input, as well as mechanisms through which scientists and policy makers can discuss scientific information and analysis.

Discussion with Opening Speakers:
Participants discussed the following questions with the plenary speakers.

How can cross-jurisdictional efforts be funded? Leadership is crucial. Approaches to issues such as fire and invasive species, which are outside of everyone's jurisdiction, may offer some insights.

Regarding the LCC's – what are benchmarks for success? Collaboration among groups.

Are there models that can compare large-scale, expensive restoration efforts and help us identify which ones to invest in? We can ask: Where are the tipping points? Which projects within an area are critical to restoration? Is there an opportunity to conduct assessments across multiple projects? Where is the need most immediate and necessary?

This nation needs to consider the societal costs of not taking action in comparison to the cost of undertaking multiple major restoration efforts. Identify systems that have not yet been pushed beyond tipping point. The President has identified Everglades and Mississippi as important from both an economic and societal standpoint. It is the prerogative of legislators to make the selections and allocations of resources.

Regional Overview Panel

Moderator: Rob Marshall, Director, Center for Science & Public Policy, The Nature Conservancy

Lisa Graumlich, Director-School of Natural Resources and the Environment, University of Arizona

Lisa opened the panel session by offering some context about how climate change is affecting the southwest. She said that rapid ecosystem and temperature changes are happening now in Arizona. For example, she observed that increased temperature is now the greatest contributing factor to wildfire, whereas it used to be drought. Lisa also noted that robust records in snow melt trends are available, and it is important to look at where the tipping points are to help guide natural resource management.

Peter Warren, The Nature Conservancy and Reese Woodling, President, Malpai Borderlands Group

Peter Warren, The Nature Conservancy, shared the history of the Malpai Borderlands Group, which was organized in 1990 following a conversation among neighboring ranchers. He said two factors in the Malpai Group's success have been collaboration with numerous private and governmental organizations, and the collaborative development of a goal statement soon after the group was formed. To achieve their goal, the Malpai Group has protected 72,000 acres of private land on 12 ranches with conservation easements. They have also cooperated on four major prescribed fires to reduce the dominance of shrubs and rejuvenate perennial grass cover. Peter noted the importance of talking with people who live and work on the land so that the data they gather on a daily basis can be included in assessment and management of natural resources. Reese Woodling, President of the Malpai Borderlands Group, shared how he converted his ranch to grass-fed cattle, and how he has observed climate change on his ranch through changes in the amount of dew on his boots in the morning, which aligns with records on climate change in the area.

Discussion

How do you communicate "boots on the ground" information about adaptive management? A reporter from the Washington Post quoted me on climate change…lots of calls and emails. On my 40 square miles I can see things are changing. People that work with cattle and wildlife see things they can't report technically, but they know deep inside. When you are on a ranch you don't really have time to get out. Everything is condensed into small ecosystems of farms.

Edward Smith, Forest Ecologist, Four Forest Restoration Initiative

Edward Smith, The Nature Conservancy, described the Four Forest Restoration Initiative, which covers 2.4 million acres, 4 National Forests, and a timespan of 20 years. The goal of the group is to accelerate ecological restoration from the current 15 acres/year to 50 acres/year. He noted that restoration is very expensive and risky and that the group wants to continue learning about the system by formally applying adaptive management and experimental design. Edward said the 4FRI group has submitted a proposal for funding from the Forest Landscape Restoration Program to conduct 800,000 acres of treatment.

Discussion

How do you use the rigid/flexible approach to make decisions? Right now we are making recommendations to the agency on how the collaborative should proceed. We are trying to decide whether to present one majority or consensus recommendation or the range of perspectives within the group, to the Forest Service.

Can you tell us more about discussions on economics? We pride ourselves on being science-based. We have much more information on ecological issues than on economics. We need more economic data, and have some ideas on biomass. It's going to take some creativity.

What is the goal of the group for 50 -100 years? I think a lot of the people think if fire is reintroduced things will fall into place. That is not for sure since the fire regime has changed so much. This is why collaboration and monitoring are so important so we can see our effects on the landscape.

How is the 2.4 million acres selected? It's across the four forests that are engaged in restoration. The wood supply study looked at all the acreage of these forests and used criteria such as sensitive habitat, close to roads, etc. to narrow it down to 2.4 million acres.

Lindy Brigham, Executive Director, Southern Arizona Buffelgrass Coordination Center (SABCC)

Lindy Brigham, SABCC's Executive Director, described how buffelgrass, a perennial bunchgrass from Africa/S.Asia, is invading the Sonoran Desert and altering the ecosystem. She noted that buffelgrass was introduced for cattle feed and erosion mitigation. Some of its other attributes include that it is able to survive grazing, drought, and fire, and when it burns, fire temperatures reach 1400 – 1800 degrees Farenheit with 16 – 18 foot flames. SABCC is working to: minimize spread in areas where buffelgrass is not yet established; restore treated areas in ways that increase resilience against future invasion; and mitigate fire risks to life & property in

areas where control is no longer feasible. Lindy said that SABCC has initiated an assessment of the distribution and abundance of buffelgrass within the Tucson Basin. In addition, they plan to design, implement and monitor/evaluate buffelgrass control treatments across 14 national parks, monuments, forests, wildlife refuges and military reservations in Southern and Central Arizona.

Discussion

What constitutes success for SABCC?
Until we do experiments we won't know the level of control we have.

Will your efforts cross the border into Mexico?
They are planting actively in Mexico because it's used as cattle feed. Staff at Organ Pipe had a considerable volunteer crew pulling buffelgrass and for a while they had it at bay. Now given the border situation, biologists can't work without accompaniment of a ranger and rangers are tied up in trafficking issues. As a result, the ability to work on the issue has gone way down.

Given the scale and lack of resources, how will a systematic approach be developed?
Part of the mapping approach is to know where the buffelgrass is, how it's expanding, and how to treat it. We won't know all the issues until the mapping process is completed.

What is the decision support system by USGS that you mentioned?
It was developed in British Columbia and based on a couple different model products. It is along the same lines as most of adaptive management modeling systems, the strategy is to move grid cells depending on treatments. It's going to depend on spread modeling and determining the cost effectiveness of if you go after big stands or small colonies, etc. Treating buffelgrass is expensive, so has to be done strategically.

Lee Case, Chief Scientist, Adaptive Management and Salton Sea Ecosystem Restoration

Lee Case, USGS Salton Sea Science Office, explained that the Salton Sea was created by a levy break in 1905 and provides habitat for over 400 species, including 20 species of conservation concern. The Sea is critical for migratory birds. Lee said that as suburban growth requires more water, the Salton Sea is shrinking; however, this will accelerate salinity increases, degrade water quality, and increase air pollution which has significant human health impacts. To address questions about how to retain biological value, avoid adverse impacts to human health and agricultural production, and avoid selenium problems, the program is applying adaptive management. The adaptive management approach includes: a monitoring and assessment plan, a "Progressive Habitat Development Alternative" (PHDA), and a Shallow Habitat Project (SHP). Lee said the PHDA would focus on developing and monitoring relatively small parcels (250-500 acres per phase) of saline habitat complex (SHC) in an adaptive, sequential manner. During each phase, continuous detailed evaluations could be obtained concerning water quality, habitat values and use, biologic issues, and engineering performance. Information from these evaluations would be used to refine the designs and adaptive strategies for the next phase of complexes. He proposed that development of adaptive and flexible strategies would reduce

risks and uncertainties associated with operating larger complexes. Through the SHP, originally designed to address selenium problems, the following has been learned:

- Constructed wetlands will attract most waterbird guilds
- Island habitat will help reduce nest depredation and flooding
- To minimize selenium effects nesting islands should not be built in ponds directly receiving agricultural water

Discussion

Is there any study on health impacts on the birds themselves?
There has been significant die-off on certain species. There have been studies. A lot has to do with the fish the birds rely on. Tilapia is the only fish left and they are not used to the high salinity and are very sensitive to temperature.

There must be other chemicals in the Salton Sea?
Definitely. There is a potpourri-arsenic and pesticides. Selenium is key but there are many others. Any activity that involves moving dirt requires assessment in advance.

Featured CAM Program: Las Cienegas National Conservation Area Adaptive Management Program

Panelists: Brian Powell, Program Manager, Pima County; Gita Bodner, Conservation Ecologist, The Nature Conservancy; Karen Simms, Ecosystem Planner, BLM; Ian Tomlinson, Manager/Vice President, Empire Ranch; Jeff Williamson, Cienega Watershed Partnership

Panelists introduced themselves and shared how special Las Cienegas National Conservation Area (LCNCA) is to them and why they work there together. Karen Simms, BLM, explained that Las Cienegas is a high elevation grassland and home to significant natural and cultural resources, including 6 federally listed species, rural lifestyles, and historic sites from over 7,000 years of human occupation. Las Cienegas is managed by BLM, ~~includes~~ is interspersed with Arizona State Trust land, and is bordered by Forest Service land as well as significant private interests. Karen lived on Las Cienegas for three years and has worked there for 22 years. Ian Tomlinson ~~owns~~ manages the 100,000 acre Empire Ranch, which includes a combination of BLM and Arizona State Trust Land grazing leases and associated private land. Gita Bodner with The Nature Conservancy has designed the monitoring for the adaptive management program and believes accountability and flexibility are both important in adaptive management.

Karen explained that BLM acquired LCNCA in 19~~9~~88. The first effort that BLM undertook to develop a plan for how to manage the land used a traditional approach with limited public involvement and it stalled. In 1995, partnerships began to form and a new collaborative planning effort was initiated. A Resource Management Plan was completed for LCNCA in 2003 with substantial stakeholder involvement. Currently, BLM in partnership with ~~local ranchers~~ Ian Tomlinson uses an adaptive management approach to adjust ~~grazing permit limits~~ livestock

numbers and rotations annually on the Empire Ranch based on ecological conditions. LCNCA is also looking at applying adaptive management to grassland restoration-vegetation treatments and restoration of riparian habitats. Adjacent Pima County is exploring how to apply adaptive management principles to their Sonoran Desert Conservation Plan. Lessons learned from this experience include:

- Consider stakeholder engagement in all components of the adaptive management cycle – relationships are critical to success
- Develop shared goals
- Incorporate science into planning (LCNCA refers to their process as the Biological Planning Process)
- Engage partners in monitoring (BLM partnered with TNC to design and conduct monitoring for LCNCA)
- Engage partners in fund raising (Cienega Watershed Partnership has assisted with this for LCNCA)

Field Visit

Pre-Meeting at Empire Ranch

On Monday morning, participants traveled from Tucson to Las Cienegas National Conservation Area (LCNCA). The day began with an overview of the field visit and opening remarks by Kathy Jacobs from the White House Office of Science and Technology Policy.

Markian Rekshynskyj, Manager of Las Cienegas National Conservation Area

Markian talked about the importance of partnerships to successful natural resource management. He and Karen Simms used a map to show LCNCA location, wildlife corridors, and the area that had been slated for development prior to its designation as a National Conservation Area.

Kathy Jacobs, Assistant Director, Climate Adaptation and Assessment, White House Office of Science and Technology Policy

Larry Fisher, U.S. Institute for Environmental Conflict Resolution, introduced Kathy Jacobs, Chair of the National Academy of Sciences Report on Climate Adaptation and former University of Arizona professor and director of the multi-campus Arizona Water Institute. In her current position at the White House, she is responsible for developing an assessment of climate change impacts and vulnerabilities, which is required every four years by Congress. Her goals for the next report include:

- Focus on key areas of vulnerability
- Engage stakeholders and build a network among groups already conducting assessments of climate change impacts
- Identify decisions that require science support
- Depoliticize climate change
- Re deploy science to make it more useful to decision makers

Participants then divided themselves into four groups which each visited four sites throughout the NCA to hear about and discuss the collaborative and adaptive approach that BLM is taking to management of the LCNCA. Below is a summary of the presentations and discussions that occurred at each site.

West Pasture Site
Presenters: Karen Simms (BLM), Gita Bodner (TNC), Ian Tomlinson (Empire Ranch,)Dan Robinett (Robinett Rangeland Resources LLC), Jeff Williamson (Cienega Watershed Partnership)

Site Description: This is a unique spot because of the long-term exclosure from grazing that combined with surrounding areas open to grazing allows us to monitor the effects of grazing. We need to protect the groundcover to prevent erosion. Our objectives change as we learn, but our main goal is to restore historic (reference) conditions of the ecological sites. Monitoring is done with a lot of stakeholder involvement.

Questions and Discussion:

What historic sites do you use to compare?

Reference areas for ~~E~~ecological sites have been developed using areas with little disturbance (the Audubon ranch, Fort Huachuca). The monitoring ~~area~~ exclosure was established back in 1984 so it is a good reference area as well.

Is an exclosure that is not used for grazing a good baseline? Isn't some presence of hooved animals good for grasslands?

This area was not a historic range for Bison, so an area without any grazing is a good historic baseline. Historically, drought and fire have been present, so it is important to measure those effects.

Has this area given you good data?

Yes, this pasture was grazed in the summer and lost a lot of basal cover, but when we compared it to the exclosure we could see it was a result of drought and not grazing.

When you think about the "tool box" of tools you use for adaptive management, what are your tools?

We use the following tools: fire, grazing, and water placement. You can split pastures and put water in different areas (such as on high sloped areas) that cattle would not normally go which spreads the use around.

What are you trying to achieve from a grazing perspective? What is the benefit (financial or otherwise) for ranchers? Ranchers want a sustainable environment, flexibility, and financial stability. The Biological Planning Process gives us the science to make decisions. Grants are available through NRCS for fencing and other activities. Ranchers also invest their own resources in this process.

What is your experience with the outcomes and the degree of buy in from stakeholders?
There are certainly ups and downs. The process has been beneficial in diffusing some of the tensions. We have been able to move past positioning to a truly more collaborative process. There has been a cultural shift as to how people are relating to the data, which has been especially interesting. We have had to adjust data collection to move away from a grazing-only focus to look at recreational and other uses. A lot of trust has been built through the sharing of data with people. Having the citizens at the table is a big strength and means we work together to develop the scoping questions for the monitoring (e.g. "What do we want to find out?"). It would be interesting to better understand what motivates people to become involved and how to engage others.

What are the challenges?
Challenges include:

- Not having all the players at the table
- People don't have time. The average citizen in the local area probably does not know what we are doing out here.
- Working within government budget constraints and cumbersome procedures

How do you deal with recreation?
There is a whole section in the resource management plan (RMP) that deals with recreation. There are a lot of management strategies proposed in the plan but implementation has been slow due to funding levels. There is some monitoring of overall visitor numbers and recreation permits but no overall monitoring program at present.~~We have involved the stakeholders on a personal basis but there is no monitoring for it.~~ The main issue is dispersed recreation; we cannot manage it all at one time. Enforcement is always an issue. The jury is still out in how we will deal with this in the Biological Planning Process. We are not sure if the Biological Planning Process would be the right forum for this. We need to really consider what biological planning can address and what is dealt with in other ~~places~~ ways such as the NEPA process or BLM policy and regulations (e.g. immigration effects from trash and traffic in riparian areas, recreation and trails).

Riparian / Cienega Creek Site
Presenters: Doug Duncan (USFWS), Jeff Simms (BLM), Dennis Caldwell (University of Arizona and CWP)

Site Description: In 1995, the BLM Tucson Field took a collaborative approach to create a long term land use and restoration plan for Las Cienegas NCA. Portions of this creek flow year round. Significant portions of the creek's watershed provide Tucson's outlying areas with groundwater recharge. Activities have included elimination/control of non-native species, elimination of warm season grazing, and closures to motor vehicle use in the riparian areas, and periodic review of monitoring data.

Questions and Discussion:

How are you using adaptive management on the creek? The RMP identifies common goals, ecologically based objectives, clear targets, and models to highlight uncertainties. As an example, we removed warm season livestock grazing on the creek back in the early 1990's. Following livestock removal, there was rapid growth of native woody species and development of a dense over story along the creek. The shading and increased input of detritus from these trees combined with less flood flows from drought has resulted in less suitable habitats for endangered native fish and consequently lower populations of these fish. Several alternatives have been looked at to address this issue including using livestock as a tool, prescribed fire, mechanical cutting and reintroduction of beaver. So we are planning on using beavers instead of chainsaws and monitoring the effectiveness.

What approach have you taken toward invasive species? We have approached this by:

- On federal lands, an active control program is in place to remove bullfrogs (exotic in the west) and eliminate tamarisk (exotic riparian tree)
- Since source populations may be on private lands, we have focused on building ~~a~~ relationships with ~~a~~ neighboring landowners
- We acquired one pond ~~and acquiring a lake~~ on neighboring ranch and were able to radicate crawfish~~, bass, and blue gill~~

There are currently no non-native fish in the creek.

Presenters and participants discussed the benefits and challenges of involving the public in scientific discussions.

Airstrip Vegetation Treatment Site
Presenters: Ron Tiller (TNC), Dan Quintana (BLM), Laura Olais (BLM)

Site Description: Historically this area has been a semi-desert grassland characterized by low numbers of mesquites. This provides antelope habitat. The goal for this site is to restore grasslands. 20,000 acres were identified for treatment in the Resource Management Plan. Treatments include:

- Prescribed burns
- Mechanical treatment
- Herbicide

From our monitoring, wee learned that the herbicide did not work well in initial efforts; it was oil based and we had to use a lot more than originally planned; the method of cutting mesquite trees (mastication) did not allow safe application of herbicide immediately after cutting which also impacted success. So we went back to the drawing board. We found that removing ~~stumps~~ mesquite trees including rootballs mechanically (grubbing) worked well. We are still monitoring the results of foliar spraying of mesquites from~~with~~ all terrain vehicles. This method cannot be used on the largest trees.

Questions to Consider from Participants:

How are you deciding how much to burn?
Do the holes created by grubbing create a microclimate?

Is there any experimental design to the treatments you are conducting?
What can you learn from these treatments?
How do the treatments compare in terms of cost and effectiveness?
Has there been any degradation of riparian areas as a result of the treatments?
Have there been any limitations on your ability to conduct prescribed fires from users?
What degree of certainty is there that cattle bring in mesquite (by seed ingestion)?
What percent of the acreage has mesquite where there is no fire?
Is there a downside to increasing fire frequency?
Who is part of the discussion about which treatments to use? BLM, TNC, cattle owners
How is monitoring data being shared?

Pima County Site
Presenters: Brian Powell, Kerry Baldwin, and Julia Foneseca (Pima County)

Situation Description: Pima County has acquired a number of lands to mitigate development and avoid outward expansion of the Tucson-area, as well as to conserve species and habitat types. The watershed of the purchased lands feeds Tucson, and provides ecosystem services. The acquisition came out of the Sonoran Desert Conservation plan. The conservation plan for the land includes a sustainable ranching component, and most of the ranchers have stayed on as operators-site stewards with 10 year grazing agreements. Now that the lands have been acquired, the question is, what's next? There is a lot of freedom to develop a management plan and move forward collaboratively. The discussion at this site focused around the presenter's requests for suggestions and perspectives on next steps for applying adaptive management given a landscape-level plan, the management needs of individual ranches, and the lack of a heavy prescription for the lands.

Questions and Discussion
What criteria were used to identify acquisitions?
Biological importance, sensitive to urban development, presence of vulnerable species, and presence of ranching, which is part of our cultural and economic history.

What are the existing conditions of the lands?
We are designing a program of monitoring and ecological assessment. We have a big picture, but lack detailed parcel-by-parcel information.

How do you collaborate with agencies to work at the landscape level on data management?
We are working together to create a shared data set.

Are other counties contributing to the effort?
Other counties contributed by participating in the effort to develop a common vision for the area, rather than providing resources. This gave Pima County the capacity to undertake the work, with the understanding that it is important to demonstrate the value of this effort for other counties. Suggestion from participant: The Foundation of Success provides support and technical assistance to groups like this.

Have you identified mutually beneficial objectives with ranchers?
We would like to do this.

How are ranchers included in decision making?
We work cooperatively with ranchers. The final decision is made by the County.

How can the partnership start to integrate adaptive management into the project?
Suggestions from participants included the following:

- ***Build partnerships.*** Begin by identifying who will be impacted by actions on the land and building relationships with those partners. This helps inform goal setting and monitoring, engages citizen stewards and citizen scientists, and enables sustainability of the effort.
- ***Develop a collective vision, goals, targets, monitoring.*** Identify a collective vision of success, and steps for developing common goals to ensure that goals are specific enough to guide science and management. Identify targets to provide specificity. When ecological issues are caused by factors outside the system, it is helpful to articulate the scope of the project, identify direct threats and what allows the threats to be present, and develop strategies to address those threats, and ways to measure them.
- ***Articulate management objectives and ecological questions*** that need to be answered to achieve them. Be explicit and specific about uncertainties in management.
- ***Include economic information*** in your data collection to document the value of the acquisitions.
- ***Quantifying ecosystem function and change*** could be a useful tool to organize management.
- Take advantage of the opportunity to ***test different assumptions through experiments,*** including testing different management actions on different parcels of land.
- ***Preserve the capacity to test assumptions and have the ability to adapt.***
- ***Connect monitoring back to the management decisions.*** The project's goals and objectives give guidance to science. Target monitoring to help answer critical management questions. Communicate the science to the ones who pay the bills.
- Many groups are already developing AM plans. Don't reinvent the wheel.

Field Visit Debrief

At the end of the day, presenters and participants gathered at Empire Ranch to debrief the field visit. Participants shared their observations about what is working well at LCNCA, questions about the collaborative approach and work at LCNCA, and suggestions for improvement in the application of adaptive management. A summary of input is provided below.

What is Working Well at Las Cienegas

- It is apparent that you all really enjoy working together and what you are doing.
- It is really interesting to see how this group has stitched several collaborations together and developed common goals on a larger landscape.

- It was a wise observation by the BLM that one process may not work for everything.
- There is a real effort to conduct targeted monitoring to answer specific questions. It is impressive that you are reviewing and using the data.
- Listening to scientists AND stakeholder questions to get at the information you want.
- The adaptability of the monitoring, and how questions are adjusted by working with stakeholders.
- The group is supportive of each other, which allows people to make mistakes...and its ok!
- I heard the word "partnership" used 50-100 times today. Very impressive.
- There is 10-20 years of history here, and the process seems to have developed into true collaboration.
- There is an inherent recognition that this is an iterative process.
- Implementing, monitoring, and evaluating different treatments (e.g. "beavers vs. chainsaws"). That is adaptive management!
- The quality and level of leadership from all the organizations and groups provides a vision that keeps people on track.
- A lot of times changes in leadership change the dynamic. It is such a benefit that Karen has been here as long as she has. There is high turnover in many places and they should weigh the strengths and benefits there are with keeping continuity to build relationships and trust.
- It's astounding after 12 years looking back, that SVPP could agree on anything. I think developing the mission and the vision of the group first was crucial. It was after that things began to fall into place.

Questions

- Are there tensions among the different agencies?
    - We do have intermixed land with the state and they do have a different mandate. While we manage for multiple use, they manage to generate revenues.
    - The stakeholders sometimes use the different agencies against each other as a good guy/bad guy approach.
- Are water management regimes commensurate with water needs of the area?
    - We are convening conversations with the state on this topic. We are trying to develop strategies to deal with groundwater tapping, which is a sensitive issue.
- It's obvious that a lot has been accomplished and a lot of it is positive. Is there a way to get things done more quickly?
    - We have emergency protocols for addressing time-sensitive management actions (e.g. invasive species around a pond with implications for endangered species). Some groups have set guidelines for emergency situations which makes moving through them more efficient.
    - If you have longstanding relationships with people it may be easier to withstand the saying "act now, beg forgiveness later".
    - In reality, collaborative processes usually move quicker than traditional processes because you avoid the litigation, etc.

Suggestions for Improvements

- It might be helpful for when you are telling the story of the Las Cienegas adaptive management program to talk about what questions you are trying to answer with monitoring.
- Look at the current monitoring and see how these questions are valued by society.
- The anecdotes are great. Interviews and photos would be good addition.
- There is a huge opportunity here for youth mentoring.
- There has been a shift from ranchers managing cattle to ranchers managing rangeland. Some information may not be getting to ranchers and they may need more regular meetings to feedback what you are learning.
- You need to raise awareness of this project at the national level.
- Social and science issues will continue to intersect. Consider looking at human issues such as immigration that may impact this landscape in the future.

Climate Change: Implications for Environmental and Land Use Planning and Management

Jonathan Overpeck, Co-Director, Institute of the Environment; Professor, Department of Geosciences; Professor, Department of Atmospheric Sciences Climate Change in Relation to Adaptive Management University of Arizona

Jonathan provided an overview of threats from climate change that are already underway, what can be done about these threats, and some scientific reality checks. He explained that the southwestern U.S. is among the most rapidly warming regions of the world; parts have warmed more than 2 degrees Fahrenheit relative to average 20th century temperatures. Anticipated impacts from this include: less snow, less late winter precipitation, reduced stream flow, more flooding and drought, and increased wildfires and tree death. Jonathan noted that even in the absence of climate change, decades-long droughts did, and will continue to occur. He said that one key threat is that the southwest includes the fastest growing states of the U.S., and water is over-allocated in many watersheds. He suggested that cooperative adaptive management will be required to reduce greenhouse emissions and manage for renewable energy resources on public lands.

Questions and Discussion

How do we communicate abstract impact happening in future but building now? The number one issue is communicating better. Scientists cannot stand above it all and rely on others to communicate it. We have to figure out how to make what is going to happen resonate. In the southwest, we can explain the impacts to forests from beetles and decreasing reservoirs. In other areas, we can communicate the costs of sea level rise to coast-dwellers in the form of increased insurance rates.

Robin Kundis Craig, Attorneys' Title Professor of Law, Florida State University College of Law - Stationarity is Dead - Long Live Transformation: Five Principles for Climate Change Adaptation Law

Robin explained that it was previously thought that mitigation would take care of the climate change, but that now people are recognizing the need for adaptation. She offered examples demonstrating how policy will need to adapt as well. Robin suggested that environmental and natural resources laws are mismatched with climate change impacts because current laws assume stationarity of baseline conditions and ecosystems and are based on goals of preservation and restoration. She said this assumes things can be put back/kept the way they were, assumes predictability, and assumes reversibility of impact on ecosystems. In reality, she explained, conditions change, ecosystems change, and some changes are nonlinear, unpredictable, and irreversible.

She proposed a new legal model of principled flexibility, distinguishing climate change impacts from other anthropogenic impacts and creatively implementing consistent principles for adaptation rather than requiring fixed regulatory panaceas. She outlined five principles for climate adaptation law:

1. Monitor and study everything all the time.
2. Eliminate or reduce non-climate change stresses and otherwise promote resilience.
3. Plan for the long term with increased coordination.
4. Principled flexibility in goals and natural resource management.
5. Accept that climate change will often be painful.

Questions and Discussion

Participants discussed the following issues with the speakers:

Counterbalancing principled flexibility with accountability - The idea of principled flexibility is not intended to set up a "free for all". Decisions need to be based on and linked to what is understood at the time.

Administrative law changes - In place of up front justification, administrative law would have to change to require identification of anticipated changes, goals within that context, and evaluation of actions implemented to determine their effectiveness.

Integrating collaborative approaches into the accountability - Changes in law would be needed to allow or mandate agencies to work together.

Planning - Scenario planning needs to be done up front. Protocols are needed for ***emergency interventions.***

Monitoring- Judges don't want to make rulings that end up back in court. Intervention mechanisms could include an institution that will be responsible for monitoring results.

How to improve the interface between law and science - When science interacts with the regulatory regime, the question is, is there a serious risk of harm? If so, that's enough of a basis (e.g. FDA) to accept a case. On the other hand, using science to prove causation requires a lengthy process to get the case into the courts. We should be moving towards the first kind of interaction, where the science is there to identify risk, the degree of risk, and what the risk means for a policy decision made in a particular legal framework. Having judges evaluate the accuracy of the science itself asks for a competence they do not have.

How can environmental law become flexible? - Natural resources laws were theoretically trying to be ecologically based. The current movement in environmental law towards ecosystem management is an example of developing the law and trying to get it right. Climate change adaptation will add visibility to the non-stationarity of ecosystems, which may catalyze changes in the law. Legal changes may be driven by public health impacts when climate change influences disease vectors. In water law, judges are more willing to go beyond stationarity and require changes of baselines. Understanding on the part of the public will be required to affect the scale of change needed.

Modeling - Stationarity is also assumed in ecological modeling. Previously, anticipating a normal distribution was a good assumption; now, we're trending. Probability analysis will still be used, but with modified stationarity assumptions.

Climate Change Response Panel

Julio Betancourt then introduced three panelists who responded to Jonathan Peck's and Robin Craig's presentations and offered additional ideas for the group to consider.

Tom Swetnam, Professor and Director Laboratory of Tree-Ring Research, University of Arizona raised a question about whether history is important given non-stationarity. He proposed that ecological history and scientists who can communicate it in a place-based manner can be extremely valuable.
Melinda Harm Benson, Assistant Professor-Department of Geography, University of New Mexico discussed institutional and legal challenges to addressing climate change and integrating adaptive management into natural resource management.

Don Falk, Associate Professor School of Natural Resources, University of Arizona shared information about a firescape project that incorporates science and adaptive management in forest restoration using advanced technologies. He suggested that because some changes are irrevocable the concept of *resilience ecology* may be more appropriate than restoration ecology.

Plenary Discussion: Implications of Climate Change for Natural Resources Management

Participants engaged in discussion with the panelists and keynote speakers on the following questions and topics:

Are there any laws that address changes in ecosystem functions? - Some laws that are starting to incorporate ecosystem services. Work in ecological economics people is farther along than changes in law. For example, Florida has done work assigning monetary values to the services coral reefs provide. The concept of ecosystem services also needs to be integrated into agency requirements. Some definitions of ecosystem services are too narrow. In Tucson, tourism is the cornerstone of the economy. Viewscapes do matter. It will be problematic if this type of ecological good is lost.

In the context of increasing wildfires, should the regulatory framework of clean air be adapted? There is a building body of work that some of these systems may emit less carbon in prescribed fires than in a major wildfire. However, there is a significant question of to what extent urban centers will tolerate smoke and its impacts to health and visibility. In some areas wind can disperse smoke. Culturally people have lived with fire and smoke forever – can/should we adapt back to a situation where people accept smoke in the air as a natural occurrence like rain? The Clean Air Act is a good tool, but it does not embrace the complexity of reality. Laws are not set in stone and can be updated.

How to communicate with Congress on this issue? - Develop a communication strategy that recognizes that our political system is based on interests.

We need to understand the historic variability in climate. We know there has been an 8-10 day early onset of spring. We don't know to what extent that actually drives upheavals in plants, etc. In some cases, we do not have the information we need about variability because we did not invest in the monitoring systems early on. In other cases, we do have the necessary information, but it does not get to decision makers.

Balancing the need for more information with the need to take action – We need to take into account how long it will take to get additional information when making decisions because conditions can become irreversible.

Breakout Group Reports

Four breakout groups were formed to address the following topics:

- Incorporating climate information into CAM steps (stakeholder engagement, goal setting, developing alternative management actions)
- Incorporating climate information into CAM steps (monitoring, adjusting)
- Policy and legal opportunities and barriers executing CAM
- Education and outreach

A summary of key points from discussions in each of the four groups follows.

Group 1- Incorporating Climate Information into Collaborative Adaptive Management: Stakeholder Collaboration, Goal Setting, and Management Actions

This group discussed how to incorporate climate information into the initial steps in the CAM process and offered suggestions for how projects/programs can do this.

Stakeholder Collaboration

- Because of the potential impacts of climate change, it may be important to include a broader range of stakeholders.
- Engage scientists who can provide climate information.

Goal Setting

- Acknowledge that climate change is a stressor and a multiplier.
- Be more explicit about climate change in goals.
- Two possible approaches for incorporating climate information into project goals include:
    - Develop one set of goals and update them as new information becomes available.
    - Develop multiple sets of goals based on different scenarios.
- Consider using both species goals and landscape goals in recognition that species may migrate to different locations as habitats change in response to climate change.
- Consider organizing goals in a tiered/nested fashion, by identifying which goals are the most fundamental and need to be met no matter what the impacts of climate change as well as those that are appropriate under current conditions but may be unachievable within the project area under future conditions (e.g. a species migrates due to changing climate conditions). This raises the need for cross-jurisdictional coordination.

Management Actions

- Identify actions that are robust to multiple scenarios (e.g. land acquisition).
- Consider actions related to ecological processes.

Group 2- Incorporating Climate Change/Variability into CAM: Monitoring, Decision Making

This group discussed how to incorporate climate information into the latter steps in the CAM process and offered the following suggestions for how projects/programs can do this:

- Communicate the rationale for moving from trial-error to "real" AM.
- Distinguish between baseline assessment and effectiveness monitoring. Consider organizing monitoring by hydroclimatic areas.
- Access to climate information, models, and long-lead forecasting is important.
- Communicate with DOI/NOAA Climate Centers about what they can provide to support program/project monitoring.
- The National Phenology Network is a good resource.
- Develop cross-jurisdictional protocols for monitoring, reporting, and sharing results.
- Create the capacity to use data that is collected. If internal capacity is lacking, explore partnerships to accomplish this.

- Monitor for specific objectives.
- Assess along a gradient.
- Prioritize research needs and communicate them to academia.
- Close the loop from research to management.

Group 3 – Policy

This group discussed policy and legal opportunities and barriers to executing CAM and offered the following recommendations:

- Ask CEQ to re-energize the effort to develop guidance on how to apply adaptive management within the context of NEPA.
- Ask Congress/OMB/agencies to require reporting on ecosystem services and landscape health rather than "widgets" (e.g. acres treated) and on a decadal scale.
- Ask Congress to require agency budgeting for monitoring and implementing adjustments if needed.
- Establish multi-stakeholder institutions to support a long-term focus. Identify opportunities to get NGOs and community groups directly involved in institutions. Conduct a pilot project using a legislatively established special district as a way to accomplish this.
- Create incentives for private landowners/lease holders related to ecosystem services. (Now incentives are for programmatic items.)

Group 4 - Outreach and Education

This group noted that education is important to enable society to address climate change and offered suggestions for how to reach out to a broad and diverse audience.

Education for the Next Generation

- Establish multi-generational groups like the Newport Bay group.
- Provide topics and articles to publications such as the Society for Environmental Journalists, the National Association for Environmental educators, and museums.

Education for Public Understanding

- Differentiate between climate and weather.
- Add charisma to the topic.
- Identify the right people to deliver the information.
- Develop quality materials to communicate the information. Use site specific examples of climate impacts (e.g. Mono Lake) and images to increase understanding. Explore funding for cities to conduct photo simulation of alternative futures.
- Describe potential impacts in periods of time that people can relate to, and tangible ways for people to address the problem.

Education for Resource Managers

- Provide climate science information/articles to professional societies and magazines.
- Use field visits to demonstrate the issues and needs.

- Create a toolbox for CAM and climate change, including educational activities that can take place for each AM step. For example, when deciding among management options, consult climate experts and use modeling results.

Next Steps

1. Meridian Institute will prepare a summary of the event and post it, along with slides from the presentations on the CAMNet website.
2. Participants are encouraged to send their favorite resources – case studies, papers, etc. – to Jennifer Pratt Miles at jprattmiles@merid.org for posting on the CAMNet website.
3. CAMNet will review the following suggestions for the location of next year's Rendezvous: Washington, DC; California; Rogue River Basin, OR; Boise, ID; New England.
4. CAMNet and Rendezvous participants will explore ways to share the ideas generated during this meeting with relevant audiences, such as CEQ, resource managers, the environmental law professors international listserv, the National Conservation Training Center, and professional societies (fisheries, foresters, wildlife managers, etc.).

Rendezvous Evaluation

Participants shared the following closing thoughts about what worked well and suggested improvements for future CAMNet gatherings.

What Worked Well

- As local organizers, being given the latitude for an extra half-day.
- The field visit is exceptional.
- University of AZ presence elevated the conversation by offering applied information and a big picture framing.
- Good diversity of participants, geographically, from policy makers to local stakeholders, and across disciplines.
- Panel and short talks were effective.

Suggested Improvements

- First day (1-6PM) was tough. Use small groups/tracks/breaks.
- Facilitate opportunities for attendees to interact with people they don't know/work with. Use random seating at dinner or conference tables.
- Video tape the session
- It was a little exhausting to hear a lot of talks. Allow more discussion time, more brief talks/panels.
- Conduct breakouts at a time when local stakeholders can be present.
- Provide a list of AM tools/clearinghouse on web.

- Engage more social scientists, marketing research people, to help understand what it will take to leverage this outside the science focus.
- Offer different tracks to provide opportunities for new people and old-timers.
- Invite/engage legislators to participate for part of the event.

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