Episodic golden algae blooms that have killed fish have been reported at Brantley Reservoir since at least 2002 (J. Lusk, New Mexico Ecological Services Field Office, electronic mail message, April 11, 2006). However, it is currently unknown if these fish kills are adversely affecting terns foraging at the reservoir. It has also been reported that DDT (dichloro-diphenyl-trichloroethane) levels are elevated at Brantley Reservoir when compared to other lakes across the U.S. (J. Lusk, New Mexico Ecological Services Field Office, electronic mail message, April 11, 2006), but it is currently unknown whether these DDT residues are adversely affecting terns feeding at Brantley Reservoir.

IV. Effects of the Action

The Service must consider the direct and indirect effects, as well as the effects of interdependent and interrelated actions to the shiner and the tern. Indirect effects are those that are caused by, or result from, the proposed action, and are later in time, but are reasonably certain to occur.

Direct Effects

Pecos Bluntnose Shiner

This year, Reclamation and the Service will continue to work together with river users to monitor the water supply and work to devise management options to meet the needs of both the shiner and the river users. We anticipate this coordination will be especially important to ensure that river management provides continuous flows. A negative effect of the proposed action is the loss of semi-buoyant eggs and larvae into the Farmlands reach and Brantley Reservoir during block releases. While some loss of eggs and larvae can occur during block releases in May and June, July would be the primary month when significant loss of these life stages would occur because shiners normally spawn during elevated flows associated with monsoonal storm events. The eggs require water velocity to remain suspended in the water column. In the reservoir, the eggs sink to the bottom and will likely perish when they are covered with sediments and suffocate or are eaten by predators. Larval fish will likely be eaten by predatory fish. Eggs and larvae can drift downstream for a total of 3 to 5 days; the distance they travel depends on the rate of egg and larvae development and water velocity (Platania and Altenbach 1998). Assuming a drift rate of 1.8 mi/h (3 km/h), the eggs and larvae could be transported 176 to 220 mi (284 to 354 km) in 4 to 5 days. Swifter currents and a more uniform channel would carry the eggs and larvae a greater distance. Block releases exceeding 65 days per year have a cumulative negative effect on shiner size class distribution because many age-0 shiners are transported into the Farmlands reach (Hoagstrom 2002). The effect is not as pronounced when the total is less than 65 days per year; we do not anticipate block releases exceeding 65 days (Hoagstrom 2002).

There are numerous benefits to the shiner that will result from Reclamation's proposed action to keep the river whole. Because shiners normally spawn during monsoonal storm events in July and August, their ability to maintain or improve their condition during the pre-spawn period of March through June will increase their spawning success. Even when fish survive intermittent conditions, they are less likely to spawn successfully because of the increased energetic expenditure associated with survival. Poor water quality, predators, and competitors all become

problematic when flows are not continuous. We expect shiner abundance to stabilize and/or improve slightly with continuous flows.

Reclamation is proposing to assist the Service in the capture and holding of shiner in refugia. The refugia would provide a secondary shiner population should any unforeseen circumstances (e.g., disease, parasites) impact the wild population. Because only a small fraction of the river will be sampled, there are few anticipated impacts to the shiner population from c apture and movement of individuals to a refugia.

Indirect Effects

We anticipate there will be no indirect, interdependent or interrelated effects to the shiner that are reasonably certain to occur.

Direct Effects

Interior Least Tern

The tern is generally restricted to river segments that have not been heavily altered from historic conditions (U.S. Fish and Wildlife Service 1990). Prior to the construction of Sumner and Santa Rosa Dams, maximum peak flows in the Pecos River reached 26,200 cfs. Post-dam, maximum peak flow was 1,980 cfs, a 92.5 percent reduction. Sandbar geophysiology and associated hydrology are integral components of suitable tern habitat. Those natural components necessary for successful tern nesting on the Pecos River were and likely will be eliminated by water operations that restrict maximum flows. The effect of these water operations has been the utilization of human-created ecosystems like Brantley Reservoir and Bitter Lakes National Wildlife Refuge that the terns have found as surrogates for the river sandbars that are no longer present.

Reclamation is authorized to store a maximum of 40,000 af of water in Brantley Reservoir for the Carlsbad Project (Reclamation 2005). Conservation storage space is comprised of this water and some sediment. Each year, the quantity of sediment increases. In 2005, the total conservation storage space was 42,556 af at an elevation of 3,256.13 ft. Reclamation makes block irrigation releases from Sumner Dam to deliver water to Brantley Reservoir to meet the irrigation requirements of the Carlsbad Irrigation District. Reclamation is authorized to fill all storage space up to the top of conservation storage. Usually, water levels are kept several hundred af below the storage limit in case of unexpected-flood inflows. Any water exceeding the top of conservation storage is remitted, or spilled, to the State of New Mexico and is foregone to the Carlsbad Project. Because block releases depend on an assortment of variables which include, but are not limited to, the annual snowpack in the upper Pecos Basin, the current volume of water stored at each of the Pecos River reservoirs, the demand by downstream irrigators, and the amount of local rainfall, Reclamation stated that they can not predict, and have limited discretion over, the frequency and timing of block releases that may affect terns at Brantley Reservoir within a given year.

If terns arrive at Brantley Reservoir in late April and May 2006 with their previous colony site and they find their nesting area unuseable and they cannot find any other suitable habitat nearby, they may lose an entire season of reproduction and recruitment, as occurred in 2005. On the other hand, if terns can locate suitable habitat at Brantley and nest at elevations near or above the top of conservation storage, then Reclamation's block releases would pose little risk to the terns. However, if they nest at elevations quite low within the conservation space, then it is more likely that the nests could be inundated by a block release. Adult terns would be able to easily escape this inundation, although the terns would potentially lose reproduction and recruitment depending upon the timing. Juvenile birds would likely be harassed and possibly harmed by inundation of the active colony if it interfered with their dependency on parent terns and finding adequate shelter. Any eggs and very young chicks that could not move out of the way of the rising water would be killed by inundation of their nests.

Effects to Critical Habitat

Pecos bluntnose shiner

The critical habitat constituent element for the shiner likely to be affected is the maintenance of a wide channel with sandy substrate. Reduced peak flows cause channel narrowing (Friedman et al. 1998) and allow non-native vegetation to encroach on the channel (Shafroth 1999, Polzin and Rood 2000, Shields et al. 2000). Once non-native vegetation is established, it maintains a narrower channel leading to increased water velocities and the loss of fine sediments such as sand. Peak flows also maintain high levels of habitat diversity through channel migration (Ward and Stanford 1995). A reduction in peak flows reduces channel migration and channel complexity (Shields et al. 2000). The result is less available habitat to the shiner. Although block releases help maintain the existing channel width, the magnitude of the block release is limited by Sumner Dam and is much less than historical peak flows leading to a reduction in shiner habitat. Given the duration of this BO, there are no anticipated impacts to channel width.

Interior least tern

There is no designated critical habitat for the tern in the action area.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Although many adverse effects have occurred to the shiner, it appears that river intermittency is the primary threat to the continued existence of the shiner.

Pecos Bluntnose Shiner

Cumulative effects include:

- Increased urban use of water, including municipal and private uses. Further use of surface water from the Pecos River will reduce optimal river flow and decrease available habitat for the shiner.

- The diversion of up to 100 cfs (2.8 m^3/s) from March 1 through October 31, by FSID and the pumpback operation that sends return flows back to agricultural fields. The FSID diverts 100 percent of the river onto agricultural fields when their calculated allotment is 100 cfs or less. In dry years, seldom does the calculated allotment reach 100 cfs (2.8 m^3/s). Consequently, FSID is able to divert the entire natural flow. This reduction in flow played a large role in the drying of the river in 2002 (Reclamation 2002). It is expected that the diversion will continue to have a significant impact on the amount of water available to the river in the future. Without a pumpback system as much as half the diverted water returns to the river. With the pumpback operation, less than 20 cfs (0.6 m^3/s) returned to the river in 2002 and it is expected that similar low returns will occur in the future. The FSID diversion reduces river flow, reduces shiner habitat, and increases the probability of river drying and subsequent mortality of shiners.

- Capture of sediment by dams on streams tributary to the Pecos River. There are many flood control dams built to protect municipalities that effectively stop the input of fine sediments into the Pecos River. The shiner prefers a silt/sand substrate. Reduction of these fine materials can alter the substrate composition over time.

- The water quality of irrigation return flows to the Pecos River is unknown. However, irrigated agriculture amounts to 84 percent of total water use in De Baca, Chaves, and Eddy counties (Department of Interior 1989). Typically, irrigation return flows are higher in salts than freshwater and may also contain pesticides, herbicides, and elevated amounts of nutrients (nitrogen and potassium) from fertilizers used on crops (http://www.fao.org/docrep/W2598E/w2598e04.htm). When irrigation return flows are diluted by natural flows water quality is not usually a problem. However, in situations where return flows provide a large portion of the total water available to the shiner (i.e., below the FSID diversion canal) and the pesticides, herbicides, and nutrients from fertilizers become further concentrated as the water evaporates, it is possible that water quality could negatively affect the shiners.

- Oil and gas development. There is extensive development of oil and gas wells between Artesia and Carlsbad with associated roads and pipelines. Most of the pipelines are laid on top of the ground. Many pipelines cross ravines and some cross the Pecos River. Leaks and breaks in the lines have been documented (Steve Belinda, Bureau of Land Management, pers. comm. 2002). Delivery of petroleum products to the Pecos River either directly or by storm runoff, could have a negative impact on the shiner.

In summary, human activities have had many adverse effects on the Pecos River ecosystem in the last 100 years. Although many adverse effects have occurred, it appears that lack of permanent flow and an altered hydrograph (diminished peak flows and sustained block flows) are the primary threats to the continued existence of the shiner.

Interior Least Tern

The New Mexico State Parks and Recreation Division will continue to manage human use of selected lands around Brantley Reservoir. The New Mexico Department of Game and Fish will continue their lease agreement to authorize and enforce State fishing and hunting regulations at Brantley Reservoir. State Park recreational use and other forms of human disturbance are expected to continue and can adversely affect tern breeding success. The use of all-terrain and four-wheeled drive vehicles and watercraft may allow recreational users to explore areas previously inaccessible other than by foot. Occasionally, users may violate restricted Wildlife Management Areas. Even momentary presence of human activity may be enough to directly or indirectly affect the breeding or nesting behavior of terns. Displaced adults may be forced to leave their nests open, resulting in direct disturbance. Nest contents can be accidentally crushed under foot or wheel without being noticed.

The Carlsbad Irrigation District will continue to call for block releases that cause the water elevation in Brantley Reservoir to rise, possibly inundating tern nests and habitat.

V. Conclusion

Pecos Bluntnose Shiner

After reviewing the current status of the shiner, the environmental baseline for the action area, the effects of the proposed water operations, the short duration of time covered by this BO, and the cumulative effects, it is the Service's biological opinion that the proposed Pecos River water operations as proposed, is not likely to jeopardize the continued existence of the shiner, and is not likely to destroy or adversely modify designated critical habitat. We found that the proposed action is not likely to have adverse effects to designated critical habitat or alter the function and intended conservation role of shiner critical habitat.

Despite the extremely low runoff forecast for the Pecos River Basin this year, the Service reached these conclusions because Reclamation has the reservoir storage to meet their commitment of maintaining a continuous river. The relatively high storage in the upstream reservoirs this year provides Reclamation with more flexibility to manage block releases and avoid intermittency for shiners. Because intermittency is associated with declines in the shiner population, continuous flow is essential to maintain minimum population levels. Reclamation is also pursuing additional water acquisitions (i.e., lease agreements with FSID, Pecos River water users, groundwater pumping) that, if successful, would provide even more flexibility with their future water operations and contribute to ensuring that the flow of water in the Pecos River will not become intermittent. Therefore, we did not analyze the effects of river intermittency in the BO.