

TRANSCRIPT OF SEPTEMBER 17, 2008

List of Presenters:

1. Rob Marshall, The Nature Conservancy
2. Julian Fonseca, Pima County Natural Resources
Parks and Recreations Department

**Presenter #1:
ROB MARSHALL, THE
NATURE CONSERVANCY:
ENVIRONMENTAL NEEDS FOR
WATER**

CHAIRMAN JIM BARRY: Now we move on to - I got the presentations: Environmental Needs for Water. And the first presenter is Rob Marshall, who's the Director of Science for the Nature Conservancy in Arizona. He's been with the Nature Conservancy since 1997, oversees the work of nine Staff, supports the Land and Water Protection efforts and works with private and public partners in developing science to support effective land manage- - land and water management.

Prior to joining the Nature Conservancy, Rob was a biologist with the U.S. Fish & Wildlife Service and U.S. Forest Service, obtained his Master's in wildlife ecology from the School of Forestry and Environmental Studies at Yale University, and he's a member of the Pima County Conservation Acquisition Commission. Rob, thank you very much. And you've got 30 minutes, and the Committee has directed me to remind you when you've got 15 minutes left and ten minutes left and five minutes left and, when you have nothing left, we'll cut you off.

MR. MARSHALL: All right. Thanks, Jim. Good morning to all and thank you for the invitation to come and speak this morning. As I was mentioning to Jim, I'm an early riser, whether I want to be or not, so this is no problem for me to come out this early, but I'm really impressed with the commitment of this Committee to make the effort, because I'm sure some of you are not early risers. So, I was asked to talk about Environmental Water Needs and to give you a statewide perspective, and then Julia Fonseca is going to zoom into Pima County. So, the topics that I'm going to cover today are really to show you some data that we've been working with over the last

Topics Covered

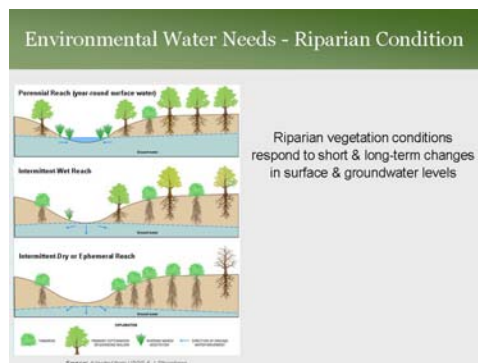
- ✓ Environmental needs for rivers, wildlife, and riparian habitat
- ✓ Relationship between land use & water availability
- ✓ Priority mechanisms for land & water protection



mechanisms available that are used for land and water protection.

But, I want to start by reminding us all that our river and riparian systems provide a number of services to us for free, and they also have a number of values. Some of those services include provision of drinking water, and water to irrigate our agricultural crops. They purify our wetlands and our water and they also recharge our aquifers that supply our groundwater sources.

Our riparian systems, of course, sequester carbon; they provide oxygen; they filter the air; they provide lots of recreation opportunities. And here in the southwest, in particular, they are very, very valuable for wildlife. And you can imagine we live in an arid environment and so you come into these areas that a sudden you have vegetation, you have lots of space, and are very important really harbor an disproportionate State's wildlife, smaller areal have a lot of they're very small acreage-wise, but they harbor a disproportionate share of the State's wildlife, so they're very important from those standpoints.



have water, all of lots of have lots of food, cover, you have so these systems in the fact they inordinate or amount of the given their extent. You don't riparian areas,

You know, often in the past, when we've talked about conservation of these resources, it's really been framed as protecting nature from people, but when you think about it from the standpoint of they provide service to us, they provide it

for free, and those services we have to pay for if they're not there, this really becomes protecting nature for people.

Okay. So, I was asked to talk about Environmental Water Needs; this is a big topic. You can take many college courses on this, so I'm going to just give you a thumbnail and talk about a very small component of it, and it's the relationship between our groundwater and surface water and riparian condition, or riparian health. And I'm going to use this little diagram here to start us off and then I'll show you some pictures.

So, the essence here is that riparian vegetation conditions respond to changing surface and groundwater level, over both short time frames and longer time frames. And what we have in these three diagrams are the spectrum of conditions. At the top, we have a perennial river system that flows year round and has surface water in the bottom. We have an ephemeral or reach that's dry and just has flow in response to precipitation events.

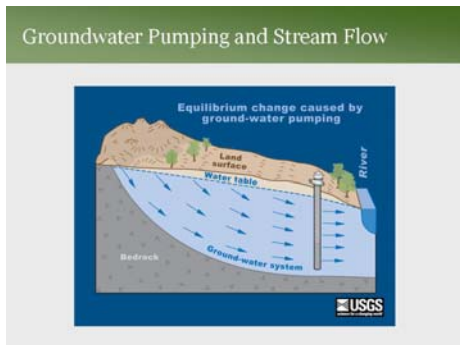
So, let's look at the characteristics in the top frame. We have flowing water, so we have an aquatic ecosystem here. We have wetlands plants. When you go up onto the banks, you have riparian trees, shrubs, lots of vegetation. You have high groundwater levels. When you get into an intermittent reach, water that only flows here we have water that only flows here we have lower groundwater tables. Obviously, you



flowing water, so you start to lose your marsh vegetation. You start to lose some of the big trees because they can't access the groundwater, your vegetation gets lower in stature, you have fewer species, less wildlife diversity. And then you get to the bottom end of the spectrum, these ephemeral reaches, where groundwater levels have dropped to the point where they can't really support the riparian trees that need saturated soil, so you get shrubs, you don't have any aquatic community, just much less diversity. So, this spectrum occurs naturally out there, but it also can be exacerbated by human activities in the floodplain, and I'll talk about those in a little bit.

To make it more real with pictures, here we have the San Pedro River just over the Catalina Mountains. This is a perennial reach, so notice we have a flowing stream; it's year-round and has its own aquatic community. It's got fish; it's got frogs; it's got all the components, detritivores and herbivores and consumers. It's a very rich ecosystem. There's a lot going on in there. You go out to the banks here, you have a lot of wetland vegetation, then notice you have this big gallery forest of native riparian trees, cottonwood, willow, and boxelder. It's a very complex system. You can see there's lots of vegetation, space, cover. The temperatures are more moderate, there's a lot of places for wildlife, and there's a lot of interaction between the organisms living here in the terrestrial side and the aquatic side. Often you have species that are only here because they rely on food that's in the water. So, it's a very complex system.

Let's go to the dry wash here. This is the Rillito River looking downstream from the Campbell Avenue Bridge. You can see this is essentially a terrestrial system. It's dry for most of the time. There's one species of vegetation here; this is desert broom. So, very little diversity. You don't have to be a biologist to see that there's going to be a lot more habitat here for wildlife than there will be here. There's also going to be a lot more of our ecosystem processes happening here - a lot of water purification; carbon sequestration, et cetera.

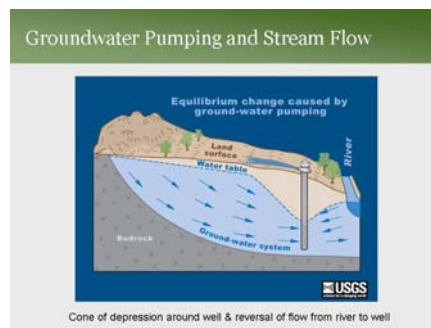


alluvial basins, or the we have here in Arizona. courtesy of the USGS.

is showing you is a

that currently has no groundwater extraction out of it. So, precipitation falls on the land surface; it infiltrates and forms the water table; it flows towards the river, gets towards the bottom of the valley and pops out as discharge into this river. So, this is what we call an "equilibrium setting."

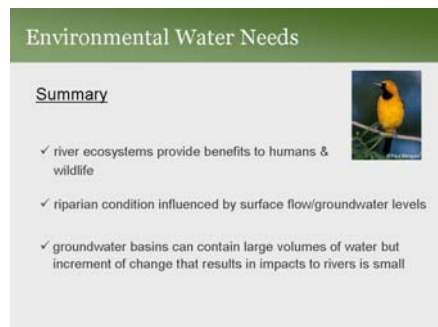
Okay. So, I mentioned to you that those scenarios occur naturally. They also can be exacerbated by human activities, and I want to walk you



through the relationship between groundwater and our river flow in our aquifers that This is And what this water table

Let's add in groundwater pumping. Here we add a pump. So, what happens here? The pump actually starts to draw down water where it creates what we call a "cone of depression," and if the pump is close enough to the river, or it's extracting enough water, it's actually going to start to capture this river flow and change the direction of water from the river back towards the well. And, as it does that, it starts to draw down the water and, over time with enough pumping, you can actually de-water a stream that way.

Why is this important? Well, Southern Arizona's aquifers - these alluvial basins - actually have lots of water, there is lots of water in these basins; it can furnish a lot of growth, at least over the short-term.



The slide is titled "Environmental Water Needs" and has a green header. Below the header, the word "Summary" is written in a blue font. To the right of the text is a small photograph of a yellow bird perched on a branch. Below the title and image, there is a list of three bullet points, each starting with a checkmark. The first bullet point says "river ecosystems provide benefits to humans & wildlife". The second bullet point says "riparian condition influenced by surface flow/groundwater levels". The third bullet point says "groundwater basins can contain large volumes of water but increment of change that results in impacts to rivers is small".

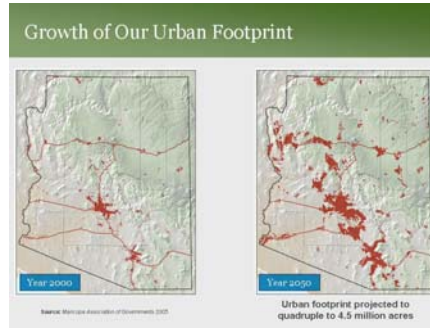
The problem is what discharges into the river is what falls from the sky on an annual basis. And so it doesn't take much impact, or it doesn't take much groundwater pumping before you start to lower this water table and affect the river flows. And this is the challenge we have in moving forward with growth where the growth will be relying

primarily on groundwater supplies.

To summarize, our river and riparian ecosystems provide a lot of benefits, a lot of services to humans and they're very important to wildlife habitat, particularly in this State, not just for the resident wildlife, but we also have migratory birds, bats, and other pollinators that are wintering in Central and South America coming through Arizona using our riparian resources as a stop-over as they migrate to places elsewhere in North America. So, this is a hemisphere resource that we have here. Riparian conditions and rivers are influenced by surface and groundwater levels. And then, although our groundwater basins can contain an awful lot of water, the increment of impact that results in adverse effects is actually small.

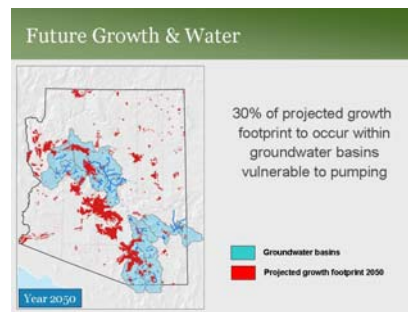
So, I'm going to shift into the growth data that we've been looking at. And to start this off, I just want to review the data on population growth. So, based on the Department of Economic Security growth projections, Arizona's slated to double its population by 2050, have over 12 million people, and so the question remains is: Where are we going to obtain the water supplies to furnish that population growth?

This map footprint produced Association of done these spatial projections out to actually a number of growth now. For the sake going to show you are the major highways and all these red dots comprise the urban footprint in the year 2000.



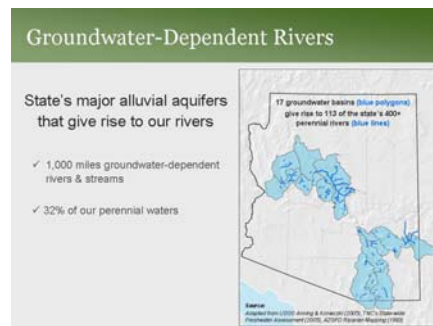
here is an urban by the Maricopa Governments. They've footprint growth 2050. There's of different sources projections out there of time, I'm just the MAG data. These

Let's and immediately there's a in the growth of in fact, it's going 4.5 million acres including areas in southern Arizona. the growth here is in Maricopa and These are growth projections; they're not real. Things are going to be different; it could be larger; it could be a smaller footprint. We have choices, so we can dictate what this growth looks like, but these are the projections.



move ahead to 2050 you can see that substantial increase the urban footprint; to consume another of land in total and northern Arizona, You can see a lot of projected to happen Pinal Counties.

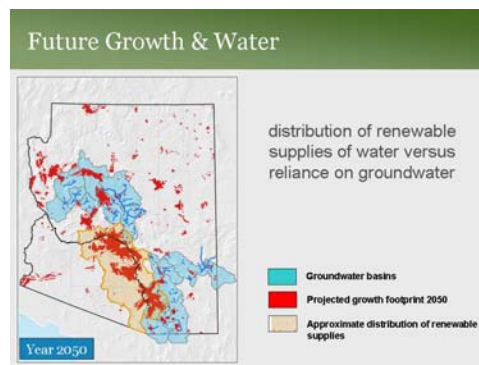
Let's start to look at the relationship between this growth and the distribution of our rivers and riparian areas. And to do this, I'm just going to focus on a subset of the river systems that we have in the State. We have a lot more going to point out this is a map of 17 that the U.S. has mapped, and the these groundwater groundwater basins these still give The groundwater our remaining perennial streams; in fact, it's about a quarter of the State's perennial streams. You have over 400 streams; it's a little over 100 streams and rivers that are furnished by these groundwater basins; it's 32% of our perennial water; about 1,000 miles of groundwater-dependent rivers.



water that I'm in the State. But, groundwater basins Geological Survey distinction between basins and elsewhere is that rise to rivers. discharges to form

The significance of this is that we've lost 36% of our perennial flow in Arizona over time due to diversions, to dams, to groundwater pumping; all legitimate societal uses, but uses that don't come without an effect to the environment. And so, in the past, we've gone ahead and done this without the technical information we know now about the importance of river ecosystems. Moving forward, we have an opportunity to do things differently so we don't continue to just lose these river systems and their accompanying riparian and wildlife resources.

Okay. So, let's put this growth footprint at 2050 over these groundwater basins, and just point out a couple of things. The red's the growth, these blue lines are the rivers, and these blue polygons are the groundwater basins that are going to be vulnerable to pumping because they discharge, they still give rise to these rivers. So, if we look at the growth, these blue lines are the rivers, and these blue polygons are the groundwater basins that are going to be vulnerable to pumping because they discharge, they still give rise to these rivers. So, if two, the first thing that a lot of the projected to occur in Maricopa/Pinal County there's really no basins, so they're drawing from those basins, ostensibly they won't be. A lot of growth, though, the Prescott/Kingman area, down the San Pedro, even eastern Tucson, lower San Pedro Basin, this are all areas that are going to be, potentially, in conflict with the river and riparian resources that currently exist.

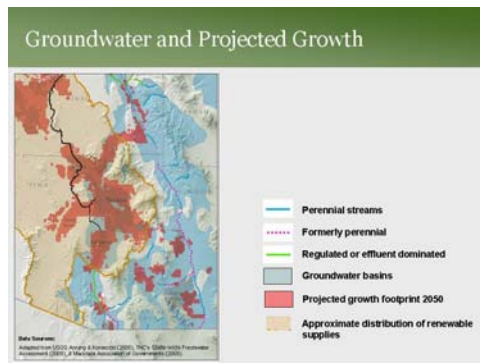


Okay. So, let's look at this from the standpoint of where we have renewable supplies. This is a very coarse analysis, because what I'm using as a proxy for renewable supplies are the AMAs, the Active Management Areas, as we don't yet have a layer put together that shows you the Central Arizona Project Service Area, which is really our only renewable supply in Arizona. But, let's just use this, 'cause it makes the point.

So, these are the AMA boundaries. This is the area where, theoretically, Colorado River water can be supplied and we can totally get off groundwater here and use Colorado River supplies. You notice a lot of the State does not have renewable water, including here, the San Pedro River and in eastern Pima County. And let's actually take a closer look. Julia Fonseca is going to go into much more detail at the County level but I just

wanted to take this data down to the super-County level, Pima County plus, and let's show you what it looks like. So, if you can see this, this blue outline here, are the alluvial basins. And this is, essentially, what Sean was getting at, the areas where groundwater supports surface flow. The status of surface flow of surface flow are these lines - and Julia, again, has actually much better data. So, these blue lines are areas where we still have perennial flow. This is the San Pedro River. Here's Sonoita Creek. Here's Cienega Creek. The red dash lines are areas that, historically, were perennial flow, but no longer are perennial, and then the green lines are areas that are effluent-dominated.

So, let's put the growth here. And the first thing I want to point out is if we had a better layer you'd see that we don't have here, or even Tucson, so overstatement "renewable" renewable with that, lots of to happen in have any so - and this forward and how we are going to grow and protect those supplies.



And the first thing I want to point out is if we had a better layer you'd see that we don't have here, or even Tucson, so overstatement "renewable" renewable with that, lots of to happen in have any so - and this forward and how we are going to grow and protect those supplies.

So, why does this matter? Well, I'm sure it matters for different people. There This is only a them. In basins that I there are species that And by either on the list, or they're likely endangered future. So, when those areas are gone, if we lose those species, it's loss of an irreplaceable resource.

The complex block is titled "Population Growth & Water Availability". It contains a list of reasons why this matters, along with two small images: one of a river flowing through a lush green landscape, and another of a colorful bird perched on a branch.

Why does this matter?

- ✓ habitat for 73 imperiled species
- ✓ loss of recreational opportunities & nature-based tourism
- ✓ increased regulatory burden/project costs
- ✓ impacts to those with surface water rights
- ✓ water supplies may be exacerbated by climate change

reasons for different are a lot of reasons. small portion of those 17 groundwater showed you statewide, already 73 imperiled inhabit those areas. "imperiled," they're endangered species they're very rare and to be on the species list in the

But, if wildlife's not your thing and biodiversity's not your major concern, there are other concerns, including economic concerns. First, we lose recreational opportunities

that many of us enjoy, if not all of us. We also start to lose nature-based tourism, which is pretty significant, particularly here in southern Arizona.

When we have more endangered species listed, we get increased regulatory burdens as we try to mitigate and try to weave our way through these complex endangered species issues, which increase project costs. And I can tell you as a former endangered species biologist, we're going to either pay on the front end by being proactive, or we're going to pay on the tail end as we try to mitigate, and paying on the tail end is always going to be more expensive and there's going to be less certainty, because when you've got endangered species you've got small populations, and the smaller they get, it becomes a numbers game, and you have no certainty that your actions are going to actually be able to recover them. So, it's far preferable to make the hard decisions up front; it's going to be far cheaper.

The other thing is that there may be people in this audience that own surface water rights, and so if people are pumping groundwater and affecting those surface rights, what's going to happen? We may get litigation. What happens with litigation? We get higher project costs, and so we're going to be potentially pitting groundwater users against surface right-holders. It has nothing really to do in the environment; there's just a societal conflict in the making; it's already happening in Prescott, between Prescott and Phoenix over the water supplies in the Upper Verde.

Finally, I know you've had presentations on climate change, so I'm not going to spend any time here, except to say that the effects to human water supplies that you've heard from Kathy Jacobs and others are only going to be exacerbated by these riparian systems and the wildlife. Why? We have technology that can help mitigate and help us adapt to the changing conditions produced by climate change. Wildlife species don't have that option.

When those tropical migrants are flying from Central America to where they nested last year somewhere in Pima County, that habitat's not there, they've got to make choices, they've got to make them fast, and if there aren't other choices to breed, they're not going to breed, they're not going to reproduce, those wildlife populations are going to go down. We have other options.

Okay. So, I'm doing - I'm on the last part of my section here. I'm going to stick to my times. So, now I'm going to talk about the mechanisms for protecting our rivers and riparian areas, and this is going to be very brief because the reality of - the reality is that we really don't have legal authority to protect particularly groundwater pumping. There's very limited authority to effect protection. And why is that? Well, there's no State jurisdiction over the regulation of groundwater pumping to benefit river, springs, wildlife, et cetera. There's no State authority to protect from groundwater pumping.

Some of you have either talked about Safe Yield in the context of this Committee or you know of Safe Yield. I want to dispel the notion or just make it clear that Safe Yield is about human

it's not about environment. under the Act says you aquifer what's basis. Well, about that those streams sky on an

allowed to extract all of that, you're leaving nothing for the river. So, Safe Yield is simply about managing human water supplies, not about managing water for the environment.

Mechanisms for Protection

Protection of rivers limited by lack of legal authority

- ✓ No state jurisdiction over regulation of groundwater pumping to benefit rivers, springs, wetlands, riparian systems, or wildlife
- ✓ 'Safe Yield' provision under Groundwater Management Act allows for use of all annual recharge for human consumption
- ✓ 'Assured Water Supply' provision does not require evaluation of impacts to rivers, riparian systems, etc.

consumption of water; protecting the The Safe Yield provision Groundwater Management can only take out of the recharged on an annual if you go back and think graph, what flows in is what falls from the annual basis. If you're

Similarly, the Assured Water Supply provision, this is about managing human water supplies. There's no requirement for an evaluation of impacts to rivers, streams, riparian systems, et cetera. And I want to clarify that just because these terms sound good; it's important that we don't confuse them with what provisions are actually in there to protect the environment. So, that's on the groundwater side.

If we look at the surface water side, there are some mechanisms but, water's protected indirect measures certainty is very Well, we have the have the stream going on where people who getting those

Mechanisms for Protection

Protection of surface water for the environment occurs through indirect measures or tools with limited certainty

- ✓ Stream adjudications & 'sub-flow' ruling
- ✓ Federal actions where Clean Water Act & ESA are invoked
- ✓ Land acquisition with water rights converted to instream flow for benefit of wildlife or 'sever & transfer'
- ✓ 2007 Pima Co. Plan Amendment requiring impact study?
- ✓ Shift from groundwater to CAP & re-use/recharge have potential but would require secure allocation to environment?

in reality, surface really through and the level of low. And why is that? stream for example, we adjudication process throughout the State hold rights are rights certified. If

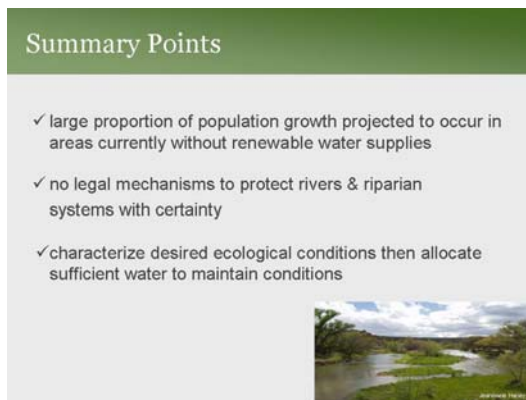
we're fortunate you have a senior right-holder who's on the downstream end and he or she wants his water, he's going to have a call on that water all the time, and that water's going to flow through that river to the downstream end. It'll benefit the river and the riparian ecosystem, but it's an indirect benefit; it's not happening because we set out to protect the river; it's happening because you have a senior priority water right down at the downstream end. If it's on the upstream end, I think you can see what happens.

You have federal actions to clean water and the Endangered Species Act. These are very blunt tools that were not intended to keep water in rivers. These are last-ditch efforts to stop species from going extinct. They really were not meant to keep water in river or to protect riparian systems, and they don't do a very good job of it.

The mechanism that is used most often is the acquisition of land with a water right, and then the conversion of that water right into instream flow to benefit wildlife and riparian systems. So, in other words, you take a water right that was, say, used for mining or agriculture and you convert it to an instream flow, which means you have a right to keep that water in the stream.

So, what's the problem? It's a mechanism that's been used on 38 different streams in the State so far by the Forest Service, the Bureau of Land Management and the Nature Conservancy, and there's 60-plus pending applications that the Department of Water Resources for more instream flow permits. There's two challenges. First, land acquisition land management is very expensive and very few entities can do it.

The second is that when you convert that use from agriculture to instream, your seniority changes. You have the prior appropriation system, priority dates, the goes to the earliest if you have a very right, 1912 water you convert it to flow, your priority 2008, which means on the list when call on water or if drought. So, when to instream flow, you



Summary Points

- ✓ large proportion of population growth projected to occur in areas currently without renewable water supplies
- ✓ no legal mechanisms to protect rivers & riparian systems with certainty
- ✓ characterize desired ecological conditions then allocate sufficient water to maintain conditions

The slide features a green header with the title 'Summary Points'. Below the header is a list of three bullet points, each preceded by a checkmark. At the bottom right of the slide is a small photograph of a river flowing through a lush green landscape under a blue sky with white clouds.

lose, essentially, your status on the river. That means in times of drought, or over-allocation, you're not going to have your instream flow, or you're going to have less of it than you have a right to.

Sever and transfer is a little more complicated; it's actually never been granted by DWR, so I'm not going to go into it at the moment.

So, what else is out there? Well, the Plan Amendment the Board of Supervisors passed in December of 2007 required an Impact Study; that's actually a very progressive move and a good policy advancement. But, as was mentioned in this Committee, there's no certainty. What will the County do if we have an Impact Study that demonstrates that there will be effects to our riparian systems? It's really an unknown and it's probably fraught with peril, given our litigious society.

Finally, we can shift from groundwater use to CAP, and that sounds good but, because so much of our area is not serviced by CAP, there's a large infrastructure cost and it'll be a fair amount of time before the infrastructure makes it to those areas and so the question is: Will that infrastructure be in place before we've already had adverse impacts to the rivers?

To summarize, from the data that we showed you can see that a fair amount of our population growth is projected to occur in these areas that do not have renewable water supplies, so there's the challenge. How do we maintain our river and riparian systems and accommodate the growth that's coming at the same time? We really don't have very good legal mechanisms to protect our river and riparian systems. The prior appropriation laws were set up for beneficial use. Beneficial use is agriculture and mining, domestic consumption, et cetera. And the provision, such as instream flow, they're useful and it's good that we have them, but they're not enough, particularly given the growth that we're seeing.

Really, there's two challenges. The first is we need to characterize the desired ecological conditions we want out there in the riparian systems; that's a scientific challenge; it's being done all over; it's pretty straightforward; it takes time; it takes money but it can be done. The greater challenge is a policy challenge and that is to allocate and to secure sufficient water to maintain those conditions.

I'm going to end here and just let you know that some of the data that was presented, that the Nature Conservancy's developed is on our Conservation Science Website, azconservation.org. You're welcome to go there. And I'm going to end it there, But, before I do mention I think reading that's science staff, Rivers and Water Southwest; it's a covers some of talked about. to have a sustainability, to pass around this work from the scientific literature. It's two alternative models of water use; one is a sustainability model, and one is kind of the *status quo*, and I'll leave those with you so you can deliberate, have those as part of your deliberation when you start talking about sustainability and thank you.



let Julia take over. that, I just want to you we emailed this done by one of our Jeanmarie Haney, on Management in the very good primer, the issues that we've And you also started discussion about and so I just wanted

CHAIRMAN JIM BARRY: Rob, thank you very much.
(Applause.)

CHAIRMAN JIM BARRY: Let me ask a question. Julia, where are you?

MR. MARSHALL: Back of the room.

CHAIRMAN JIM BARRY: What you're going to do is take Rob's presentation and then pinpoint it into Pima County?

MS. FONSECA: That's right.

CHAIRMAN JIM BARRY: Okay. Now, audience, do you want to wait for Julia and then have questions? I mean, Committee and audience, or do we want to have some questions of Rob now?

UNIDENTIFIED COMMITTEE MEMBER: I say wait.

CHAIRMAN JIM BARRY: Wait? Okay.

UNIDENTIFIED COMMITTEE MEMBER: Go ahead and wait.

CHAIRMAN JIM BARRY: Julia, come on up, please. So, our next presentation is by Julia Fonseca, who is the Environmental Planning Manager for the County's Office of Conservation Science. I've known Julia for a long time, and all I can say is what I used to say in the past, "Man, is she smart." She works with various scientists and agencies and nonprofit groups on conservation and monitoring of natural resources. She's been with the Flood Control District; it's now the Regional Flood Control District, I believe it's called, for 22 years, and worked on programs involving floodplain management, groundwater recharge, surface water quality and land

management. She received an MS in geology from the University of Arizona. Julia, thank you.

**Presenter #2:
JULIA FONSECA, PIMA COUNTY
NATURAL RESOURCES PARKS AND
RECREATIONS DEPARTMENT:
ENVIRONMENTAL NEEDS FOR WATER**

Sustaining Environmental Flows



*Pima County and Pima County Regional Flood
Control District
September 17, 2008*

MS. FONSECA: Thank you and good morning everyone. Unlike Rob, I'm not an early riser, but I appreciate this wonderful opportunity to get to speak about a topic that's near and dear to my heart and that is about sustaining environmental flows for streams and springs in Pima County.

You Committee members have been chosen for a really important role and that is to help the City and the County find what

I hope will be 21st Century solutions to what's really an age-old problem of how societies adjust their activities to the facts on the ground and, also, the historical legacies that have been left by previous generations.

So, what I hope to do is to define some key issues for you folks to contemplate as you move into Phase II, and I'm going to present three specific concrete examples of places where there are opportunities to protect existing riparian ecosystems. And I tried to choose these areas, not knowing of your debates about the study area boundaries, but thinking about the areas that close in to the Tucson Water Service Area, because I don't know what it is you will choose for your limits.

And when I use the term "riparian" today, I include the aquatic component, the stream side; it's not just the vegetation. A lot of times people think riparian areas are the lushly vegetated areas along streams, and I want you to also be thinking about the stream-flow component, and also the shallow groundwater ecosystems that support mesquite bosques, which often have a connection to groundwater, as Rob has mentioned.

Too often I think that discussions about water have left water from the environment out of the picture, if they've talked about them at all, and the consequences Rob described very well. I'm not going to go over those but they are, in part, what led to the Sonoran Desert Conservation Plan. A lot of the endangered species that we have in Pima County, and the ones that are not yet listed, but may be in the future, are related to aquatic ecosystems.

SDCP Riparian Goals

- Maintain floodplain functions
- Manage uplands
- Manage pollutant sources to maintain water quality
- Protect in-stream flows

And if you haven't heard about the Sonora Desert Conservation Plan, this was a very large public process, 600 public meetings to define goals for protecting our cultural and natural heritage in Pima County. There was a lot of work, 150 contributing scientists, 200 specific studies.

So, in your background documents, you do have a PDF handout that has the Sonora Desert Conversation Plan goals, and those include the biological goals, as well as specific riparian goals. And the reason that that's in your materials is that I think these goals you're going to be hearing -

CHAIRMAN JIM BARRY: Julia, let me interrupt one second. You're talking about this February 21st Memo?

MS. FONSECA: No. In the material, the background reading -

CHAIRMAN JIM BARRY: Oh, okay.

MS. FONSECA: In the background reading for this, there's a PDF that has the riparian goals and the biological goals. The reason that I provide the goals is that you Committee members will hear a lot of different proposals, and very specific ones, but I think that if you realize that the Sonoran Desert Conservation Plan has a lot of ideas that have already been debated at length with the public about where we should go and how we should get there, at least in terms of the ecosystem, this may help frame some of your responses.

So, let's see, I think I'll go to this one, since you don't have - you may not have a copy of that PDF. This is the shorthand version of the riparian goals for the Sonoran Desert Conversation Plan, Maintain Flood Plain Functions, Upland Condition, Pollutant Sources to Maintain Water Quality, and then, of course, Protecting the Instream Flows.

So, the question really is: How do you translate that to the particulars of your City/County Study? Well, floodplain functions are really important and have been greatly compromised, and it would be a good idea, I think, to have an integrated City/County discussion at some point about surface waters. Right now surface waters are managed through storm water management, through the AZPDES Program, they're managed

through floodplain management programs, and they're also discussed and affected greatly during our land use deliberations. So, there's a great need, I think, to integrate those across departments within the agencies and across jurisdictions. But, for lack of time, that's not going to be my topic today. Neither will Managing Upland Condition, although it has everything to do with what land use decisions are made and it affects the ecosystem of riparian areas greatly. I will touch a little bit on water quality and then the rest of this presentation will be about instream flows and groundwater-dependent sources for them.



- Sabino Creek
- Tanque Verde
- Agua Caliente
- Cienega Creek
- Santa Cruz River (effluent)
- Rincon Creek
- Agua Verde
- Ventana Wash
- Santa Cruz at Canoa...

So, as part of the Sonora Desert Conservation Plan, we did a great deal of inventory work, and this really helps understand where some of the remaining stream ecosystems are that can be affected by groundwater pumping or removal of other sources of water. One of the things we found was where our natural water sources are located. There was very little information that had ever been compiled in one place.

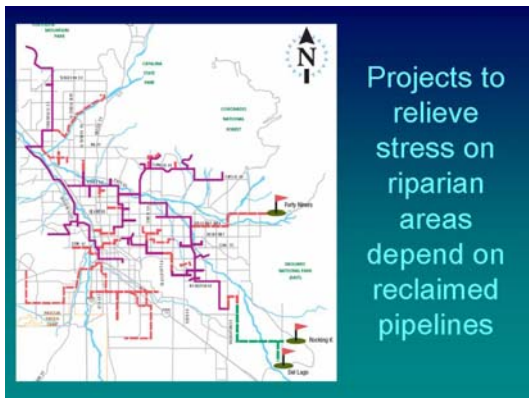
And, secondly, the surprise was: There's really a lot left out there in terms of perennial and intermittent streams, and this doesn't even show the springs. There are over 250 springs in eastern Pima County. In blue and in orange, you have perennial and intermittent stream segments, and then in light-blue color areas are the shallow groundwater areas. And nobody had ever taken the time to define those, but those shallow groundwater areas are areas that help support, or can help support, mesquite bosques, so that's why we included them in this ecosystem analysis. And this work was done in combination with Staff at Pima Association of Governments and it has its own set of reports if you want to go to the Sonoran Desert Conservation Plan Website.

- NE Tucson:
- Agua Caliente
- Tanque Verde
- Sabino Creek
- Ventana Wash

We also had inventories on hydro-geology, the distribution of species in eastern Pima County, and our water

supplies as part of the Conservation Plan, and some of those background documents were provided in your materials.

So, one of the important things to get out of this slide is that if you look at the distribution you can see that it's very unequally distributed. In Avra Valley right here you can see that there's an absence of these groundwater-dependent ecosystems, and that's important for you to know. There's one exception up here, which is Coccio Wash. It's a tiny riparian area that got dessicated in the '80s, and the watershed is completely destroyed because of mine-tailing, so it's not going to come back. But, aside from that one place, which was on a kind of a bedrock shelf, the rest of Avra Valley is very deep alluvium. Historically, it never had any flowing streams that were supported by groundwater, and so what that means is one could pump forever out there and never have this kind of link with a stream. That's good because Avra Valley was purchased as Tucson's water farm, basically, and there's been a lot of investment in infrastructure to store water in Avra Valley. Avra Valley is a great place for those kinds of activities.



But, you can see that the Tucson Basin is different; it's included in the USGS study that Rob Marshall referred to as one of those areas that does have a lot of places where groundwater comes to the surface, or near the surface, to support either stream flow or these groundwater-dependent riparian ecosystems. And, historically, there was groundwater discharge

along the Santa Cruz River and downtown Tucson and over at San Xavier del Bac, along the Pantano Wash, the Rillito Creek, and those areas have gone away. But there are still quite a few other areas in eastern Pima County where groundwater pumping can make a difference in terms of riparian ecosystems, and you can see that a lot of those areas are in northeast Tucson. In the northeast Tucson Basin, there are a number of different streams and springs, I would also say, that have some kind of relation to shallow groundwater. Because of these lush riparian environments, there's actually studies that have been done of the prices that people will pay to be near one of these lushly-vegetated areas. There's a substantial market premium just to be near there, even if it's not on your property that is reflected in the values, the property values out there. And it

also matters, apparently, about how lush it is. The more lush, the more you pay. So, it's a big amenity to the area.

Historically, a lot of this was agricultural. There's a lot of agricultural pumping to support pastures and farmland. And then, beginning in the 1980s, there was a lot more municipal pumping as well. So, this area's largely built-out now, but the groundwater table has been depleted. And, in fact, there was so much depletion, combined with a drought in 1989, that a lot of the wells in the area started to go dry. Wells that people had used for many years. They were generally shallow wells, I might add, along the stream.

And so, in 1989, Mayor and Council did something that was extraordinary. They passed a Resolution, a policy, that restricted the increase of groundwater pumping in this area, and I think they're probably the only City Council, to my knowledge, in Arizona that's ever taken a measure to voluntarily restrict groundwater pumping for the combination of reasons that included citizens' wells going dry, and the protection of the riparian ecosystem.

At the same time, they also directed Staff to develop a Conservation Program, and they said the Conservation Program should not only include the Tucson Water Service Area, but also the private water companies' and private users that are out there, so the ag people, as well as the a 49ers Water Company.

For the Conservation Plan, we reviewed the situation, That was in 1990 and around 2000, a little bit later, we reviewed the situation again to see, you know, what had happened with the water table and the condition of the riparian areas. So did the Parks Service. We still had concerns about the ecological condition in relation to groundwater pumping. We recommended reduced groundwater pumping, and also the importation of reclaimed water to the area, because that area lacks an alternative water supply.

And, happily, Tucson Water has built a reclaimed water since I think it was by 2006. The reclaimed line to the 49ers' golf course had been extended to the Rincon Valley, and this has made a difference. This has reduced the stress to the aquifer in that uppermost part of the Tanque Verde Valley where the storage is most limited underground. And people in the Wentworth area are reporting that their wells have come up, and there is actually stream flow in the stream again along Tanque Verde Creek. This is the 49ers' development, the golf course.

Here's the stream flowing, and then you have cottonwoods and a lot of mesquite bosque in that area. So, that's really helping. And this May, 2008, photo was taken - the prior summer there really wasn't much recharge in the Tanque Verde Valley. So, the - Upper Tanque Verde, the situation looks good.

Tanque Verde 49ers (2008)

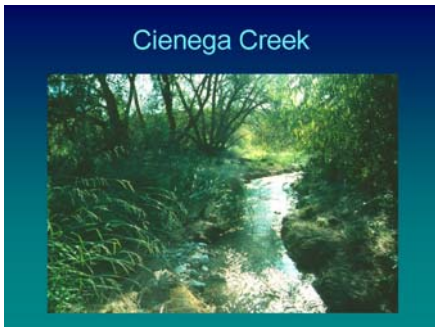


Farther downstream and along lower Sabino Creek - at least last time I looked at it - very serious situation. Their water table is still very low, and it's going to be. It would be a lot harder to make a difference there; that's a lot closer to the Central Wellfield. Not only is there Tucson Water pumping and - and some residual pasture land irrigation, there's also some use for the Tucson Country Club Golf Course, as well as the old Metro Service Area of - it was formerly called the "HUB Water Company."

One of the issues in the Sabino Creek/Tanque Verde Confluence Area is that Metro has only a few wells and it's a very limited service area, and they have no access in this area to the CAP blend that Tucson Water does. One of the things that could help relieve stress to the aquifer at the Confluence Area there with Sabino Creek and along Sabino Creek further up, would be an interconnection between the two systems. This would allow for a mixture of wells that would be further away from these areas to be used, and also to allow for some CAP blend. But, I realize that might be difficult between the parties, but there are emergency provisions already in place between not only Metro and Tucson Water, but other water companies that to address times when there might be supply limitations, such as drought. And drought times, as a matter of fact, are the times when the riparian ecosystems get the most crunch because water demand goes up because of landscape irrigation and water tables drop.

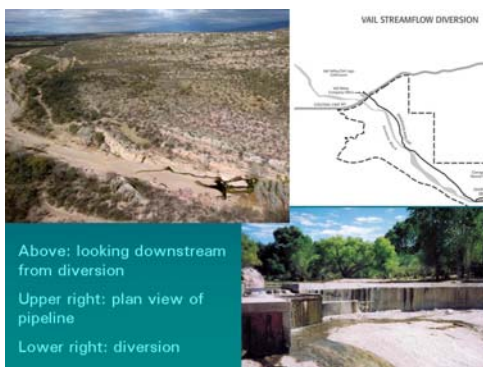
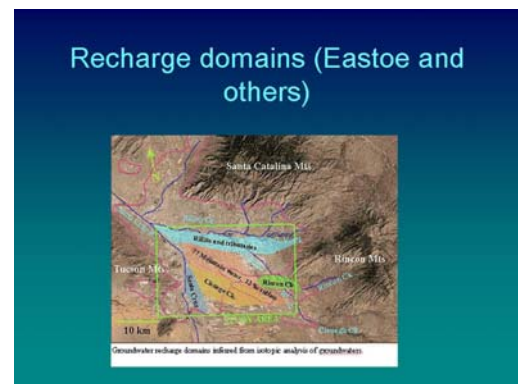
So, another thing that could help both along Tanque Verde Creek, Sabino Creek and, possibly, a few other areas would be to - to try to address the legacy problem left by these shallow wells that may be dry, but may actually be draining the - the shallowest part of the aquifer into the deeper parts. Sometimes what's left is a - we call it in hydro- - hydro-geologic terms these "transiently saturated aquifers" that are close to the surface, so they have an ecosystem role in keeping water up near the root systems of these riparian trees, but they can be drained inadvertently by wells that are perforated all along the casing as many of the old wells are.

It would take some sleuthing to find out what these areas are, but it could also be a form of well head protection protecting water quality for some of these companies.



So, I'm going to move on now to Cienega Creek as the second example. Cienega Creek is the ecological treasure of Pima County; it has a number of rare and endangered species; it's a beautiful place to hike. I encourage you to go. If you ever want to see what the Santa Cruz River was like in San Xavier del Bac and downtown Tucson, this is an example of it. It has a lot of the same plants and animals, albeit it's much smaller; it's much smaller than the Santa Cruz River ecosystem was. It's a lot of attention gets put on the San Pedro River, but Cienega Creek actually has a much more intact aquatic ecosystem than the San Pedro River and it's very valuable for that reason also.

It's also, as far as the recharge to the Tucson Basin, this is Cienega Creek right here, and about in here it flows into the Tucson Basin. There's a hydro-geologic structure - and the groundwater that's recharged in this area does not flow along Pantano Wash, rather it takes a different flow path that goes under the old IBM plant and can be traced even as far as the University of Arizona campus because of its distinct isotopic composition; this is from work by Chris Eastoe and others.



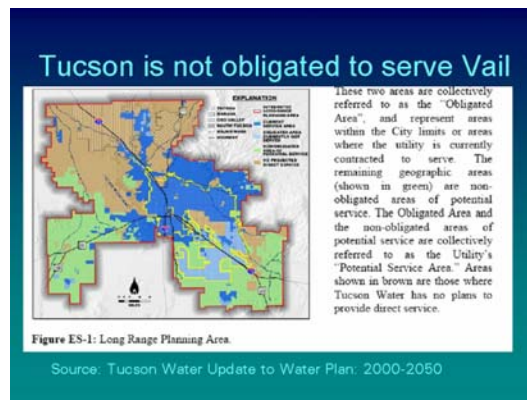
Above: looking downstream from diversion
 Upper right: plan view of pipeline
 Lower right: diversion

So, most of lower Cienega Creek - this area - is in a County preserve, but land acquisition alone seldom is enough to protect these stream systems. The fact that the land is acquired doesn't mean that the water sources are all protected. This is one place in Pima County where surface flows are diverted for use on a golf course, and that's pursuant to a historic water right, surface water right of longstanding. There's a dam, most of it's below ground, there's hardly any of it sticking up. This is what it looks like here. Here's the riparian area, here's the stream flow; it

falls into a (inaudible) and then it goes in a pipeline about a mile and a half down to the Del Lago Golf Course, and it used to be used for irrigation a long time ago in that area.

So, it's a very important water source for the golf course, obviously; it's considered a renewable supply; it's not subject to all of the restrictions that would apply if groundwater were used. It also helps sell the houses around the golf course. So, there's no willing seller there. The County has expressed interest in acquiring this surface water right, but there's no one willing to sell and for understandable reasons.

In 1990, when the Board of Supervisors approved the Vail Valley development, which was a large master-planned community, there were plans to have a reclaimed line come to the area, and the requirement is that when reclaimed is available, they must use it on the golf course. And so, at that time, the surface water right becomes a lot less valuable and we would hope that we would be able to acquire that. But, there is no plan now to build pipeline, or on the five-year many years ago. reason, the proposed to put funds for a pipeline to this bond election; proposal. I that will happen. restore some of that's diverted here, it would be a way to get some of the flow back into Cienega Creek/Upper Pantano Wash.



the reclaimed there's nothing CIP as there was And, for that County has construction reclaimed area in the 2009 that's just one don't know if If we could the stream flow

Another complicating situation is the fact that this area is served by the Vail Water Company, and so here's Cienega Creek, and the brown area here is the Vail Water Company and so, you know, Tucson Water is not obligated to serve the Vail Water Company and it's considered non-obligated because there is this existing water company.

The Vail Water Company sits on this divide between the Cienega Creek Basin and the Tucson Water, so some of the wells are in the Tucson Basin and don't - we think - affect Cienega Creek. But there are a few wells that are up-gradient of the stream, and so that means that as they're pumping they will, eventually, have an effect on the Cienega Creek water supply

area. And so, again, an interconnect between such water companies could allow for more flexibility in the operation of the well systems to minimize future impacts as development increases in the area.

Another option might be for Tucson Water to consider buying Vail Water Company and, again, those kinds of flexibilities, perhaps, could be realized if they were united with the Tucson Water System, not through a contract, but through actual acquisition.

So, now I'll move on to the Santa Cruz River. If you think about the Santa Cruz River, downtown Tucson; it's gone but, you know, there's a lot of groundwater pumping in the Santa Cruz Valley still, and that water doesn't just disappear; it goes through our municipal supply system, through our toilets and over to Ina Road and Roger Road. So, the effluent that we see in the Santa Cruz River today is a mixture of water from the Santa Cruz Valley, as well as other places that groundwater sources, and even a little CAP; it's essentially been displaced. It's a very different ecosystem than historically occurred because there's no connection to groundwater; it's been disconnected. The effluent flow does not mix closely with the groundwater, and that's a distinction between our effluent-dominated reach of the Santa Cruz River, and the Santa Cruz River that you see down when you go to Tubac. You know that there's a very broad riparian ecosystem there. They have trails and encourage people to enjoy that, and that's because the effluent mixes there with groundwater.

Here, our - our Santa Cruz River, downstream of Roger and Ina Roads, is solely effluent, except when it's mixed briefly with - with storm water, but it is - it is the County's largest, longest perennial stream, and it does have the second largest cottonwood-willow forest, second only to Cienega Creek in eastern Pima County. So, it is an important riparian ecosystem for us. It's also one of the areas that's richest in bird life and particularly, migratory water fowl, something that we don't have a lot of in Pima County elsewhere.



Notably, it is drought-proof in the sense that a lot of what we're seeing in some of the streams and springs in Pima

County is that they dry up during these times of drought, and being Cienega went dry for several years during the 2000 drought, the flows at Agua-Caliente Spring are down; this is the case in many riparian and aquatic ecosystems throughout eastern Pima County. But, basically, the Santa Cruz River -

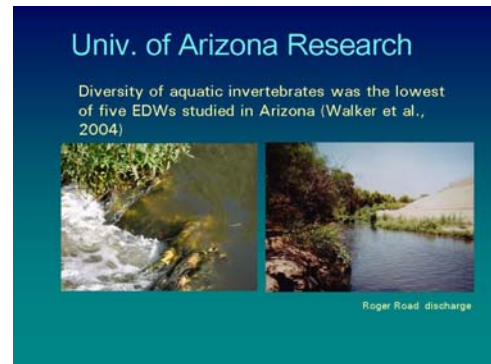
CHAIRMAN JIM BARRY: Julia, five minutes, please.

MS. FONSECA: How much?

CHAIRMAN JIM BARRY: Five.

MS. FONSECA: Five. Okay. Has - has very little left.

So, one of the things that you should know is that although the riparian ecosystem is great, the aquatic ecosystem is quite poor. The County is planning to improve that, and that will have very important riparian and aquatic ecosystem benefits because it will improve the base of the food chain. But, one of the issues is that there's no water allocated, none of the effluent is really allocated to the river; it's just there because it needs to be disposed of.



There is something called the "Conservation Effluent Pool" that has been negotiated between the City and the County, but that will not be sufficient to maintain flows in the river, and it was never really intended to do so. So, there are some significant issues associated with keeping the Santa Cruz River flowing if we want to keep those ecosystem benefits there.



So, you know, it's my hope that we do allocate some water to the Santa Cruz River. There is a handout today that represents the Science Team's position, the Science Team that helped develop the ecological component. The Sonoran Desert Conservation Plan does recommend that some water be allocated to keep the riparian ecosystem along the Santa Cruz River going, because that may be our most ecologically viable stream if some of the more dire global warming projections come true. And even if it isn't, it is something that right now does provide a lot of the ecological values that we have.

So, in conclusion, I want to say that land acquisition is seldom going to be enough to protect environmental flows. We need to allocate flows for these ecosystem functions, flows from groundwater, from surface water, from effluent. And I think municipal water companies are uniquely qualified to consider these issues of environmental flows. Private water companies can't; they are precluded by State statutes.

Tucson Water's Mission Statement does include considering and minimizing environmental impacts of operations and sustainably managing groundwater basins. So, Tucson Water's already internalized that. And the Pima County Board, on its part, has adopted a sustainability directive that dedicates County water resources to sustain and protect the natural environment. Unfortunately, the County doesn't have a lot of the water rights or effluent rights to devote to that purpose, but those that are, are there.

Water conservation - I want to suggest that water conservation could target some of these groundwater-dependent ecosystems and have a good benefit, more so than water conservation. Water conservation, in many areas, simply won't have an ecosystem benefit.

The reclaimed water infrastructure, and the potable water interconnections, could also be ways to relieve some of the stresses on the aquifers.

Conclusions

- Target GDEs for water conservation
- Use potable and reclaimed water infrastructure investments to reduce stress on GDEs
- Preserve and restore in-stream flows by allocating water sufficient for stream functions
- Maintain and improve water quality to streams, including effluent discharges

And, finally, I want to say it's great to re-vegetate areas, but this does not replace the ecosystem benefits of having a flowing stream that gets these pulses of sediment and floods that rework things, off-channel drip-irrigated, riparian vegetation and created ponds simply do not provide ecosystem function - they're not equivalent. So this is why we need to keep the focus on some of these stream flow issues.

And - now I think we're ready for questions.
(Applause.)

CHAIRMAN JIM BARRY: Julia, thank you very much. Rob, why don't you come on back up here. Mark?

MEMBER MARK STRATTON: Yeah, Julia. I know that during the ROMP process, Wastewater did look at, on the surface, what amount of flows would be necessary to maintain the ecosystem in the Santa Cruz River. Has that been finalized of what quantity of flow would be necessitated to maintain that, or is that still under study?

MS. FONSECA: Well, it depends on what reach you want to talk about. And I know some people have talked about why should we let it flow out of Pima County?

Ecologically-speaking, we have a report that talks about the value of that component of the Santa Cruz River ecosystem that lies within the La Ossa Ranch, which is a place where the flows of the river, basically, spread out and there's a mesquite bosque and wetland complex that supported bi-effluent in that area. So, in terms of defining a reach for study, our ecological recommendation would be to include that area through La Ossa Ranch. And, I believe, Frank Postillion has done some estimates of the stream flow that would be needed and these are in the 30,000 acre-foot range, but I do believe that it would - if we were serious about the effort to allocate effluent flows to the river, that's the sort of thing that we'd put more focus on.

It also, I think, depends on where your release points are, too, because if you just look at Roger and Ina Roads and Marana, those are the three release points that we have right now for effluent, the picture changes if you have more release points. So, one could look at options. But it's not all of the flow. There's more flow there right now than there has to be to keep a lot of these functions around. So, there's enough to not only keep a lot of the ecosystem functions, but also to use for other purposes, including off-channel storage and so forth; it's not an either/or situation.

CHAIRMAN JIM BARRY: Bruce?

MEMBER BRUCE GUNGLE: Julia, an absence of discharge from the Nogales Wastewater Treatment Plant, would there be surface flow in the Santa Cruz in the area of, what, Canoa or Tubac?

MS. FONSECA: Probably not. There's Canoa Ranch, when it was purchased by the County, it was purchased subject to decisions that have been made by the developer and acquisitions of pumping sites for the mines. It's a water ranch for Phelps-Dodge. Many, many thousands of acre-feet are pumped out of that area, and that affects things, plus there's an agricultural - lower soppery (ph.) and upstream of that site, there's a lot of agricultural pumping as well. So, one would have to see some reductions probably of the existing stress on that aquifer.

CHAIRMAN JIM BARRY: Bob?

ALTERNATE MEMBER BOB COOK: With increasing reliance for CAP for our water supply and, consequently, content in the effluent stream, what will be the increase salt impacts on our riparian systems?

MS. FONSECA: Craig Tinney did some projections years ago about the increased salt load on the Tucson system, and I don't have on top of my head the results of that, but I believe that it was in the range where there are some ecosystem alterations. As you get up to 1,000 milligrams per liter of the salt load, basically, you start to see some shifts in composition - maybe fewer cottonwoods, more willow.

With a lot of sulfate, you start to get a lot of preferential enhancement of Tamarisk. We see a lot of that in the mined areas where there's a lot of sulfate releases. So, it can have some effects as you increase the salt, but the -

ALTERNATE MEMBER BOB COOK: In other words, the invasive -

MS. FONSECA: - you still get a lot of -

ALTERNATE MEMBER BOB COOK: - the invasive species?

MS. FONSECA: - the ecosystem benefits from the aquatic flow and, also, even from the structural, you know -

CHAIRMAN JIM BARRY: Yeah.

MS. FONSECA: - characteristics, willow has a lot of benefits as well.

CHAIRMAN JIM BARRY: Marcelino?

MEMBER MARCELINO FLORES: A question for Rob - and it's a long kind of (inaudible) question for clarification. Before the summary slides of the Environmental Water Needs, you had used the term "lots of water" as referring to the Basin, can you clarify that? What do you mean by "lots of water?"

MR. MARSHALL: Well, in the San Pedro Basin - Bruce would know better - there's many millions of gallons in that aquifer.

MEMBER MARCELINO FLORES: In terms of, like, acre-feet, what does that translate to?

MR. MARSHALL: Can you help me out, Bruce?

MEMBER BRUCE GUNGLE: No, I can't, Rob.

MR. MARSHALL: It's - it's -

CHAIRMAN JIM BARRY: It's a lot.

MR. MARSHALL: It's a lot of water.

MEMBER BRUCE GUNGLE: It's a very difficult thing to quantify.

MR. MARSHALL: Yeah, there's a lot of water and

MEMBER BRUCE GUNGLE: (Inaudible; not speaking into a microphone.)

MR. MARSHALL: And right now in the Upper San Pedro, the domestic consumption is less than 2% and they're already showing effects. So, it just makes the point where you can have a lot of water, but a small increment of change can have impacts to the river.

CHAIRMAN JIM BARRY: John, and then Sean.

MEMBER JOHN CARLSON: Couple of definitions, statements, and then I got a serious question. You said human consumption, and I presume that does not mean the stuff that goes in the crops and really is eventually consumed or able to be consumed by humans, is that right, when you use the term "human consumption?"

MR. MARSHALL: That's all categories, so agricultural use -

MEMBER JOHN CARLSON: Including what goes into crops. Okay.

MR. MARSHALL: - mining . . .

MEMBER JOHN CARLSON: It seemed like - okay. When you were talking about groundwater basins contributing to river flow, you use this quick term of "Pinal County - there's no Pinal County groundwater basin" when we know there's water there with even some people gonna buy up land and ship it up to Phoenix, you mean there's nothing there to contribute to river flow. Is that - is that what you meant?

MR. MARSHALL: So, in the area where the growth was projected, it doesn't overlap with the groundwater basins that support surface flow.

MEMBER JOHN CARLSON: Yeah. Okay. Here's my serious: "Cone of depression" or "cone of influence." My Master's thesis was on groundwater; it was in the northwest Nevada, but a hell of a lot of the data was USGS right along the Santa Cruz and other things down - down here, and I'm confused now, but State law in one place you could pump whatever and it had nothing to do with whether you were drawing it out of the river or not; that's the cone of influence on the river flow and, yet, I think there is some restrictions here, but I sense that you're saying that we really have to get into the ground - to our water laws and probably revise them. Is that a right interpretation?

MR. MARSHALL: So there is a sub-flow ruling associated with the adjudications on the San Pedro; they're delineating an actual boundary where pumping of groundwater off the river would actually - they'd consider it connected to the surface flow. But, in most of the areas, we don't have sub-flow rulings, so and - and when - if you're - if you're just a private individual with an exempt well, there's no restrictions.

MEMBER JOHN CARLSON: But, you're hinting that maybe we better look at this and revise?

MR. MARSHALL: Well, you know, the basic - the basic challenge with our water law is that it doesn't recognize there's a connection between groundwater and -

MEMBER JOHN CARLSON: Yeah.

MR. MARSHALL: - surface water -

MEMBER JOHN CARLSON: Yeah.

MR. MARSHALL: - so that's why we can pump and pump and pump even if it has effects in the surface water, unless it's a surface right-holder that -

MEMBER JOHN CARLSON: Yeah.

MR. MARSHALL: - wants to litigate, there's no -

MEMBER JOHN CARLSON: Well, maybe Julia -

MR. MARSHALL: - (inaudible) conclusion.

MEMBER JOHN CARLSON: - has a thought on this area. I don't know.

CHAIRMAN JIM BARRY: Well, let's go to Sean, please.

MEMBER SEAN SULLIVAN: First off, I have a 9:00 o'clock meeting, so I'm going to have to leave early, so I apologize for that.

And my question - I think Rob just started to touch on is: For a specific area, such as the Cienega Creek, are you able to determine a specific distance to keep wells away from, and also a maximum extraction limit for groundwater in order to ensure that that ecosystem continues to function?

MR. MARSHALL: Well, that's really a better question for Julia to answer, and Julia mentioned it, the closer you get your wells to the system, the quicker the effects are going to show up if there are effects. Where the aquifer lies and where they're pumping and where the washes are can be separate areas. But, I bet Julia could define where that pumping would start to affect.

MS. FONSECA: Well, actually, there was an effort back when there was a Governor's Water Commission on the subject, and there was a recommendation to adopt Groundwater Protection Zones and they actually used Cienega Creek as one of the areas. And, because this would be difficult on a statewide basis to get in and do site-specific studies, they were talking about a standard distance - and I don't remember if it was several hundred feet to maybe a quarter mile away - there is some renewed interest in - by the State in having Groundwater Protection Zones, mainly motivated by the sub-flow issue that - that Rob spoke of. So, you know, I don't have a lot of hopes for that.

But, it would be possible to define areas of - you know, it's a natural continuum, basically. You have to put a line on it, and so it would be possible to do that. There would be further studies required, but one of the advantages we have there is that there is a lot of hydro-geologic information and

more is being gathered all the time, including by people at the Flood Control District like Frank Postillion.

MEMBER MARCELINO FLORES: Mr. Chair?

CHAIRMAN JIM BARRY: Marcelino?

MEMBER MARCELINO FLORES: Kind of building on what John was beginning to ask. In terms of the isotopic composition work that was done by Eastoe and others, is that part of an adjudication argument, and how well was it received or is it being received?

MS. FONSECA: That work was research and it is not part of the adjudication and it is, to my knowledge, it's not been used in any way in the adjudication.

CHAIRMAN JIM BARRY: Any other questions?

MEMBER JOHN CARLSON: Yeah.

CHAIRMAN JIM BARRY: John's got a -

MEMBER JOHN CARLSON: Yeah. Julia, you - you mention about Vail being outside of Tucson Water and it could be bought or whatever, and you mentioned something about effluent up there. I heard there is some hope or push to get effluent up there. And the thing I've pushed, and they tell me I don't know what I'm talking about, is why not have an intermittent treatment plant halfway down the Rillito and instead of running another ten miles through enlarged pipes and then pumping it an extra ten miles back up to Vail. You got any thoughts in this area? I think it should be investigated thoroughly.

MS. FONSECA: You know, I'm not an operator of the Reclaimed System, so I think the folks that operate the Reclaimed System could offer the best insights about how it would improve their operations. My main ecological goal, I guess, would be to see groundwater pumping stresses relieved, and there's so many different ways to do that in the Cienega area; that could be one of them, but there are a lot of options.

CHAIRMAN JIM BARRY: Is this a fast one, Bob?

ALTERNATE MEMBER BOB COOK: Yeah, just to go to Rob's presentation on population projections; those are based on DES. DES is no longer going to be responsible for population projections because of the inflation in the recent decade. I understand that population projections are useful in

CHAIRMAN JIM BARRY: Bob, let me interrupt one second. Sean, when - for next week, will you be prepared, please, to come back and re-discuss your motion in light of what we heard today?

MEMBER SEAN SULLIVAN: Yes.

CHAIRMAN JIM BARRY: Okay. Thank you. Go ahead, Bob.

ALTERNATE MEMBER BOB COOK: Yeah.

CHAIRMAN JIM BARRY: And you are going to get to a question; right? Or you just going to make this a statement?

ALTERNATE MEMBER BOB COOK: Yeah. it's just simply a statement that, the big theme here in this Committee is whether the future going to be an extrapolation of the past, or are we really moving into a new future? And I think that posing these problems in light of a projection that's highly questionable is - needs to be pointed out.

CHAIRMAN JIM BARRY: Okay.

MR. MARSHALL: Well, you know, you mention that Bob - if I just may respond briefly. I was in a discussion with a number of demographers and that question was posed, given our current economic situation. The demographers' response was that It's always going to be cheaper to air condition your house in the southwest than it will be to heat your house in the northwest, and so economic opportunities are going to continue to drive people here. And so they were not as optimistic as you were that -

ALTERNATE MEMBER BOB COOK: What about the cost of water, though?

MR. MARSHALL: That trajectory might change. Now, granted, we can't project the future, but the cost of living here, the demographic changes in the country, I think that's an open question, so valid point.

CHAIRMAN JIM BARRY: Audience, any questions? Mr. Stagner? This is a question; right?

CLYDE STAGNER: Tertiary treatment from Las Vegas is put into Lake Mead and there are pollutants in there individually or (inaudible; not speaking into a microphone) causing the male fish to become effeminate. This effluent comes down the CAP canal, goes into (inaudible) CAP and ends up in the effluent that you are going to want to put out according to your presentation. In the effluent there's (inaudible) already been measured in the (inaudible) discharge. There are other contaminants (inaudible) -

CHAIRMAN JIM BARRY: Mr. Stagner, do you have a question, please?

CLYDE STAGNER: - in addition to the Las Vegas water (inaudible), which is diluted, you have all the wastewater coming to Tucson with these pollutants going into the effluent which are not taken out. Are you getting contaminant monitoring measurements from the Pima Wastewater Management people? Have you advised them which ones you need to look at? Do you have a list which includes the use of effluent for (inaudible) for and from?

MS. FONSECA: So, your question is concerning all of the contaminants that exist in effluent, and there certainly are a lot of them. And the problem is most acute for the Santa Cruz River effluent-dominated part because it's not diluted,

generally, with a base flow of groundwater and some other streams - effluent-dependent streams are.

Both Tucson Water and Pima County have been very concerned about the contaminants issue and there has been some research about the ability of our existing treatment plant and our recharge systems to attenuate those pollutants, and it varies; it varies according to the chemicals, and new chemicals are being invented every day.

There's also been studies of the effects of effluent on fish from effluent derived from the Roger Road Treatment Facility, and they are seeing some effects on fish that are in some ways similar to what they saw in Las Vegas Wash as well. So, it is an area of concern and, despite all of this - these issues, the facts remain that the Santa Cruz River effluent-dominated stream is one of the largest riparian ecosystems, and it's an unfortunate situation that that's where we are today - that one of our most reliable streams is one that depends on effluent that has constituents that are not good for aquatic life.

CHAIRMAN JIM BARRY: Anybody else from the audience?
(No response.)

CERTIFICATE

I hereby certify that, to the best of my ability, the foregoing is a true and accurate transcription of the audio recording of (Presentations) excerpts of the City/County Water & Wastewater Study Oversight Committee Meeting held on September 17, 2008.

Transcription completed: September 27, 2008.

DANIELLE L. KRASSOW-TISDALE