



Final 2010 Annual Adaptive Management Report for the Carlsbad Project Water Operations and Water Supply Conservation Environmental Impact Statement



**U.S. Department of the Interior
Bureau of Reclamation
Albuquerque Area Office
Albuquerque, New Mexico**

April 2011

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

2010 Annual Adaptive Management Report for the Carlsbad Project Water Operations and Water Supply Conservation Environmental Impact Statement

Prepared by:

AAO Bureau of Reclamation

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Cover photograph: Pecos River south of Bottomless Lakes State Park, 9.22.2010 by M. Carra



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Introduction

This report covers the period January 1, 2010, through the end of the calendar year December 31, 2010, as stated in the Carlsbad Project Water Operations and Water Supply Conservation Environmental Impact Statement (EIS), June 1, 2006. This report describes the actual Adaptive Management Plan (AMP) as published in the EIS, including the criteria, triggers, monitoring and responses, then the actions taken this calendar year. The final portion of this report will describe the changes required in the AMP, establishing new procedures for monitoring the results of management action and integrating this new knowledge into future policy and management actions.

Adaptive Management Plan The AMP outlines a procedure for monitoring indicators (which serve as signs or symptoms) and modifying river operations when needed. It is a means to address uncertainty by monitoring EIS targets, identifying actions to be taken for targets that are in jeopardy, and applying lessons learned in the future management of river operations by modifying operations within established parameters.

The AMP was designed to ensure compliance with the Biological Opinion (BiOp) and the Record of Decision (ROD) and EIS, completed August 2006.

Adaptive Management – Carlsbad Project Water Operations: Taiban Constant Alternative
The AMP appropriately addressed the range of alternatives under consideration. Since the Bureau of Reclamation (Reclamation) has identified the Taiban Constant as its preferred alternative and consulted with the U.S. Fish and Wildlife Service (Service) regarding the effects on endangered species, it is meaningful to reformulate an AMP that is focused on the Taiban Constant alternative. In fact, to better determine potential future effects on Pecos bluntnose shiner, it is necessary. Seven objectives were identified for the development of adaptive management guidelines specifically for the Taiban Constant alternative:

1. Develop a monitoring, decision-making, and response program for the long-term management of the Pecos River flows;
2. Identify agency responsibilities for monitoring and response;
3. Conserve populations of the Pecos bluntnose shiner;
4. Conserve the Carlsbad Project water supply;
5. Assure critical habitat remains wetted;
6. Meet flow criteria at the Taiban gage as specified in the EIS, and;
7. Minimize river intermittency in reaches not designated as critical habitat.

The AMP provides structure for making decisions based on changing environmental and hydrological conditions and offers a forum to stakeholders for developing consensus. Communications for the AMP are carried out throughout the year primarily through conference calls among the Pecos River Stakeholder Group and the preparation of the Annual AMP report. Members of the Pecos River Stakeholder Group include the Service, Reclamation, Carlsbad Irrigation District (CID), Ft Sumner Irrigation District (FSID), New Mexico Department of Game and Fish, New Mexico Office of the State Engineer (NMOSE), New Mexico Interstate

Stream Commission (NMISC), US Army Corps of Engineers (Corps) and interested environmental groups.

Criteria, Triggers, Monitoring, and Response

The core components of the AMP for the Taiban Constant alternative are criteria, triggers, monitoring, and response. These four components are described for the following eight indicators for 2009:

- (1) Continuous River Flows
- (2) Flow Monitoring at Taiban and Acme Gages
- (3) Incoming Flows Available for Bypass
- (4) Block Releases
- (5) Density for the Pecos Bluntnose Shiner (Shiner)
- (6) Density for the Interior Least Tern (Tern)
- (7) Carlsbad Project Water Supply Status
- (8) Aquifer storage and base inflows from the Roswell Basin.

This report describes the actions taken in the calendar year January 1, 2010, through December 31, 2010, and future recommendations which are in the AMP report for monitoring and river management for CY2011.



Pecos River 2nd Restoration Project Meeting September 22, 2010

Methods - All methods are discussed in detail in the final AMP available on the web site: <http://www.usbr.gov/uc/albuq/library/eis/carlsbad/carlsbad.html>

Indicator 1 - Continuous River Flows

Criteria: During the irrigation season or other periods of time when FSID is entitled to their direct diversion right from the Pecos, water will only be diverted into storage in Sumner and/or Santa Rosa Reservoirs when the following three conditions are all being met:

1. there is available reservoir inflow in excess of FSID's flow entitlement as calculated on a two-week basis by the New Mexico Office of the State Engineer
2. the 35 cfs river flow target at Taiban Gage is being met
3. there is no risk of river intermittency

During the non-irrigation season or other times when FSID is not entitled to utilize their direct diversion right from the Pecos, water will only be diverted into storage in Sumner and/or Santa Rosa Reservoirs when the following two conditions are being met:

1. the 35 cfs river flow target at Taiban Gage is being met
2. there is no risk of river intermittency

Trigger: The river flow trigger is activated when the flow rate measured and reported by USGS at Taiban is 40 cfs or less, or the flow rate measured and reported by USGS at Acme is 10 cfs or less.

Monitoring: River flow and reservoir elevation data are collected electronically every four hours from gage sites and relayed, via satellite links, to US Geological Survey and Army Corps websites. Reclamation staff monitors these sites daily. During the irrigation season, Reclamation holds weekly conference calls. Gage data is collected and recorded on logs and discussed on the calls at the beginning of each week. Participation from all Pecos Stakeholders is encouraged on the weekly operation management conference calls. These weekly conference call logs are available from Reclamation staff upon request and available online, Reclamation Albuquerque Area Office webpage.

Response: When the trigger is activated by reaching the target point at either gage, Reclamation initiates additional monitoring (i.e. flow measurements, observation flights, video camera observations, or other methods) to establish the accuracy of the gage data. Depending on the accuracy of the data, Reclamation may initiate corrective actions.

If bypass water is available, Reclamation will begin bypassing inflow to target 35 cfs at Taiban and/or keep the river continuous. If bypass water is not available and the Vaughan Conservation pipeline (pipeline) is operational and available for use, Reclamation will order the operation of the pipeline at a rate needed to keep the river continuous. If bypass water is unavailable and the pipeline is unavailable, Reclamation will release Fish Conservation Pool (FCP) water at a rate needed to avoid intermittency. Reclamation has on-going water leases for artesian groundwater on the Pecos River, which is also used to avoid intermittency.

Actions taken in CY 2010: During the irrigation season, Reclamation prepared weekly logs of the conference calls. These are available from Reclamation staff upon request.

No drying occurred between Sumner Dam and Brantley Dam on the Pecos River during the time period covered by this report. The trigger for Indicator 1 was activated on seven occasions throughout the year. Only three of these incidents required action. The other four instances Taiban flow was still above 35 cfs and Acme was well above 10 cfs.

Action 1: From January 5 through March 14, 2010, Taiban gage measured below 40 cfs. Water was bypassed through Sumner Dam from January 1 through March 15 supplementing the river. Acme did not drop below 15 cfs during this time and the average over the time was 29 cfs. With the supplemental water, Taiban did not drop below 29 cfs and averaged 34 cfs during this time.

Action 2: From April 30 through May 8, 2010, Taiban gage measured below 40 cfs. Water from Sumner Dam was used to supplement the river starting May 1 through May 14. Supplemental water release was increased all the way to 60 cfs with an average of 33 cfs. Acme was never below 21 cfs during this time.

Action 3: The Taiban gage dropped to 30 cfs on June 3, 2010. The supplemental water release was increased by 10 cfs. Acme remained above 20 cfs.

From November 1, 2009, through October 31, 2010 (the 2010 water year), Reclamation had water lease agreements with five Pecos River pumpers, one of whom is also a Hagerman Irrigation Company irrigator, to lease 1,842.9 af (consumptive use portion) of surface water rights and 507 af (consumptive use portion) of Hagerman Canal water rights. The land associated with the leased water was fallow. The Hagerman Canal water was pumped directly into the Pecos River.

The pipeline was established to supplement flows on the Pecos to meet the needs of the 10-year BO. The outfall structure of this pipeline is located upstream of the USGS Taiban Gage. Maximum output is between 10 and 12 cfs. The pipeline provided 24 of 1,583 af purchased for 2010. The pipeline was used briefly during the dive inspection of Sumner Reservoir in November. The rest of the pipeline water was not needed to meet the supplemental flow for the 10-year BO.

Draft calculations produced using the Pecos Annual Accounting Method, developed jointly by the NMISC and Reclamation, indicate that for the 2010 water year Reclamation's Carlsbad Project Water Acquisition (CPWA or offset) program put 94 af more water into the Pecos River than the additional depletions incurred by the modified operations of Sumner Dam. The supplemental water and agreements with FSID and CID allow Reclamation the flexibility to meet target flows and keep the Pecos River continuous consistent with the EIS and BiOp for the federally threatened Pecos bluntnose shiner (*Notropis simus pecosensis*) (shiner).



September 21, 2010 Meeting at BLNWR on the Location for the second restoration project on the Pecos River

Indicator 2 - Flow monitoring at Taiban and Acme Gages

Criteria: Correctly operating gages are important to river management. The USGS is responsible for measurement and maintenance of their gages. For Reclamation's Pecos River operations for the shiner, the two most important gages are Taiban and Acme, although other gages are used for operations. These two gages provide data on intermittency and flow targets.

Trigger: The gage trigger is activated when the Taiban or Acme gage is malfunctioning or non-operational.

Monitoring: Monitored gages by independent contractor as well as USGS. Reclamation funds USGS to operate and maintain the gages along the Pecos River. Inoperable gages are reported to the USGS and Reclamation initiates contracted monitoring as necessary to measure gage sites and report all findings immediately.

Response: Have contractor out during these times to manually measure flows as often as necessary until gages are repaired.

Actions taken in CY2010:

Reclamation, in coordination with the Service, intensively monitors the river by the best methods available at the time, including website gage readings, field site verification and measurements, flights to monitor river connectivity, monitoring the video field camera, or other technology as it becomes available.

No flights over the Pecos to monitor flows were made in the 2010 irrigation season.

Additionally, Reclamation hosted weekly operation management conference calls throughout the irrigation season on flows and river operations. The Service was a part of the weekly events and the calls served as a condition of consultation, informing the Service of any necessary corrective actions taken or that were expected to be taken as a result of low flows.

Reclamation contacted the contractor in Ft Sumner 4 times to verify gage readings during 2010. Reclamation requested USGS verify gage readings approximately 15 times during the 2010 irrigation season. These requests were made during the weekly, Monday morning conference calls.

Indicator 3 – Incoming Flows Available for Bypass

Criteria: FSID is entitled to the natural river flow up to 100 cfs as measured at the Puerto de Luna gage upstream from Sumner Lake. FSID's entitlement is calculated every 2 weeks based on the NMOSE computations. Reclamation can divert to storage or bypass any inflows in excess of FSID's maximum water right (100cfs). Flow data are obtained from the NMOSE Pecos Water Master in the Roswell district office. Information collected by the NMOSE on flow entering Santa Rosa Reservoir and Sumner Lake, as well as USGS gage data, are used to determine the availability of water for bypasses. This information is used to assess whether there is available Carlsbad Project Supply to bypass through Santa Rosa and Sumner.

Trigger: The bypass trigger is activated when it is determined by NMOSE that incoming available flows exceed FSID's senior diversion rights.

Monitoring: The NMOSE measures flows at gage sites along the river for compact accounting purposes. These flows are calculated for FSID's senior water right and the results are faxed to Reclamation's staff on a bi-weekly basis. Flows are then calculated for the amount of water available for bypass through Sumner. If flows are not needed to keep the river continuous, water is diverted to storage for Carlsbad Project Supply.

Response: Make incoming available flows exceeding FSID's senior diversion rights available, as needed, for bypass during these time periods. After the end of FSID's irrigation season on October 31, all Sumner inflows will be made available for bypass for meeting in-stream target flows.

Actions taken in CY2010:

During the period covered by this report, inflows did not exceed FSID's senior diversion right from February 12 through March 29, July 5 through August 16, and August 30 through October 31. Reclamation did not make inflows available for Sumner bypass during these periods. After the end of FSID's irrigation season on October 31, all Sumner inflows were available for meeting instream flow targets. Reclamation made 3 bypasses totaling 3,923 af during the 2010 calendar year, with 2,162 af during the irrigation season.

During the periods when bypasses were not available water, was released from the FCP pool to meet instream flow targets. During the irrigation season 772 af of supplemental water was released from the FCP pool. The remaining 228 af of FCP was released in November to meet flow targets. Beginning November 16 Forbearance water was released to meet the flow targets, a total of 2,117 af were released from this pool.

Indicator 4 – Block Releases

Criteria: A block release is defined as moving water efficiently from Sumner to Brantley Reservoir for the purpose of irrigation. These block releases are a large quantity of water released within a short timeframe so as to avoid evaporation losses. Block releases also occur between Santa Rosa and Sumner. The frequency and duration of block releases from Sumner will be recorded as they occur and compiled into this annual report. Four key criteria are: (1) block releases will not exceed 15 days; (2) there will be at least 14 days between block releases; and (3) block releases should not occur during the 6-week period centered on August 1; or (4) the cumulative duration of block release from Sumner shall not exceeds 65 days.

Trigger: The block release trigger is activated by at least one of the following four conditions: (1) the 15-day block release duration is exceeded; (2) there is less than 14 days between releases; or (3) a block release is expected in the 6-week period centered on August 1; (4) the cumulative duration of block release from Sumner exceeds 65 days.

Monitoring: Plans for future block releases will be compared to the trigger criteria to determine if trigger criteria will be activated. The start, end and duration of block releases will be measured and recorded based on the flows reported at the USGS gage: Pecos River below Sumner, NM, USGS 08384500.

Response: Coordinate all block releases with CID when flows have dropped below specified levels (Acme 10cfs, Taiban 40cfs) to keep the river continuous and meet CID demand. Notify CID and the Service when release time is exceeded, there is less than 24 days between releases, the release occurs in the inappropriate time or last too long.

Actions taken: in CY2010

None of the triggers occurred in 2010.

Three block releases were completed last year:

3/22/2010 through 3/27/2010	14,903 af
6/23/2010 through 6/30/2010	21,445 af
9/21/2010 through 9/27/2010	15,778 af

Indicator 5 - Density for the Shiner

Criteria: The density of the adult shiner, as stated in the BiOp, is based on a two year running average.

Trigger: If fish densities fall to a low level in one year, then this is a warning that next year an action would need to be taken based upon the likely cause of decline (e.g., intermittency).

Monitoring: Fish monitoring done monthly, year round at specified sites.

Response: Reclamation will give both CID and FSID as much advance notice as possible when there is potential for changes in water operations to benefit the Shiner.

Actions taken in CY2010:

Reclamation continues to monitor flows under the 2006 10-year BO operates the Carlsbad Project with a target flow of 35 cfs at the Taiban Gage and to keep the river continuous in order to conserve the federally protected shiner. The purpose of the project was to meet the contracted irrigation needs of the Carlsbad Project, to avoid hindering New Mexico delivery requirements to Texas, and to establish partnerships in the basin. Flows remained continuous throughout the 2010 calendar year on the Pecos River between Santa Rosa Dam and Avalon, a distance of nearly 300 miles.

Reclamation received an annual update on the status of the shiner from the Service. Cumulative catch-rate in 2010 was $(17.7 \pm 1.6 \text{ shiner}/100 \text{ m}^2 \text{ SE})$ and cumulative percent abundance was $(14.0 \pm 1.1 \% \text{ SE})$. Shiner catch-rate was highest in September $(31.9 \pm 6.1 \text{ shiner}/100 \text{ m}^2 \text{ SE})$ and percent abundance was highest in November $(25.8 \pm 5.5 \% \text{ SE})$. Catch-rate and percent abundance was lowest in March $(5.8 \pm 1.7 \text{ shiner}/100 \text{ m}^2 \text{ SE}$ and $7.7 \pm 2.4 \% \text{ SE}$, respectively). Shiner have not been collected at either of the sites in the tailwater section below Sumner near Fort Sumner since 1999. Catch-rates were greater than the density thresholds set by the 10-year BO for 2010 (Table 5) (from the Service draft report). The 10-year BO stated that take would be exceeded if density fell below 3.5 shiner per 100 m² in Trimester 1 and 8 shiner per 100 m² in Trimester 3. Density targets remain the same for the duration of the 10-year BO.

In 2009, Reclamation, in collaboration with the Service completed a fish restoration project at Bitter Lake National Wildlife Refuge which included plugging and diverting the river into a historic oxbow (Oxbow 4) in Reach 4, excavating a meandering channel within the oxbow (12 feet wide at the base and 44 feet wide at the top), removing nonnative vegetation, and lowering banks. Revegetation was initiated in cooperation with the Service. The reconnected channel replaced approximately 3,000 feet of the current channel with approximately 8,200 feet of channel in the historic oxbow. The Service conducted the first year of monitoring within the restored area in 2010 initial results are showing high use of the area by shiner.

Table 1. Pecos bluntnose shiner two year catch-rate mean with standard error, and number of samples (N) 2006-20010. Standard error is not required under the 10 year Biological Opinion, but is provided to illustrate variation. Two year running average calculated from site means for the year stated and preceding year (for example in 2006, by calculating mean from all sites for trimester one in 2005 and 2006; same for trimester three).			
Year	Trimester one PBS/100 m ²	Trimester three PBS/100 m ²	Any trimester 2008
2006	3.5 ($\pm 0.75 \text{ SE}$, N = 48)	5.3 ($\pm 0.90 \text{ SE}$, N = 48)	> 2.7 (2.5)
2007	5.0 ($\pm 0.8 \text{ SE}$, N = 53)	9.8 ($\pm 1.8 \text{ SE}$, N = 50)	> 4.0 (2.5)
2008	7.2 ($\pm 1.3 \text{ SE}$, N= 62)	14.3 ($\pm 4.5 \text{ SE}$, N= 59)	> 9.8 (2.5)
2009	11.9 ($\pm 1.9 \text{ SE}$, N= 64)	17.4 ($\pm 3.8 \text{ SE}$, N= 73)	>15.2 (2.5)
2010	13.1 ($\pm 2.1 \text{ SE}$, N= 75)	21.0 ($\pm 2.2 \text{ SE}$ N= 82)	>12.3 (2.5)

This table is from the Pecos Bluntnose Shiner Monitoring Summary 2010 from the Service by Stephen Davenport 2011.

Indicator 6 - Density of the Interior Least Tern (Tern)

Criteria: The density of the adult interior least tern and activities at created nesting habitat sites.

Trigger: Nesting terns in the conservation pool of Brantley Reservoir

Monitoring: Monitor lake levels and water delivery plans to assess the potential for impact to nesting terns.

Response: Assess potential for take; coordinate with CID and other interested parties on water management to help prevent inundation of nests and/or young. If all other options are exhausted, consider moving nests to avoid rising water. If take is anticipated, coordinate in advance with the Service.

Actions taken in CY2010:

During the summer of 2010, 6 individual terns (3 pairs) were observed, initiating 3 nesting scrapes prior to the raise in surface water elevation within the lake. At the time the lake began to rise, one nest contained two eggs, one contained one egg and the last nest was empty. Over the course of five days as the water level continued to rise, the nest scrapes were moved in 6 foot increments and by 6/30/2011, out of the three nest scrapes, one had one egg and two had two eggs. On the evening of 6/30/2011, heavy rain caused arroyos and drainages to run into the reservoir at a pace too fast to move the nests. In addition to the raising water level, locations to safely move the nest scrapes away from water were limited due to saltcedar vegetation at the elevated shoreline of the reservoir. At that time, it was decided to collect the eggs and incubate as they would have been lost if left in place. From 7/7/2011 on, no terns were observed and lake elevations had risen to eliminate good nesting habitat.

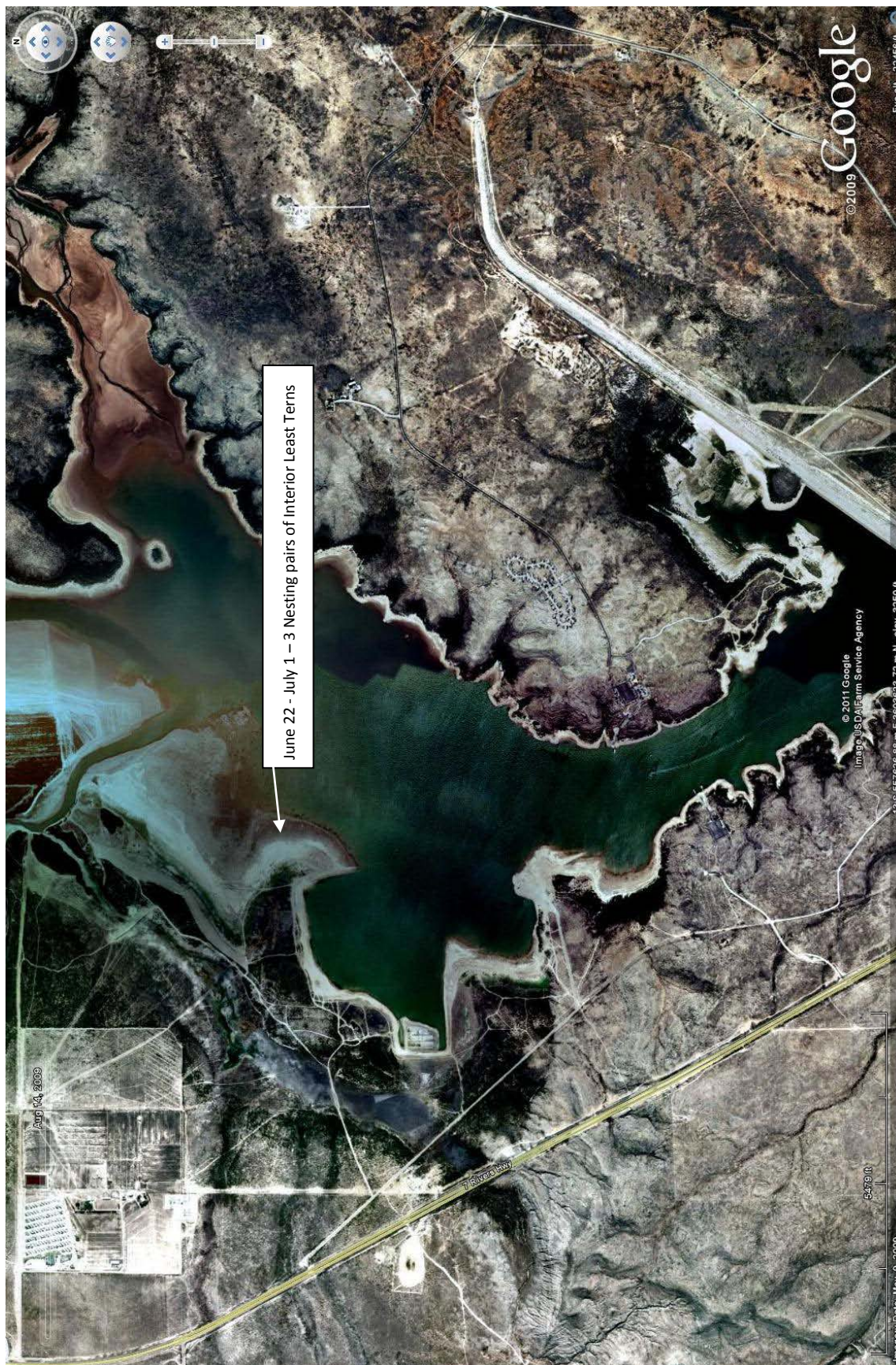
To the best of our knowledge, there was an incidental take of 3 tern nests during the summer 2010. A complete 2010 report is in preparation. Reclamation's 2008 tern monitoring report is available on the following web sites:

<http://www.usbr.gov/uc/albuq/library/eaba/saltcedar/saltcedar.html> or

<http://www.usbr.gov/uc/albuq/library/eis/carlsbad/carlsbad.html> or contact Reclamation's Albuquerque Area Office for a paper copy.

Survey Date	Surveyor	Breeding Adult	Sub-Adult	Immature	Total Least Terns	Comments
May 13- May 14	Moore	0	0	0	0	Several gulls (ring-billed and Franklin's) and one Forester's tern observed. Lots of recreational activity.
May 20- May 21	Moore	0	0	0	0	No terns of any species observed.
May 27- May 28	Kennedy	0	0	0	0	Lots of recreational activity. Waterfowl such as killdeer, Wilsons phalarope, snowy plover, Franklin's gull, ring-billed gull, and eared grebe observed.

June 3- June 4	Kennedy	0	0	0	0	One Forester's tern observed.
June 9- June 10	Carstensen	0	0	0	5	5 Interior least terns observed. 4 foraging and walking along shore, 1 always sitting on sandbar – possibly incubating. Terns about 2-3m from waters' edge.
June 16- June 17	Ahlers/ Reed	0	0	0	2	16 th was rainy weather. 2 adults (possible pair) observed. No nesting behavior observed. Same general location as June 10 detection.
June 22- June 23	Carstensen	2	0	0	6	6 total least terns observed. 1 confirmed breeding pair – scraping activity observed. Possible 2 nd pair, but not showing breeding activity.
June 25	Moore	6	0	0	6	Courtship behavior observed for all 3 pairs. 3 nest scrapes observed – 2 empty, 1 with 1 egg. Lake level rising.
June 26	Moore	6	0	0	6	Same comments as on June 25 th . Posted 'keep out' signs and forming perimeter around nesting area.
June 27	Moore	6	0	0	6	2 nest scrapes now contain 1 egg each. 3 rd nest still empty. Hira Walker and Ty Allen assisted to move nests up the beach 6' to higher elevation. Lake level rising.
June 29- June 30	Kennedy	6	0	0	6	3 pairs of least terns observed around nests incubating and foraging. 2 nests with 2 eggs, 1 nest with 1 egg. USFWS had one last attempt for moving nest, heavy rain adding to surface water elevation within lake.
July 7- July 8	Kennedy	0	0	0	0	No terns observed. Lake elevations have risen to eliminate any good shoreline nesting habitat.
July 14- July 15	Kennedy	0	0	0	0	No least terns observed.
July 20- July 21	Carstensen	0	0	0	0	No least terns observed. Water level sill up
July 27- July 28	Ahlers	0	0	0	0	No least terns. Lots of killdeer. Didn't see any plovers either, generally less shorebirds observed.
August 3 – August 4	Carstensen	0	0	0	0	No least terns observed. Water levels down slightly.



Indicator 7- Carlsbad Project Water Supply Status

Criteria: One of the purposes of the EIS is to conserve Carlsbad Project water supply. Operation of Sumner for the benefit of the shiner could result in reductions to the available Carlsbad Project water supply, potentially impacting the CID. Water acquisition options have been developed to acquire additional water to compensate for net depletions to Carlsbad Project supply.

Trigger: The trigger is activated annually to evaluate whether a shortage or surplus is occurring with respect to the Carlsbad Project water supply. However, informal periodic discussions with CID should occur during the year to monitor the status of irrigation water supply and use.

Actions taken in CY2010: Reservoir content levels at end of CY2010:

Santa Rosa	42,763 af
Sumner	21,041 af
Brantley	11,202 af
Avalon	1,789 af

Supplemental water management tools generic order of use:

1. Bypass (when available up to depletion volume of water leases plus credit water)
2. Vaughan (until exhausted and meets flow requirement)
3. Vaughan with FCP (until either is exhausted)
4. FCP (if pipeline is exhausted before FCP)/ pipeline with Forbearance (if FCP exhausted before Vaughan)
5. Forbearance (can be used to pay for depletions at end of year)

During the CY2010, Reclamation used the following amounts of supplemental water:

Bypass	3,923 af
Vaughan	28 af
FCP	1,000 af
<u>Forbearance</u>	<u>2,117 af</u>
Total	7,068 af

Pecos River Basin – Summary of Annual Accounting for Pecos Bluntnose Shiner Bypass Operations

During the non-irrigation season prior to irrigation, between January 1 and February 28, 2,521 af was released for ESA purposes, 1,761 af from bypasses and 760 af from FSID required by the forbearance agreement. During the irrigation season, which runs from March 1 through October 31, a total of approximately 2,934 af were released from the FCP and bypasses, 772 af and 2,162 af, respectively for ESA related purposes. During the non-irrigation season after irrigation, between November 1 and December 31, 2,345 af was released for ESA purposes, 228 af from the FCP and 2,117 af from the FSID Forborne water.

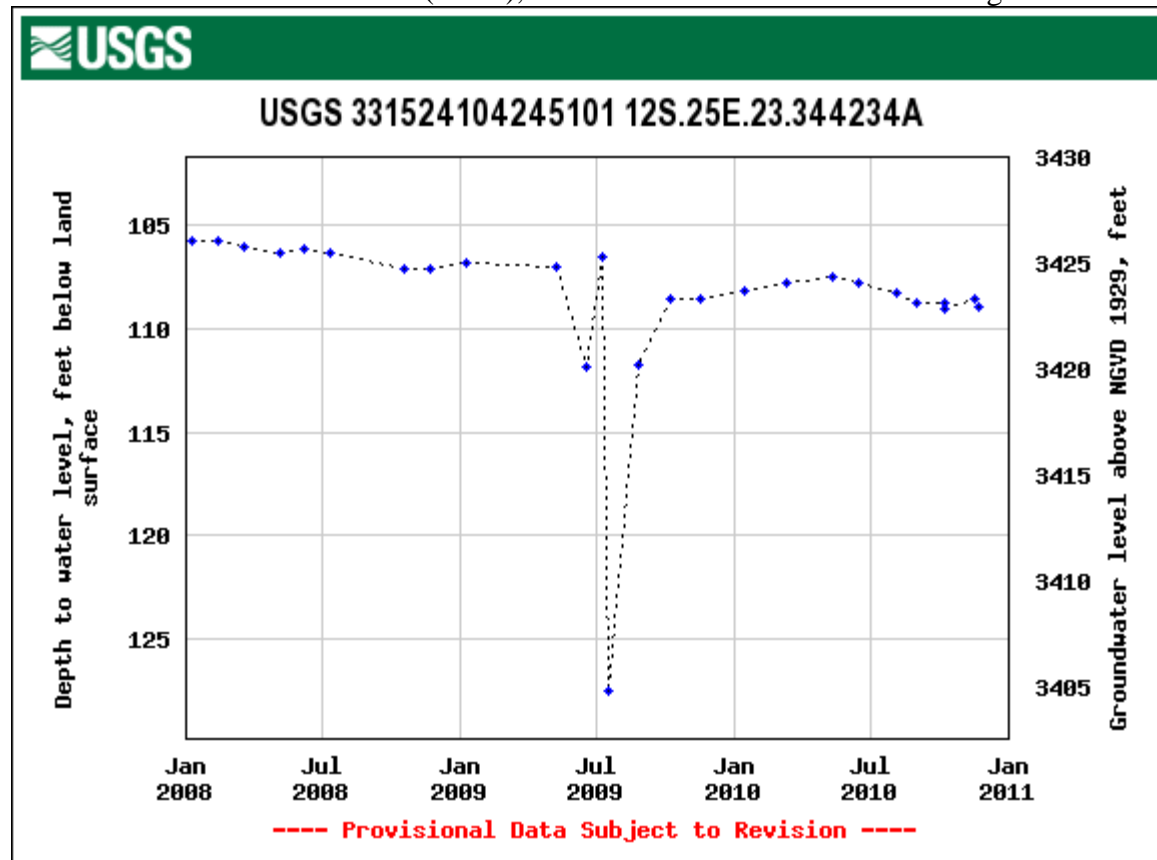
Indicator 8- Aquifer Storage and Base Inflows from the Roswell Basin

Criteria: Surface and ground water resources are interconnected. An increase in ground water supplies in the Roswell and Artesia basins is expected to eventually result in an increase in surface water supplies. Thus, improving groundwater conditions can indirectly benefit the Carlsbad Project, CID and the shiner. In addition, ground water resources can be lost to evapotranspiration as aquifer levels rise. The USGS maintains four monitoring wells in the Roswell and Artesia basins that provide regular data of groundwater depths. NMOSE and NMISC collect and review data on aquifer storage and base inflows.

Trigger: Aquifer storage and base inflows from the Roswell Basin are used as an indicator and do not contain a trigger.

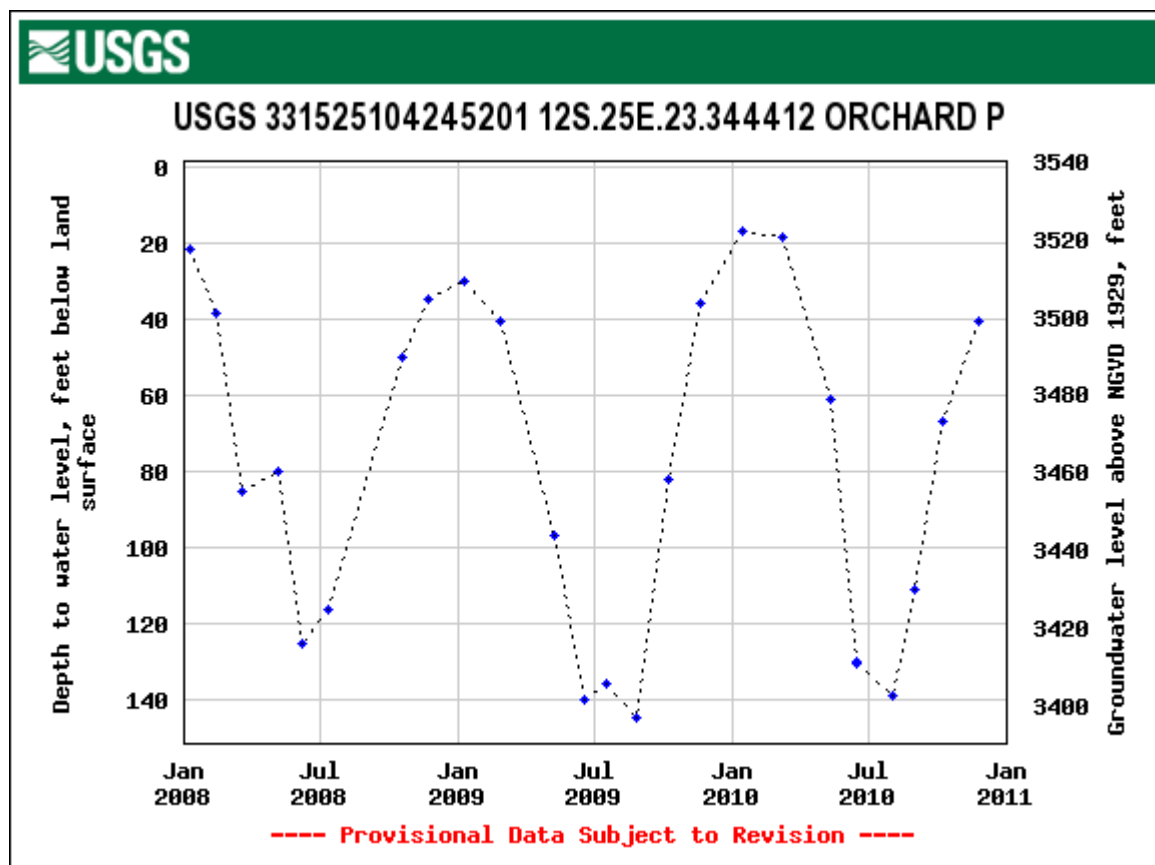
Actions taken in CY2010: The USGS periodically measures the depth to water in a series of wells in the Roswell Basin. Some of the wells are in Chaves County, and others are located in Eddy County. Within Chaves County, two wells have been measured in the past few years. Depth to water measurements in these two wells suggests an increase in aquifer storage for the artesian aquifer and a decrease in storage for the shallow aquifer in the Roswell Basin between 2009 and 2010. The two wells are close together in a location approximately equidistant between Roswell and Dexter.

The first of these wells is designated USGS 331524104245101 and is completed at a depth of 231 feet below ground surface (bgs) in alluvial, bolson, and other surface deposits (see Figure 1). Based on eleven measurements in 2010, the average depth to water was 108.42 feet bgs. In 2009 the average of eight measurements was 111.06 feet bgs. Although the decrease in water levels between 2009 and 2010 is small (3 feet), a downward trend can be seen in Figure 1.



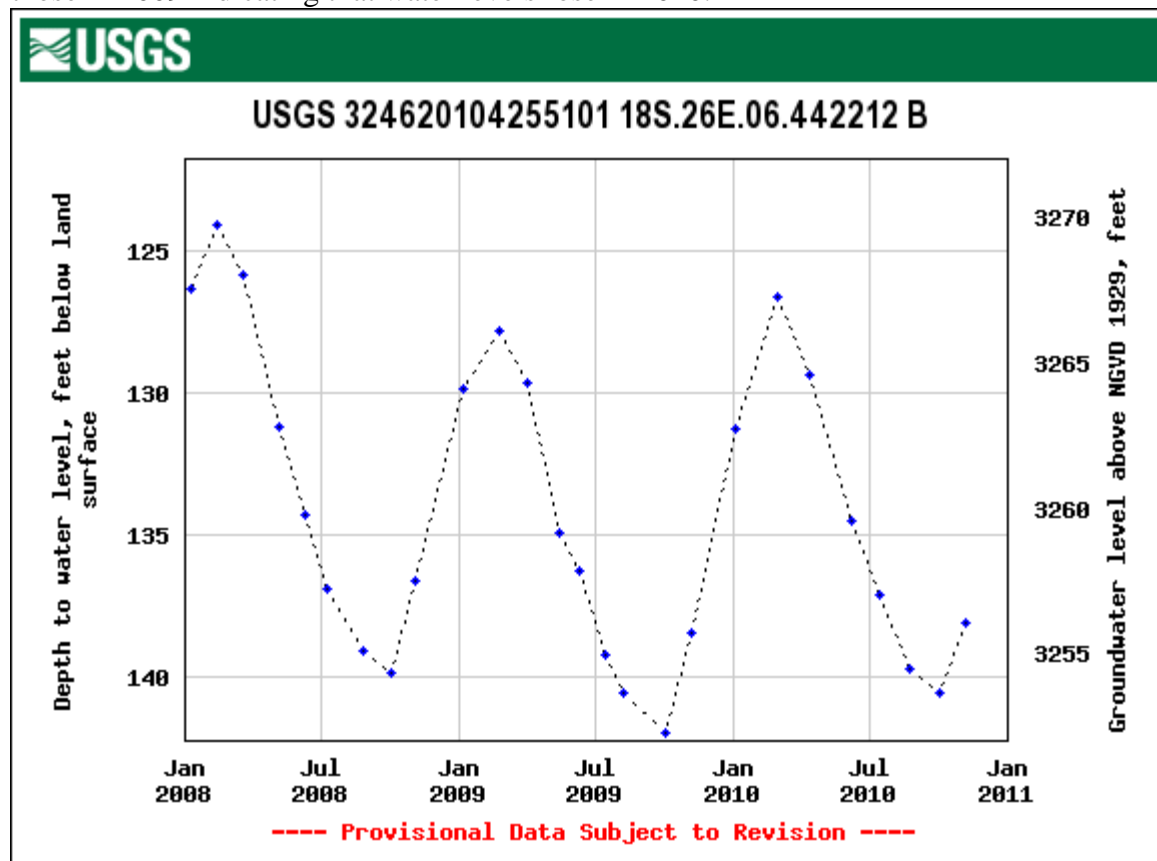
Figure_1. Depth to water for USGS shallow well 331525104245101 located in Chaves County, New Mexico.

The second Chaves County well, designated USGS 331525104245201, is 930 feet deep and is completed in the confined aquifer within the San Andres Limestone (see figure 2). Based on ten measurements in 2010, the average depth to water was 74.35 feet bgs whereas the 2009 average was 88.26 feet bgs. Confined aquifer water level measurements often show a dramatic response to irrigation pumping; consequently, yearly averages may not be a reliable indicator of aquifer storage. Alternatively, by comparing both the highest and lowest water levels in 2009 and 2010, it appears that water levels rose in this well in 2010. The measurements made during the non-irrigation season when water levels are the highest may be the most illustrative of aquifer conditions, as there is very little pumping occurring at that time. In this case, as shown in Figure 2, the non-irrigation season water level rose over 10 feet between 2009 and 2010.



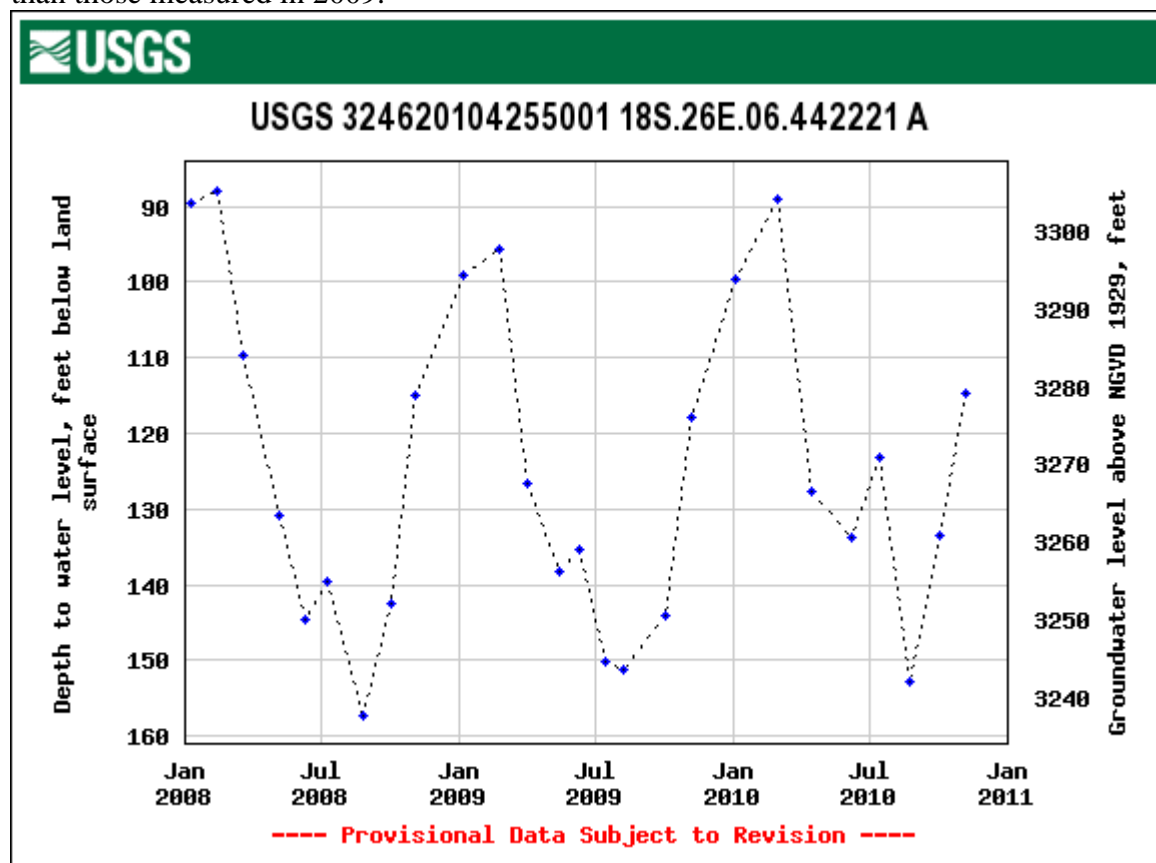
Figure_2. Depth to water for USGS Artesian well 331525104245201 located in Chaves County, New Mexico.

Within Eddy County, two wells have been measured in the past few years. The two wells are close together in a location south of Artesia. The first of these wells is designated USGS 324620104255101 and is completed at a depth of 246 feet bgs in alluvial, bolson, and other surface deposits (see figure 3). Based on eight measurements in 2010, the average depth to water was 134.64 feet bgs which was slightly lower than the 2009 average of 135.40 feet bgs. Water levels in this well vary with season most likely due to irrigation pumping; in 2010, the peak water level in the winter and the lowest water level in the summer both appear to be greater than those in 2009 indicating that water levels rose in 2010.



Figure_3. Depth to water for USGS shallow well 324620104255101 located in Eddy County, New Mexico.

The second Eddy County well, designated USGS 324620104255001, is 1,008 feet deep and is completed in the confined aquifer within the San Andres Limestone (see Figure 4). Based on eight measurements in 2010, the average depth to water was 121.78 feet bgs. The 2010 average water level is about 7 feet lower than the 2009 average of 128.74 feet bgs. Confined aquifer water level measurements often show a dramatic response to irrigation pumping; consequently, yearly averages may not be a reliable indicator of aquifer storage. By comparing the highest water levels in 2009 and 2010, it appears that water levels rose in this well during the 2010 non-irrigation season. During irrigation season, however, water levels in 2010 were slightly lower than those measured in 2009.



Figure_4. Depth to water for USGS Artesian well 324620104255001 located in Eddy County, New Mexico.

Because this water level data set is very small, these measurements may not be representative of aquifer storage conditions throughout the entire basin. There may be areas of the basin in which water levels are rising in response to conservation programs, increased recharge, or other factors and areas where water levels are falling due to proximity to pumping.

The Pecos Valley Artesian Conservancy District (PVACD) monitors water levels three times per month in ten wells in the Roswell Basin. Compared to 2009, the 2010 average water levels were higher in all ten wells. Four of the wells had less than 1 foot difference between 2009 and 2010 averages but the other six wells rose between 1.4 and 15.6 feet.

Base Inflows

Beginning in 1985 and every year since then, the federal river master has determined and published base inflows for the Roswell Basin for the reach of the Pecos River between the Acme and Artesia stream gages. The base inflow for calendar year 2010 will be published at the end of June 2011. During calendar year 2009, the federal river master reported the base inflow was 19,800 acre-feet (af). This amount was less than that reported for calendar year 2008 when the base inflow was 28,600 af. Between 1985 and 2009 the average base inflow was approximately 30,400 af.

NEW for 2011

Indicator 9 – Decreasing Flow Target at Taiban to Conserve Water Supplies

Criteria: Recognizing that keeping the river from intermittency throughout the year is higher priority and more beneficial to the endangered Shiner than always keeping Taiban gage at 35 cfs, Reclamation will drop flows in times of anticipated shortage and coordinate with the Service to conserve supplemental water supply.

Trigger: Consistently high flows at Acme (>10 cfs) gage while Taiban is at the target of 35cfs or lower. This usually occurs during weather events and commonly during non-irrigation months.

Monitoring: Reclamation funds USGS to operate and maintain the gages along the Pecos River. Inoperable gages are reported to the USGS and Reclamation initiates contracted monitoring as necessary to measure gage sites and report all findings immediately. Bureau of Reclamation Albuquerque Area Office Water Operations Group will initiate the need to begin this variance based on their evaluation of the current water situation.

Response: Reclamation will consult with the Service to determine the most prudent water management based on the well-being of the endangered species. If variance from the Taiban target of 35cfs is the most prudent action Reclamation will adjust its operations as such.

Discussion

Actions available to Reclamation include: 1) if bypass water is available, Reclamation will begin bypassing inflow to target 35 cfs at Taiban and/or keep the river continuous. 2) If bypass water is not available and the pipeline is operational and available for use, Reclamation will order the operation of the pipeline at a rate needed to keep the river continuous. 3) If bypass water is unavailable and the pipeline is unavailable or not enough, Reclamation will release Fish Conversation Pool or forbearance water at a rate needed to avoid intermittency. 4) Supplemental water pumpers (water leases) are used.

Recommendations:

Improve Communication/Coordination

Improvements to communications between CID, FSID, and Reclamation should be incorporated into 2011 Carlsbad Project water operations. Irrigation districts should provide updates on the progress of repairs and maintenance on facilities critical to water delivery. Reclamation should actively prompt irrigation districts for timely updates or progress reports when maintenance is occurring on facilities that could become critical to Reclamation's operations to benefit the shiner. Specific recommendations include:

1. CID and FSID should promptly inform Reclamation of any potential delays in scheduled or on-going maintenance or repair activities.
2. Reclamation should actively request and obtain at least weekly updates on maintenance and repair activities for on-going work related to structures that could become critical to Reclamation's operations to benefit the Pecos bluntnose shiner.
3. Reclamation should give both CID and FSID as much advance notice as possible when there is the potential for changes in water operations to benefit the shiner or Tern.
4. CID/Reclamation improve communications on block releases
 - Water demand in CID
 - Need for river continuity
 - Advance notice to ranchers and Corp of Engineer
 - Status of Tern courtship and nesting

New Indicator list with criteria, triggers and monitoring for 2011 AMP:

Due to foreseeable drought (weather conditions) on the Pecos River, alternative water operations/ new indicator/trigger is proposed as indicator number 9 (see above).