

Southwest Adaptation Forum Summary Report¹



Co-convened by the Southwest Climate Adaptation Science Center and
the Center for Climate Adaptation Science and Solutions

University of Arizona
October 29-31, 2018

¹ This report is intended primarily for the program committee and participants in the event, and is intended to document what we learned through the conversations at the Southwest Adaptation Forum. Many of the findings are in bulleted short phrases, based on extensive notes taken at the event. We focus primarily on points that were emphasized by multiple people, on ideas for next steps, and on take away messages; the explanation of the actual format and approach taken the sessions is limited in this document but the agenda provides more illustration of the actual format.

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November 2019

I. Executive Summary

The inaugural Southwest Adaptation Forum (SWAF) was held at the University of Arizona in Tucson from October 29-31, 2018. Co-convened by the Southwest Climate Adaptation Science Center and the Center for Climate Adaptation Science and Solutions, the Forum brought together over 100 adaptation and assessment practitioners from across the interior Southwest region as well as from across the United States. The main goals of SWAF were to 1) strengthen existing and build new relationships among climate adaptation practitioners in the region, 2) identify gaps in our existing stakeholder and practitioner networks, 3) generate synergy and momentum for future engagement among partners and stakeholder groups, and 4) position this emergent network to take tangible action. SWAF participants heard from experts across five specifically chosen themes of *tribal adaptation*, *working lands/public lands*, *wildland-urban interface*, *built environments in the Southwest*, and *public health/human well-being*. After hearing from experts from each of these different theme areas, participants discussed these themes further in breakout groups to narrow down specific key priority areas.

From a high-level perspective, participants were interested in creating a regional network of networks to support adaptation, facilitated by leaders from across sectors. Specific suggestions ranged from creating a Tiger Team of diverse individuals who can support others in their adaptation efforts, such as in the preparation of climate change materials for professional development and educational curricula (e.g., within medical school training). Youth engagement was also seen as critical to facilitating action, particularly with those from underrepresented groups (e.g., tribes, Hispanic, and rural communities). The following are themes that emerged as cross-cutting multiple themes and having resonance with Forum participants:

- *Integration*: Different forms of knowledge (e.g., indigenous, local, traditional, etc., in addition to western science) should be represented in the adaptation planning and implementation processes.
- *Coordination*: Although there are a lot of small adaptation efforts underway across the landscape, these efforts would benefit from increased coordination.
- *Leveraging*: Increased partnerships and leveraging of existing partner activities could support landscape-scale adaptation.
- *Knowledge Sharing*: Communities that are seeking to implement adaptation actions can learn from “tested practices,” that have proven successful in other communities. At the same time, it’s important to keep in mind that what works in one location may not work in another.
- *Community Engagement*: Community and tribal leaders, members, and organizations should be key players in the conversation. For example, many ranchers have generations’ worth of knowledge about how to adapt land management practices to arid land weather variability.

II. Introduction

The inaugural Southwest Adaptation Forum (SWAF) was held at the University of Arizona from October 29-31, 2018 in the Environment and Natural Resources 2 Building. Attended by over 100 people from across the interior Southwest states (primarily Arizona, New Mexico, Nevada, Utah, and Colorado), this workshop was held in association with the National Adaptation Forum. Hosted by the Southwest Climate Adaptation Science Center (SW CASC) and the Center for Climate Adaptation Science and Solutions (CCASS) in the Institute of the Environment, **the goal was to gather climate adaptation and assessment practitioners to exchange best practices and build a network dedicated to integrated, community-based climate assessment and adaptation.** Sessions were focused on the state of adaptation practices within tribal lands and communities in our region, as well as assessment of adaptation efforts in the built environment, health, working lands, and at the wildland-urban interface.

SWAF keynote speakers included Dr. Susanne Moser (Susanne Moser Research and Consulting) a nationally and internationally known adaptation expert, and Dr. Richard Moss (then at Columbia University), who is currently leading an effort to build a civil society-based climate assessment consortium. Both gave inspirational talks and emphasized the urgency of moving quickly to scale up adaptation efforts to address rapidly escalating challenges in both human and natural systems. Although heat, drought, and wildfire were commonly cited concerns, the focus was largely on the need to work together to solve complex issues at the interface between science and society by filling gaps in leadership and resources to address these problems. Though there are multiple small adaptation efforts across the region, they need to be better coordinated to be more impactful if we want to be more resilient to what lies ahead. There was a very clear message that Tribal representatives need to be part of all aspects of this conversation. Engaging youth, increasing outreach activities, and encouraging an escalation of action on the ground were common themes.

At the workshop's close, those in attendance agreed that they had strengthened existing and built new relationships, identified important gaps in our networks, generated synergy and momentum for future engagement, and positioned our emergent network to take tangible action. **The participant list is attached as Appendix B.**

The SWAF organizing committee envisaged this forum to be part of a larger dialogue occurring across the nation. The committee did this by engaging with the American Society of Adaptation Professionals (ASAP) early on in the process, joining in convenings of other regional fora to glean lessons learned, and reviewing agendas and reports from similar convenings all across the country and the world. ASAP recently released a synthesis report on all of the regional adaptation fora that occurred in 2018, including SWAF, which is titled [*Advancing the Adaptation Field Through Regional Conferences: Reflections on the 2018 Regional Adaptation Fora.*](#)

The goal of this report is to summarize, not synthesize, the major highlights and outcomes of SWAF. The report focuses on what we learned to lay a foundation for moving from dialogue to tangible action in the Southwest region. Therefore, the intended audience and end users of this information are SWAF participants, other adaptation practitioners in the region, and others who are responsible for organizing similar convenings.

Forum Organization

The structure and design of this particular regional forum was different from other regional adaptation fora across the country. The SWAF program committee organized the Forum with the intention of exploring the connections between assessment, adaptation, and the state of knowledge in five categories: **tribal lands and communities, working lands/public lands, the wildland-urban interface, built environments, and public health**. Therefore, the invitees were specifically nominated and selected to be able to support those conversations, and, as a result, most of the people who attended the Forum had adaptation expertise in the areas listed above. The program committee chose panel members with sufficient expertise to support in-depth knowledge of the theme areas; geographic and sectoral diversity was a secondary consideration.

SWAF participants explored Forum themes through panel sessions, in which each panel consisted of five experts plus a moderator, followed by facilitated breakout discussions. Panelists were asked to answer the following questions:

1. What does your success look like relative to climate adaptation?
 - a. Give one tangible example/success story from your work.
 - b. What are the lessons learned from your work?
2. What needs to happen next?
 - a. What are the biggest needs to take your efforts to the next level?
 - b. What do you think you need to scale up the impact of your work in terms of pace and scope?
3. Based on your experiences, please provide a key takeaway for the audience.

During the breakout discussions, Forum participants discussed the key takeaways from the panels, identified any existing gaps, generated new action items, and prioritized next steps needed within each theme. Panelists were encouraged to think about adaptation issues in their sectors from an interdisciplinary perspective and to reflect on the *state of knowledge* of that topic within our region.

The section that follows summarizes the panel sessions as well as the major outcomes from each of the theme area breakout discussions. The working lands/public lands and wildland-urban interface small group discussions were combined as were the discussion on built environments in the Southwest and public/health human well-being. Following the session summaries section, the report authors have also included in this report feedback and ideas that we received from two separate written inputs: a feedback form that participants filled out during the Forum and an index card exercise that included particular ideas for next steps that were passed around and voted on by other participants.

III. Session Summaries

The following sections summarize and highlight the major outcomes from each of the forum theme discussions as well as the key ideas that came out of each associated breakout session.

A. Tribal Lands

Background:

The SWAF Tribal Panel provided the opportunity to hear various perspectives that illustrated how climate adaptation is being advanced within and across tribal nations. This session laid the groundwork for deeper conversations around effective partnerships, existing models for advancing adaptation, and the unique challenges and benefits of working with tribal nations to advance climate adaptation. The overall goals of this session were to explore: 1) how the broader adaptation community could integrate tribal adaptation practice into their work/networks, and 2) how tribal practitioners could effectively leverage non-tribal resources while maintaining tribal sovereignty.

Panelists:

Leanna Begay, Institute for Tribal Environmental Professionals
Karletta Chief, University of Arizona Department of Soil, Water, and Environmental Sciences
Russell Benford, Gila River Indian Community Department of Environmental Quality
Trent Teegerstrom, University of Arizona
Cynthia Naha, Santo Domingo Tribe

The panel was moderated by Althea Walker, Southwest Climate Adaptation Science Center/American Indian Higher Education Consortium, and Amber Pairis, Climate Science Alliance and Center for Climate Impacts and Adaptation, Scripps Institution of Oceanography

Tribal panelists were asked to identify the state of knowledge related to climate adaptation within their own reservations as well as across Tribal lands more broadly.

Key Points:

- Tribes often lack capacity/staff to attend meetings and geography can make participation difficult. Staff members don't have time in addition to other tasks, so it is important to make the effort to go to the reservation to offer assistance
- Because of the multitude of other issues in tribal communities, climate change may not be recognized as a priority for many tribal agencies/communities, but other priorities will be affected by climate changes
- Information is not being communicated effectively in language that is meaningful to tribal communities
- Funding amounts and timing of funding cycles is often inconsistent with tribal needs
- There is a need to reach across the spectrum from formal to informal networks - some networks are already existing, but others still need to be built
- There is a fundamental need for respect for tribal perspectives, and a recognition that there is a fear of failure to overcome among other issues that may limit effectiveness of interactions with non-tribal members
- Engagement priorities include: Connecting with youth, trust building, empowerment, capacity building, peer learning processes
- Issues need to be described in ways that are locally relevant and place-based
- Climate change is not priority that can be changed by effective communication alone

- Because there are multitudes of resources on the web, it is hard to know what is useful and how to use the tools that are available
- Trust-communication and relationship building are critical. Need to establish trust, build on existing partnerships, and know that:
 - Tribal members may not agree with the assessments of non-tribal members
 - Tribal members need to be at the table in a meaningful way, not “on the menu”
 - Tribal and non-tribal communities need to work together

Summary of Responses to Questions:

(These questions were answered in a round-robin style facilitated conversation. All participants were divided into small groups that rotated from station to station to respond to questions (in bold below) posed by a facilitator. This event occurred outside in the courtyard of the ENR2 building).

Partnership models: what are examples of existing partnerships that serve as good models for advancing tribal resilience?

- Empowering community members to lead or staff collaborative initiatives
- Structures of successful partnerships range from informal to formal
 - Formal ones give you opportunity to use existing structures and available resources
 - Informal can be cross-cutting and can bring people together; coalition-building and opportunistic;
- Maintain consistent communication in order to keep continuity
- Many partnerships use sense of place (large or small) to build common visions and goals
- Important for maintaining partnerships: trust and relationship building take time and money, can't be rushed
- Coming together in unity is more important than any small conflicts; need unity to fight the big fight
- Each tribe has its own unique culture that is related to their own specific geography and history. This place-based uniqueness is really important

Lessons learned on what makes partnerships around tribal resilience successful. Key components that support lasting and effective partnerships?

- Basic respect, humility, consistency, remember nuance and context, respecting sovereignty, and listening
- Being aware of historical context
- Community engagement: Find the right people to help vs. build relationships from the ground up?
 - Depends on the context how to approach project planning
 - Need to understand the organizational structure in order to appropriately engage
- Changing the way outreach is conducted
 - Go to one-on-one/individual relationships/invitations rather than general invitations

Resources and opportunities?

- There are lots of resources. General categories: funding, capacity building, education, information (climate), organizational, and networking
- Across the groups at the Forum there were many resource ideas but few people named the same options. This means there are many opportunities to pursue!

Aside from funding, what are your biggest challenges to advancing actions to address climate change in your community/organization?

- Competing issues and immediate concerns that take priority over climate adaptation
- There is a disconnect between science and practitioners
- Reactive vs. proactive systems or approaches
- Not enough capacity. There is too much responsibility on too few people in different organizations to be able to focus on it
- Lack of political will or leadership
- Disbelief in climate change or its effects on society
- Rigid organizational structures that don't allow for quick or adaptive actions

What are recommended actions to achieve the overall session goal of integration of tribal and non-tribal resources for adaptation moving forward?

- Trust
- Building relationships--Build on existing relationships with existing groups that are already meeting
- Accept and be aware that everyone brings unique perspectives to the table
- Do your due diligence to know the history and context of the group that you're working with
- Agree to disagree in a respectful way
- Identify champions to help carry the messages and inspire/activate actions
- Recognize the value of one-on-one relationships

B. Working Lands, Public Lands and the Rural-Urban Gradient

Working Lands/Public Lands

Rural communities and adjacent public and private lands continue to face the direct effects of climate change and extreme weather, ranging from catastrophic wildfire and intensive storms to widespread flooding, post-fire debris flows, and severe erosion. Moreover, our shared ecosystem services are at increased risk from invasion of non-native species and the desertification of our rangelands. It has become increasingly clear that both working lands and public land advocates need to join forces to combat the synergistic effects of climate change, looking for shared goals and solutions. This includes prioritizing watersheds for ecosystem restoration treatments that maximize water availability, conserving intact landscapes for both ranching and biodiversity outcomes, promoting investment in food security and sustainable agriculture practices, and—perhaps most importantly—cultivating multi-jurisdictional collaborations. In short, rural

communities need to come together to support one another's well-being and livelihoods, by working at a landscape scale that crosses political and physical boundaries.

Panelists:

Mike Crimmins, University of Arizona

Emile Elias, USDA Southwest Climate Hub

Jennifer McRaye Ruyle, USDA Forest Service Southwestern Region

Karen Simms, Pima County and Bureau of Land Management, retired

Peter Warren, The Nature Conservancy and Malpai Borderlands Group

Moderated by Carolyn Enquist, Southwest Climate Adaptation Science Center, U.S. Geological Survey

Wildland-Urban Interface

When thinking about the areas in the West that straddle a landscape that is no longer wild, yet not totally created by human efforts, we struggle to characterize these places, and typically default to the broad term, wildland urban interface, or the "WUI." The Forum organizers have also referred to it as the rural-urban gradient to encompass all of the diverse landscapes that fall within this range. As divergent as the communities may be, the one quality in common across almost all WUI areas is growth. A recent study calculates that homes in wildfire prone areas have increased from about 607,000 in 1940 to 6.7 million in 2010; this growth also encompasses a range of other impacts in addition to wildfire risk—watershed health, water quality, and water supply. As the number of people residing in these areas continues to increase, a warming climate and shifting precipitation patterns will likely continue to increase the potential for wildfires and further stress water resources.

Panelists:

Mark Apel, University of Arizona Cooperative Extension

Mark Brehl, Arizona Department of Forestry and Fire Management

Rebecca Davidson, National Forest Foundation

Craig Mackey, Business for Water Stewardship

Maureen McCarthy, University of Nevada, Reno and Desert Research Institute

Moderated by Tamara Wall, Desert Research Institute

Background Input:

The following ideas were preliminary key messages that the panelists provided prior to the Forum as a "strawperson" or starting point for conversation.

- Urban and rural communities are linked through shared ecosystem services, and both are facing the direct effects of climate change and extreme weather as well as growth and changes in land use
- Climate adaptation on public and private lands requires a long-view with a focus on relationships
- Working together across boundaries allows for solutions at the landscape scale; existing projects can be a starting point

- Resilient landscapes are the basis of resilient rural communities
- Ranchers are and should be part of the solution
- Creative financing for adaptation needs to be explored; partnerships are the new model of doing business
- Need a combination of top-down and bottom-up approaches; there is no single set of solutions for the diverse issues along the rural-urban gradient
- Education related to water and reducing fire risk is a good starting place for connecting people and their environment
- A paradigm shift is needed in forest/watershed management and fire suppression/fire policy

Integrated Summary from the Working Lands/Public Lands and the Wildland-Urban Interface Report-back:

The report authors have organized the following summary in order to emphasize categories of comments that were most commonly mentioned.

Tribal voices and perspectives across the spectrum are key.

- Effective adaptation promotes resilient landscapes: remember and honor tribal history in landscapes and relationship with the land
- Social justice is a priority; economic/community development promotes overall resiliency: multisolving (looking for solutions that resolve more than one problem)
- Tribal engagement goals/strategy should be explicit, e.g.:
 - Learn about tribal history of the land you are working on;
 - Develop written agreements/plans with tribes;
 - Tribes are financial partners, not dependents;
 - Opportunities for comment in public processes is not enough – tribal engagement needs to be meaningful;
 - There is a Federal trust responsibility for funding adaptation;
 - Language is important: keep oral traditions alive (e.g., land management in native languages, use tribal names, languages);
 - Need to facilitate intergenerational engagement, traditional education;
 - Keep in mind that relocation policies have altered the true sense of landscape for tribal members.

It is important to strategically leverage work and priorities to guide adaptation action where investments are likely to produce higher returns.

- Basic knowledge should underpin political will, which can in turn determine the ability to craft a path forward. Education is key to forming basic knowledge and can have a lasting and expansive impact.
- Resilient communities depend on resilient landscapes (and vice-versa).

Short-term strategies

- Focus on building understanding and connections
- Build forums for discussion, identify leaders/champions, appropriate venues for conversation, strengthen understanding of rural/urban issues
- Need a typology of community connectivity
- Use crisis strategically to bring people together (be prepared for the next crisis/opportunity)
- Build capacity of local orgs doing complementary work
- Experimentation across organizations to create shared adaptive learning and implementation

Long-term, large-scale strategies include:

- Need a network of networks to help learn across sectors, provide training. Crisis, common threats, and engaged leaders are key
- More groups at the table increases the diversity of views/voices, helps to break down silos
- Move towards a people-centered, place-based approach
- Leverage existing-trusted relationships/groups/convenings to build from, also engage new actors
- Use scenario planning to define what the long view is – use interdisciplinary language, ID near to mid-term actions, then contingent long-term actions
- Co-produce a flexible action plan; maintain working partnerships
- Leverage funding (public and private)
- Combine adaptation efforts with hazard mitigation projects/plans, joint feedback loop/reassess
- New ways of doing business and funding solutions - new models, economic accountability
- Change the game/board; market innovation is critical; shift demand to evolve supply

Youth education and engagement to develop future leaders; what will the education of the future look like?

- Science nights/youth climate summits
- Use social media to engage youth, e.g., geolocation, flash-mob for youth events
- Integration of climate change/adaptation into curriculum and state standards; stewardship opportunities, hands on
- Integrate into 4H, Girl Scouts and Boy Scouts Programs
- Careers in green infrastructure – jobs, community colleges (e.g., Pima Community College), universities
- Lobbying Coalition of Youth – youth innovation grants for climate change adaptation
- Political change/state/national standards – future leaders for climate change adaptation

Shift in our approach is needed

- Broadening our lexicon—need for proactive, nature-based paradigm; flexible, iterative approaches
- New world view on western land/conservation/water management: more relational and less managerial-world view, as a steward and not resource manager
- Proactive vs. responsive-eye towards a transformed future
- Funding for public private partnerships; figure out how to ensure project sustainability;
- Localism is critical – no single set of solutions
- Inventory/assessment of current initiatives focused on communication and adaption to find opportunities for collaboration/finding shared resources
- Community-climate related issues: drought impacts, water quality, wildfire plans, wildlife corridors, emergency management, shelter vs cooling centers
- Regulatory and incentive-based approaches: Need the carrot and the stick—this is rarely addressed in adaptation.

C. Built Environments and Public Health/Human Well-being

Built Environments

In the urbanized and growing U.S. Southwest, climate change is impacting the region’s environmentally, economically, and culturally diverse cities and the people within them. These impacts have consequences for economic development, public health, food security, energy and water usage, urban ecology, and increase the stressors on vulnerable populations. Climate adaptation in the built environment requires efforts at different scales—individual, neighborhood, city/municipal, and regional—as well as efforts across sectors and organizations including grassroots, local, state and federal government, and the private sector.

Panelists:

Ladd Keith, University of Arizona

Sara Meerow, School of Geographical Sciences and Urban Planning, Arizona State University

Irene Ogata, Tucson Water, City of Tucson

Jeremy Stapleton, Sonoran Institute

Missy Stults, City of Ann Arbor

Moderated by Beth Gibbons, American Society of Adaptation Professionals

Public Health/Human Well-being

Climate changes are projected to directly and indirectly affect public health, through changes to temperature, seasonality and frequency of extreme weather events, and other factors. These, in turn, affect the timing and occurrence of diseases in new locations and our exposure to factors affecting our health, including disease vectors, air pollution, and heat. Effectively, the productivity and comfort of society is contingent on successful adaptation, planning, monitoring, information, and research.

Panelists:

Erika (Barrett) Austhof, University of Arizona College of Public Health and CLIMAS

Heidi Brown, University of Arizona, College of Public Health

Maggie Messerschmidt, The Nature Conservancy

Matthew Roach, Arizona Department of Health Services

Barbara Warren, Physicians for Social Responsibility, Arizona Chapter

Moderated by Gregg Garfin, University of Arizona, School of Natural Resources and the Environment and Southwest Climate Adaptation Science Center and the Institute of the Environment

Background Input:

The following ideas were preliminary key messages that the panelists provided prior to the Forum as a “strawperson” or starting point for conversation.

- Cities in the Southwest are culturally, economically, and environmentally diverse, and are facing different challenges at multiple scales and across sectors
- The Southwest faces multiple climate-related public health concerns; this is also an opportunity since climate change can motivate policy changes and appeal across the political spectrum
- Urban areas have the opportunity to leverage the benefits of natural systems while facilitating adaptation (e.g., open space and green space will help with resiliency from multiple perspectives); need to connect natural systems and built environments, work together to protect nature’s benefits
- Participation by local and regional health practitioners is essential in the success of adaptation and mitigation projects
- Adaptation solutions rely on the co-production of science and translation of science into action; spanning boundaries will help create new solutions
- Support from community members is needed to reach the most vulnerable populations
- New strategies are needed to inspire action, catalyze collaboration, and engage urban communities in adaptation
- Talking about health impacts of success stories from around the country can help inform adaptation in the Southwest.

Integrated Summary from the Built Environments and Public Health/Human Well-being Report-back:

The report authors have organized the following summary in order to emphasize categories of comments that were most commonly mentioned.

Economic and financial issues and opportunities

- How to justify investments in public health and infrastructure in terms of return on investment? What is the cost of inaction/value of avoided loss? Can we create realistic assessments of the economic benefits of climate planning in public health?

- Economic issues associated with health can motivate people to deal with climate issues (e.g., bike paths can increase property values while improving health and reducing emissions; insurance companies can incentivize healthy lifestyles to reduce their costs).
- If we can quantify public health benefits, cost-benefit analysis can be a tool for resilience.
- How to incentivize adaptation action without creating new risks, or maladaptation?

Human Capital

- Listening to the community and understanding existing capacity is key; long-term relationships an important first step in trust-building
- Need to identify existing gaps and resources, issues in social cohesion
- Develop collaborative definitions of what success looks like across communities
- Identify trusted intermediaries, people with capacity to engage specific groups, strategic/key partners
- Use small projects to catalyze learning, build relationships, and then expand into networks
- Inspire and catalyze youth; consider succession planning across generations; we need to build and sustain human capital over time, create a sustained and diverse workforce and adaptation community
- Address equity issues through community development incentives, design solutions, deliberate efforts to empower underserved people
- Use social media platforms like Reddit, Facebook to build community capacity to engage and support each other
- Build more social infrastructure and physical healthcare infrastructure in rural areas
- Encourage regionalism, so neighboring communities can help each other; regional visioning as a tool, resilience hubs as a model
- Encourage non-traditional partners working together on a common goal

Education

- Nurturing public support to drive political will; educating with the intent of empowering communities with information
- Integrate climate change issues into medical school curriculum; encourage healthcare professionals to locate in rural/underserved areas
- Foster multi-loop learning that leads to transformative adaptation
- Include diverse sets of knowledges and viewpoints/perspectives
- Communication may be the difference between success and failure (e.g., need signs on the cooling centers in Phoenix so people can find them!)
- Connections between mental health and climate impacts are significant and need to be better understood (e.g., 300% increase in domestic violence cases after hurricanes, significant depression issues for farmers and ranchers during drought)

Short-term to mid-term actions

- Identify success stories from local, state, national efforts; collect and aggregate them; establish peer learning networks
- Integrate public health objectives into other adaptation efforts, e.g., evaluate how to deliver health outcomes through land management
- Train healthcare practitioners in managing climate change threats, e.g., how to manage mosquitoes in neighborhoods
- Develop inventories of costs and payoff horizons, e.g., connections between public health and bond ratings need to be emphasized
- Develop a network of health/adaptation resources in regions and sectors
- Create new data catalogues of health issues on costs of impacts vs costs of savings, and to support development of vulnerability assessment baselines;
- Rapid holistic vulnerability assessments, e.g., rural built; tribal; financial; climate refugees; food; transportation
- Encourage communities to collect own data and do analysis – citizen science
- Break down silos within government and businesses – create working groups around solutions, encourage disruptors and innovators from within organizations
- Build sharing tools; identify change agents
- Frame issues in a risk management format: improve risk communication using what we know about risk perception
- Thorough pilot-scale interventions: do strategic testing of tools and methods, including social media; identify messages that move people and change behavior
- Catalog new options, build tools to allow objective analysis

Longer term

- Sustained human/social capital dedicated to climate adaptation solutions

IV. Lessons Learned from Successful Networks

These lessons were compiled from a feedback form that was completed by Forum participants. The report authors have used bold font to emphasize and highlight the main ideas and key words that came out of participants' feedback.

- Have an **explicit common purpose, shared goal and plan**, that is co-developed, well-articulated, realistic, and based on a shared understanding of problems and theory of change
- Have **one or more organizers or champions** who are interdisciplinary; motivated leadership team; energetic and committed leadership
- **Dedicated network coordinator/staff** to manage the network, listserv, resource lists, and website
 - Clearly define roles and responsibilities for team leads, members and funders of the network;
 - Willingness to take from and contribute to related networks

- Don't expect long-term volunteer efforts, people are motivated by money.
- Leverage funding from other networks, don't duplicate efforts
- Keep everyone in the loop on other teams through newsletter/calls
- In person dialogue; sustained, personal connections
- Balancing trust and accountability; great notetakers and coordinators
- Go to where "they" are – especially tribes and rural communities; share their thoughts with scientific and other communities
- Transparent feedback to other "nodes" in the network
- Important to have different subgroups working on different issues but then have regular report backs to the overall network
- Realistic timeline; consistent, regular schedule
- Feedback on progress
- **Develop outcome orientation, smart objectives**, and well aligned activities; meaningful outputs and outcomes (e.g., frameworks, guidance documents, toolkits, training materials)
 - Action teams to work on high scoring ideas; timeline and logic model for getting there
 - Action-oriented convenings; regular engaging interactions
 - Broad and inclusive, but with clear focus; thoughtful in communications and time requested; transparent
 - Multiple or all participants vested in the outcome
 - Regular communication, tangible outputs
- Have multiple sources of funding/**sustained funding**; long-term resources and support
 - Funding (including cash), collaborative, shared grant writing
- Need to have a **focus on people**
 - Collaborative, not competitive approaches; people who like each other
 - Include human dimensions in the discussions: values, trust, listening and sharing
 - Support each other's projects reliably
 - Consistent reflection, reassessment and realignment
 - Respect, trust, listening, safe environment is important
 - Need to understand public/private partnerships
 - Need to encourage more open sharing of information; not all groups do this openly
 - Careful framing, social learning
 - Shared commitment, ownership, explicit membership; allow people to lead, drive and own the network
 - Driven by who comes to the table/participants
- **Diversity**; investigate who needs to be present, **include all stakeholders relevant to mission**, inclusion of multiple disciplines/sectors, science as well as practitioners
 - Include tribal members, in all aspects...development, capacity building, presence/voice, technical assistance
 - The Institute for Tribal Environmental Professionals is a successful model; meaningful tribal engagement is important
 - Cross sector inclusion, including business, a range of private sector interests
- **Need incentives** for participation
 - Benefits of regional partnerships, ability to meet regional needs

- Criticality – if people need the network people will engage
- Having the right people in the network is more important than having the right organizations there
- Focus on success
- Delegation of responsibilities so that people can roll into their “normal” work

V. SWAF Index Card Exercise: Priorities for Action

During this exercise, SWAF participants wrote a big idea/goal and a corresponding action on index cards, exchanged cards, and scored one another’s big ideas in order to rank their priority. This list is more or less in order of the scores (noting that there were some tied with the same score). The instructions were to write “one idea that resonates with a goal and some bold action(s).” These ideas are listed in order of priority from the one with the most votes to the one with the fewest. The key idea in each one appears in bold so that themes become more visible.

- 1) Goal: **develop a network** where there is openness, equity and inclusion in decision-making so that all people feel part of the adaptation and mitigation process now and in the future
Action: Create and support a **Tiger Team of diverse adaptation professionals that travel and serve as the igniters**, or spark within and/or across communities in the SW, the team helps identify the local champions and helps find the opportunities for sustaining momentum and funding.
- 2) Goal: empowering youth/empowering the next generation
Action: **Youth summit on climate, natural resources, and human health**; first step, initial discussions with land managers in Tucson (separate discussion in Phoenix) to develop a proposal. Leading to urban and then rural summits. Youths learning about issues, but also given the opportunity to share what the issues mean to them through art, poetry and presentations.
- 3) Goal: **Bring business voice and resources to the mission in a people-oriented network**. Make resilience and environmental stewardship a competitive advantage and market motivator.
Action: Engage fortune 500 companies (and-or B Corporations) in planning next adaptation forum. Frame the conversation so they have a role and voice. Evangelize if need be to find the right disruptors and create a win. ID opportunities for efficiencies, collaboration, etc., supply chain? Product design? Life cycle marketing/messaging? Can we start a business alliance or team with Arizona Forward to scale the campaign and champions? Produce and promote success stories.
- 4) Goal: Form a new kind of dynamic, **collective impact network of networks** that supports the many varied existing networks, associations, collaboratives across sectors, not become one more network.
Action: Provide support for communication materials, tools, priority strategies, policy models, support system, community of people who care, movers and shakers, decision support tools; shared leadership.
- 5) Goal: Building a bridge to Implementation: **implement neighborhood heat adaptation plans**.

Action 1: Work with neighborhoods and partners to plan for residents sheltering in place, identify location to be off grid cooling area. Maintain stock of emergency supplies at location: first aid, water, flashlights, etc. Identify nearby support individuals. Fire station, other health workers, etc. Identify vulnerable residents in neighborhood who may need assistance.

Action 2: Convene local cross-cutting group, include rural, built, tribal, public health, businesses, economists, climatology etc. to create a collaborative for local adaptation strategies. Utilize group members to identify menu of climate adaptation actions that they collectively could implement for the area. For each strategy develop metrics to track accomplishments.

- 6) Goal: **Medical school curriculum changes to integrate climate resilience**, resulting in doctors who education all patients on developing emergency plans for their home and consider the health effects of climate.

Action: Create curriculum, e.g., considering pollen/ozone levels for those with asthma, identifying the nearest cooling center to their home.

- 7) Goal: Communication with Opposing Stakeholders

Action: **Regular meetings to bridge boundaries; more informal methods of communication**, dinner or breakfast meetings, round table discussions, policy framed discussions on issues that stakeholders want to discuss, access to resources. Stakeholders can pitch their priorities for resources and start the conversation on how to compromise. Final reports in multiple communication frames: social media, literature, new workshops, call for research, or policy changes, etc.

- 8) Goal: **Create climate adaptation group/network/center in rural or tribal community** focused on taking community-based actions.

Action: Approach private sector entities for funding. Create secure resources to fund community projects and education around renewable energy, local food products, environmental health, community health.

- 9) Goal: **Identify local barriers to rapidly scaling up mitigation and adaptation, build coalition around solutions**

Action: Form a small team of academics, practitioners, local operatives (including private industries, utilities, SAHBA, biz organizations, politicians (including Tea Party). Meet with, gain commitments to support scale up efforts. Leverage commitments to coproduce roadmaps, e.g., codes, etc.

- 10) Goal: Inclusion of diverse voices/non-traditional partners/ people early in the process of creating a community.

Action: **Identify nontraditional groups, interview them, listen to their issues**, understand their perspectives; **coproduce solutions**. Use what is learned to produce actions and solutions, monitor, learn, share and celebrate successes.

- 11) Goal: **Incentivize small and large businesses to adopt climate adaptation practices**.

Action: Develop monetary incentives; share ideas for small community pilot project and engage progressive leaders. Pilot project could be a reduced business license fee or local tax reductions. Practices could include LEED and other green building certifications.

- 12) Goal: Know the history of the landscapes you are working in.

Action: Learn what tribe/indigenous people first inhabited that landscape, whether it is sacred. Listen. **Involve tribes in every conversation, at every table**. Ask questions.

- 13) Goal: Build leaders of tomorrow.

- Action: **Presentation to predominantly low income/diverse school district supervisors to add discussion of future scenarios to all grades/curriculum** (and make it fun!)
- 14) Goal: Educate community about climate change.
Action: **Educate community leaders. Become an activist for climate change and adaptation.**
- 15) Goal: **Create local networks focused on adaptation solutions.**
Action: build from existing collaborations; include public health, tribal, landowners, businesses, decisionmakers. Meet consistently with the goal of establishing a shared vision for integrating climate solutions into the community. After creating a vision, work opportunistically (as a whole group and subgroups) to implement relevant, community-driven actions.
- 16) Goal: **Create a sustained workforce of adaptation professionals.**
Action: Leverage climate literacy in key disciplines and continuing education for professionals already in practice.
- 17) Goal: **Increase the number of active groups working to improve the practical local solutions** one project at a time, then document the solution value of the projects.
- 18) Goal: Require sustainable and climate friendly design
Action: **At City and County level, require all new development to incorporate sustainable and climate friendly design into all internal and external projects.** Incorporate human connections to built environments (trails, open space, gathers areas, arts).
- 19) Goal: **Form ongoing focus groups of like career/interest areas among attendees to continue our conversations/share ideas and experience and problem solve.**
Action: Groups to be formed could focused on resilience building and preparedness, community outreach, community education or health. Share resources, share experiences, get support and solve problems together.
- 20) Goal: **Build Resilience Hubs** (based on example shared by Missy Stults)
Action: Using the hub and spoke model – for example, Health and Safety Councils that approach adaptation through the lens of health. Meet with leaders of the Fire Safety Council to expand the mission to all aspects of community resilience. Include an all hazards approach, green infrastructure, etc. Train others to expand on this.
- 21) Goal: **Convene a private sector symposium for the region**, including best thinking on adaptation from national and international community. Include pathways to draw down regional development.
- 22) Goal: Monetize the Economic Benefit of Adaptation
Action: **Help investors make money on adaptation...** We must lead with job creation and opportunity for profit rather than with dire consequences
- 23) Goal: Assess the economic value of adaptation
Action: **What are the costs/benefits of implementing adaptation strategies?** Being able to quantify the benefits will help strengthen the argument and ultimately help increase financial investment in adaptation. Step one could be a literature review but much more needs to be done.
- 24) Goal: **Identify cross-sectoral opportunities...to integrate the health co-benefits dialogue** and to build on existing efforts to community knowledge and empowerment. In particular, youth education and citizen science projects.

- 25) Goal: **Build a network across the intermountain West**
 Action: Members can coproduce (practitioners and researchers dictate needed information). Everyone needs to be at the table, to craft a shared message (maybe using public health as the driver of change) to move the needle with policy makers and get city/county codes changes. Regional Integrated Sciences and Assessments (RISA) programs are a good example. Need to ramp up efforts to support action, including funding.
- 26) Goal: **Encourage large companies to be our partners**
 Action: Infiltrate large companies who have money and power for implementation, use economic reasoning that they need to hire innovations managers. Get more economists on board, do a better job engaging them.
- 27) Goal: **Integrate tribes in a meaningful way**
 Action: Initiate engagement with tribes that results in regular, ongoing conversations about issues of joint concern – to build long-term, trusted, respectful relationships in support of adaptation/resilience...
- 28) Goal: **Establish performance plan**
 Action: Evaluate performance based on stakeholder engagement, be at their table, hire full-time equivalent (FTE) to support our engagement and collaborative event
- 29) Goal: **Retrofit all communities to provide comprehensive access to more sustainable transportation (e.g., public transportation, bike paths, etc.)**
 Action: Immediate implementation would provide jobs and opportunities in under-utilized areas
- 30) Goal: **Engage with a non-traditional partner on a subject/plan/project that will touch the lives/livelihood of people we don't normally connect to**
 Action: Reach across real or perceived divides and set up meetings. Ask my boss to let me devote x% of my time to do this work.
- 31) Goal: **Promote water sustainability**
 Action: Reduce or end reliance on Colorado River water; promote conservation
- 32) Goal: **Enhance communications**
 Action: Use podcasts as a means of effective and entertaining communication
- 33) Goal: **Large scale effort to gather data from households about costs of climate impacts vs. preparedness.**
 Action: Build data sets and tools that help decision makers understand economic and health costs of benefits of action or inaction. Convene a few focus groups to think about what that data collection process might look like.
- 34) Goal: **Communication of tribal adaptation needs**
 Action: Communicate and build the relationship necessary for the success of agencies, consultants, and NGOs to be successful in working for tribes
- 35) Goal: **Communication and engagement**
 Action: **Need for more social scientists working with agencies, organizations, institutions, etc. To better understand community values – opportunities for meaningful change.** Education is not enough...we need psychologists, anthropologists, economists, historians, geographers, etc. but also humanities, artists, poets, etc. Need more diverse practitioners – demographically and training – Need to find a collaborator.

- 36) Goal: **Promote and fund scenario planning pilot projects that address critical local and regional issues that affect almost everyone.** And include adapting to a changing climate or climate uncertainty as a key element of that conversation.
- 37) Goal: Get going!
Action: Identify a few key partners and networks in your area, start having more regular conversations, **go out on a limb to pursue projects that are mutually beneficial, large or small**
- 38) Goal: Tree planting
Action: **Start small tree planting project, build towards a large volunteer project of mass plantings** to mitigate heat island, produce food, provide shade, bring people together, considering water supply, gleaning network tree litter/maintenance, species appropriateness
- 39) Goal: **Alliance building across the aisle**
Action: Hold a big lunch meeting where apparent adversaries are seated adjacent to each other. Facilitate, lead to talk about common ground, even if in small steps

The following ideas were not ranked (not clear why!)

- 40) Goal: **Establish sustained civil society assessment to support climate action and assess the state of practice**
Action: Create regional and problem-focused communities of practice across the US and knit into a national network of networks. Establish national convening hub and pilot community of practice.
- 41) Goal: **Require that all future hazard mitigation plans include climate change considerations and educational actions.**
- 42) Goal: **Professional communication and the integration of the private sector.**
Action: Find a way to fund a high-quality communications team to craft messages that resonate across socioeconomic groups; create the economic incentives to make climate adaptation profitable for the private sector.
- 43) Goal: **Develop relationships with key religious leaders towards a multifaith movement on climate change.**
Action: We need to move climate change out of politics and into a social movement.

VI. Toward a Southwest Practitioners Adaptation Network (SPAN)

From a high-level perspective, participants were interested in creating a regional “network of networks,” facilitated by leaders from across sectors. Specific suggestions ranged from creating a Tiger Team of diverse individuals who can support adaptation efforts of others in the region to ensuring climate change is incorporated in professional development and curricula (e.g., even within medical school training). Youth engagement was also seen as critical to facilitating action, particularly with those from underrepresented groups (e.g., tribes, Hispanic, and rural communities). Here, the report authors provide an overview of ideas with complementary themes, followed by specific actions for moving forward (bold font used to emphasize main ideas and key words).

Overview of Ideas:

- **Build capacity** to interpret/discuss/act upon nuanced climate change observations, projections, impacts
- **Elevate SW as a leader and innovator** in adaptation space, share nationally and internationally
- **Coordinate/support proposal/grant writing**, projects.
- **Shared learning**: Exchange info about what has worked on the ground, where, and why
 - Rigorous examples of where adaptation strategies have succeeded and failed
 - Bring together people interested in or doing adaptation in the SW to share ideas, provide support, look for funding to advance resilience; Dialogue on adaptation strategies/actions/tools
 - Information exchange around lessons learned from practice (successes and failures)
 - Sharing success stories to motivate replication and scaling up
- Better meet practitioner needs through **ongoing communication**
- **Incubator for transformative change**
- **Interdisciplinary team** with shared vision, non-traditional partners
- **Focus on tangible outcomes for practitioners and stakeholders** (e.g., a handbook of no-regrets actions for land managers, increase the ability for cattle producers to grass bank (by providing what, specifically?))
- **Widen our network** with more diverse voices
- Act as **convener of knowledge teams**; detailed bios of participants online.
- **Increase collaborative capacity** of SW adaptation practitioners to share opportunities, learning, etc.
 - Action teams by interest area (built environments, public health, WUI, etc.): generate projects/actions in each
- **Translation of climate science to action**
- **Addressing mitigation and adaptation locally, regionally, and nationally**
 - Go outside of traditional boundaries of professions
 - Coproduction, interdisciplinary connections
 - Connecting scientists, managers, governments, private industry, tribes for common goals: a spectrum of practitioners; a hub for sharing
 - Regular in person meetings
 - Get projects going on the ground; adapt to local needs
 - Promoting and engaging multisectoral, multidisciplinary small and medium-sized enterprises (SMEs)
 - One health policies – integration of health and well-being into all adaptation actions
 - Forums for sharing knowledge; summits for different stakeholder groups
 - Articulate priority vulnerabilities for the region, need for research, info, planning support, resources, etc.
 - Create outreach and engagement kit that can be customized to facilitated better coproduction of response and planning strategies
 - Searchable database of people working on adaptation in the region with keywords, case studies, example policies/ordinances

- **Diversity, equity, and inclusion:** including tribal and other historically disadvantaged communities in all conversations; get outside traditional media challenges
 - Engaging diverse interests: Bring in business/ag; private sector engagement, Rural communities, historically underrepresented communities
 - Going to the tables of those not present (policy makers, financial, other seemingly unaffected organizations)
- **Knowledge activating people** to reach their goals for the future
 - Seeking systemic change across the southwest, pooling resources
 - Need to have provisions for advancing action and inclusion of professional networks (e.g., communications, marketing, etc.).
 - Create momentum, implementation action... move the needle on climate adaptation; Fast dissemination of information
 - Use of scenario planning as a vehicle
 - Core network of adaptation planners/implementers; identify strategies for translating assessments into action
 - Build out from core groups to build bigger networks, infiltrating beyond the echo chamber
 - Focus on short-term, tangible outcomes, with potential to change behavior
 - ID existing resources to support the network
 - Vetted, curated information, practices, tools
 - Safe space for conversation, sharing information, comradery
 - Connections to existing networks to expand influence
- **Defining a framework for systemic change** and engaging those who can make it happen; flexibility to evolve
- **Resource repository;** sharing failures as well as successes; grant to allow experiments/expansion of practice; clearinghouse for useful resources
 - Learning about adaptation innovations, share real-world experiences, both positive and negative
 - Job board
- **Engage youth** by teaching/training young professionals about adaptation
- **Create marketing plan** to appeal to the masses; collective advocacy
- **Incorporate the economic benefits of adaptation** today along with relevance for the safety/security of future generations

Emergent Key Themes:

- *Integration:* Different forms of knowledge should be represented in the adaptation planning and implementation processes.
- *Coordination:* Although there are a lot of small adaptation efforts underway across the landscape, these efforts would benefit from increased coordination.
- *Leveraging:* Increased partnerships and leveraging of existing partner activities could support landscape-scale adaptation.
- *Knowledge Sharing:* Communities that are seeking to implement adaptation actions can learn from “tested practices,” that have proven successful in other communities. At the same time, it’s important to keep in mind that what works in one location may not work in another.

- *Community Engagement:* Community leaders, members, and organizations should be key players in the conversation. For example, many ranchers have generations' worth of knowledge about how to adapt land management practices to arid land weather variability.

VII. Next Steps

Short-term:

- Move forward with creating a network of networks: Southwest Practitioners Adaptation Network (SPAN)
 - Create a web space that encourages knowledge sharing and collaboration
 - Identify vision team members
 - Research existing networks and opportunities
 - Main pillars of SPAN would include: 1) science-focused partnerships, assessment, and translation; 2) capacity and network building, information sharing, and convenings; and 3) community engagement and science to action components

Longer-term:

- Engage private sector/businesses/tribes
- Improve communication and facilitate a reduction of polarity in perspectives, especially focusing on working with youth, economic messaging, etc.

SOUTHWEST ADAPTATION FORUM

October 29-31, 2018
ENR2 Building, 1064 E. Lowell St.
University of Arizona, Tucson, Arizona

Welcome to the inaugural Southwest Adaptation Forum (SWAF)!

Our goal is to gather climate adaptation and assessment practitioners in the Southwest to exchange experiences and best practices from their work and build a network dedicated to finding and implementing integrated, community-based adaptation solutions.

By the workshop's close, we will have: (1) strengthened existing and built new relationships among climate-adaptation practitioners in the region, (2) identified gaps in our existing stakeholder and practitioner networks, (3) generated synergy and momentum for future engagement among partners and stakeholder groups (4) and, most importantly, our emergent network will be positioned to take tangible action!

Appendix A: Agenda

Monday, October 29

11:30 <i>60 min</i>	Registration open Box lunches available	S107
Session I: Setting the Stage for Adaptation and Assessment in the Southwest		
12:30 – 12:40 <i>10 min</i>	Call to Order Tahnee Robertson, Southwest Decision Resources (SDR) Austin Nunez, Chairman, San Xavier District	S107
12:40 – 1:00 <i>20 min</i>	Welcome Carolyn Enquist, Southwest Climate Adaptation Science Center (SW CASC) Special Announcement Steve Jackson (Federal Director, SW CASC) and Gregg Garfin (University Director, SW CASC), plus special guest Introduction to Conference Carolyn Enquist, SW CASC Agenda Overview, Materials, Meals, and Logistics Amanda Leinberger, Center for Climate Adaptation Science and Solutions (CCASS)	S107
1:00 – 1:10 <i>10 min</i>	Connections to Regional and National Adaptation Forums Beth Gibbons, American Society of Adaptation Professionals Jessica Hitt, EcoAdapt	S107
1:10 – 1:45 <i>35 min</i>	Plenary Presentation: Stages of Adaptation - Overcoming Obstacles, Building Capacity Susie Moser, Susanne Moser Research and Consulting	S107
1:45 – 2:20 <i>35 min</i>	Plenary Presentation: Applied Assessment, Decision Support, and Adaptation Richard Moss, Columbia University	S107

2:20 – 2:55 35 min	Panel: Assessment and Adaptation Beth Gibbons, American Society of Adaptation Professionals Susi Moser, Susanne Moser Research and Consulting Richard Moss, Columbia University Missy Stults, City of Ann Arbor *Moderated by Kathy Jacobs (CCASS)	S107
2:55 – 3:15 20 min	NETWORKING BREAK	S107
Session 2: Assessing the State of Practice in the Southwest		
3:15 – 4:15 60 min	Theme A Panel: State of Practice, Adaptation Issues in Tribal Lands and Communities Leanna Begay, Institute for Tribal Environmental Professionals Russell Benford, Gila River Indian Community Karletta Chief, University of Arizona (UA) Cynthia Naha, Santo Domingo Pueblo Trent Teegerstrom, UA Cooperative Extension *Moderated by Althea Walker, SW CASC, American Indian Higher Education Consortium, Amber Pairs, Climate Science Alliance Center for Climate Impacts & Adaptation, Scripps Inst of Oceanography, UC, San Diego (UCSD)	S107
4:15 – 5:15 60 min	Theme A Plenary Walkabout: Opportunities for Partnerships & Taking Action Amber Pairs, UCSD and Althea Walker, SW CASC	S107, courtyard
5:15 – 5:45 30 min	Optional Building Tour Maggie Heard, UA	Meet in S107
5:45	Rooftop Reception <i>Reflections on Tribal Session (~6pm)</i> <i>University of Arizona Welcome, UA reps</i> <i>Exhibits open</i> Sponsors: Lawson Family Foundation, Speer Family Trust	ENR2 Rooftop (6 th floor)

Tuesday, October 30

7:30 30 min	Continental breakfast available	S107
8:00 – 8:05 5 min	Welcome Back, Overview of the Day Tahnee Robertson, SDR	S107
8:05 – 9:05 60 min	Theme B Panel: State of Practice, Working Lands/Public Lands in the Southwest Mike Crimmins, UA Cooperative Extension Emile Elias, USDA SW Climate Hub Jennifer Ruyle, US Forest Service, Southwestern Region Karen Simms, Pima County Natural Resources and Bureau of Land Mgmt, retired Peter Warren, Malpais Borderlands Group *Moderated by Carolyn Enquist, SW CASC	S107

9:05 – 10:05 <i>60 min</i>	Theme C Panel: State of Practice, Issues Around the Wildland-Urban Interface (WUI) Mark Apel, UA Cooperative Extension Mark Brehl, AZ Department of Forestry & Fire Management Rebecca Davidson, National Forest Foundation Craig Mackey, Business for Water Stewardship Maureen McCarthy, University of Nevada, Reno *Moderated by Tamara Wall, Desert Research Institute (DRI)	S107
10:05 – 10:20 <i>15 min</i>	BREAK AND MOVE TO BREAKOUT ROOMS	
10:20 – 11:35 <i>75 min</i>	Theme B & C Breakout: Working Lands, Public Lands & the Rural-Urban Gradient - Opportunities for Collaboration and Capacity Building 5 Breakout Groups (see color on nametag)	Black – S107 Red – S107 Green – S120A Yellow – S120B Blue – S225
11:35 – 12:30 <i>55 min</i>	LUNCH and networking	S107
12:30 – 1:20 <i>50 min</i>	Theme B & C Breakout Report-back *Moderated by Tamara Wall, DRI	S107
1:20 – 2:20 <i>60 min</i>	Theme D Panel: State of Practice, Built Environments in the Southwest Ladd Keith, UA School of Landscape Architecture and Planning Sara Meerow, ASU, School of Geographical Sciences and Urban Planning Irene Ogata, City of Tucson Jeremy Stapleton, Sonoran Institute Missy Stults, City of Ann Arbor *Moderated by Beth Gibbons, American Society of Adaptation Professionals	S107
2:20 – 2:35 <i>15 min</i>	NETWORKING BREAK	S107
2:35 – 3:35 <i>60 min</i>	Theme E Panel: State of Practice, Public Health and Adaptation Issues in the Southwest Erika (Barrett) Austhof, UA College of Public Health Heidi Brown, UA College of Public Health Maggie Messerschmidt, The Nature Conservancy Matt Roach, AZ Department of Health Services Barbara Warren, Physicians for Social Responsibility *Moderated by Gregg Garfin, UA/SW CASC	S107
3:35 – 3:45 <i>10 min</i>	MOVE TO BREAKOUT ROOMS	
3:45 – 5:00 <i>75 min</i>	Theme D & E Breakout: Built Environments and Public Health/Human Well-being - Opportunities for Collaboration and Capacity Building 5 Breakout Groups (see color on nametag)	Black – S107 Red – S215 Green – S120A Yellow – S120B Blue – S225
5:00	ADJOURN for the day and dinner on your own	

Wednesday, October 31

7:30 30 min	Continental breakfast available	S107
8:00 – 8:05 5 min	Welcome Back, Overview of the Day Tahnee Robertson, SDR	S107
8:05 – 8:50 45 min	Theme D & E Breakout Report-back *Moderated by Ladd Keith	S107
8:50 – 9:05 15 min	Session 2 Synthesis Amber Pairs, UCSD Tamara Wall, DRI	S107
Session 3: Looking Forward - Building an Assessment and Adaptation Network in the Southwest		
9:05 – 10:05 60 min	Panel: Learn from Other Networks <i>Considerations in building an adaptation/assessment network, potential short and longer-term action items. How to scale up our collective capacity?</i> Benét Duncan, Western Water Assessment Beth Gibbons, American Society of Adaptation Professionals Richard Moss, Columbia University Missy Stults, City of Ann Arbor *Moderated by Kathy Jacobs, CCASS	S107
10:05 – 10:20 15 min	Panel Synthesis in the Context of the Southwest Amber Pairs, UCSD Tamara Wall, DRI	S107
10:20 – 10:40 20 min	COMPLETE FEEDBACK FORM	S107
10:40 – 11:40 60 min	Facilitated Discussion: Moving Adaptation & Assessment Forward in the Southwest Kathy Jacobs, CCASS Tahnee Robertson, SDR Carolyn Enquist, SW CASC	S107
11:40 – 12:00 20 min	Closing Remarks Carolyn Enquist, SW CASC	S107
12:00	ADJOURN Box lunches available Completed feedback form needed for lunch and raffle	S107

Appendix B: List of Participants

Program Committee Chairs

Carolyn	Enquist	SW Climate Adaptation Science Center	cenquist@usgs.gov
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Alison	Meadow	University of Arizona Institute of the Environment	meadow@email.arizona.edu
Sara	Meerow	Arizona State University School of Geographical Sciences and Urban Planning	sara.meerow@asu.edu
Claudia	Mengelt	US Fish and Wildlife Service	claudia_mengelt@fws.gov
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Louise	Misztal	Sky Island Alliance	louise@skyislandalliance.org
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Julia	Sittig	Southwest Decision Resources	julia@swdresources.com
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Elaine	Wilson	Institute for Tribal Environmental Professionals	Elaine.Wilson@nau.edu

Appendix C: Speaker Bios

Sessions 1 and 3: Speakers & Panelists

Southwest Climate Adaptation Science Center (SW CASC)



Steve Jackson, Federal Director

Stephen T. Jackson directs the Department of the Interior SW CASC, a partnership between the U.S. Geological Survey and a multi-university consortium led by the University of Arizona. In this position, he works to foster effective engagement between researchers and resource-management decision-makers. Before assuming his current position in 2012, he was at the University of Wyoming, where he was founding Director of the Program in Ecology and is now Professor Emeritus of Botany. Jackson's research continues to utilize the past 25,000 years of earth history as a source of natural experiments to explore ecological responses to environmental changes of various kinds, rates, and magnitudes. Jackson is currently a member of the Board of Reviewing Editors for *Science* magazine, in addition to numerous other review boards. He is a past Fellow of the Aldo Leopold Leadership Program (2006), and a Visiting Research Fellow at Merton College, University of Oxford (2012).

Key accomplishments: He is an elected Fellow of the American Association for the Advancement of Science (2009) and the Ecological Society of America (2014). Jackson was awarded the 2011 George Duke Humphrey Distinguished Faculty Medal from the University of Wyoming, and the 2015 Excellence in Leadership Award from the U.S. Geological Survey.



Gregg Garfin, University Director

I conduct collaborative research and convene conversations and workshops on climate and resource management topics, with resource managers and decision-makers in the Southwest. My activities are focused on climate variability, drought, adaptation to a changing climate, and development of climate services. My work examines the need to prepare for complex hazards, such as large fires and post-fire floods, and processes and collaborations for increasing the use of climate and environmental science to inform decision-making.

Key accomplishments: Chapter lead for the Southwest chapter in the U.S. Fourth National Climate Assessment.



Carolyn Enquist, Federal Deputy Director

Carolyn has focused primarily on management implications of climate change for conservation of biodiversity and our natural resources. She has led and contributed to numerous peer-reviewed articles and national reports focused on the biodiversity impacts of climate change, practical guidance for conducting vulnerability assessments, and the practice of climate adaptation planning and implementation. Over the past two decades, Carolyn has worked for the National Wildlife Federation, the National Park Service, the Forest Service, The Nature Conservancy, The Wildlife Society and the USA National Phenology Network.

Key accomplishments: Most recently, Carolyn co-edited a special issue of *Frontiers in Ecology and the Environment* on translational ecology and was selected as a Lead Author on the upcoming Intergovernmental Panel on Climate Change report (IPCC AR6). She received her M.S. and Ph.D. degrees in ecology from the University of New Mexico.

Center for Climate Adaptation Science and Solutions (CCASS)



Kathy Jacobs, Director

Kathy is a professor in Soil, Water and Environmental Science and Director of CCASS within the Institute of the Environment. From 2010 – 2013, Jacobs served as an Assistant Director in the Office of Science and Technology Policy (OSTP) in the Executive Office of the President, and was the director of the National Climate Assessment and the lead advisor on water science and policy, and climate adaptation. Prior to her work in the White House, from 2006-2009 Jacobs was the Executive Director of the Arizona Water Institute, a consortium of the three state universities focused on water-related research, education and technology transfer in support of water supply sustainability. She has more than

twenty years of experience as a water manager for the State of Arizona Department of Water Resources, including 14 years as director of the Tucson Active Management Area.

Key accomplishments: Leading the US National Climate Assessment, serving as founding director of the Arizona Water Institute, and developing the Assured Water Supply Rules for the State of Arizona.



Amanda Leinberger, Adaptation Program Manager

Amanda is an Adaptation Program Manager with a background in international environmental policy and ocean and coastal resource management. She works to support and build the internal adaptation community at the University of Arizona (UA) as well as to expand the impact of UA adaptation activities and projects in the Southwest region. Prior to joining CCASS, Amanda spent two years in San Juan, Puerto Rico as a NOAA Coastal Management Fellow working with the Puerto Rico Coastal Zone Management Program on projects related to climate change and coastal resilience. Other areas of interest include urban resilience, ecosystem-based adaptation, and effective communication of climate change issues.

Key accomplishments: Author, US Caribbean Chapter of the Fourth National Climate Assessment; Author, Puerto Rico's State of the Climate Report 2014-2017; Fellow, NOAA Coastal Management Fellowship Program 2015-2017

Southwest Decision Resources (SDR)



Tahnee Robertson, Director

Tahnee is a professional facilitator, mediator and collaboration practitioner and Director of Southwest Decision Resources. For the past 20 years, her project work has included forest planning and management, community-based and large landscape conservation, design and development of watershed restoration and outdoor recreation collaboratives, regional visioning, youth engagement, adaptive management, network building, strategic planning, and environmental conflict resolution. Tahnee has a Bachelor's in Biology from Grinnell College and a Masters in Natural Resources from Cornell University. She is a member of the U.S. Institute for Environmental Conflict Resolution's

Roster of Environmental Conflict Resolution and Consensus Building Professionals, and serves on the leadership teams of the Cross-Watershed Network and Rocky Mountain Collaborative Conservation Network.

Key accomplishments: Development of several ongoing regional collaboratives and networks, various strategic and management plans now in implementation, and broadly supported landscape scale visions; resolution of several environmental conflicts, collaborative capacity built among numerous partners through our training workshops and coaching support, and other accomplishments typical of professional facilitators.

Featured Speakers/Guests



Beth Gibbons, American Society of Adaptation Professionals

Executive Director

Beth Gibbons is the Executive of The American Society of Adaptation Professionals (ASAP). ASAP is the premier professional society for climate change adaptation professionals in the United States. The American Society of Adaptation Professionals (ASAP) connects and supports climate professionals, while advancing innovation in the field of practice through establishing promising practices, pushing resiliency-focused policy initiatives, and celebrating tremendous work of local community and leaders.

Prior to taking the reins at ASAP Beth led the University of Michigan Climate Center and oversaw the National Oceanic and Atmospheric Administration (NOAA) Great Lakes Integrated Sciences and Assessments Center (GLISA) RISA program. This program, which spans eight states and the province of Ontario brings together researchers and community members to design and deliver usable climate information to inform decision making across a range of topics. Under her tenure these programs distributed over \$1.2 Million dollars to over 50 organizations to increase the understanding of climate change in the region and to develop strategies to prepare for current changes and future changes.



Susi Moser, Susanne Moser Consulting

President

Susanne C. Moser is a geographer (Ph.D. 1997, Clark University) who works nationally and internationally as an independent scholar and consultant from a base in western Massachusetts. Her work with government agencies, non-profits, foundations, and other researchers and consultants focuses on adaptation to climate change, resilience, transformation, science interactions, and effective climate change communication. She is a prolific writer, an inspiring speaker and has served on scientific advisory

boards for Future Earth, the International Science Council (formerly, International Social Science Council), the International Human Dimensions Program, US National Research Council, and numerous other organizations.

Key accomplishments: Susi has contributed to national and international climate assessments, and made major contributions to understanding of vulnerability assessments, program evaluation, effectiveness of adaptation options, climate communications, coastal impacts, and integrating social science into climate conversations.



Richard Moss, Earth Institute, Columbia University

Visiting Senior Research Scientist

I conduct research on scenarios, uncertainty characterization, and global change impacts and responses. I'm at Columbia developing ideas about structuring climate assessments to evaluate how we can use what we know to manage climate risk and to launch a civil society consortium to conduct such assessments. I'm really enjoying the Big Apple, Columbia, and the metro NYC climate science and adaptation communities.

Key accomplishments: I am the proud co-parent of two wonderful children. I have tried to contribute to progress in reducing global change impacts and using science to steer towards greater equity and sustainability. I've been privileged to chair several community activities such as NAS Boards/Committees, the IPCC scenarios task group, and a FAC on the National Climate Assessment.



Missy Stults, City of Ann Arbor

Sustainability and Innovations Manager

Missy works with community stakeholders to make Ann Arbor the most sustainable and equitable city in America. Her job includes managing climate programs (adaptation and mitigation), managing organizational-wide sustainability, and collaborating with community partners to drive deep sustainability actions in every sector. Missy also works on national field building efforts, including serving on the Board of Directors for the American Society of Adaptation Professionals.

Key accomplishments: Surviving during this chaotic time. Optimist.



Jessica Hitt, EcoAdapt

Scientist and CAKE Program Manager

Jessica Hitt is a Scientist and Program Manager at EcoAdapt. She manages the Climate Adaptation Knowledge Exchange (CAKE; cakex.org) Program, a cutting-edge climate adaptation-focused knowledge sharing platform and community of practice. In addition, Jessica provides research and programmatic support to a wide range of EcoAdapt's projects and research efforts. Jessica has been with EcoAdapt since 2009 and has broad experience training and building the capacity of adaptation practitioners, developing communities of practice, and facilitating adaptation knowledge exchange. Jessica also created and managed the EcoAdapt-Allianz Foundation Youth Climate Change project, which engaged youth in Washington, DC on climate change issues through an integrated educational program that focused on community action and civic engagement. She currently serves on the United Nation Environment Programme's Global Adaptation Network (GAN) Steering Committee, the U.S. National Adaptation Forum's Program Committee, the California Adaptation Forum's General Advisory Committee, and the Interagency Land Management Adaptation Group.



Benét Duncan, Western Water Assessment, University of Colorado

Climate Assessment Specialist/Research Scientist

As a Research Scientist/Climate Assessment Specialist at Western Water Assessment, I am responsible for coordinating our climate assessment activities and building a set of best practices for sustained climate assessment in the Southwest. I work to understand how organizations produce climate services and meet the climate information needs of stakeholders in the region, with the ultimate goal of contributing to a regional and national scale sustained climate assessment infrastructure. Previously, I worked at the science-policy interface in California, with a focus on producing usable science around California's coast and developing ocean climate change indicators for a national marine sanctuary.

Key accomplishments: Convening Editor, State of the California South Coast Report; Lead Author and Coordinator, Greater Farallones National Marine Sanctuary Ocean Climate Indicators; Postdoctoral Research Fellow, PACE (Postdocs Applying Climate Expertise) Program

Theme A Panel: Tribal Lands

Introductory Statement: The SWAF Tribal Panel provides the opportunity to hear various perspectives that illustrate how climate adaptation is being advanced within and across tribal nations. This session lays the groundwork for deeper conversations around effective partnerships, existing models for advancing adaptation, and the unique challenges and benefits of working with tribal nations to advance climate adaptation. The overall goals of this session are to explore: 1) How can the broader adaptation community integrate tribal adaptation practice into their work/networks, and 2) how can tribal practitioners effectively leverage non-tribal resources, while maintaining tribal sovereignty?

Preliminary Key Takeaways:

- 1. Relationship and partnership building are critical.** We need to build relationships with tribes and tribal organizations that culminate in lasting and effective partnerships that serve as effective models for advancing tribal resilience.
- 2. Tribal communities need access to new and existing resources.** Tribes need assistance in identifying, creating, and advocating for resources that support and advance tribal resilience planning and actions in our region.
- 3. Tribal communities need support to overcome challenges, turning barriers into new opportunities.** Tribes need additional support to address challenges and identify new opportunities to advance climate adaptation action in tribal communities.

Panelists:



Leanna Begay, Institute for Tribal Environmental Professionals

Program Coordinator

Prior to coming to ITEP, Leanna worked for the Navajo Nation Department of Fish and Wildlife as a Wildlife Biologist. She traveled many miles crisscrossing the Navajo Nation to provide public outreach presentations, assist with data collection, and on some occasions interpreting the importance of biological resources found on the Navajo Nation. Many of these activities allowed for opportunities to visit parts of Navajo that not many get to visit. She greatly appreciates the significance of wildlife to Navajo Culture and how it relates to the work she participated in throughout the years.

Key accomplishments: I cannot choose specific accomplishments to share but I would like to thank all who have contributed and allowed me to join on ventures partnering with tribal communities.



Karletta Chief, University of Arizona Department of Soil, Water, and Environmental Sciences

Assistant Professor & Extension Specialist

Dr. Karletta Chief (Diné) is an Associate Professor and Specialist in Soil, Water, and Environmental Sciences at the University of Arizona (UA). Her research focuses on understanding, tools, and predictions of watershed hydrology, unsaturated flow in arid environments, and how natural and human disturbances impact water resources. As an extension specialist, she works to bring relevant science to Native American communities in a culturally sensitive manner by providing hydrology expertise, transferring knowledge, assessing information needs, and developing applied science projects. Dr. Chief is a member of a national climate change network of indigenous and non-indigenous scientists.

Key accomplishments: Dr. Chief is Diné from Black Mesa, AZ and was raised without electricity or running water. She is a first-generation college graduate. Dr. Chief received a B.S. and M.S. in Civil and Environmental Engineering from Stanford University in 1998 and 2000 and a Ph.D. in Hydrology and Water Resources from UA in 2007. She completed her post-doctorate at Desert Research Institute in Las Vegas, NV. In 2011, Dr. Chief was named American Indian Science and Engineering Society (AISES) Most Promising Scientist/Scholar, 2013 Stanford University Distinguished Alumni Scholar award, 2015 Native American 40 under 40, 2016 AISES Professional of the Year, and 2016 Phoenix Indian Center Woman of the Year.



Russell Benford, Gila River Indian Community Department of Environmental Quality

Program Manager

Russell Benford is a wildlife ecologist who runs the Wildlife and Ecosystems Management Program for the Gila River Indian Community (GRIC). He works with species of ecological and cultural concern and is interested in mitigating human-wildlife conflict. He also manages a nationally-recognized crew of 20 tribal members who specialize in exotic species control, wildfire risk reduction and native habitat restoration. The crew has numerous projects at the confluence of the Salt and Gila Rivers, and they work in National Forests and Parks throughout the Southwest.

Key accomplishments: Benford is building a Youth Conservation Corps and developing plans for a large-scale grow-out of endemic plants and seeds for widespread use in restoration. He participates in regional conservation planning and advises the US Fish & Wildlife Service in the implementation of their Native American Policy. Benford has helped indigenous people in the Southwest and Western Pacific manage their wildlife resources since 2012.



Trent Teegerstrom, University of Arizona

Associate Director of Tribal Extension Programs and Extension Specialist

Trent is the Associate Director of the Tribal Extension Program at the University of Arizona and an Extension Specialist with the Department of Ag and Resource Economics. He has worked with a variety of agricultural enterprises including dry-land farming in the mid-west; irrigated agriculture in the southwest; and livestock production in the northeast, mountain west, and southwest, he has also worked with the green industry in the west and with the fruit, nut and vegetable producers in the northeast and southwest. He joined the UA in 1997 after spending the previous two years as a Farm Business Management

Specialist with Cornell Cooperative Extension working in farm finance and risk management. His main area of concentration includes fostering Tribal relations for CALS Cooperative Extension, production economics, tribal agriculture, risk management, agricultural taxes and labor issues.

Key accomplishments: The establishment of a Trusted foundation between entities that allows for growth and the capacity for trying new programming efforts and projects.



Cynthia Naha, Santo Domingo Tribe

Director of Natural Resources

Cynthia Naha is the Director of Natural Resources Department for the Santo Domingo Tribe, is an enrolled member of the Hopi Tribe, and is Tewa and Ianktowan Dakota Oyate (Yankton Sioux). She has worked in various capacities, including but not limited to: solid waste, recycling, Brownfields, emergency response and preparedness, water quality, climate change, Unexploded Ordinances (UXO) and more. Throughout the past 15 years, Cynthia has worked to build Tribal environmental capacity and seeks to ensure that the communities she works with and for, maintain a balance between environmental protection and public health and safety. She enjoys establishing partnerships with neighboring Tribes, Pueblos, and Federal and State

agencies and holds the Tribal Government seat on the New Mexico Recycling and Illegal Dumping Alliance (NM RAID). She was a Tribal Waste Response Advisory Program Steering Committee member, serving out her last term. Cynthia is a graduate of Arizona State University, where she obtained her BS in American Indian Studies. Since graduating from college in 2003, Cynthia has continuously worked with and for Tribal Governments/Organizations in the area of environmental and natural resources protection.

Key accomplishments: Becoming the Director of our department here in Santo Domingo after 2.5 years.



Althea Walker, Southwest Climate Adaptation Science Center/American Indian Higher Education Consortium

Tribal Climate Adaptation Science Liaison

Althea Walker is the Tribal Climate Adaptation Science Liaison for the Southwest Climate Adaptation Science Center (SW CASC) and is employed by the American Indian Higher Education Consortium (AIHEC). Althea has a Bachelor of Science degree in Environmental Resource Management and a Master of Science degree in Environmental Technology Management from

Arizona State University. Prior to joining the SW CASC and AIHEC, she worked for the Gila River Indian Community Department of Environmental Quality leading climate change adaptation planning for the Community. She has tribal affiliations with the Nez Perce, Hopi, and Gila River nations and is an enrolled member of the Gila River Indian Community.

Key accomplishments: Certified Public Manager; Leadership in Energy & Environmental Design Green Associate; Indigenous Foods & Knowledges Network Steering Committee Member; Winds of Change Editorial Board Member



Moderated by: **Amber Pairis, Climate Science Alliance and Center for Climate Impacts and Adaptation, Scripps Institution of Oceanography**

Director

Pairis' work centers on building a science focused network of leaders, scientists, and managers focused on sharing ecosystem-based resiliency approaches to safeguard our communities and natural resources from climate change impacts. Pairis leads several initiatives related to terrestrial ecosystem resilience and natural resource conservation, including innovative community engagement programs.

Key accomplishments: Director, Climate Science Alliance; Recipient, 2017 Climate Adaptation Leadership Awards for Natural Resources; Program Coordinator, Center for Climate Impacts and Adaptation, Scripps

Institution of Oceanography, UC San Diego; Appointed by Governor Brown, Assistant Secretary for Climate Change at the California Natural Resources Agency; Science Advisor, Association of Fish and Wildlife Agencies

Theme B Panel: Working Lands/Public Lands

Introductory Statement: Rural communities and adjacent public and private lands continue to face the direct effects of climate change and extreme weather, ranging from catastrophic wildfire and intensive storms to widespread flooding, post-fire debris flows, and severe erosion. Moreover, our shared ecosystem services are at increased risk from invasion of non-native species and the desertification of our rangelands. It has become increasingly clear that both working lands and public land advocates need to join forces to combat the synergistic effects of climate change, looking for shared goals and solutions. This includes prioritizing watersheds for ecosystem restoration treatments that maximize water availability, conserving intact landscapes for both ranching and biodiversity outcomes, promoting investment in food security and sustainable agricultural practices, and—perhaps most importantly—cultivating multi-jurisdictional collaboration. In short, rural communities need to come together to support one another’s well-being and livelihoods, by working at a landscape scale that crosses political and physical boundaries.

Preliminary key takeaways:

- 1. Climate adaptation on public and private lands requires a long-view with a focus on relationships between land managers, permittees, and communities that work on these lands.** This can be challenging due to the high turnover rate among agency land managers. This is all the more reason to engage with local community members with long-term connections to the land as vested partners.
- 2. Effective climate adaptation action promotes resilient landscapes; these landscapes are the basis of resilient rural communities.** For generations, farmers, ranchers, and tribal members have practiced adaptation to arid land weather variability to maintain their livelihoods and homes. By working together as integrated communities, collective impact and success will be more attainable, ensuring strong and resilient rural communities now and into the future.
- 3. Work with ranchers to find and address common goals.** Need to take their insights seriously (e.g., 4-5 generations worth of knowledge), making sure they are heard in decision-making processes. Build bridges with others that have similar goals, identifying projects conducive to working together. Remember that keeping ranches as working ranches can be a part of an effective conservation approach.
- 4. It is important to leverage ongoing work and priorities to guide adaptation action.** Adaptation action can happen more quickly by leveraging existing issues such as wildfire and forest management, invasive species, and drought impacts. This also can help with prioritizing landscapes and watersheds for restoration work, particularly those with riparian areas that need erosion control work. Projects such as “restoring our future” have experienced success by embracing these tenets.
- 5. Explore creative financing strategies for adaptation projects.** In addition to taking an “all hands on deck” approach to leverage resources, we need to find ways to move government action more quickly than ever before, and to explore creative financing strategies for adaptation projects. Ideas include a bond project with a strategic campaign (based on formative research on willingness to pay) for green infrastructure and a large grant to support the design and implementation of a green jobs training program.

Panelists:



Mike Crimmins, University of Arizona

Extension Specialist—Climate Science

Mike Crimmins is on the faculty of the Department of Soil, Water, and Environmental Science at the University of Arizona and is an Extension Specialist in Climate Science for Arizona Cooperative Extension. He has been in this role for 14 years, working with ranchers, farmers and natural resource managers across Arizona to integrate climate information in their planning and decision making, and assisting them in developing strategies to adapt to a changing climate.



Emile Elias, USDA Southwest Climate Hub

Acting Director

Dr. Elias has worked for more than two decades at the interface of water scarcity, water quality, agricultural production and natural resources with the goal of supporting resilient landscapes and resilient communities. As a research hydrologist within the USDA Agricultural Research Service, Emile investigates land-use and climate-related changes in regional water resources, crop and rangeland production and their impact on agricultural communities and food security. More broadly, Dr. Elias leads a Southwest Hub team engaged in research and

science synthesis, tool development to support climate informed decision-making, and stakeholder outreach. She holds degrees in Environmental Biology, Watershed Science and Hydrology.

Key accomplishments: Proposed and led a special issue in the journal *Climatic Change* on vulnerability of Southwestern forest and agricultural ecosystems. Served as an author of the Southwest Chapter of the Fourth National Climate Assessment and the Fourth California Climate Assessment. Presented the keynote address at the 2018 Soil and Water Conservation Society meeting.



Jennifer McRaye Ruyle, USDA Forest Service Southwestern Region

Deputy Director, Planning, Watershed and Air

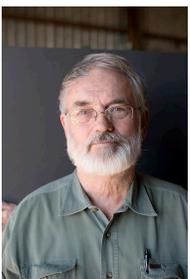
Jennifer has worked in natural resource management and research since 1979. She holds a Bachelor of Science degree in Soil Resource Management from the University of California at Berkeley, and a Master of Science degree in Soil and Water Science from the University of Arizona. She started her Forest Service career with seasonal positions on the Modoc and Dixie National Forests, and the Rocky Mountain Research Station. She then served on the Coronado National Forest as a District Ecologist, NEPA Planner, Forest Planner, Natural Resources and Planning Staff Officer, and Acting Deputy Forest Supervisor. She is currently the Deputy Director of Ecosystem Analysis and Planning, Watershed, Soil and Air for the Southwestern Region, and recently served as Acting Director of Planning in the Rocky Mountain and Southwestern Regions.



Karen Simms, Pima County and Bureau of Land Management, retired

Natural Resources Division Manager

Karen has worked for the Natural Resources program for Pima County for one year. Prior to this appointment, she spent nearly 30 years with the Bureau of Land Management (BLM) in southern Arizona before retiring in September 2017. Hired as a wildlife biologist by BLM through the US Department of Interior Cooperative Ecosystems Studies unit in 1988, Karen lived on BLM's newly acquired Empire and Cienega Ranches for three years and collected baseline inventory data on riparian areas, grasslands, birds, and fish. Karen was the project lead on the development of the Muleshoe Ecosystem Management Plan for the Muleshoe Cooperative Management Area (BLM, The Nature Conservancy, and USFS). In 1995, Karen became a Planning and Environmental Coordinator and led the development of Las Cienegas Resource Management Plan until her retirement. Karen graduated from the University of Arizona in May 1989 with a MS degree in Wildlife Management. Her Master's research was on the Habitat selection of Reintroduced Masked Bobwhite quail on the Buenos Aires National Wildlife Refuge, where she lived from 1986-1988. Karen received her BS degree in Zoology from the University of California, Davis in 1983.



Peter Warren, Senior Field Representative, The Nature Conservancy, Board Member, Malpai Borderlands Group (serving as a replacement for Richard Winkler, Rancher & Malpai BG Executive Director)

After completing an undergraduate degree in Environmental Biology at U.C. Santa Barbara, Mr. Warren moved to AZ in 1974 to attend graduate school at University of Arizona. He received an MSc degree in Ecology and Evolutionary Biology from UA, where he studied the relationship between desert rodent distribution and vegetation structure. He worked for seven years at the University of Arizona Remote Sensing Center studying patterns of distribution and changes in vegetation of the Southwest.

Mr. Warren has worked for The Nature Conservancy since 1986. His work with TNC has included population studies of rare plants, designation of special management areas on Federal lands, conservation of grasslands, and land protection using tools such as conservation easements. For the last fifteen years his work has focused on working with rancher-led community groups such as Altar Valley Conservation Alliance and Malpais Borderlands Group to support large-landscape conservation.



Moderated by: **Carolyn Enquist, SW Climate Adaptation Science Center, U.S. Geological Survey**

Deputy Director

Carolyn has focused primarily on management implications of climate change for conservation of biodiversity and our natural resources. She has led and contributed to numerous peer-reviewed articles and national reports focused on the biodiversity impacts of climate change, practical guidance for conducting vulnerability assessments, and the practice of climate adaptation planning and implementation. Over the past two decades, Carolyn has worked for the National Wildlife Federation, the National Park Service, the Forest Service, The Nature Conservancy, The Wildlife Society and the USA National Phenology Network.

Key accomplishments: Most recently, Carolyn co-edited a special issue of *Frontiers in Ecology and the Environment* on translational ecology and will be serving as a Lead Author on the upcoming Intergovernmental Panel on Climate Change report (IPCC AR6). She received her M.S. and Ph.D. degrees in ecology from the University of New Mexico.

Theme C Panel: Wildland-Urban Interface

Introductory Statement: When thinking about the areas in the West that straddle a landscape that is not wild, yet not totally created by human efforts, we struggle to characterize these places, and typically default to the broad term, wildland urban interface, or the “WUI”. As divergent as the communities may be, the one quality in common across almost all WUI areas is growth. A recent study calculates that homes in wildfire prone areas have increased from about 607,000 in 1940 to 6.7 million in 2010; this growth also encompasses a range of other impacts in addition to wildfire risk—watershed health, water quality, and water supply. As the number of people residing in these areas continues to increase, a warming climate and shifting precipitation patterns will likely continue to increase the potential for wildfires and further stress water resources.

Preliminary Key Takeaways:

- 1. Public-Private Partnerships and innovative conservation finance mechanisms are the new model of doing business to restore and create resiliency across federal (and state, private) lands.** The federal government will never be able to adequately fund needed restoration efforts. We must be working on incentives across sectors (business, municipalities, government at multiple levels, policy makers, individuals, universities, etc.) to build capacity & leverage one another’s efforts.
- 2. Political will, based on basic knowledge of western climate/water realities, will determine our ability to craft a path forward.** Consider top-down and bottom-up policy and implementation architecture, leveraging the will of sub-national governments (state, county, city, etc.) and big business that are proactively addressing climate impacts, while also catalyzing ground-up (pilot) implementation projects that highlight potential paths forward. “We need to determine which horse(s) to ride, how to clear the deadfall from the path forward, and then saddle up and get going.”
- 3. Localism is critical: there is no single set of solutions for our diverse national problems.** Each community must tailor solutions to meet their individual needs and share their success and failures to aid other communities facing similar challenges. To facilitate this, we need more exchanges with other communities dealing with similar issues around beneficial water use for conservation, disincentives for conservation in water entities business model.
- 4. Water conservation and Firewise education can have a lasting and expansive impact over time by changing people’s attitudes and behaviors towards their landscapes.** These programs may be perceived as a ‘drop in the bucket’ in terms of stemming groundwater depletion or reducing fire hazards resulting from residential and commercial development in the WUI. Nonetheless, these programs can have lasting and expansive impact over time by changing people’s attitudes and behaviors towards their landscapes.
- 5. Business as usual is not working and we need a paradigm shift in fire policy and public support.** We must get past the catch-22 of wildfire suppression (which now tops \$2 billion annually) versus landscape restoration/wildfire mitigation funding. Proactive forest and watershed protection efforts are dollars and cents investments that make sense financially and result in resilient landscapes more capable of withstanding ongoing change.

Panelists:



Mark Apel, University of Arizona Cooperative Extension

Area Agent – Community Resource Development

I conduct Extension programs in land use planning, sustainable development, small acreage landowner assistance and economic development in southeastern Arizona. I have over 32 years of environmental and planning experience having worked as a Peace Corps Parks and Wildlife Volunteer, a planner for the National Park Service, a preserve manager with The Nature Conservancy, and as a county planner addressing growth and development issues.

Key accomplishments: Initiated and oversee Externships in Sustainability and Extension program for past 7 years; Initiated first statewide online training for Arizona's Planning Commissioners; UA College of Agriculture 2012 Outstanding Faculty Team Award; Developed Cochise County's first water conservation overlay district and regulations.



Mark Brehl, Arizona Department of Forestry & Fire Management

Statewide Good Neighbor Authority Coordinator

Mark attended both Virginia Tech and Northern Arizona University, receiving a B.S. in Forestry with an emphasis in forest health. Over his 20-year career, he has worked in forest management and wildfire response related positions with Arizona Department of Forestry and Fire Management, the Flagstaff Fire Department, the National Park Service, private forest management industry and non-governmental

organizations. Mark focuses on working with community partners to plan and implement projects advancing the three tenets of the National Cohesive Wildfire Fire Management Strategy to create: 1) Resilient Landscapes, 2) Fire Adapted Communities, and 3) Safe & Effective Wildland Fire Response.

Key accomplishments: President – Greater Flagstaff Forests Partnership; Chair – AZ Fire Adapted Communities; Member of the national Fire Adapted Communities Learning Network; 2003 NPS Special Achievement Award in Wildland Fire Mgmt.; 2005 National Firewise Leadership Award (State level); 2007 National Firewise Leadership Award (Local level); 2007 AZGFD and USFWS Forest Treatment Innovation Award; 2015 IAFC Innovation in Mitigation Award; 2015 Rare's "Reducing our Risk," People's Choice Award; 2016 Two Chiefs Partnership Award



Rebecca Davidson, National Forest Foundation

Director, Southern Rockies Field Program

I implement and manage conservation programs and develop forest and watershed restoration capacity in partnership with the Forest Service across Arizona, Colorado, and New Mexico. In addition, I build partnerships with communities, business, municipalities, and other organizations across sectors, to connect people to their public lands and build the support needed to increase the pace and scale of work.

Key accomplishments: In partnership, developed and grew the Northern Arizona Forest Fund, a watershed investment tool. A Teaching Assistant to Vermont Law School's International Climate Law UNFCCC class, since 2015.



Craig Mackey, Business for Water Stewardship

Policy Director

As Policy Director for BWS, I work on a secure water future for ag, industry, communities and the environment in the CO River basin. Working on water policy, flow restoration projects, business education and engagement, current efforts including shifting Farm Bill funding to the American SW for irrigation modernization/efficiency, watershed health, and drought mitigation/climate adaptation. For 25 years, I have worked on protection, management, access and use of public lands and waters in the West.

Key accomplishments: Former Director of Government Affairs, Outdoor Industry Association, trade group for manufacturers and retailers of outdoor products. Collaborator on recreation economy studies. Collaborator on studies on economics of CO River water, and CO River recreation economy. Member, Leadership Council, National Forest Foundation. Board member, Colorado Fourteeners Initiative.



Maureen McCarthy, University of Nevada, Reno and Desert Research Institute

Research Director

Maureen McCarthy is a faculty member in the Department of Physics at the University of Nevada, Reno (UNR) and the Graduate Program in Hydrologic Sciences, where she serves as the Tahoe & Great Basin Research Director. She is also research faculty in Earth and Ecosystem Sciences at the Desert Research Institute. Her research portfolio includes managing large, multi-institutional, transdisciplinary research programs focused on climate resiliency, water sustainability, natural resource management, and multi-hazard early warning. McCarthy is Project Director for the Water for the Seasons Project, a multi-institution research project focused on climate adaptation and water sustainability in snow-fed arid land

river systems, and the Native Waters on Arid Lands Project, a research-extension partnership with Land-Grant Institutions, Tribal Colleges & Universities, tribal communities, and research institutions, focused on enhancing the climate resiliency of Native American agriculture.

Key accomplishments: Defense Policy Fellow of the American Association for the Advancement of Science; directed the Interface Physics Group at the Pacific Northwest National Laboratory in Richland, Washington; Lady Davis Postdoctoral Fellow at the Hebrew University in Jerusalem, Israel



Moderated by: **Tamara Wall, Desert Research Institute**

Deputy Director, Western Regional Climate Center

Dr. Tamara Wall is an assistant research professor at the Desert Research Institute in Reno, NV and deputy director of the Western Regional Climate Center. Additionally, Dr. Wall a co-PI of California-Nevada Climate Applications Program (part of the national NOAA-sponsored Regional Integrated Sciences and Assessments network) and the Southwest Climate Adaptation Science Center Consortium and has worked extensively with stakeholders in California, Nevada and other regions of the West in co-produced climate science projects for the last six years. Her research focuses on qualitative and quantitative social science research in climate information use by stakeholders and evaluating co-produced climate science.

Key accomplishments: Deputy Director, Western Regional Climate Center; co-PI, California Nevada Applications Program; co-PI, Southwest Climate Adaptation Science Center

Theme D Panel: Built Environments

Introductory Statement: In the urbanized and growing U.S. Southwest, climate change is impacting the region's environmentally, economically, and culturally diverse cities and the people within them. These impacts have consequences for economic development, public health, food security, energy and water usage, urban ecology, and increase the stressors on vulnerable populations. Climate adaptation in the built environment requires efforts at different scales – individual, neighborhood, city/municipal, and regional – as well as efforts across sectors and organizations including grassroots, local, state and federal government, and the private sector.

Preliminary Key Takeaways:

- 1. Diverse cities in the Southwest are facing multiple climate impacts and addressing them through a range of dedicated to mainstreamed climate adaptation approaches.** Cities in the Southwest are culturally, economically, environmentally diverse, facing different climate impacts in different policy and political contexts. How do we “mainstream” climate adaptation into existing policies and innovate new tools where needed?
- 2. Urban areas have the opportunity to leverage the benefits of natural systems.** There are challenges and opportunities of adaptation from the municipal perspective. Leveraging the benefits of natural systems within the built environment brings new opportunities that will facilitate climate adaptation efforts.
- 3. Adaptation solutions rely on the co-production of science and translation of science into action.** Spanning boundaries (science – policy – implementation) will help generate new and creative solutions.
- 4. New strategies for communicating climate change can be used to inspire action, catalyze collaboration, and engage urban communities in adaptation.** What are effective ways to engage communities and catalyze collaboration for adaptation? How do we frame stories that engage and inspire people to play the hero and recruit others to a cause?
- 5. Success stories from around the country can help inform what adaptation looks like in the Southwest.** What does success look like? Success needs to be co-defined. How do we approach climate adaptation in ways that are equitable? What are the roles of boundary spanners and those in the audience who want to take their actions to next level?

Panelists:



Ladd Keith, University of Arizona

Chair, Sustainable Built Environments

Ladd Keith leads the Sustainable Built Environments program and researches climate action planning in cities in the Southwest. He is currently leading a project evaluating the use of heat maps in urban planning across the Southwest and is co-investigator on a project creating community climate profiles tailored to community needs. He has contributed to the development of a number of local policies, including land use and development regulations, comprehensive plans, and hazard mitigation plans. He is also an active member of the American Planning Association and Urban Land Institute, and serves on the City of Tucson's Planning Commission.

Key accomplishments: Founder and Chair of the Sustainable Built Environments program at the UA, Chair of the City of Tucson Planning Commission during the general plan update in 2013, founding member of the Urban Land Institute's national Center for Sustainability, and named one of Urban Land Institute's 40 Under 40 in 2016.



Sara Meerow, School of Geographical Sciences & Urban Planning, Arizona State University

Assistant Professor

I am an assistant professor at ASU. My work focuses on the challenge of how to make cities more resilient in the face of climate change and other social and environmental hazards while also making them more sustainable and just. My problem-driven, collaborative research lies at the intersection of urban geography and planning and combines qualitative and quantitative methods with spatial analysis to study, and ultimately inform, resilience, green infrastructure, and climate change adaptation planning in a range of cities, from Detroit to Manila. Prior to starting at ASU in 2017, I completed my PhD at the University of Michigan.

Key accomplishments: Research has been published in academic journals, including Landscape & Urban Planning, Urban Geography, and the Journal of Planning Education & Research, as well as book chapters and policy reports. Principal investigator on a collaborative research grant from the National Science Foundation to study flood resilience planning networks.



Irene Ogata, Tucson Water, City of Tucson

Urban Landscape Manager

Irene is involved in city wide landscape issues and policies. For Tucson Water, she manages rainwater/stormwater harvesting programs involving limited income populations/neighborhoods. These programs incorporate One Water goals of managing all water resources. The multiple benefits of rainwater capture include improving community livability as it impacts human and environmental health; addressing urban heat islands and water resources, the nexus between water and energy and issues of climate change and social/environmental justice. As a member of the

Green Infrastructure Leadership Network, I was on a team with 3 other cities that collaborated to develop a Green Infrastructure and Health Manual.

Key accomplishments: Lead grant writer, Green Infrastructure & Health; Project Manager, Limited Income Rainwater Harvesting Program; Project Manager, Neighborhood Scale Stormwater Harvesting Program; Project Manager, Work Force Development Green Infrastructure



Jeremy Stapleton, Sonoran Institute

Director, Climate Resilience

I direct and manage the activities of Resilient Communities and Watersheds, a joint program with the Lincoln Institute of Land Policy to define and scale awareness and adoption of best practices for stewarding community resilience, sustainability, equity and quality of life. Our Growing Water Smart program is addressing the fundamental lack of integration between land use planning and water management in the western United States. Our Exploratory Scenario Planning resources help communities plan and prepare to adapt to the uncertainties of their future. And our Resilient Communities Starter Kit helps communities build capacity to address and endure the threats of flooding, wildfire and drought.

Key accomplishments: Urban and Landscape Systems Planner and Designer, Phoenix AZ; Wilderness Guide, Grand Canyon, California, Mexico, Australia, New Zealand...; Adoption of Phoenix Complete Streets Ordinance as former chair of the Environmental Quality and Sustainability Commission for the City of Phoenix.



Missy Stults, City of Ann Arbor

Sustainability and Innovations Manager

Missy works with community stakeholders to make Ann Arbor the most sustainable and equitable city in America. Her job includes managing climate programs (adaptation and mitigation), managing organization-wide sustainability, and collaborating with community partners to drive deep sustainability actions in every sector. Missy also works on national field building efforts, including serving on the Board of Directors for the American Society of Adaptation Professionals.

Key accomplishments: Surviving during this chaotic time. Optimist.



Moderated by: **Beth Gibbons, American Society of Adaptation Professionals**

Executive Director

Beth Gibbons is the Executive of The American Society of Adaptation Professionals (ASAP). ASAP is the premier professional society for climate change adaptation professionals in the United States. The American Society of Adaptation Professionals (ASAP) connects and supports climate professionals, while advancing innovation in the field of practice through establishing promising practices, pushing resiliency-focused policy initiatives, and celebrating tremendous work of local community and leaders.

Prior to taking the reins at ASAP Beth led the University of Michigan Climate Center and oversaw the National Oceanic and Atmospheric Administration (NOAA) Great Lakes Integrated Sciences and Assessments Center (GLISA) RISA program. This program, which spans eight states and the province of Ontario brings together researchers and community members to design and deliver usable climate information to inform decision making across a range of topics. Under her tenure these programs distributed over \$1.2 Million dollars to over 50 organizations to increase the understanding of climate change in the region and to develop strategies to prepare for current changes and future changes.

Theme E Panel: Public Health

Introductory Statement: Climate changes are projected to directly and indirectly affect public health, through changes to temperature, seasonality and frequency of extreme weather events, and other factors. These, in turn affect the timing and occurrence of diseases in new locations and our exposure to factors affecting our health, including disease vectors, air pollution, and heat. Effectively, the productivity and comfort of society is contingent on successful adaptation, planning, monitoring, information, and research.

Preliminary Key Takeaways:

1. The Southwest faces multiple climate-related public health concerns; thus, comprehensive discussions must move beyond a narrow focus on extreme heat. Other concerns include diseases carried by vectors, air quality, and health risks associated with wildfires, extreme precipitation, and drought. The Centers for Disease Control and Prevention's Climate Ready States and Cities Initiative is currently funding 3 county health departments (Maricopa, Pinal, and Yuma) to implement climate and health interventions.

2. Public health and health practitioners are key pieces of the adaptation puzzle. Participation by local or regional public health practitioners is an essential factor toward improving the chances of success for adaptation and mitigation projects. Sustained, ongoing public health adaptation and mitigation projects are best positioned to make the most of the co-benefits of climate-related public health interventions.

3. Support from community members, health related volunteer organizations, and community leadership—including neighborhood leaders, who are often innovative in finding ways to educate and prepare neighborhoods—is key to broad adoption of a program for preparedness, health, and safety. The most vulnerable populations are the most difficult to reach and require special kinds of outreach and advocacy. By sharing and disseminating our resource information, we can strengthen efforts to improve preparedness.

4. A successful program of taking on the challenges of climate-related public health risks requires community building—that is, a commitment to efforts in the self-interests of frontline communities, that move beyond mere outreach. To improve the prospects for adaptation and mitigation success, we need to address those issues head on, by building bridges between influencers and advocates, and provide opportunities to make it work for them.

5. We're moving in the right direction, talking about health impacts of climate change. Shifting the perspective to consider health impacts will likely open new mitigation and adaptation strategies and activities, which can motivate and catalyze policy changes that are appealing across the political spectrum. It is important to note that climate-related health interventions are in progress in the Southwest, and these actions provide a foundation for further collaboration.

Panelists:



Erika (Barrett) Austhof, University of Arizona College of Public Health, CLIMAS
Epidemiologist

I am currently engaged in collaborative research in climate change and health with a focus on applied public health research. My research aim is to expand networks of health practitioners involved in climate change work in order to facilitate well-informed decision-making and a greater public understanding of environmental health hazards. Areas of interest include communicating the health risks of climate change as well as vector-borne disease surveillance.

Key accomplishments: Co-Lead, Coordinating Research Efforts to Catalyze Change Action Team at Maricopa County Department of Public Health; Co-Author, Arizona's Climate and Health Adaptation Plan; Member, CSTE Climate Health & Equity Subcommittee



Heidi Brown, University of Arizona, College of Public Health

Assistant Professor

I am an infectious disease epidemiologist with a focus on how the environment shapes disease risk and how that, in turn, informs disease prevention. Our multi-disciplinary team works to identify human disease risk through modeling vector, host and pathogen distributions. Current research areas include vector-borne and zoonotic diseases, spatial epidemiology, and climate change.

Key accomplishments: Co-Author NCA-4 SW Chapter; Fulbright Scholar



Maggie Messerschmidt, The Nature Conservancy

Urban Conservation Program Manager

I developed and am now leading a program for urban conservation in Phoenix, Arizona focused on reducing heat through the application of nature-based solutions. I work with a strong understanding of climate and environmental science and with skills including green infrastructure design, action planning, and environmental policy. I advocate for inclusive social-ecological change in every aspect of my work.

As a Cities Program Lead at The Nature Conservancy in Phoenix, Arizona, I work at the interface of water management, climate adaptation, and landscape-level conservation with a goal of creating a cooler landscape. I hold a B.A. in Anthropology and a B.A. in Spanish from the University of Kentucky as well as an M.S.E.S. (Environmental Science) and M.P.A. (Public Affairs) from Indiana University's School of Public and Environmental Affairs with concentrations in Water Resources and Applied Ecology.



Matthew Roach, Arizona Department of Health Services

Climate and Health Program Manager

I am an Epidemiology Program Manager at the Arizona Department of Health Services and have been with the department since 2012. I hold an MPH in Epidemiology from the University of South Florida. I am the Principal Investigator for the CDC's Building Resilience Against Climate Effects (BRACE) Grant, the Environmental Public Health Tracking Grant, and the Safe Water for Community Health Grant. As the Principal Investigator over these projects, my work revolves around leading multidisciplinary teams for

surveillance and prevention activities of environmental related illnesses, including leading mini-grants for climate and health hazards with county health departments and universities.

Key accomplishments: Lead Author of the State of Arizona Climate and Health Adaptation Plan; Co-Lead for the National Environmental Public Health Tracking Climate and Health Indicators Workgroup; Co-Lead for the Council of State and Territorial Epidemiologists Heat Syndrome Workgroup



Barbara Warren, Physicians for Social Responsibility, Arizona Chapter

Director

As a native Californian, I attended University of California at Berkeley and am a graduate of Northwestern University Medical School and the University of Michigan School of Public Health. I practiced internal and community medicine and served in academic medical education and health care administration through my 40-year career, with faculty appointments at Schools of Medicine in Chicago (University of Illinois and Rush Medical College), Arizona (University of Arizona) and Colorado (University of Colorado). I served on the National Board of Physicians for Social Responsibility, an affiliate of Nobel prize winning International Physicians for the Prevention of Nuclear War.

Key accomplishments: Co-founder and Director of Physicians for Social Responsibility, Arizona Chapter. Lead organizer of "Health Impacts of Climate Change" conference in 2008 and Climate Smart Southwest community conference in 2013 with 450 local, national & international attendees and subsequent/ongoing "Building Resilient Neighborhoods" for extreme climate events. Board member of Tucson 2030 District.



Moderated by: **Gregg Garfin, University of Arizona, School of Natural Resources and the Environment + Southwest Climate Adaptation Science Center + Institute of the Environment**

Associate Professor and Associate Extension Specialist

I conduct collaborative research and convene conversations and workshops on climate and resource management topics, with resource managers and decision-makers in the Southwest. My activities are focused on climate variability, drought, adaptation to a changing climate, and development of climate services. My work examines the need to prepare for complex hazards, such as large fires and post-fire floods, and processes and collaborations for increasing the use of climate and environmental science to

inform decision-making.

Key accomplishments: Chapter lead for the Southwest chapter in the U.S. Fourth National Climate Assessment.