

How Agencies in New Mexico Will Contribute to the Statewide Water Assessment

Editor's Note: The following papers represent a transcription of the speakers' remarks made at the conference; no follow-up papers were submitted by the speakers. Remarks were edited for publication by the editor. The speakers did not review this version of their presentation, and the editor is responsible for any transcription and editing errors.

Moderated by Bruce Thomson, University of New Mexico

Bruce Thomson will be retiring from the University of New Mexico where he is a Regent's Professor in the Department of Civil Engineering at the University of New Mexico and is Director of the UNM Water Resources Program. He has a BS degree in civil engineering from the University of California at Davis, and MS and PhD degrees in environmental science and engineering from Rice University, Houston, TX. Bruce teaches in the areas of water chemistry and treatment, ground water hydrology and remediation, and water resources management. Recent research has included projects on water resources of New Mexico, the impact of energy and mineral development on water resources, and water reuse and treatment. He has served on many federal, state and local committees involved with management and protection of water resources. Bruce was recently elected to the Board of Directors of the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). He is a licensed Professional Engineer in the State of New Mexico and received the 2013 New Mexico Public Sector Engineer of the Year award.



Office of the State Engineer

Michael Johnson, Office of the State Engineer

Mike Johnson has been Chief of the Hydrology Bureau at the New Mexico Office of the State Engineer since 2006, where he serves as a lead technical adviser to the State Engineer and heads a professional team of nine hydrologists. Prior to becoming chief, Mike worked seven years as a hydrologist in the bureau, conducting hydrologic data collection, analyses and modeling in support of water rights administration and management in New Mexico. Before joining OSE in 1999 Mike worked as a hydrogeologist with the Navajo Nation Water Resources Department and in consulting. Mike has B.S. and M.S. degrees in geology and is a registered Professional Geologist with 22 years of experience as a hydrogeologist in the southwestern U.S.



Editor's Note: The following transcript does not include the beginning of Michael Johnson's presentation, which was missing from the recording.

More and more we are also dealing with the Endangered Species Act (ESA), which is one of State Engineer Scott Verhines' priorities. Managing environmental mandates basically means dealing with the ESA. They are also charged under the statutes with development of the state's water resources and water planning.

We have heard a lot about that already, but I am going to talk more about that, because I think that is the strongest nexus between the Statewide Water Assessment and what our agency does. The Interstate Stream Commission (ISC) is also involved with resources monitoring on the surface water side.

I'm going to focus on groundwater permits and water rights administration (Figure 1), because that is what I know the most about, and it is the bulk of what we do. There is a potential link there with the Statewide Water Assessment. Some of the talks we just heard relate to things such as recharge. When we administer water rights, as Scott Verhines mentioned, it is technical and data driven. We use numerical models for a lot of that work. We rely upon data and information to develop the models and to update and run them. This is an area where we could see benefits from projects being conducted by KC Carroll and Fred Phillips concerning groundwater and recharge. Later, we will also hear from Stacy Timmons with the Bureau of Geology on another groundwater project. These projects, I believe, could help us with groundwater rights administration (Figure 2).

On the OSE side of things I'll go back to KC Carroll's talk. He showed a lot of data points. Those data points don't come free. Someone pays for them. In fact, we all pay for them as citizens of the State of New Mexico. The state invests a lot of money into monitoring groundwater levels. Figure 3 gives you an idea of the data points for which we have groundwater levels for the period mentioned (Figure 3). The OSE and the USGS work on about 400-500 wells a year via a cooperative agreement. The USGS does the actual measurements for most of those wells, with contractors and OSE personnel doing the rest. All of the data then goes to the USGS, and is housed in their database where it is accessible to the public. It is a cooperative effort on the measurement and funding side of things. The State funds this work,

and the State is increasingly funding a higher share of this work because of decreases in funding from the federal side. We are having to invest more and more just to maintain the measurement networks we already have at a time that we are hearing that data are becoming more and more important.

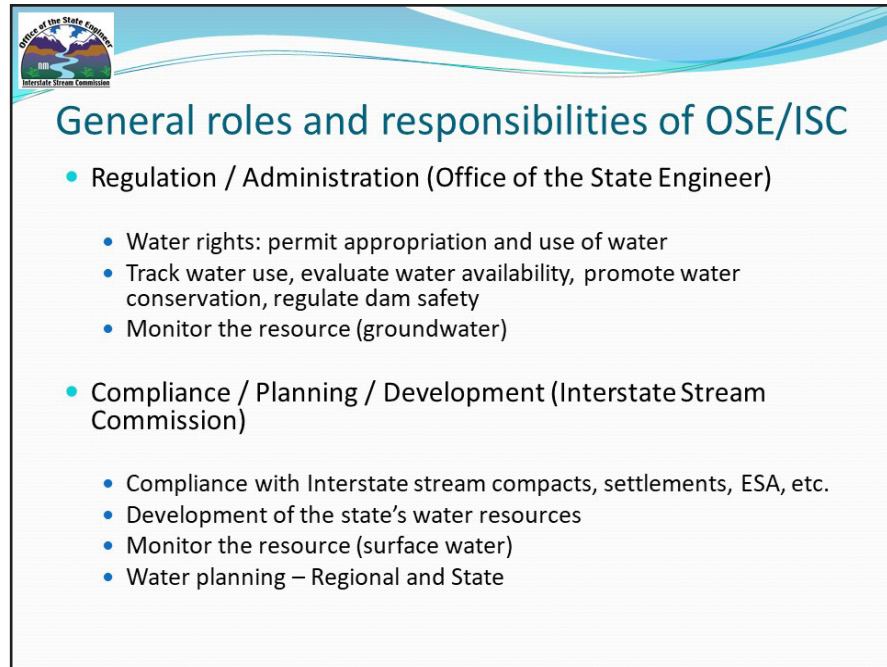


Figure 1. General roles and responsibilities of OSE/ISC.

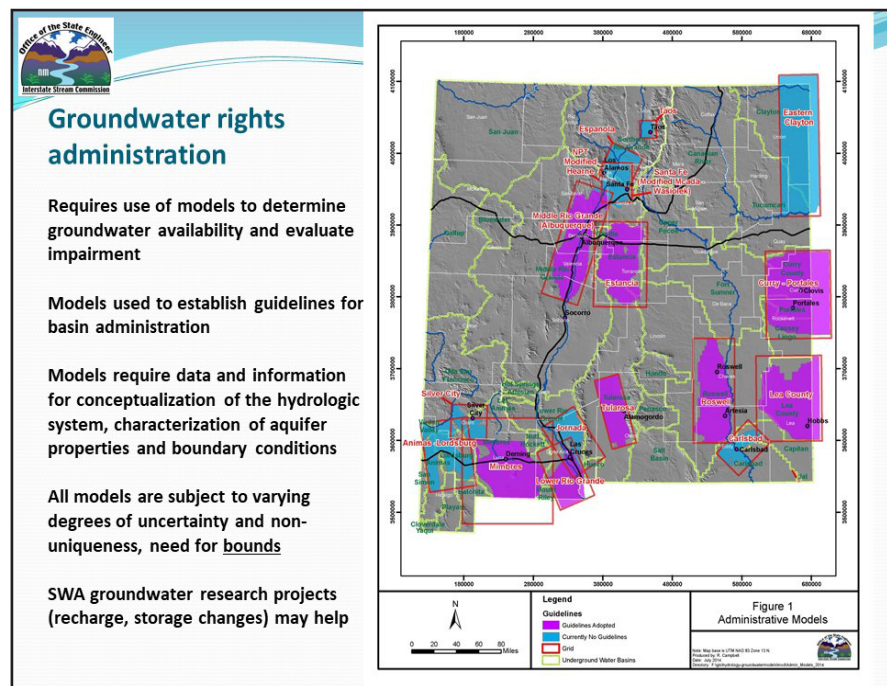


Figure 2. Groundwater Rights Administration.

The map on the right in Figure 3, I believe, is a USGS map, and may be the one being used in the Statewide Water Assessment; it shows some of the stream gauges being used. About 50 of the 150 stream gauges depicted are funded through the ISC, another cooperative program with the USGS.

Finally, I'm going to focus on planning because, as I said, I think that is the clearest nexus right now between what we do and what the Statewide Water Assessment is attempting to do (Figure 4). I've simply pulled out some statutory language here that is in the state water planning statute under the ISC's charge. It includes items on quantifying water budgets, which includes quantity and quality of the state's water resources. It is all quantification, and that is what the Statewide Water Assessment will focus on.

The limitations of the current round of water planning has been mentioned. Planning is an iterative process, as my friend Angela Bordegary, our State Water Planner, would say. The current round is not the final round of planning. We understand and realize the limits of what we are calling the administrative supply as something to plan on. But, we do think it is the most important piece to start with, and we will get to the physical supply and other potential sources of water that exist in the state in future rounds of planning. So again, I think that is an area where the Statewide Water Assessment could help by filling in gaps of current efforts.

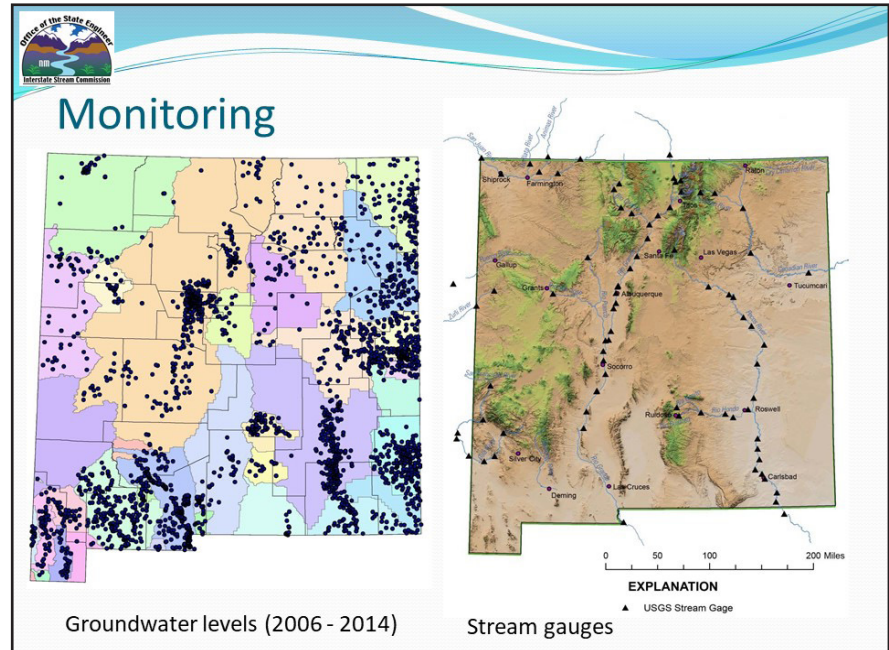


Figure 3. Monitoring Groundwater levels 2006-2014 and Stream Gauges.

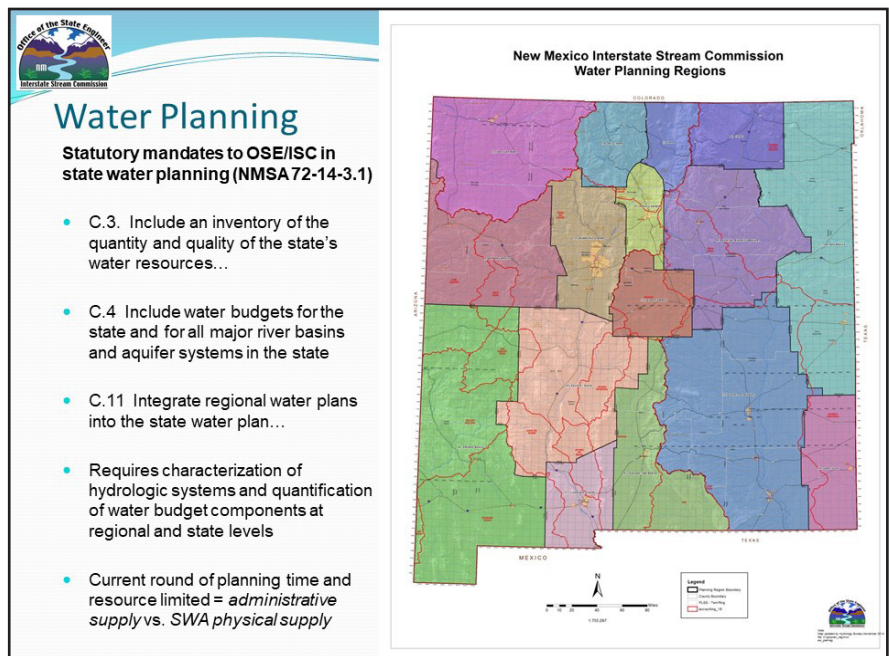


Figure 4. Water planning - Statutory mandates to OSE/ISC in state water planning (NMSA 72-14-3.1).

In closing, I want to describe what we are doing as an agency with the Statewide Water Assessment (Figure 5). I am participating on Sam Fernald's steering committee, which funded some of the projects that produced the early results you are hearing about today. I'm also very generously and graciously named on a couple of projects that I am collaborating on. I also identified a need on the planning side for a produced water component of the Statewide Water Assessment. Through the steering committee, I was able to bring in NM Tech and their Petroleum Recovery Research Center into contact with Sam and their group to get funding. Martha Cather is going to talk about that tomorrow, where they are going to reinvigorate and bring back to life an important database that has been dormant for about ten years. That is what is going on now.

In terms of future work, I think it is important to have a square peg like me among the round holes of the steering committee because it is me among a bunch of researchers. I am not a researcher. I am where the research rubber meets the road in terms of actually administering water resources. I think that it is important to have that perspective among the group, so I thank Sam for asking us to participate. As I mentioned, I think the assessment will also help us fill in gaps in our current knowledge and planning base with things like brackish water resources. Finally, I would like to see if we could find more ways to link the seven OSE priorities that Scott Verhines mentioned with further research conducted under the Statewide Water Assessment.

Thank you.

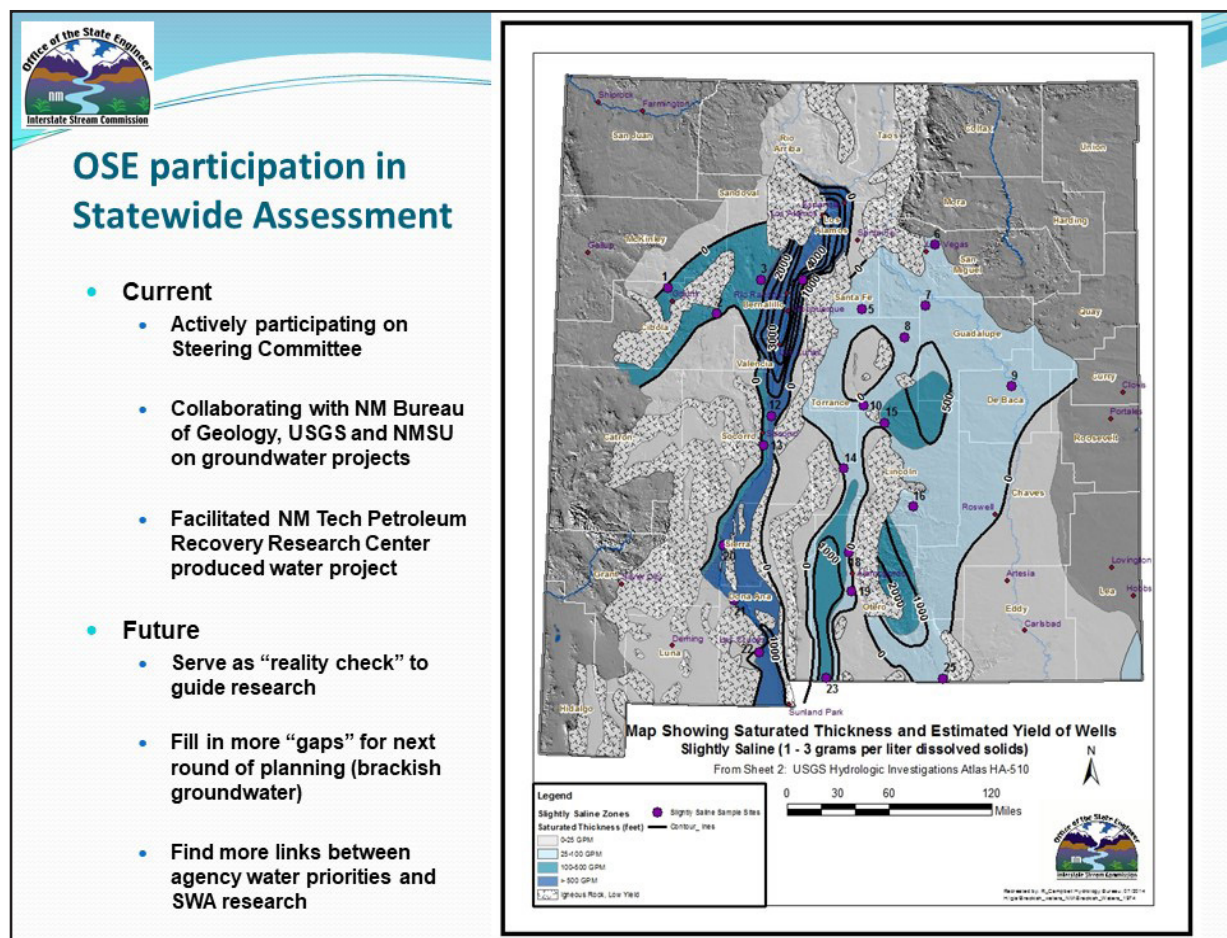


Figure 5. OSE participation in the Statewide Assessment.

Reclamation Programs that Support Assessment of the New Mexico Water Budget

Dagmar Llewellyn, Bureau of Reclamation

Dagmar Llewellyn is a hydrologist, with an educational background in geosciences and civil engineering, and post-graduate studies in climate dynamics, paleoclimatology, river restoration, GIS, and water law and management. Since 2000, her work has focused on water-management and endangered-species issues in the Upper Rio Grande Basin. Her work has involved water supply and demand evaluation, groundwater/surface-water interaction, irrigation efficiency, habitat and hydrologic requirements of endangered species, accounting under the Rio Grande Compact, and Reclamation project operations. After 25 years in environmental and water-resource consulting, her interest in working for the federal government was sparked by the passage of the SECURE Water Act, which was assigned to the Bureau of Reclamation a west-wide evaluation of the potential hydrologic implications of climate change. Since 2010, she has worked Reclamation on programs authorized under the SECURE Water Act, as well as on Rio Grande water management and endangered species/environmental compliance issues.



Hello, thanks on behalf of Reclamation for being able to come here and speak about some of the programs that we have going on. I am speaking in Mike Hamman's stead. He was unable to be here today. Reclamation has a strongly vested interest in understanding the water budget in the state of New Mexico. We have projects throughout the state on the Rio Grande, the Pecos, and the San Juan Chama Project where we import water into the Rio Grande. We are also in a leadership role in terms of environmental compliance, endangered species compliance, and more so with our future water budget instead of just the current one. We work on programs that involve both, and we work both on our own and in partnership with all of you in local water management entities. We do this for the needs of Reclamation as well as our partners and community in general.

Some of the things that we have going on at the moment include strong participation in Sam Fernald's Innovation Working Group. They got this water budget process going. We had four participants from Reclamation sharing some of the work that we have been doing. I also work with Bruce Thomson on the Middle Rio Grande Water Budget which he'll talk about later and he has had support from Reclamation on that. Also, I'm not sure if anyone is here from MRCOG (Mid-Region Council of Governments) but we have been working with them, some other colleagues that I see here, and with the Department of Transportation Volpe's Center on trying to

get a handle on variability and extreme events changes. Finally we are working with the Corps of Engineers in trying to develop daily time step projections of the future that can help us with our water planning using URGWOM (Upper Rio Grande Water Operations Model).

Most of the work that we are doing at Reclamation that involves evaluating the water budget both now and in the future comes under our WaterSMART Program.

WaterSMART (Figure 1) was initiated by a secretarial order and is related to implementation of the Secure Water Act, but also incorporates programs from prior to the passage of the Secure

- Initiated by Secretarial Order 3297, February 2010 to:
 - Establish a framework to provide federal leadership and assistance on the efficient use of water
 - Integrate water and energy policies to support the sustainable use of all natural resources
 - Coordinate the water conservation activities of the various Interior offices
- Important to Reclamation's implementation of the **SECURE Water Act** (P.L. 111-11, Title IX, Subtitle F)

RECLAMATION

Figure 1. WaterSMART Program: history and purpose.

Water Act in 2009. The idea is to integrate water and energy policies and to promote the sustainable use of natural resources throughout the western United States and to coordinate conservation efforts both with other agencies within Interior and local water management entities. The WaterSMART Program includes WaterSMART grants which some of you have maybe used for some of this water budget work (Figure 2). We have the Cooperative Watershed Management Program where we work with local watershed and environmental planning agencies. We have the Basin Study Program which I will talk much more about. We have the Title XVI Water Reclamation and Reuse Program, and I know that a lot of money has come out of that program and into New Mexico. We have our Water Conservation Field Services Program, and also our Shared Investment Water Innovation Program which colleagues at UNM have taken advantage of.

The component of this WaterSMART program that involves water budget assessments and has actual quantitative evaluations comes under the Basin Study Program (Figure 3). I am going to start by

WaterSMART Program Includes:

- WaterSMART Grants
- Cooperative Watershed Management Program
- Basin Study Program, including the West-Wide Climate Risk Assessments
- Title XVI Water Reclamation and Reuse Program
- Water Conservation Field Services Program
- Shared Investment Water Innovation Program

RECLAMATION

Figure 2. WaterSMART program inclusions.

talking a bit about the West-Wide Climate Risk Assessment, which is a team from all of the regions of Reclamation and we do some of the basic scientific, quantitative, and modeling work that supports planning across the western United States.

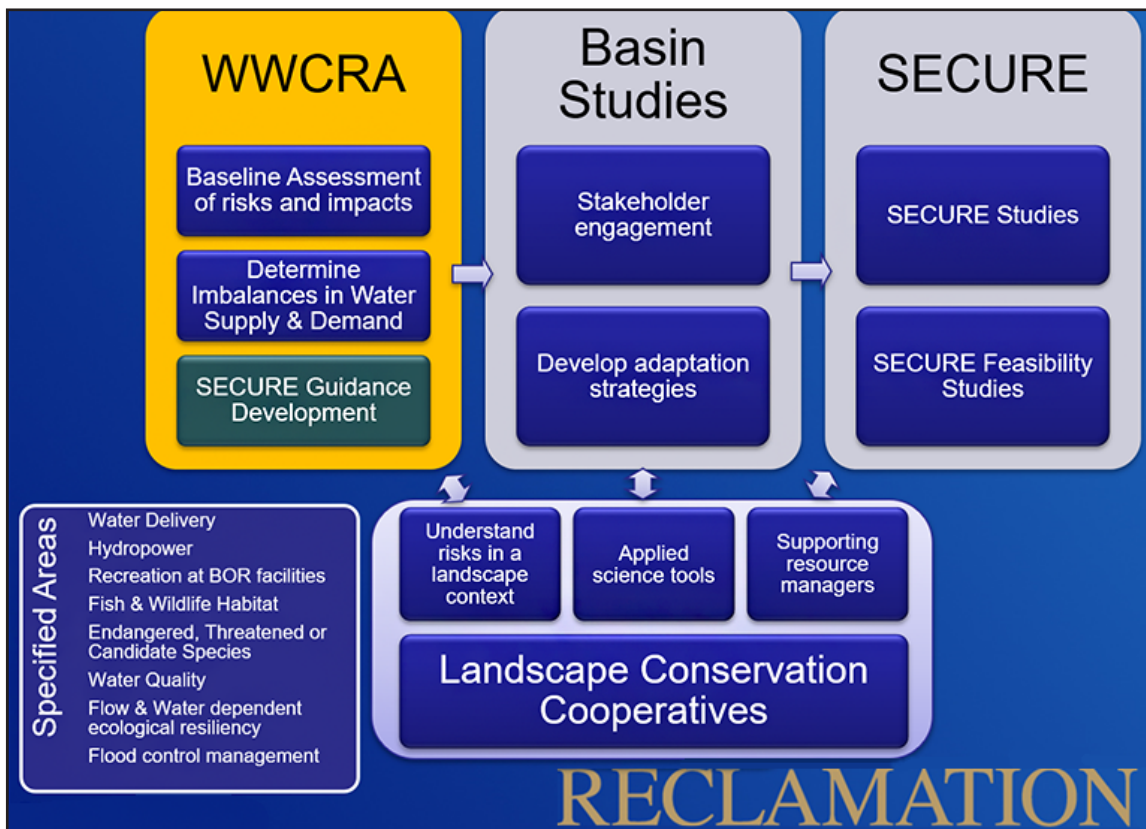


Figure 3. Basin Study Program.

I think one of the contributions to research that many of you are doing is available on what we call our Stream Flow Website. There we have taken a large number of the general circulation models and have downscaled and bias corrected them and then run them through hydrologic models as Dave Gutzler will talk about later. It is described a little bit more here in Figure 4.

This is to get a basic handle on the changes of water supply, primarily headwater supplies, throughout the West. Reclamation with other partner entities as well as on its own work to try to figure out what those changes are on the ground as we operate our system. I know that many of you have heard me talk about the Upper Rio Grande Risk Assessment that I partnered on with Jesse Roach who spoke this morning and Ariane Pinson with the Corps of Engineers. That work is a foundational piece trying to figure out what our future projections of water supply might look like so that we can begin our planning process. This West-Wide Climate Risk Assessment addresses a number of components of the water budget that we have been talking about this morning. This pertains to not only that water budget, but the one in the future as well. That includes changes in snowpack, changes in the timing and quality of our runoff, changes in groundwater recharge and discharge as we heard about earlier this morning, as well as demand. These all affect both Reclamation's facility operations and those of our partners.

Something that is coming out soon that you haven't seen yet is our demands assessment where we have done some modeling throughout the western United States and Reclamation's major basins to try to assess future demands based on changes in temperature, ET, and to a lesser degree precipitation patterns but that is included as well (Figure 5).

**S&T product (2007-present):
Downscaled Climate Projections**

http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/

- **Collaboratively hosted web data-service**
- **Goal**
 - Develop and maintain a projections-rich information resource consistently developed over contiguous U.S. that supports risk-based climate adaptation planning.
- **Content**
 - climate projections (monthly BCSD, daily BCCA), CMIP3 (2007-2011), CMIP5 (2012-2013) through support from WaterSMART grant
- **Collaborators**
 - Reclamation (S&T, PMO (2011-present))
 - USACE IWR
 - Santa Clara University
 - Climate Central
 - LLNL Green Data Oasis
 - Scripps Institution of Oceanography/ USGS

Figure 4. S&T product (2007-present): Downscaled Climate Projections.

Pending Release of New Demands Report

<http://www.usbr.gov/WaterSMART/wcra/index.html>

RECLAMATION
Managing Water in the West

DRAFT - Technical Memorandum No. 96-60210-2014-015
**West-Wide Climate Risk Assessments:
Bias-Corrected and Spatially-
Downscaled Irrigation Demand and
Reservoir Evaporation Projections**

RECLAMATION

Figure 5. Pending release of new demands report.

The idea of doing all of this work is to provide a foundation for a basin study. Today I'm hoping to talk about not just what Reclamation is doing, but how we can all partner together. This is one opportunity. The Basin Study Program is a partnership with local entities in which the cost of the study is split where Reclamation pays half and the other combined entities pay for the other half. This is an opportunity to start taking these projections, refining them, and then figuring out how that is going to change our water management in the future. There is a small version, you could call it a pilot version of this basin study approach in the upper Rio Grande. It is coming out shortly for the Santa Fe Basin. It includes not only the Santa Fe Watershed, but other components of supply that feed both the city and the county. That includes the upper Rio Grande water, water from the San Juan-Chama Project, and then water from their groundwater. I don't have a slide of it, but I am also working with the Interstate Stream Commission on a project with the Pecos River which should be coming out sometime in the middle of next year where we are doing some of the same projection work and trying to create adaptation strategies for the projected changes.

As the Secure Water Act is written, the Basin Study Program includes a step beyond the basin study where we can work with the local partners that we've partnered with in the study to do some feasibility and design studies for some of the selected adaptation strategies. It is a fairly comprehensive program and is also supported by Landscape Conservation Cooperatives. Those do some applied science to help figure out what the water budget needs for certain ecosystems, or what the needs are of specific social and ecological systems.

One final note is for letters of interest for the 2015 Rio Grande Basin Study. The announcement will come from the Bureau of Reclamation in the next month and consider this a letter of invitation to partner with Reclamation. If we can get a study like this going here, we can use it to characterize both our current and future water budget and also to start to work together to plan our combined water future.

Thank you very much.

Army Corps of Engineers

Ryan Gronewold, U.S Army Corps of Engineers

Ryan Gronewold, P.E. is a Hydraulic Engineer with the U.S. Army Corps of Engineers, Albuquerque District, Reservoir Control Branch. He began working with the Corps upon his graduation from the University of New Mexico with a BS in Civil Engineering. As the Rio Grande Basin Coordinator, Ryan's primary duty is to oversee the water management and flood control operations of the Corps dams within the Rio Grande Basin. Ryan is also involved in other areas where water management is a concern. Prior to his current position, Ryan was a hydraulic engineer with the Corps in the Hydrology and Hydraulics Section where he worked on flood risk management, ecosystem restoration, and watershed studies.




Today I'd like to talk about the Corps' role in water resources and then talk a bit more about how the Corps can support the Statewide Water Assessment. Some of the major authorities that the Corps of Engineers has in its Civil Works Mission-Water Resource Development includes: Flood Risk Management (dams, levees, floodplain management, emergency operations); Environmental Stewardship (1990 Water Resources Development Act); Recreation; Navigation; and Infrastructure (2012 Infrastructure Strategy). Flood risk management is primarily what people probably think of when they think of the Army Corps of Engineers. That is building dams, levees, and flood plain management. Environmental stewardship has kind of taken over though. We are doing a lot of work with environmental restoration projects, which stems from the Water Resources Development Act of 1990. Recreation is also an authorized purpose for many of our projects, and a small part of almost all of our projects. Navigation doesn't really apply to New Mexico much, but there has been much more emphasize placed upon infrastructure lately. We aren't building dams or major water projects anymore. Many of the projects that we built are fifty years old now, and the planning projects that were done for those water projects are even older. We are now looking at much of our existing infrastructure and projects and determining how they could be repurposed or operated in a different way to meet current needs.

I attended the Innovative Water Summit about a month ago and presented Figure 1. I was surprised that I saw many peoples' eyes start to glaze over

or turn to their cell phone when I started talking about the Corps' planning process. I thought that it would really get people all juiced up. I was wrong. I'll quickly go over what the Corps is doing to transform the civil works process. We have a very robust planning process, so much so that I think the phrase "paralysis by analysis" sometimes applies. We can plan the heck out of things. We recognize stakeholders' frustration with that and so our goal is to do our planning studies faster, cheaper, and better. The 3x3x3 process is supposed to take less than three years, cost less than \$3 million, and have a three-tier integrated planning process to better meet the needs of stakeholders and sponsors.

- ▶ **Modernize Project Planning**
 - Produce Concise Chief of Engineer's Reports Faster and Lower Cost
 - 3x3x3
- ▶ **Enhance and Refine the Budget Development Process**
 - Systems Oriented Watershed Approach
 - Collaboration with Stakeholders
 - Innovative Financing
- ▶ **Evaluate Water Resources Projects through a Smart Infrastructure Strategy**
 - Evaluate assets in their Value to the Nation and their current performance in meeting project purposes
 - Seek alternative and innovative funding to meet the nations high value infrastructure needs
- ▶ **Improve Methods of Delivery to Produce Critical Products and Services on Schedule**
- ▶ **Engage other Governmental and Non-Governmental Partners in working toward National, Regional, and Local Priorities**



BUILDING STRONG®

Figure 1. Transforming Civil Works Process.

Today I am still learning about the Statewide Water Assessment. Figure 2 provides some ideas of how the Corps can support the Statewide Water Assessment. The first thing that came to mind was the Upper Rio Grande Water Operations Model, or URGWOM. This model is primarily a surface water accounting model that the Corps of Engineers, Reclamation, and the State of New Mexico use on a daily basis throughout the Rio Grande Basin. It is also a planning model that we use each year for snowmelt runoff in combination with San Juan-Chama River Project water that will be managed throughout the year. We budget over a \$1 million to maintain and refine this model and I think there is a real opportunity to leverage that federal effort with the Statewide Water Assessment.

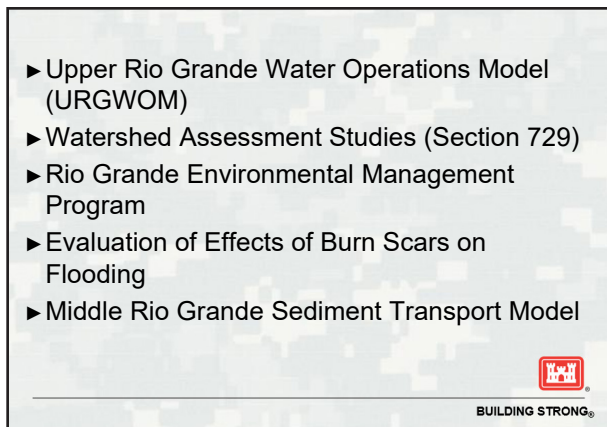


Figure 2. Corps role in the Statewide Water Assessment.

Another way that immediately jumped out at me concerned our Watershed Assessment Studies, with our Section 729 authority. This is broad study authority where the Corps looks at a watershed from a water supply standpoint as well as flood and water quality issues. Two of these studies are going on right now, one in the Lower Rio Grande from around San Marcial to Fort Quitman, and another on the Pecos River. Those studies are focused mostly on salinity issues, but I think they provide another opportunity to leverage a water assessment study with the goals of the Statewide Water Assessment. Another authority that we have is the Rio Grande Environmental Management

Program. This program is meant to implement projects within the Rio Grande basin and to monitor those with a basin-wide perspective, and again another possibility for collaboration with the Statewide Water Assessment.

Although it doesn't relate directly to the Statewide Water Assessment, over the last few years we have started to come to terms with the effects of wildfire on flooding effects. In 2007 there was the Las Conchas fire in the Jemez Mountains. At the time, it was the largest fire in the state's history, but that record was broken later that year by the Whitewater-Baldy fire in the Gila Mountains. We are just now coming to terms with the effects from those fires. The flooding effects are very substantial. We are finding that a two-year rainfall event is producing flooding events that previously would have been realized from a 50- to 100-year magnitude event. The altered hydrology in these burn scars is tremendous. Not only flooding, but also debris flow issues happen, and the sediment loading downstream of these burn scars has a large effect on water resources projects and the water balance as well.

Another area for collaboration concerns our Middle Rio Grande Sediment Study. Sediment transport and geomorphology is critical to water resource management in the Rio Grande and other areas as well. What we are trying to do with this project is to determine the drivers of sediment movement in the sediment budget. We are looking into both anthropogenic factors such as dams, diversions, and levees as well as hydrologic changes such as snowmelt changes, runoff changes, and monsoonal changes and how they are impacting the overall sediment budget.

These are just areas that I had initially thought of although I am sure that there are more opportunities that the Corps would have to help support the Statewide Water Assessment. I invite other ideas that you all might have.

Thank you.

New Mexico Environment Department

James Hogan, New Mexico Environment Department

James Hogan has over 15 years of experience from both the academic and public sectors working on a variety of hydrology and water quality issues. Since May 2012 James has served as the Bureau Chief of the Surface Water Quality Bureau at the New Mexico Environment Department. In this position he is responsible for coordination and oversight of all bureau responsibilities including water quality protection and regulation, watershed restoration and water quality standards development. The bureau has roughly 50 staff members and nearly \$6 million annual operating budget. Prior to this he served as the program manager of the Monitoring and Assessment Section of the Surface Water Quality Bureau since February 2009. Responsibilities of his section included collecting water quality data statewide, assessing this data to develop the biennial 303d list of impaired waterbodies, and developing TMDL documents. Before joining the Environment Department, James was the Assistant Director of SAHRA, an NSF Science and Technology Center focused on Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA), and an Adjunct Assistant Professor in the Department of Hydrology and Water Resources at the University of Arizona.

He has over 25 peer-reviewed publications covering many areas of environmental geochemistry and hydrology. He has a Ph.D. in Earth Sciences from Dartmouth College and a B.S. in Geochemistry from Bates College.



I want to thank Sam Fernald and the planning committee for inviting me to talk today. I'd like to turn the page a bit and focus upon water quality issues. It is something that has been mentioned by several people, but it is going to be the exclusive focus of my talk here and the data that we collect in the Surface Water Quality Bureau that I am the bureau chief of within the New Mexico Environment Department. The focus of the program that I manage is implementing both the New Mexico Water Quality Act as well as the Clean Water Act in New Mexico. There is a fair amount of text in Figure 1, but what I want to make clear is that in these laws, the state has requirements to adopt water quality standards that protect the public health and welfare, enhance the quality of water, and are consistent with and serve the purposes of the New Mexico Water Quality Act and the federal Clean Water Act (Figure 1). Really, the goal of this is to restore and maintain the chemical, physical, and biological integrity of the waters of the state and the nation under the Clean Water Act. The goal, specifically within the Clean Water Act is that water quality that provides for the protection and propagation of fish, shellfish, and wildlife that provides for recreation in and on the water.

One of the things that my bureau is involved with is proposing standards to the Water Quality Control Commission that will protect these

Clean Water Act / NM Water Quality Act



- The state of New Mexico is required under the New Mexico Water Quality Act (Subsection C of Section 74-6-4 NMSA 1978) and the federal Clean Water Act, as amended (33 U.S.C. Section 1251 *et seq.*) to **adopt water quality standards that protect the public health or welfare, enhance the quality of water and are consistent with and serve the purposes of the New Mexico Water Quality Act and the federal Clean Water Act.**
- It is the objective of the federal Clean Water Act to **restore and maintain the chemical, physical and biological integrity of the nation's waters**, including those in New Mexico.
- Meets with Section 101(a)(2) of the federal Clean Water Act, which declares that it is the national goal that wherever attainable, an interim goal of **water quality that provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water** be achieved by July 1, 1983.

Figure 1. Clean Water Act / NM Water Quality Act.

uses. These are specific numbers that we try to maintain in our waters so that they can be used for irrigation, aquatic life use, and for swimming and recreation. But, the other important piece of this is that we go out and collect data to evaluate whether we are meeting those standards or not. So, one of the main focuses of the program is collecting data and then we evaluate them against those standards to see if we are meeting them. That is the goal that we are trying to address and why we are focused on going out and collecting data. With water quality data, Mike Johnson provided a snapshot

in terms of the groundwater level and surface water gage data. Unfortunately, our records are not nearly as systematic as they are for quantity. To my knowledge, the New Mexico Environment Department's data set, at least on the surface water side, is the only real comprehensive data set statewide. The USGS collects a fair amount of data, but a lot of that is project specific, and there are many other project specific data. So, we are one of the few places that is collecting water quality data systematically across the state.

What do we monitor? Well, what we monitor is based upon evaluating those standards to determine if those water quality standards and uses are being met and whether those water bodies are impaired. We will often go back if a water body is impaired and see how that quality is changing over time. Sometimes we will also collect data to decide whether those standards need to be revised. But, the type of data are split into these three groups and goes back to the national goal of protecting the physical, biological, and chemical integrity (Figure 2). We collect a lot of physical data on the water which includes things such as sediment, temperature, flow, although our measurements are often more crude than what would be useful for Mike's work, dissolved oxygen, turbidity, conductance, and these sorts of things. On the biological side we collect data on three main groups of biological organisms. There are the benthic macroinvertebrates which are the insects that live within the stream. We also collect fish community data and data on periphyton which are the algae and other stuff that grows on the surface of the rocks. Then there is the chemical data which is what most people think of when they think about water quality data. These are things like total dissolved solids, nutrients, metals, organics, radionuclides, PCB's, PH, and all of these sorts of things.

How do we go about collecting those data? Well, New Mexico is a big state, and we don't have a lot of water relatively,

What Do We Monitor?

Determined by Water Quality Standards, Existing Uses, Known Impairments, Standards Revision

<u>Physical</u>	<u>Biological</u>	<u>Chemical</u>
<ul style="list-style-type: none"> • Sediment • Temperature • Flow • Dissolved O₂ • Turbidity • Conductance 	<ul style="list-style-type: none"> • Benthic Macroinvertebrates • Fish • Periphyton 	<ul style="list-style-type: none"> • TSS/TDS/Ions • Nutrients • Metals • Organics • Radionuclides • E. coli • PCB • pH

Figure 2. Three groups monitored for quality standards and water impairments are physical, biological, and chemical integrity.

but you would be surprised how much you can find out there. We have a relatively small program for this, so we are able to go around the state on an eight year rotation. We sample between one and three basins a year. This past year you can see the Middle Rio Grande Basin and that was the basin that we were working in (Figure 3). In the course of the year we will collect data at between a hundred-and-fifty stations within those three basins and over the course of the program we have collected data at roughly 1500 monitoring locations around the state. Those are the green dots that you can see on the map. So, we have a lot of data and information that is collected at small snapshots in

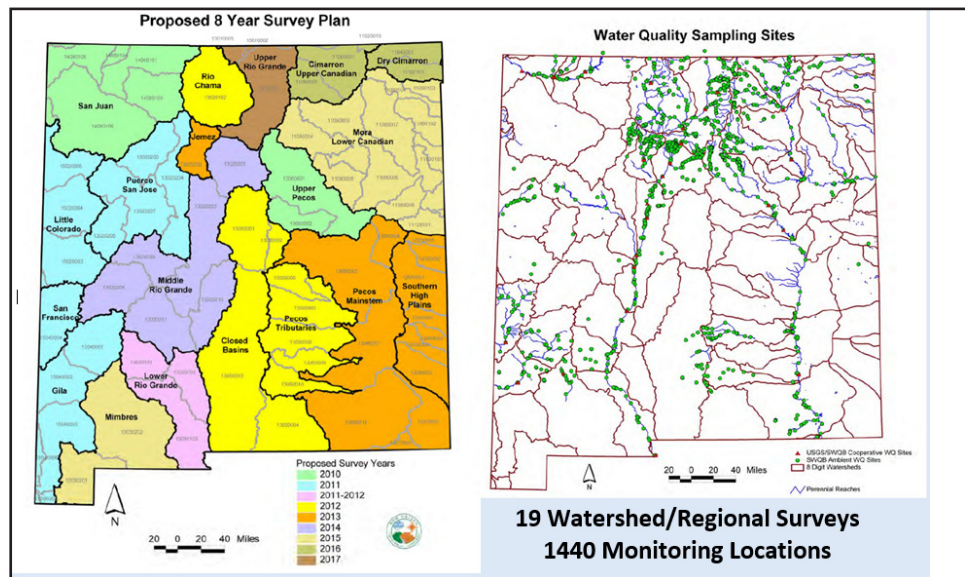


Figure 3. SWQB monitoring program.

time across the state. When we work in one of those basins, and this is now looking just at the Middle Rio Grande and our survey for this past year, we focus in on assessment units which is what we are evaluating when we look at whether the water quality is meeting those water quality standards. These are reaches of a stream, lake, or reservoirs with relatively similar water quality characteristics. We often try to position our monitoring stations at the lowest point downstream, but we also try to focus our water quality sampling locations where there are known impairments or where there are surface water discharges such as those permitted under the NPDS program such as wastewater treatment plants or storm water discharges (Figure 4). We also try to take samples at historic sites so we can look at trends and perform analysis over time. It doesn't show up particularly well here, but you can see those reaches and sampling locations on the map here.

We also have a database that stores all of those data. It is called SQUID which is the Surface Water Quality Information Database (Figure 5). It is the repository for all of the data that we collect as well as all of our assessment results. This includes the conclusions of within those assessments whether those water quality standards are being met or not. This gives us a lot of functionality and allows us to do quality assessment analysis and reports, to generate reports on several metrics and measures, and then to seamlessly upload this to the EPA's national database which is WQX. Right now, in terms of accessibility of this data, you can go onto our website and go through a GIS mapper that we have on the surface water quality website that will allow you to look at the stations where we have collected data and also to select reaches and see the assessment conclusions. So, you can see within a specific reach of the Rio Grande what water quality standards are not being met currently. You can't actually get the data underlying this, but you can request it from us and we provide this for many people on an almost weekly basis on some level of information. We are working with our IT department to make sure those data are accessible to the public through our website and we hope that will be the case relatively soon.

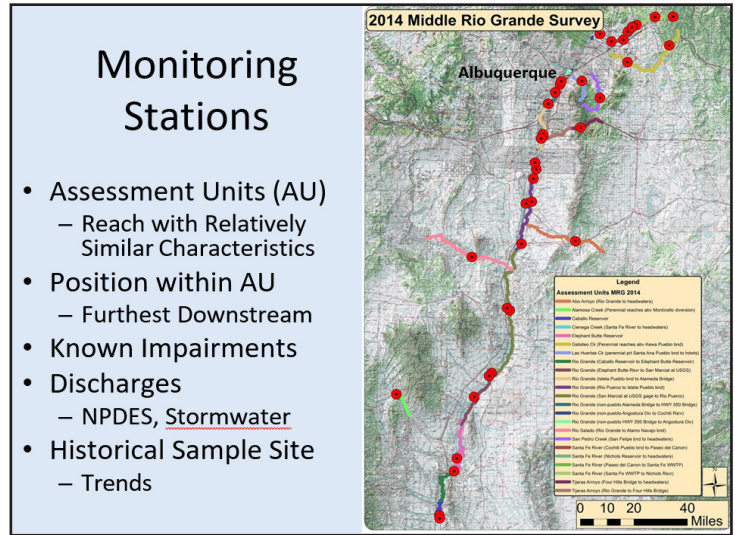


Figure 4. Monitoring stations.

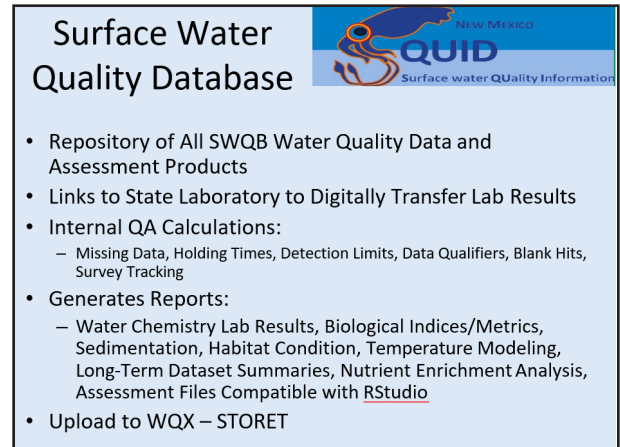


Figure 5. Surface Water Quality Database.

Finally, I just want to end with the fact that yes, we are doing a pretty good job of getting around the state, but there is always a need for more data. We are happy to work with other agencies and partners which includes during our specific survey years. For example, this year we have been working with many of the folks in the Middle Rio Grande Valley such as some of the pueblos and other agency folks and watershed groups down there. But, we are also willing to work with people between those surveys where they might have an interest and want to collect data for better information and to understand data that we collected and to follow up on impairment

or use conclusions and efforts to address and restore those watersheds. From our perspective, I can say that the most useful data is a lot of the really more basic data such as long-term datasets on dissolved oxygen, turbidity, temperature, pH, and things that we often, see impairments from such as E. Coli, nutrients, PCB's, and some metals

although we don't see many impairments from metals. These are some things to keep in mind. I also want to put a plug in for our monitoring team supervisor Scott Murray who has a poster providing some more information on our data and data resources. With that I will say thank you.