

White Paper: Perspectives on Water for Natural Resources in Water Management and Planning in Arizona

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Front Page: Randomly generated word cloud of responses to the question: What would make considering water for natural resource more attractive to you? The larger the word the more frequently it was said.

Introduction

This paper is intended to provide a summary of the 43 focus group meetings the University of Arizona Water Resources Research Center (WRRC) conducted to learn about the perspectives of different water-using groups in Arizona regarding allocating water to natural areas. This is the second in a series of white papers designed to stimulate discussion on how and why different water-using sectors, interest groups, or communities might consider water for natural areas in their water management and planning decisions.¹ The information presented here will eventually become an integral part of a roadmap, or toolbox, for considering water for natural areas in Arizona water management and planning. The goals of the Roadmap are to articulate common water management objectives, explore strategies to meet those objectives, and produce a document that describes “avenues” of opportunity for considering the environment in water decision making. Roadmap “avenues” will be designed in a way that allows communities to pursue and refine them at the local level so they may meet the needs and reflect the priorities of water users like you. We welcome your thoughts, concerns, and questions about this document and the larger roadmap-building process.

Understanding how much water aquatic and riparian ecosystems need to survive and thrive has been the focus of study for many years (e.g., Poff et al., 1997; Richter, et al., 2006; Arthington et al., 2006; Angus Webb et al., 2013), and an international consensus has emerged on methodologies for quantifying the water needs of these ecosystems (Merritt, et al., 2010). Less well understood is how to identify and implement effective environmental flow policies (Richter et al., 2009; Merritt et al., 2010; Pahl-Wostl et al., 2013). When water is scarce, establishing a scientific baseline of water needs for species and simply incorporating those identified water needs into water management and planning is problematic because use often already exceeds supply. In these cases it is critical to understand not only the water needs of natural areas but also the perspectives of different water users on how and where water should be provided to ecosystems (Vorosmarty et al., 2010). Insight on these perspectives can result in innovative solutions to providing water for the environment that work with, instead of against, the interests of current water users. This is particularly true if those perspectives are similar across water using groups.

In Arizona there has recently been increased interest in comprehensively examining our water resources. These efforts include, but are not limited to, the 2011 Arizona Water Resources Development Commission (WRDC), the 2012 Colorado River Basin Study of Supply and Demand, and most recently, the January 2014 release of the Arizona Department of Water Resources (ADWR) planning report *Arizona's Next Century: A Strategic Vision of Water Supply Sustainability*. In each of these efforts, water managers are beginning to look at our water resources not just from the standpoint of supply and demand for human uses, but also how water for natural areas fits into the puzzle. Having adequate science and stakeholder engagement to effectively connect these two interrelated priorities has been a challenge. For example, during the 2011 WRDC process, water for riparian and aquatic ecosystems was not considered as part of the statewide water supply and demand calculations because of inadequate data (Water Resources Development Commission, 2011).

Efforts at state and Colorado River Basin-wide water management and planning are reflective of the larger concerns Arizonans have about water. For example, in an October

¹ The first white paper is: Mott Lacroix, K. and B. Choate Xiu, 2013, Calculating and Considering Environmental Water Demand for Arizona, Water Resources Research Center. The paper is available on the WRRC webpage at: http://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/White%20Paper_Final.pdf

2013 survey, participants indicated that they were very concerned that future generations will not have enough water in rivers if we do not act responsibly (Public Opinion Strategies, 2013 for Environmental Defense Fund (EDF)). This result is supported by earlier polling through The Arizona We Want, which found that the people of Arizona not only consider the natural environment the state's greatest asset, but also recognize the need to adopt a statewide water management plan (Center for the Future of Arizona, 2009). The 2009 Gallup poll that identified these priorities did not directly link water management planning to preservation of natural areas. These two priorities were, however, ranked first (water plan) and second (preserving natural resources) among the best use of tax dollars or private sector funding. (Center for the Future of Arizona, 2009).

In an effort to more deeply understand the difficult issue of water allocation in relationship to Arizona's natural areas, the WRRC, through funding by the Nina Mason Pulliam Charitable Trust, has been working to examine how, if, and where we should be considering water for natural areas in statewide water management and planning decisions. The emphasis of this project has been on exploring voluntary, stakeholder-driven options within the context of limited water supplies and existing water rights. Most recently, we set out to answer the following questions:

- How do the perspectives of different water using groups vary regarding water for natural areas?
- Are there any cross-cutting values that could be used to design win-win policies or transactions?

Gathering the Information

To answer these questions, in January 2013 the WRRC invited representatives from different water-using sectors or interests to join a Steering Committee (Table 1). Most of the initial Steering Committee members were actively involved in the WRDC Environmental Working Group. The purpose of this Steering Committee is to provide advice to the WRRC on how to form a roadmap for consideration of water for Arizona's natural areas that is reflective of a broad array of thoughts and concerns on the subject. In initial meetings with the Steering Committee it became clear that they had two main concerns: communication about water for natural areas and on how to build common ground and foster trust on these issues in a state that has diverse perspectives. Initially the WRRC tried to gain insight into these perspectives through an online survey. The results, while interesting, were notably influenced towards those who self-identified as an environmental interest. As a result the WRRC, under the guidance of the Steering Committee, decided to conduct a series of statewide focus groups in order to collect and assess both quantitative and qualitative measures across different interest groups in Arizona.

Focus group participants were identified through a stakeholder mapping exercise with the Steering Committee. In this exercise, Steering Committee members were asked to write down interest groups within the state that are currently or should be involved in a conversation about water for natural areas. The Steering Committee members were then asked to vote for the top five groups or organizations that should be consulted. Through this process 155 groups were identified and 47 of them were listed by at least one Steering Committee member as a top priority. Steering Committee members assisted the WRRC in contacting these key participants and setting up focus group meetings.

Themes for the focus group meetings were decided by the Steering Committee; questions were drafted by the WRRRC, then reviewed and revised by each Steering Committee member. The WRRRC also sought and received approval for the process from the University of Arizona Institutional Review Board. All focus group participation was anonymous with participants only identifiable by their self-described interest in water and the county or counties in which they work and live.

Questions asked in each focus group were:

1. What natural resources are you most concerned about professionally and personally?
2. How do you plan to use water in the future? Do you anticipate an increase, maintenance, or decrease in your water use?
3. Are you concerned about water security?
4. If you were to consider water for the benefit of natural resources, how would you go about it? AND/OR If you already consider water for the benefit of natural resources, how do you do it?
5. What management or infrastructure changes might you make to provide water to natural resources?
6. What would make considering water for natural resources attractive to you?

Due to the Steering Committee’s interest in communication, and the use of language in encouraging or discouraging dialogue on water for natural areas, each focus group participant was also given a series of terms and asked if their reaction was positive, negative, or neutral.

Table 1: Active Roadmap Steering Committee Members
(As of February 26, 2014)

The terms discussed were:

1. Water dependent natural resources
2. Environmental water demand
3. Instream flow
4. Environmental flows and levels
5. Ecological flow requirements

Name	Affiliation
Karletta Chief	UA Soil Water & Env. Science Dept., Watershed Hydrology Assistant Professor
Rebecca Davidson	Salt River Project
Chad Fritz	Freeport McMoRan
Leslie Meyers	U.S. Bureau of Reclamation
Wade Noble*	Yuma County Agriculture Water Coalition
Joe Sigg	Arizona Farm Bureau
Linda Stitzer	Western Resource Advocates
Robert Stone*	Gila River Indian Community, Council Member
Warren Tenney	Southern Arizona Water Users Assoc., Metro Water
Chris Udall	Arizona Agribusiness Council
Summer Waters	UA Cooperative Extension
Dave Weedman	Arizona Game & Fish

Forty-three focus groups were conducted with 226 individuals. The focus groups were conducted between late August 2013 and early March 2014. Focus group meetings lasted for approximately one hour and were held in multiple locations across Arizona (Figure 1). The size of the focus group meetings ranged from 15 people to a single person (there were six of these individual interviews). The average focus group size was five people. At all but one focus group meeting there was a facilitator and a note taker. The note taker transcribed the conversation and any gaps in the conversation were filled in using digital recordings. These

*Recently joined the steering committee, did not participate in identifying focus group participants or in creating questions.

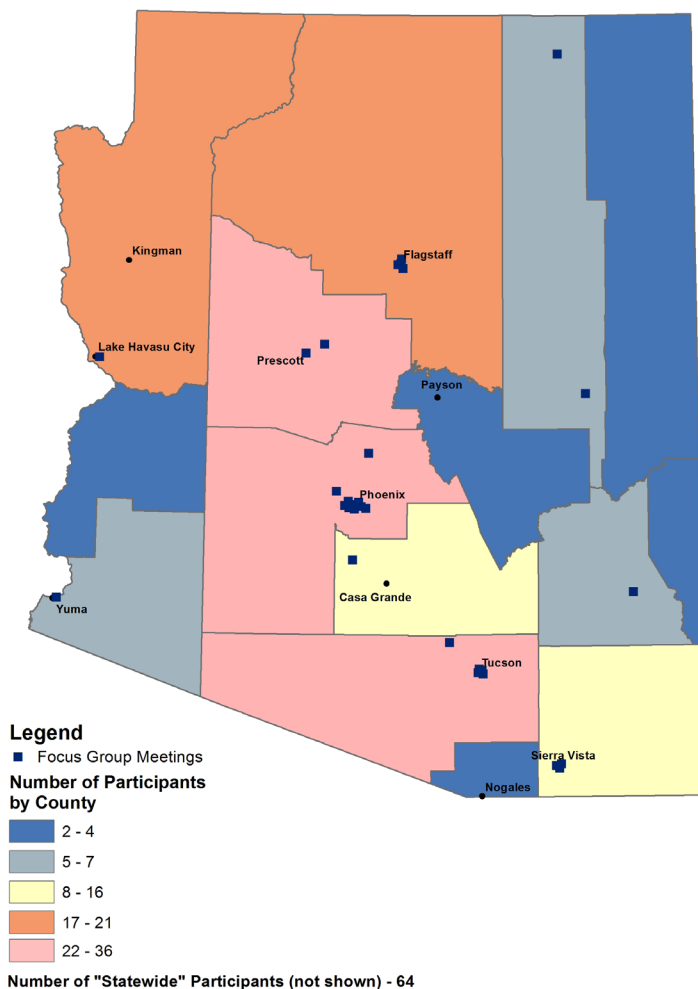


Figure 1: Focus group meeting locations (blue squares) and number of participants by county. Not shown on the map are the 64 participants who indicated their work/interest was statewide.

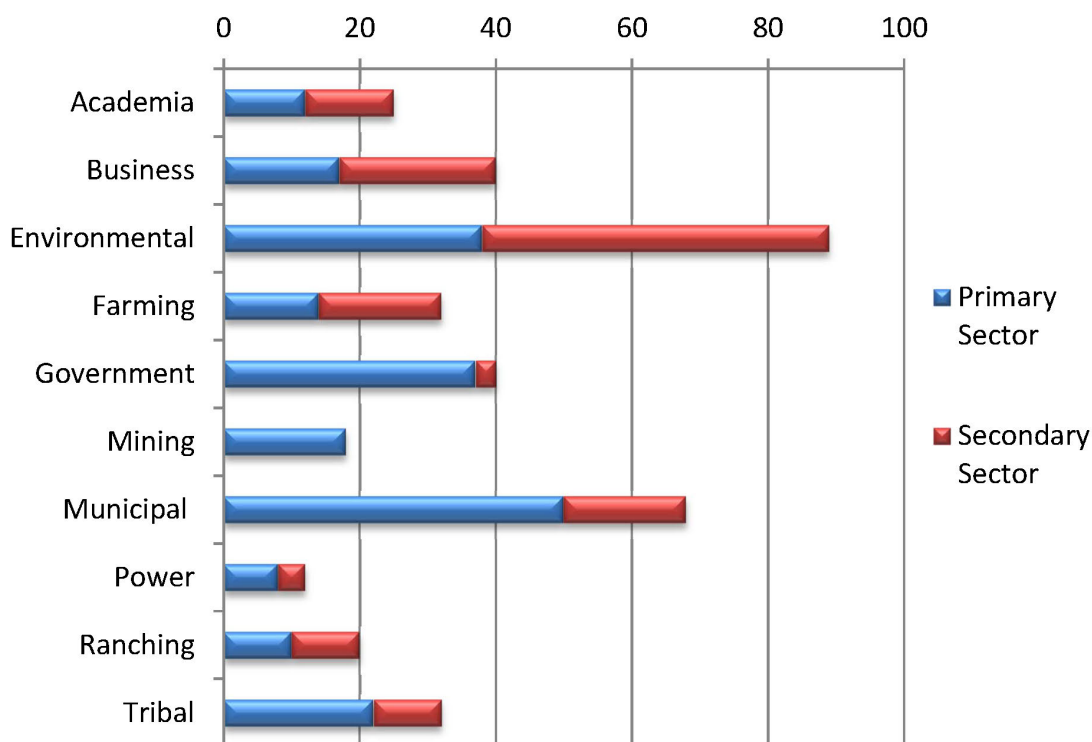
recordings were destroyed once the transcriptions were complete. Transcribed data from the focus groups were analyzed using NVivo software. NVivo is a qualitative data analysis computer software package produced by QSR International. The software allows users to: classify, sort, and arrange information; examine relationships in the data; and combine analysis with linking, shaping, searching, and modeling.

Of the original list of 47 high priority groups identified by at least one Steering Committee member, 41 were interviewed. Of the 47 high priority groups, 19 of the 21 groups identified by more than one Steering Committee member were interviewed. Participants spanned every county in Arizona (Figure 1) and represented many different interests in water. During review of the data, we found that responses did not vary substantially by geography, and that in many cases it would be possible to identify participants or groups if we provided their interest in water and county. As a result, the following data are reported by interest in water only.

The category of interest in water was determined by the participants themselves from a list of intentionally broad categories: academia, business, environment, farming, government, mining, municipal, power, ranching, and tribal.² This simplifies reporting and protects anonymity, but also blurred the diversity of the focus group participants. Academia included current and retired university and community college professors and staff. Participants that identified themselves as business included an independent grocery store owner, recreational tourism employees and real estate professionals. Environment included individuals from non-governmental organizations and community-based groups. Farming and ranching participants ranged from larger operations including irrigation districts to small farms and ranches. Government participants included individuals from federal and state agencies as well as county governments. Participants from mining represented hard-rock and sand and gravel operations. People from the power and municipal perspectives came from both large and small systems. Finally, tribal participants spanned multiple tribes across the state.

² When specific interests are listed in this document they will always be listed alphabetically. The order that they appear does not indicate that one had more responses than another.

Figure 2: Number of participants by their interest in water



The number of participants from each interest group varied considerably, ranging from eight to 50 participants (Figure 2). So that the concerns and ideas of one well represented interest do not overshadow less represented ones, all responses have been normalized by the number of respondents from each interest group who answered the respective questions. Interviewers asked participants to indicate both their personal and professional interest in water, as well as specifically asked them to respond to their natural resource concerns from both a personal and professional perspective. Asking participants to think in terms of professional and personal interests in water was done in part to determine if personal answers were distinct from professional ones. In many cases participants indicated more than one interest (Figure 2) and combined personal and professional thoughts in their responses. This highlights the difficulty in putting the responses from a participant into a single category, and the fact that many interviewees span multiple interests themselves. For example, some participants identified as business people and farmers or tribal members and environmentalists. Furthermore, some participant's personal perspectives can differ from their professional ones. Most of the participants provided their professional affiliation first and answered the questions predominately in their professional capacity. Although it is impossible to determine if all comments made were from a personal versus professional standpoint, to the extent possible we have separated the two perspectives in our analysis. Responses specifically identified as being from a personal perspective have been removed from the information presented because they were not robust enough for separate analysis. The results presented here are from the participant-identified 'primary' interest in water, and are assumed to be their professional affiliation, and where it was possible to determine, only the responses from participant's professional perspective are included.

Future Water Use

Eight of the 10 interest groups and 52% of all respondents anticipate an increase in their future water use (Figure 3). Twenty-five percent of respondents anticipate maintenance in their water use with only 14% anticipating a decrease. The only groups that did not anticipate an increase in water use are ranching and tribal.² Nine percent of respondents stated that all water use scenarios are possible, depending on circumstances. Many respondents cited improved efficiency as the driver behind anticipated “decrease” or “maintenance” in water use. Of the respondents who indicated they would maintain or decrease their current water use, 37% discussed increased efficiency. This included participants from business, farming, mining, municipal, power, and ranching perspectives. These participants noted that while their per-unit water use would decrease they will use any savings to support increased population, acres farmed, or output.

Seventy-seven percent of all respondents answered “yes” when asked if they are concerned about water security in their area of interest (Figure 4). Those concerned spanned all interests interviewed with all tribal and ranching perspectives agreeing that it is a concern. Mining expressed the least concern for water security, with 46% of the mining respondents answering “no” they are not concerned. Available water supply emerged as the main reason for water security concerns with respondents citing water quality, climate change, increasing human demand, neighboring populations, and cost. To a lesser extent, acts of terrorism that impact available water supplies or water delivery mechanisms were also a water security concern.

Figure 3: Responses by primary sector to the question: How do you plan to use water in the future? Do you anticipate an increase, decrease, or maintenance in your water use? Responses are normalized by the number of respondents in each sector who answered the question.

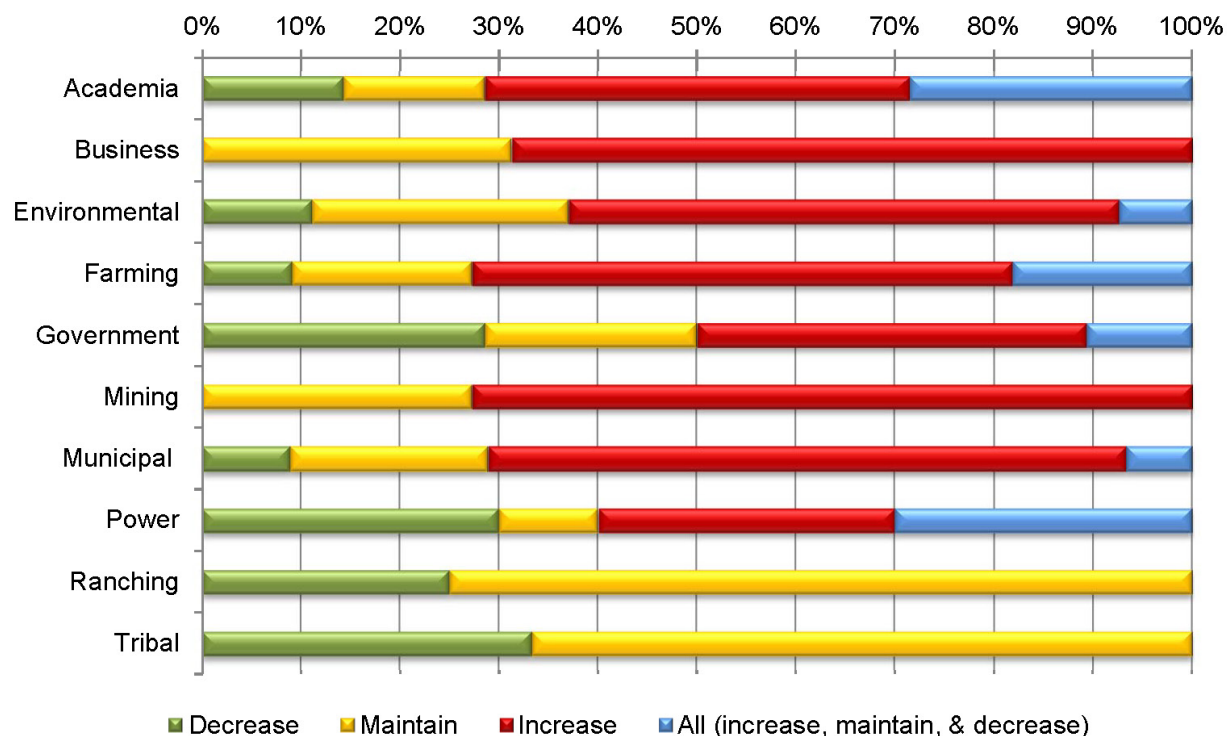


Figure 4: Responses by primary sector to the question: Are you concerned about water security? Responses are normalized by the number of respondents in each sector who answered the question.



Natural Resources Concerns

Water was the chief natural resource concern identified by participants. This result is not surprising given that the individuals interviewed were predominantly water professionals and individuals who depend upon a reliable supply of water for their livelihood. The word cloud of responses (Figure 5) displays the concerns indicated by three or more participants where larger text indicates a word was said more frequently.

Aside from water, other frequently mentioned natural resource concerns were forests, air, land, rivers, energy, riparian areas, agriculture, coal, and groundwater. Figure 6 shows these concerns by interest group. Aside from water, which was a concern cited by 95% of participants, only land was indicated as a concern for over 5% of the participants in all interest groups. Common concerns shared by 20% or greater of the group participants included minerals (mining and tribal), land (farming, power, and tribal), rivers (academia, environment, and farming), groundwater (environment and municipal), and coal (power and tribal).

Considering Water for Natural Resources

The majority of time in each focus group was spent discussing how participants think Arizonans should be considering water for natural areas. All 10 groups identified water conservation and efficiency, cooperation, and financial incentives as ways that they are either considering water for the benefit of natural resources or ways that would make it more

Figure 6: Natural resource concerns by their primary interest in water. Thickness of line indicates the percent of participants from each interest who indicated the natural resource as a concern, e.g., 44% of participants from the mining perspective indicated that minerals were a concern. Water was overwhelmingly indicated by all interests and is not included here. Table to the right shows concerns noted by 20% or more of more participants from each interest. Responses are normalized by the number of respondents in each interest group who answered the question.

Natural Resource	Sector \geq 20%
Forest	Government
Minerals	Mining, Tribal
Air	Tribal
Land	Farming, Power, Tribal
River	Academia, Environment, Farming
Groundwater	Environmental, Municipal
Coal	Power, Tribal

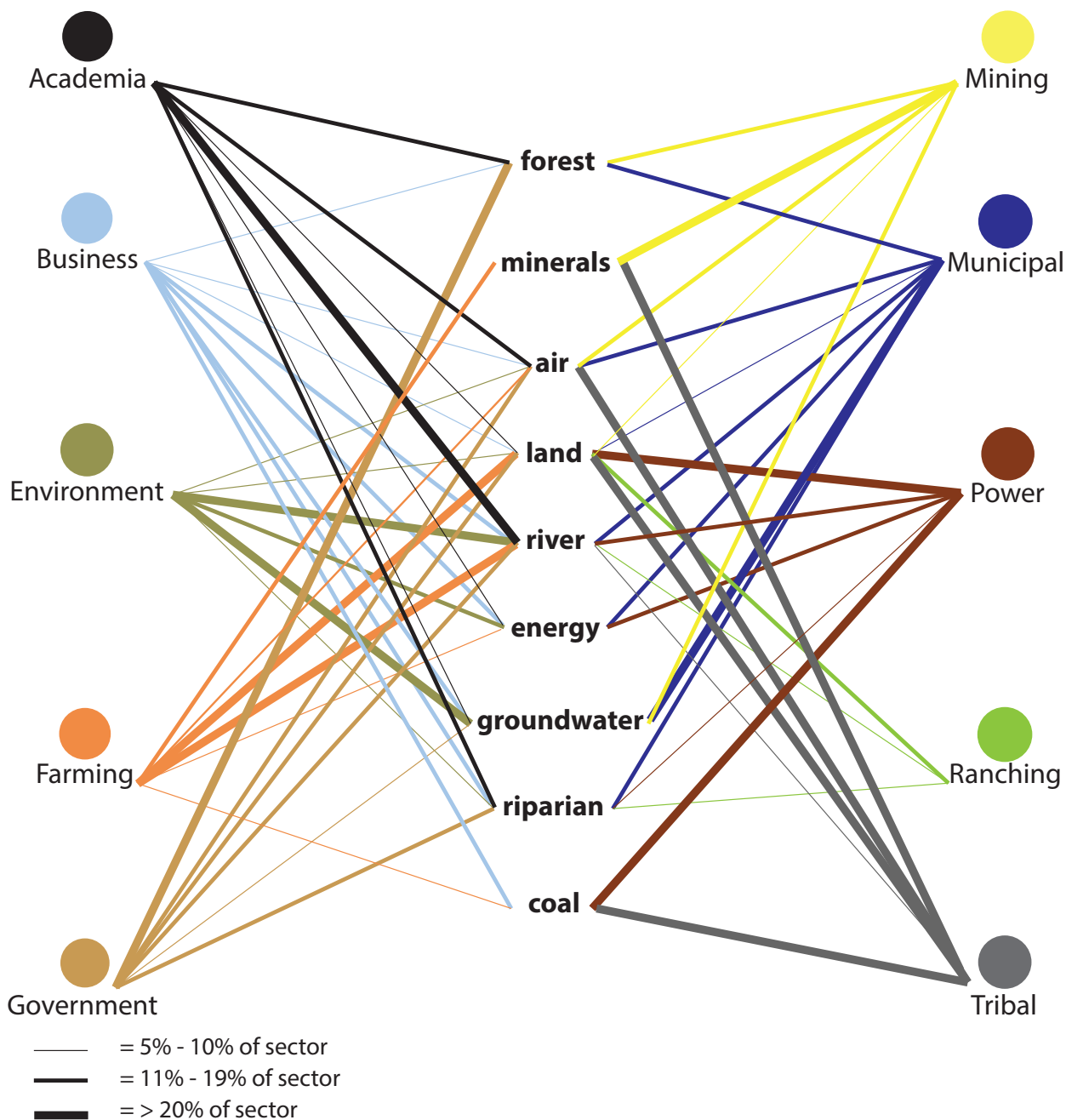


Table 2: Themes identified in response to the questions: If you were to consider water for the benefit of natural resources, how would you go about it? and What would make considering water for natural resources attractive to you? Themes are color coded based on the number of interest groups that mentioned each theme.

Themes	% of Participants Who Discussed the Theme
Conservation and Efficiency	23%
Cooperation	16%
Education	15%
Financial Incentives	15%
Environment as a Water User	14%
Priority Setting	14%
Understanding Value of Water	13%
Multiple Uses for Water	13%
More Regulation/Laws Needed	10%
Water Resources Planning	10%
Flexible Regulation Needed	8%
Policy Incentives	8%
Restoration of Habitat	8%
Public Support	8%
Groundwater and Surface Water Connection	7%
Human Needs Come First	7%
Need to Improve Permitting	6%
Need to Understand Science	6%
Infrastructure	6%
Cost of Water	5%
Funding	5%
Forest Health	5%
Balanced Water Budget	5%
Trading Water	5%
Existing Regulation is Sufficient	4%
Need Less Regulation	4%
Voluntary	4%
Fairness	4%
Publicity	3%
Technology	3%
Local Solutions	3%
Green Infrastructure	3%
Involvement of Elected Officials	2%
Limit New Water Uses	2%
No Natural Resources to Manage	2%
Water-Energy Nexus	1%

Number of interest groups discussing the theme

1-3
4-5
6-7
8-9
All Interest Groups

The diversity of themes, and the fact that no one theme was discussed by a majority of the participants, demonstrates a wide range of ideas on how we should consider water for natural areas and a lack of consensus on the subject. While some of these themes will be discussed separately in the pages that follow, it is important to remember that many, if not most, themes are interrelated. For example, conversations about using water for multiple uses were frequently followed by thoughts on conservation and cooperation; discussions about understanding the value of natural resources were often integral to a conversation on education, priority setting, and planning.

How do you currently consider water for natural resources?

As part of their response to the question, representatives from all interest groups expressed that they already consider water for natural areas in some aspect of their management and planning decisions. The methods and extent of consideration for natural resources varied widely, even among interest groups. Municipal respondents, for example, discussed increased conservation, utility customer education, and aquifer recharge as ways they already consider water for natural areas. Government entities cited the legal protections given to select Arizona species with one agency explaining that “[considering] water for natural resources is at the source of what we do...without it, we don’t have natural resources in the state of Arizona to manage”. Farming participants highlighted their increased efficiency via technological improvements, such as lining canals and drip irrigation, and that runoff/seepage from their fields aids riparian species. Similarly, ranching participants called attention to how their livestock ponds provide critical water resources and habitat to rangeland species.

How should we consider water for natural resources?

The most common themes that emerged from responses to “how should we consider

water for natural resources” were cooperation and multiple use, conservation and efficiency, and priority setting. Figure 7 shows the top 10 themes in response to this question and the percent of respondents in each interest group that discussed the theme. Figure 8 offers select participant responses on allocating water to natural areas; a closer look at what was said regarding cooperation (Figure 9); conservation and water-use efficiency (Figure 10); and priority setting (Figure 11) can be found in the pages that follow.

Although not directly asked, 20% of participants talked about their perspectives on allocating water to natural areas in response to this question. Of those who discussed their perspectives, 31% felt that it was key to consider human uses first. On the other hand, there were also participants who felt strongly that the intrinsic value of natural areas should be recognized. Participants from government, environment, and tribal interests were more likely to discuss the intrinsic value of natural areas whereas those from mining, farming, and ranching more frequently discussed meeting human needs first. Participants from municipal interests who discussed allocation of water to natural areas were split 50/50 on if humans or natural areas should receive preference. The fundamental difference between these views gets to the heart of the difficulty in conversations about water for natural resources.

Figure 7: Themes by interest group in response to the question: If you were to consider water for the benefit of natural resources, how would you go about it? Responses are normalized by the number of respondents in each interest group who answered the question.

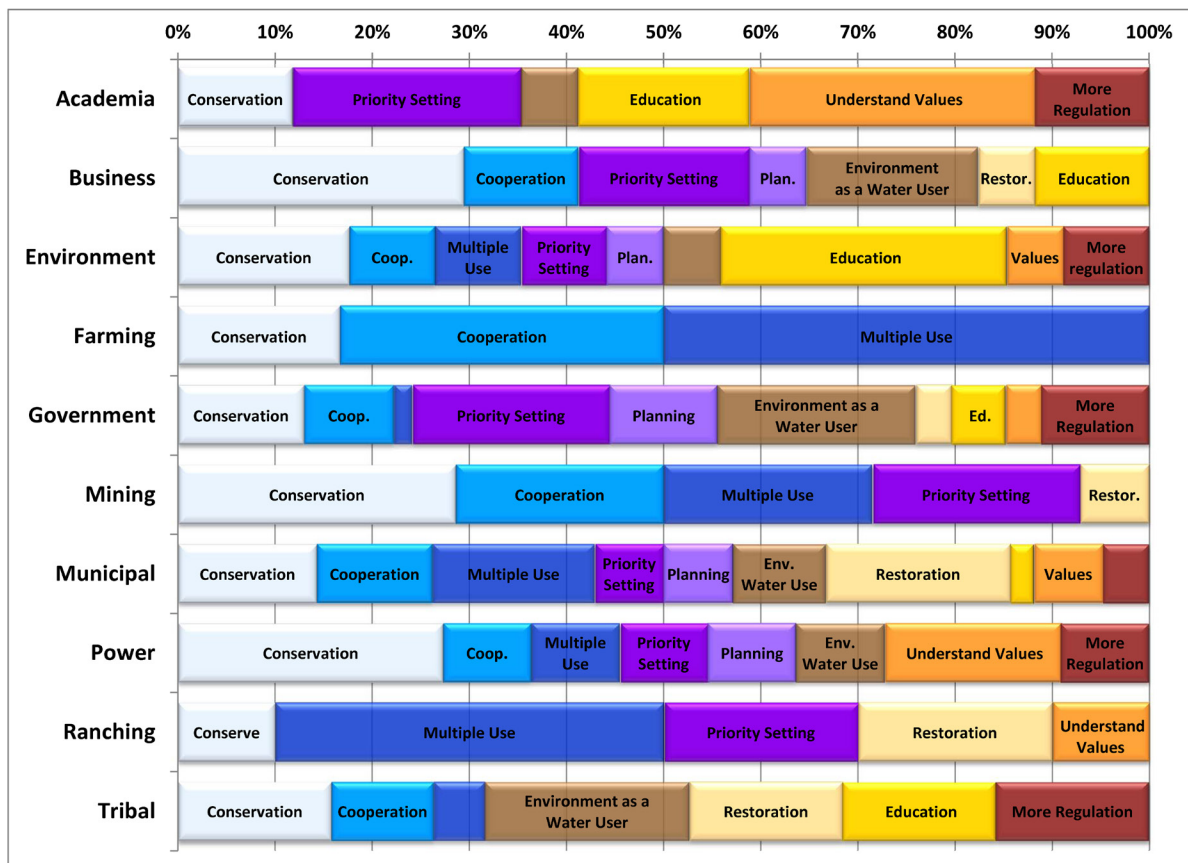


Figure 8: Selected participant perspectives on allocating water to natural areas

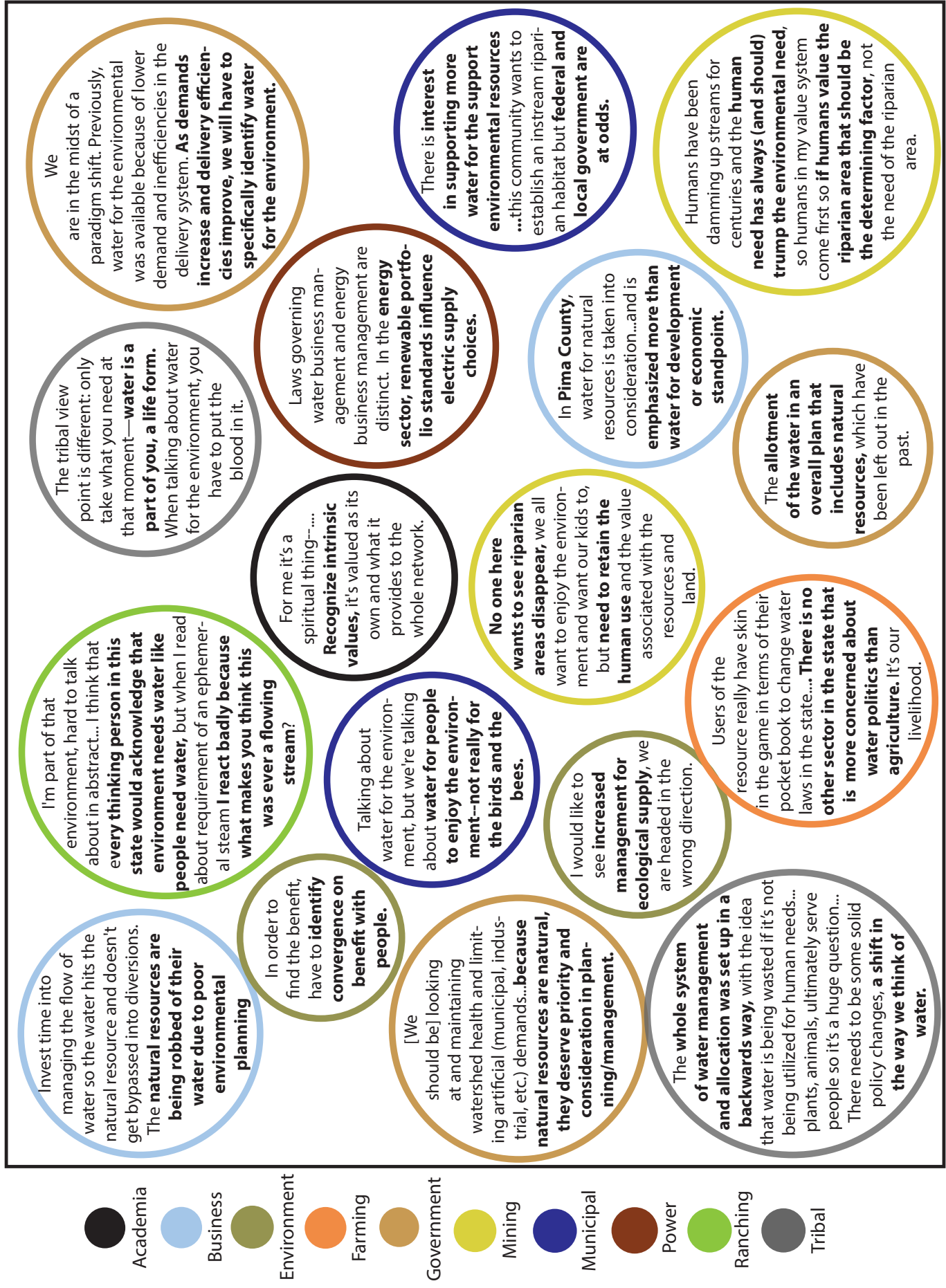


Figure 9: Selected participant perspectives on the common theme of Cooperation



Participants from eight of the 10 interest groups indicated that cooperation was one way we *should* consider water for natural areas, and all but academia discussed cooperation and/or multiple uses, which are often intertwined. In discussions about cooperation, 47% of people discussed the importance of partnerships and 34% discussed equity (Figure 9). Interestingly, at separate focus groups participants from farming, mining, municipal, and ranching interests conveyed the concern that they felt like *they* alone were required to give up their water for natural areas while other interest groups did not have to sacrifice. Moving forward, it is important to foster partnerships designed to make sure that when water is provided to natural areas it is done fairly across water users.

Conservation and water-use efficiency were mentioned by at least one participant from every interest group in response to the question “how should we consider water for natural areas”? Conversations about water-use efficiency demonstrated differences in the perception of efficiency between interest groups (see Figure 10). Participants in the farming, mining, power, and ranching interests emphasized that water is a key economic ingredient to their operations. These participants noted that the expense of water means that they are already quite efficient, because to do otherwise would harm their bottom-line. On the

other hand, participants in the business, environment, government, and municipal interests noted that agriculture in particular is inefficient, and should be required to use less water. While conservation and efficiency were common themes, less than 11% discussed ways to ensure that conserved water goes to natural areas. Of those individuals who did discuss it, the most common suggestion was through policy changes that require conserved water be dedicated to natural areas.

A number of participants highlighted the need to think critically about when and where Arizonans provide water for natural areas (Figure 11). Discussions of priority setting, and the related topic of planning, highlight a key finding. No one interviewed in this study said that Arizona should not allocate at least some water to natural areas. There were, however, participants who were very concerned about *how* water is allocated to natural resources. Of those who discussed priority setting, 70% voiced concerns about providing water to natural areas arbitrarily, i.e., without priority setting and/or adequate understanding of how much water the flora and fauna need.

Figure 10: Selected participant perspectives on the common theme of Conservation and Water-Use Efficiency



Figure 11: Selected participant perspectives on the common theme of Priority Setting

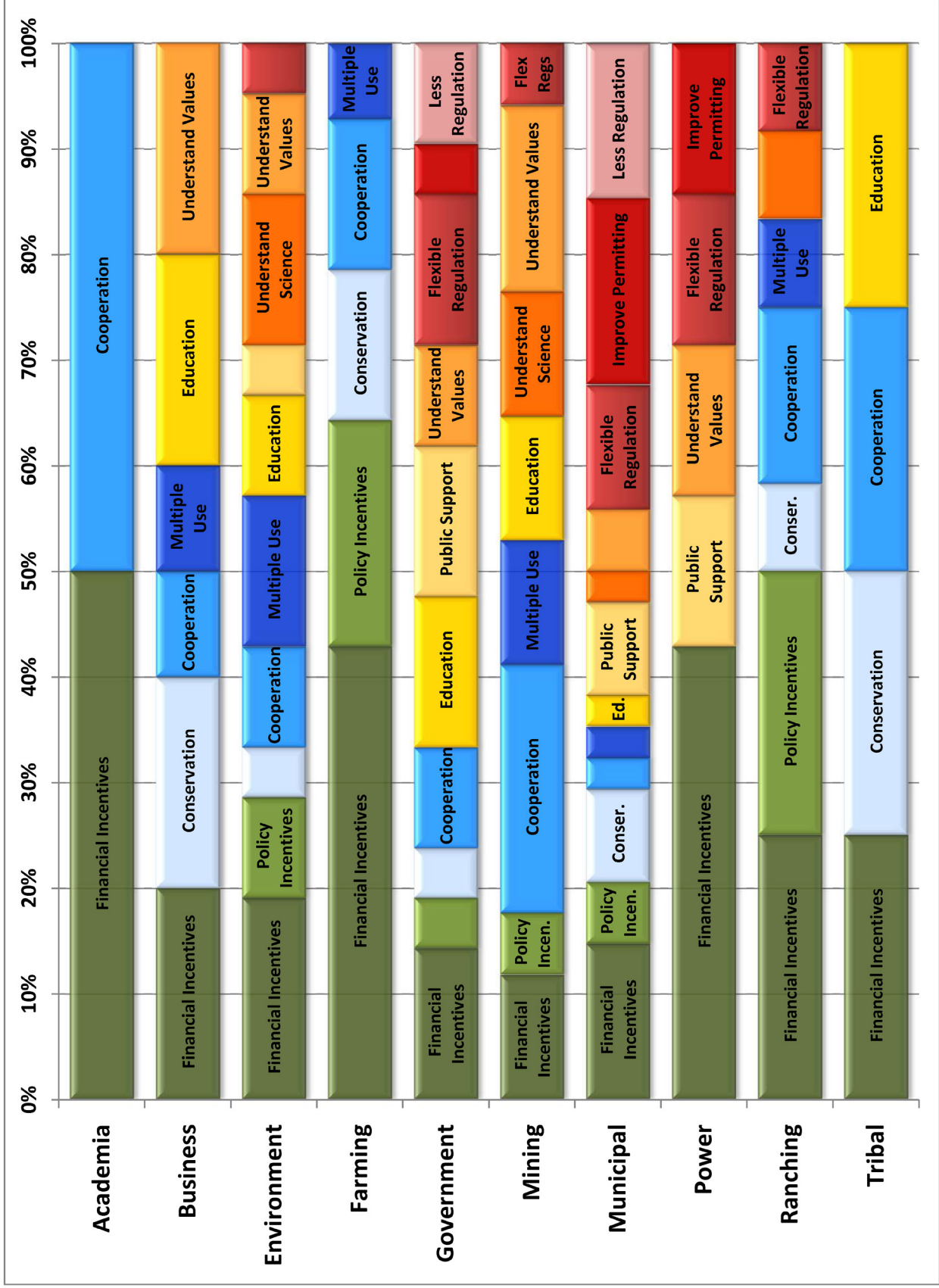


What would make consideration of water for natural areas more attractive to you?

When asked “what would make considering water for natural areas attractive”, conversations centered on incentives (financial and policy), cooperation, conservation, multiple use, education, public support, understanding (science and values), and regulations (flexible, improved permitting, or reduced) (Figure 12). All interest groups expressed that financial incentives, such as project subsidies or credits for improvements, would make considering water for natural resources attractive. Figure 13 offers select perspectives on the type of financial and policy incentives participants felt would make considering water for natural areas more attractive.

Despite the premise that the Roadmap is seeking to identify voluntary actions for providing water to natural areas, six groups expressed the idea that regulatory measures are needed to make consideration attractive. Municipal and government respondents were the primary parties interested in reducing current regulations and improving permitting. Establishing flexible regulations was of interest by environment, government, mining, municipal, power, and ranching participants. Proposed changes included revisions to the Endangered Species Act and Section 404 permitting of the Clean Water Act to allow for more flexibility

Figure 12: Themes by interest group in response to the question: What would make considering water for natural resources attractive to you? Responses are normalized by the number of respondents in each interest group who answered the question.



depending on circumstances; exemptions from long-term required maintenance of artificially created habitat; provisions for helping with environmental compliance documents, such as permit applications; and credits for ‘creating’ a new water source or making additional water available for natural areas.

In addition to incentives, participants from seven interest groups discussed the need for increased understanding, either in terms of the science used to describe the water needs of natural areas or the values humans place on natural areas, to create a level field for discussing the consideration of natural areas. Similarly, seven groups brought up the need for education. Proposed “education” topics varied among the interest groups (Figure 14) and included determining consistent definitions and language, such as what “water for natural areas” means, and how information should be disseminated, such as course curriculum or informational campaigns. Conversations also included who should be the audience for an educational program. No consensus was reached, even among participants from the same interest group, regarding who should be the primary target. Options considered included educational outreach to youth, general public, water managers, and policy makers with each category regarded as important for their unique ability to affect change.

Figure 13: Selected participant perspectives on the common theme of Incentives



Figure 14: Selected participant perspectives on the common theme of Education

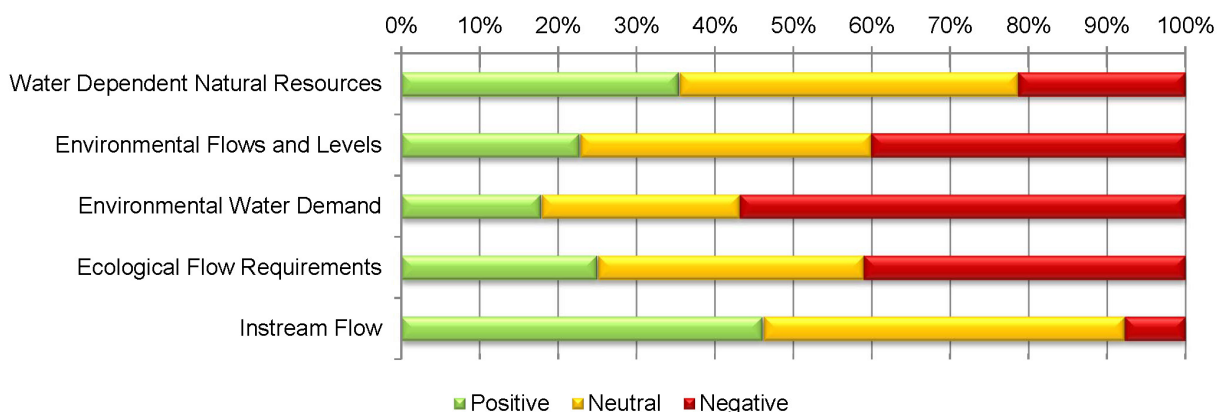


Talking about water for natural areas

What is your reaction to the following terms?

At the end of each focus group, participants were asked to give their initial reaction to five terms frequently used to talk about water for natural areas. They were not provided any context for the phrases or definitions. The phrases were chosen in consultation with the Steering Committee and included: water dependent natural resources, environmental water demand, instream flow, environmental flows and levels, and ecological flow requirements. Water dependent natural resources is a phrase created by the environmental working group of Arizona's recent WRDC. Environmental water demand is a phrase the WRRC started using to describe water for natural areas in the same way human uses are described, e.g., municipal demand, industrial demand, etc. Instream flow was chosen because of the water rights structure in Arizona that provides for water to remain "in stream" for non-consumptive use. Environmental flows and levels is language used to describe the water needs of natural areas in flowing streams and in groundwater levels. Finally, ecological flow requirements is a term used in the South African national law, which discusses allocating water for basic human flow requirements and ecological flow requirements first, and then allows water to be used for other purposes.

Figure 15: Responses to the question: What is your reaction to the following terms?



Of the five terms discussed, no proposed terminology for describing the concept of providing water to natural areas was overwhelmingly accepted by focus group respondents. (Figure 15) The most disliked phrase was “environmental water demand” with 57% “negative” responses followed by “ecological flow requirements” at 41% “negative”. Forty-seven percent of respondents expressed that they had a “negative” reaction to these terms because saying that natural areas “demand” or “require” something implies a mandate, not a choice and that the level of demand cannot be changed depending on future circumstances. “Instream flow” might have been the most favored in terms of number of responses, but during discussion of the terms, those that had a “negative” reaction to instream flow had a very strong negative reaction. Even among those favoring “instream flow” to the other terms, including academic, environment, and tribal perspectives, it was noted that it is not descriptive enough because it does not include groundwater. By interest group, the most “positive” responses to the five terms came from environment or tribal participants; farming or ranching participants had the most “negative” responses. Details on each interest groups response to each term is shown in Table 3.

Despite not being able to come to an agreement on the five proposed phrases, respondents from environment, farming, municipal, ranching, tribal, and other interests agreed that when talking about providing water to natural areas one should just “say what you mean”. In trying to appease multiple audiences, terminology is invented that is either too complicated or too watered-down to convey a concept. Many respondents agreed that this can lead to confusion or distrust and prevent progress. Another common theme across the responses was that their interpretation of these terms and others will depend heavily on the context in which it is stated and who they are hearing the term from. This was illustrated in the conversations that followed focus group meetings as once the origin of the terminology was described, participants tended to be more neutral or positive towards them. Multiple participants noted that if they heard one of these terms from a colleague or trusted contact they would be more likely to react positively or maintain an open mind versus if the term was presented to them by an organization that they viewed as opposing their interests.

Table 3: Responses by sector to the question: What is your reaction to the following terms?

	Water Dependent Natural Resources			Environmental Flows and Levels		
	Positive	Negative	Neutral	Positive	Negative	Neutral
Academia	56%	11%	33%	11%	44%	44%
Business	20%	20%	60%	13%	53%	33%
Environmental	52%	18%	30%	50%	16%	34%
Farming	15%	38%	46%	0%	69%	31%
Government	21%	16%	63%	37%	32%	32%
Mining	56%	25%	19%	19%	75%	6%
Municipal	27%	22%	51%	11%	36%	52%
Power	13%	25%	63%	0%	25%	75%
Ranching	38%	25%	38%	22%	56%	22%
Tribal	58%	17%	25%	100%	0%	0%

	Environmental Water Demand			Ecological Flow Requirements			Instream Flow		
	Positive	Negative	Neutral	Positive	Negative	Neutral	Positive	Negative	Neutral
Academia	22%	67%	11%	22%	22%	56%	33%	0%	67%
Business	7%	73%	20%	13%	67%	20%	33%	7%	60%
Environmental	41%	44%	16%	53%	13%	34%	66%	9%	25%
Farming	0%	92%	8%	8%	69%	23%	38%	15%	46%
Government	22%	39%	39%	37%	21%	42%	63%	0%	37%
Mining	0%	50%	50%	6%	56%	38%	25%	0%	75%
Municipal	11%	67%	22%	18%	50%	32%	50%	5%	45%
Power	0%	38%	63%	0%	50%	50%	50%	0%	50%
Ranching	13%	63%	25%	11%	56%	33%	0%	56%	44%
Tribal	50%	30%	20%	100%	0%	0%	50%	0%	50%

Conclusions - Problems, Prospects, and Parallels

Problems

In most focus group meetings, participants discussed problems or obstacles to providing water to natural areas. Discussions centered on unintended consequences, variability of water needs for natural areas, and a lack of funding and political will. People who discussed the unintended consequences of regulation expressed frustration over laws that were meant to protect people and natural resources but ended up pitting people against each other or providing disincentives. One participant noted that “the Endangered Species Act falls short in protecting habitat versus species and it puts people in an adversarial role,” and another said that there is a “disincentive to conserve or discharge water [because we are] penalized for doing that, and so there is an incentive in a water short state to waste water and not release it to the environment.” Mining, municipal, and ranching participants further expressed concerns that such a release may create habitat that they would then be legally responsible for maintaining.

Other unintended consequences revolved around the management of federal lands, particularly related to forests and land use. One participant noted that there are “instances when land management and wildlife agencies have precluded use of lands and unintended consequences caused trees to grow, water to dry up, and it didn’t benefit the natural resource at all.” Others were concerned with the unintended consequences to natural areas when recreation becomes popular--on the one hand, it is likely that those resources, and water for them, will be more highly prioritized; however, on the other the resource

“We can’t guarantee that the same amount of water will be available every year, it’s not consistent in history so [we] need a way to recognize the variance.”

could be “loved to death.” Finally, a few people noted the importance of thinking about the future unintended consequences of new technologies, especially as related to the use of reclaimed water.

Participants also noted that future unintended consequences could be avoided by recognizing the variability in water availability and variable water needs for natural areas. Much like the discussion of the need for flexible regulations, participants noted that we “can’t

guarantee that the same amount of water will be available every year, it’s not consistent in history so [we] need a way to recognize the variance [in our management].” This variability in supply and demand makes it even harder to set quantities for the environment, and perhaps makes collaboration and cooperation across different interest groups even more critical.

A lack of funding for conserving water, maintaining watersheds, and planning for the future were all discussed as obstacles to providing water to natural areas, as was the lack of interest from decision makers in either providing funding or changing laws that would make considering water for natural areas easier. One participant noted “in the well-established mindset in the legislature we’re not going to achieve recognition of the groundwater/surface water connection, but we can start to change public mindset.”

Prospects

Although there was considerable discussion of problems, participants also discussed prospects and ideas for the future. Ideas for moving the conversation forward regarding water for natural resources included pilot projects that can be “leveraged to show that different and disparate groups have come together to find opportunities” and local solutions. This sentiment echoes those of many others in discussions of cooperation and finding ways to use our resources for multiple uses. Numerous participants also emphasized that we should broaden the way we think about natural areas beyond the idea of wilderness or protected areas and look to the habitat created in our cities, towns, and managed lands. Municipal water providers talked about created wetlands and one business sector participant discussed the birds in his backyard and ducks on the golf course. Farming and ranching sector participants discussed the use of stockponds by wildlife and the benefits of return flow to streams and washes that would otherwise be dry.

Specific ideas discussed by participants included:

- Creating an “Environmental Active Management Area” where surface water and groundwater were conjunctively managed, adjudication was complete, and the goal is to preserve environmental flows.
- Voluntary tools through water lease agreements that could be used to keep water in rural areas and sustain/enhance environmental flows.
- Instream flows sever and transfer transactions.
- Using modern water-saving technologies in new power plants, homes, and businesses.
- Creating groundwater recharge barriers to keep rivers flowing.

“[There is a] disincentive to conserve or discharge water to the environment [because we are] penalized for doing that, and so there is an incentive in a water short state to waste water and not release it to the environment.”

- Allowing water-users to “keep” their conserved water and sell it or use it for whatever purpose they see fit.
- Working with permitting agencies to relax requirements when there is an environmental benefit.
- Looking to traditional tribal practices as a guide for how to live in our arid environment.

Parallels

The challenge of this project is to determine where the perspectives from different water-using groups align and where they diverge. One way to look at similarity is to see how close participant answers are to each other through a cluster analysis of the words they used. In a cluster analysis, sectors that have a higher degree of similarity based on the occurrence and frequency of words are clustered together, and those that have a lower degree of similarity based on the occurrence and frequency of words are displayed further apart.³ The degree of similarity, or correlation, between the responses can then be measured using a Pearson correlation coefficient where values greater than 0.7 indicate some similarity and values over 0.9 are highly correlated.

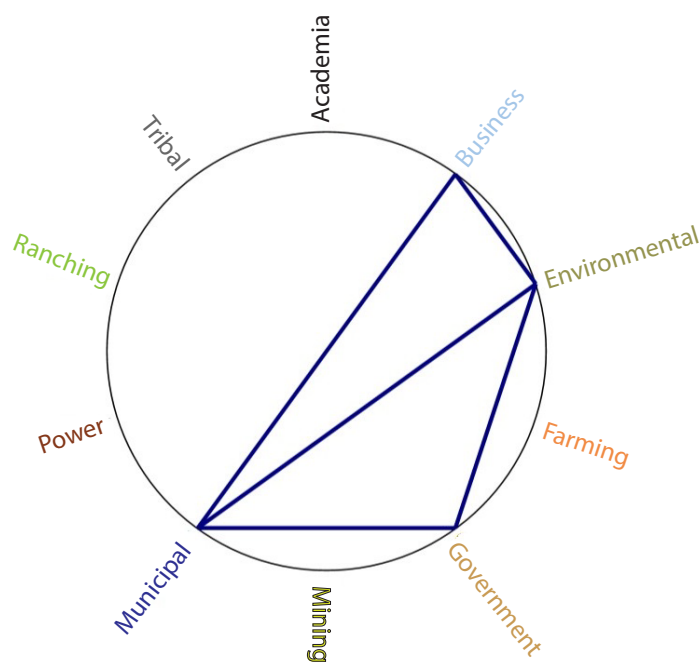
Figure 16 shows circle graph diagrams and Pearson correlation coefficients (P-values) for the words used by each sector in our focus groups. All respondents had some similarity in their responses, but that only four sectors were highly correlated. On the circle graph blue lines indicate similarity. Interestingly, not only are all sectors similar in the words they use at >0.7, no water using sector used words considered to be significantly dissimilar, i.e., antonyms. The >0.7 correlation between the words used by all sectors is because all respondents from all sectors said the word water at least once during the focus groups. When the word water is removed from this analysis only the four most highly correlated sectors remain connected at a >0.7 P-value.

This analysis shows how all of the different sectors related to each other. It can also be informative to look at a cluster analysis through a dendrogram, which is a branching diagram where similar items are clustered together on the same branch and different items are further apart. Dendrograms can be useful for comparing pairs of items. Because all sectors are related through their use of the word ‘water’, for the dendrogram shown on Figure 17 the word ‘water’ was excluded. This dendrogram shows that conversations with mining and power were more similar to one another than conversations with academia, business, environment, government, or municipal sectors. Finally, it shows that conversations with farming, ranching, and tribal groups were generally dissimilar from discussions with the other seven water-using groups.

Perhaps the most interesting aspect of using cluster analyses to examine focus group responses is that they confirm in a scientific way what we as listeners to the conversations heard. As we listened, we certainly felt like participants from some sectors, such as government and environment, were saying similar things, but could not confirm this without these types of analyses. There are, however, aspects of these focus group interviews that cannot be captured by an algorithm. One example is the passion that all of the people we spoke to have for sound water management and for our state. While we may disagree about how or why we manage our water resources, this exercise makes it clear that all agree that we *should* manage them. These focus groups bring some clarity to goals of determining how perspectives with regards to water for natural areas of different groups

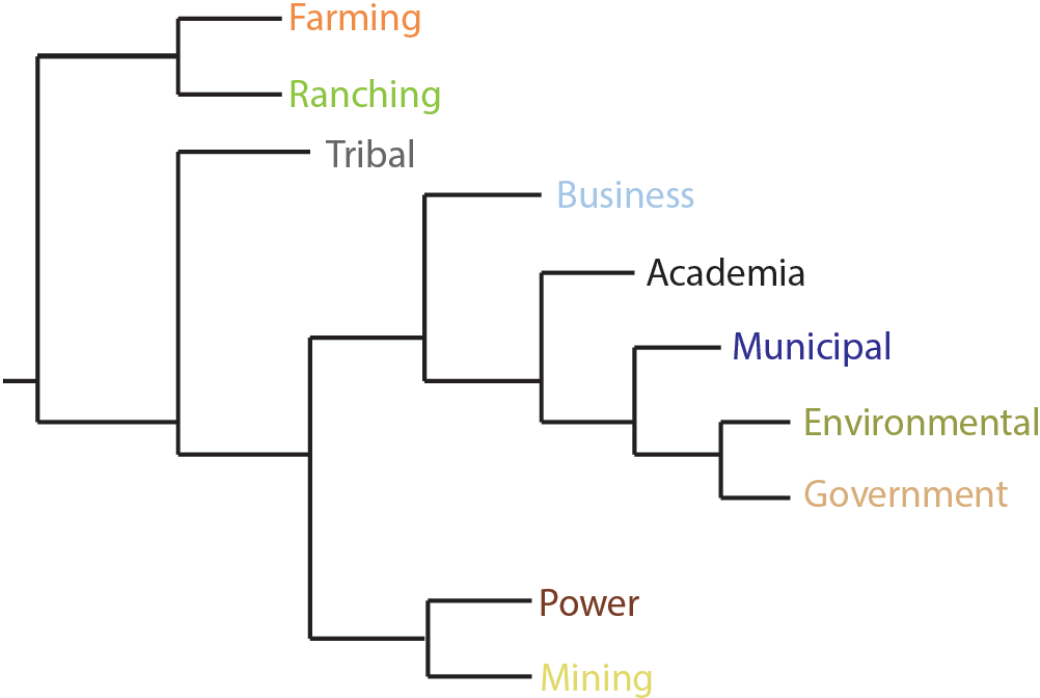
³ Using the calculated similarity index between each pair of items, NVivo groups the items into a number of clusters (10 by default), using the complete linkage (farthest neighbor) hierarchical clustering algorithm.

Figure 16: Similarity of words used between interest groups to describe natural resource concerns, water use plans, how we should consider water for natural resources, what would make the consideration of water for natural resources more attractive and discussion of terminology. Circle graph show interests whose responses are correlated at >0.90 P-value.



Sector 1	Sector 2	Pearson correlation coefficient
Municipal	Environmental	0.940
Municipal	Government	0.936
Government	Environmental	0.936
Environmental	Business	0.915
Municipal	Business	0.909
Environmental	Academia	0.900
Government	Business	0.888
Municipal	Academia	0.881
Farming	Environmental	0.877
Government	Academia	0.874
Municipal	Farming	0.872
Tribal	Environmental	0.869
Power	Municipal	0.867
Power	Government	0.867
Mining	Government	0.864
Tribal	Government	0.863
Municipal	Mining	0.863
Tribal	Municipal	0.858
Mining	Environmental	0.858
Government	Farming	0.855
Farming	Business	0.851
Business	Academia	0.848
Power	Environmental	0.842
Power	Business	0.830
Tribal	Business	0.829
Power	Mining	0.829
Ranching	Environmental	0.826
Ranching	Government	0.825
Power	Academia	0.823
Tribal	Academia	0.820
Mining	Business	0.820
Ranching	Municipal	0.816
Mining	Academia	0.815
Tribal	Power	0.812
Ranching	Farming	0.806
Mining	Farming	0.806
Farming	Academia	0.805
Power	Farming	0.804
Tribal	Mining	0.804
Tribal	Farming	0.803
Ranching	Power	0.801
Ranching	Academia	0.796
Ranching	Business	0.795
Ranching	Mining	0.793
Tribal	Ranching	0.766

Figure 17: Dendrogram showing similarity between water-using sectors based on the words they used during focus group meetings.



vary and how they agree. The challenge moving forward then is to figure out the places where we can capitalize on the similarities, such as a desire for efficiency, multiple use and cooperation, and not focus more than we have to on our differences. As the WRRRC and our Steering Committee move forward with the Roadmap through regional conversations on recommendations and action items, we will be looking for examples of existing cooperation and avenues for new partnerships. We all need to recognize that working on solutions is not a quick nor easy process, but as one participant noted on the subject, “something faster than the Gila River Adjudication would be nice.”

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