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Editor's Note: The figures referred to by Mr. Hansen in this paper were not available for the conference proceedings.

U.S. BUREAU OF RECLAMATION PROGRAMS

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I am going to start this series of discussions with a little bit of levity. I think anyone who has been involved in New Mexico water for the last several years probably has experienced this feeling before, it's a bit ironic but sometimes very good things happen under pressure. Sometimes things happen that require people to work together in a partnership to search for solutions that satisfy many competing interests. This morning I am speaking for Mike Gabaldon, our Area Manager, who couldn't be here today. He is speaking in another part of the country. Mike is a New Mexican, a native of Belen, and was just recently selected to head the second highest post in Reclamation in Washington. New Mexico will be blessed with having a fairly high-level official in Washington at the Bureau of Reclamation and only good things can come from something like that.

Reclamation has been involved in just about anything you can think of having to do with water. Today I would like to touch briefly on those areas and projects that we are involved with in New Mexico. Reclamation's Albuquerque Area Office is involved in three basins: the Rio Grande, the Pecos, and the Canadian.

On the Rio Grande Basin, the San Luis Valley Project in southern Colorado helps Colorado assure its Rio Grande Compact deliveries to New Mexico and Texas. The San Juan-Chama Project diverts water out of the Colorado River Basin into the Rio Grande Basin. Heron Reservoir stores that water at the top of the Rio Grande Basin in New Mexico. The water for this Project will ultimately comprise a diversion of 235,000 acre-feet per year, with an initial phase development of 110,000 acre-feet and

constitutes about a full quarter of the middle basin water supply. El Vado Dam is an historic structure completed in 1935 and was originally constructed to provide conservation storage for the Middle Rio Grande Conservancy District. It is one of the few dams with a steel face and its storage facility allows the Middle Rio Grande Conservancy District to meet is irrigation obligations in the valley. San Acacia Diversion Dam is one of four diversion points that the Middle Rio Grande Conservancy District uses to divert its releases of water or flows out of the river to its irrigation works.

The Low-Flow Conveyance Channel, built by Reclamation in the 50s, is an artificial channel that runs alongside the Rio Grande between San Acacia and Elephant Butte Reservoir. The Bureau built the low-flow channel as part of the Middle Rio Grande Project's river channelization program for the purpose of reducing consumption of water, providing more effective sediment transport, and improving valley drainage.

Figure 1 is a picture of the headwaters above Elephant Butte Reservoir during high water years, and it should make each of us shudder if we think in terms of depletions. You can literally see water evaporating into the air. Also shown in the photo is some of the temporary channel work that is required to get the river through this area, through this "Bermuda Triangle" where the water would disappear if man didn't help it find its way to Elephant Butte Reservoir.

Figure 2 shows some of the handiwork of our staff at the Socorro field division doing river maintenance work. These guys get to go out and play with some of the biggest Tonka toys available. Once the water finds its way to Elephant Butte, it's stored behind historic Elephant Butte Dam. A side benefit is our ability to generate power from the water released to the lower basin to meet our Compact obligations.

These projects require a whole slew of various types of support programs. One of the most obvious is dam safety. We look at a huge dam full of water and find it is not hard to imagine what effects an unsafe dam could pose to society. We pay very serious attention to dam safety issues. We routinely inspect conveyance facilities and the different types of works in our projects to make sure they maintain their integrity and are reliable.

Figure 3 is a photo showing an inspection of project facilities that can not be seen from the surface. We sent divers underwater to look at the outlet works that are located far below the surface of the water. The photo depicts El Vado Dam earlier this year after a very dry year in which most of the stored water reserves were used for irrigation. This is the lowest level it has been in many years. The divers found that sometime during the past couple of decades a big pile of concrete debris was dumped on the top of the outlet works. At the end of this season, the reservoir was actually drained down an additional 15,000 acre-feet and the waste material had to be removed from the top of the outlet structure, taking about two weeks.

Finally, we must find effective ways to interface our water operations and our dam safety programs and the various concerns the public has with these water projects with emergency operating plans and standard operating procedures. And, of course, any project delivering water to water users who pay money for that water is expected to keep good track of its books. We have now joined in partnerships with several federal agencies and other interested parties like the state and various cities to develop the Upper Rio Grande Water Operations Model (URGWOM). The model will allow us to not only automate water accounting but eventually it will be used as a daily water operations tool that will assist in water planning in the basin.

Also on the Reclamation list of responsibilities is that of Native American affairs and trust responsibilities. Figures 4 and 5 show subsurface drainage installation at Isleta Pueblo to drain high groundwater areas on irrigated lands.

Reclamation's Albuquerque office has been involved in both municipal and regional water planning. The most high profile product that we recently produced was the Middle Rio Grande Water Assessment that represents a partnership with many parties; the biggest partner being the City of Albuquerque. The assessment looked at water use in the middle basin and the best strategies to making that water stretch as far as possible. That will include quite a few different types of field investigations. For example, we determined how much water was lost in the conservancy district's canal conveyance system. A very large portion of the water lost to canal seepage ends up as recharge to municipal systems.

We also learned from that investigation that we need to do a better job of understanding depletions in the basin. That lead to creation of the interagency evapotranspiration (ET) workgroup, to the ET research that we undertook, and to developing the ET monitoring network. Figure 6 shows one of the weather stations that supplies real-time information to the ET Toolbox, a product of that work. The research brought together a very impressive consortium of participants that used state-of-the-art technology and modeling capabilities to take a look at new ways of measuring water vapor flux from crops and riparian vegetation.

Figure 7 is an example of a real-time snapshot of water vapor flux over a transpiring surface, in this case, of salt cedar at Bosque del Apache National Wildlife Refuge. Researchers from Los Alamos National Laboratory used their atmospheric modeling capabilities to model how moisture leaves the source and moves up and away from the basin–a loss of water supply. An ET toolbox has been developed and is available on the Internet via http://usbr.gov/rsmp/nexrad. A video entitled *Pulsing the Bosque* has been produced and has been shown on the public education channel a couple of times. Contact Steve Bowser of USBR's Albuquerque Area Office to obtain a copy of the video.

The ET Toolbox estimates high-resolution daily rainfall and water depletions within river reaches of the Middle Rio Grande. The Toolbox provides GIS land-use maps to specify acreage, crop and riparian water use, and open water evaporation estimates on a grid cell (resolution about 4 km x 4 km) along the Middle Rio Grande. Irrigators are able to click on an area of the map representing their fields to find out what the water requirements for their crops are for that day.

Part of Reclamation's responsibilities are to determine how to improve our measurement capabilities as well as the water supply and conveyance system in the Middle Rio Grande Basin. We are definitely lacking in the ability to monitor and measure our water and determine where it goes. In partnership with the Middle Rio Grande Conservancy District, we are building a special real time monitoring network of surface flows, also available on the ET Toolbox.

We also have a responsibility to protect the environment with respect to our operations and our water management partnerships. Most of you are familiar with our three most infamous characters in our state–the Rio Grande silvery minnow, Pecos bluntnose shiner, and the Colorado pike minnow. Most of you are aware that last year we were under a court order to keep the river flowing from Cochiti Reservoir all the way down to Elephant Butte Reservoir with a minimum flow target of 50 cfs at San Marcial. Figure 8 shows what that lower part of the river looks like at those kinds of flows. This effort took quite a bit of cooperation and resulted from the mediation process. Figure 9 shows an emergency pumping effort out of the Low-Flow Conveyance Channel to return water that is being lost from the river into that channel, acting as a drain, back to the river. We pumped about 120 to 130 cubic feet per second with these large pumps. We spent several million dollars getting the equipment in place by mid to late summer. It was one of the key factors that allowed us to keep the river flowing.

Figure 9 shows the view of the pump outlet pipes into the river. Each pump has a pumping capacity of about 22 cubic feet per second. Water is not the only solution to taking care of endangered species. We also have to incorporate habitat considerations, the biological needs of the fish themselves, and this is done through a couple of programs in our environmental group and our design, construction, and river maintenance group. We have done some channel habitat work and have an ongoing restoration project at Santa Ana Pueblo. Additionally, our design and construction group has been active in assisting the Velarde Irrigation District in rehabilitating their project to make it as efficient as possible.

With that I would like to thank you for having me here today. And one last comment. I stand here as a New Mexican and as a federal water manager, and I am proud of both. I think that if we can all view ourselves as brothers in arms in terms of dealing with the issues in this basin, we will get much further, much quicker.

Thank you.