

# Public Service Company of New Mexico (PNM) Fish Passage Facility

2014

## Annual Report



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To:  
The San Juan River Basin Recovery Implementation Program

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## **Executive Summary**

- PNM fish passage was operated for 200 days between April 1 and October 15, 2014
- 9,108 fishes were captured in the fish passage
  - 9,015 native fish were captured and transported upstream of the weir
    - 40 Colorado Pikeminnow
    - 10 Razorback Suckers
  - 94 non-native fishes were captured and removed from the river

## INTRODUCTION

The federally endangered Razorback Sucker (*Xyrauchen texanus*) and Colorado Pikeminnow (*Ptychocheilus lucius*) are the focus of recovery efforts within the San Juan River Basin Recovery Implementation Program (SJRRIP). The decline in abundance of endangered fishes in the San Juan River is thought to be a function of altered flow regime, loss of physical habitat through water development, and negative interspecific interactions from introduced, non-native species (SJRRIP 2010, Brooks et al. 2000). For over a decade, management efforts aiming to recover the two endangered species have included large scale non-native fish removals, operation of Navajo Dam to mimic a natural hydrograph, range expansion resulting from fish passage structures, and large scale endangered fish augmentation. These efforts have primarily been focused between river mile (RM) 180 (the confluence with the Animas River, New Mexico) downstream to RM 0 (Near Piute Farms, Utah). At river mile 0, a large waterfall created an upstream barrier separating the San Juan arm of Lake Powell from the San Juan River and at RM 166.6 a river-wide weir obstructs movement upstream except during high flow events and when the Public Service Company of New Mexico (PNM) fish passage is in operation.

This river-wide obstruction at RM 166.6, a 3.25' diversion dam (weir) constructed in 1971, transects the entire width of the San Juan River, near Fruitland, NM. This weir includes a concrete barrier, a series of screened intake structures, an intake channel, a settling channel, and a pump house, which impede the ability of native and endangered fishes to move upstream (BOR 2001). Studies have shown that some upstream movement could likely occur when flows reach 7,000 cfs or greater; however, flows of this magnitude are relatively rare (BOR 2001). The weir diverts water to be used at the nearby San Juan Generating Station, and fish passage is needed to

allow native fishes access to habitats above this diversion during critical periods (i.e., reproductive periods) and for refugia and foraging habitat. Adult monitoring upstream of the weir has continued to show use by endangered and other native fishes. Non-native species, particularly Channel Catfish, have lower densities in this reach than other reaches (Ryden 2009). For these reasons, selective passage at the PNM weir is important for the overall recovery of the San Juan River endangered fishes.

## **METHODS**

The Navajo Nation Department of Fish and Wildlife is responsible for the operation of the PNM fish passage under the guidance and direction of the SJRRIP. The passage is operated seven months of the year (April through October), seven days a week. Generally, the passage is operated and fishes processed at approximately 11:00 am each day, thus the passage is set to capture fish over an approximate 24-hour period. There are two entrapment bays; however, only one bay is normally used. If there is a high density of fishes then both bays can be operated.

Water intake is controlled by a mechanical gate on the upstream end of the entrapment facility. The gate is opened as far as needed to allow the maximum amount of water through the facility that the river is able to provide at any given time. We try to maintain flow through the passage that consistently supplies enough volume to provide an adequate “cue” for fishes to find the passage entry from the river. Once fishes move up the 400 foot artificial passage, they enter an upstream angled grate, with an opening of approximately 5 inches. Once they have passed through this grate, fish are trapped in a concrete basin between a ¾” sieve at the upstream end and the angled grate at the downstream end, which is designed in a manner so fish cannot find the opening while having to swim in an upstream direction against the current.

The water intake control gate is closed prior to netting the captured fishes, thereby de-watering the basin for ease of capture. A large crane-mounted net is lowered into the capture basin while fish are dip-netted and placed into the large crane net. Once all fishes have been collected from the basin, they are hoisted and placed in a holding table with 8" of water for processing. The passage and all sieves, gates and basins are then cleared of any debris.

All fishes captured are identified to species and enumerated. Endangered fishes (Colorado Pikeminnow and Razorback Sucker) are measured for total length (TL - mm), standard length (SL - mm), and weight (WT - grams). They are scanned for a PIT tag and if a code is not found, a 134.2 kHz Passive Integrated Transponder (PIT) tag is implanted. All other native and non-native fishes are only enumerated and recorded. When all native fishes have been processed they are released into a 200 gallon holding tank and flushed through an eight inch PVC pipe that directs them upstream of the PNM weir. A minimum wait of 15 to 20 minutes is generally implemented before opening the water control gate to minimize the event of any stressed/exhausted fishes, which have just been released, potentially being swept into the upstream end of the passage and being held upon the ¾" sieve by the current. Non-native fishes are weighed and measured and removed from the river. If large numbers of catfish are captured, they are stocked into one of the Navajo Nation recreational fishing lakes or donated to local people for food.

#### *PIT Tag Antenna*

A permanent stationary PIT Tag antenna was installed in the passage canal just upstream of the canal outlet, downstream of the PNM Weir. The antenna began operation on March 21, 2014 and operated continuously throughout the season. The antenna covered the entire passage channel and allowed for detections of fish that entered the canal. The objective of placing this

antenna in the canal was to determine the number of fish that entered the canal compared to the number of fish that were successfully passed through the facility. This information is useful in making management decisions that can improve the ability of the facility to successfully pass native fish. Additionally, detections of fish on the passage antenna are useful information for survival and movement of tagged fishes.

## RESULTS

During operation of the fish passage, 9,108 fishes were captured (Table 1). Of these, the majority were native (9015; 98.9%) and very few were non-native (94; 1.1%). Six species of native fishes were captured along with nine non-native species. Flannelmouth Suckers (5152) were the most abundant species captured, followed by Bluehead Suckers (3810). Two Roundtail chub were captured at the facility in 2014, one of which was an adult in spawning condition.

High capture rates of native fishes were observed during the initial opening of the passage and during periods that corresponded with the descending limb of a high flow event (Figure 1). The highest capture event occurred following the peak of spring runoff in early June. Razorback Suckers were primarily captured in April and May (Figure 2). Colorado Pikeminnow were most abundant in July and August.

Table 1. Native and non-native species captured at the PNM fish passage by month in 2014.

<b>Species</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	<b>Total</b>
<i>Native</i>								
Bluehead Sucker	383	1429	2374	882	79	5	0	3810
Flannelmouth Sucker	614	342	2647	131	66	10	0	5152





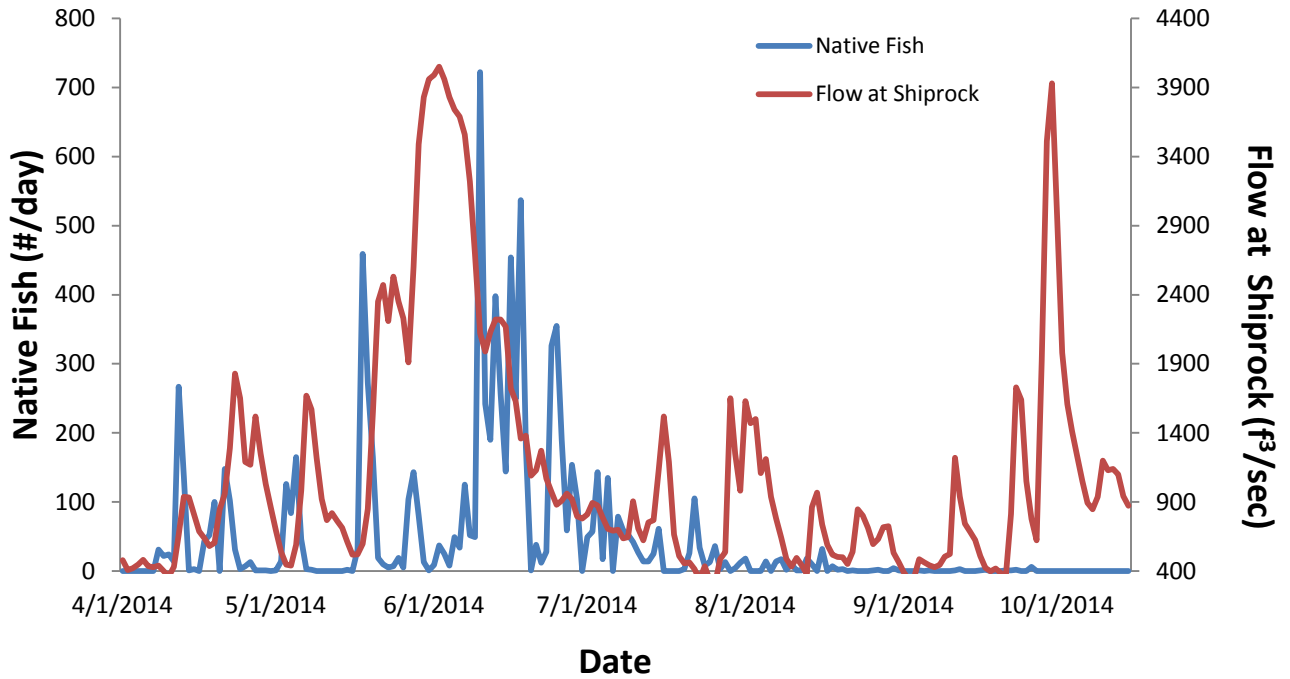


Figure 1. Daily total for native fishes captured in the PNM fish passage in 2014 along with the corresponding hydrograph for the San Juan River at Shiprock, NM.

*Razorback Suckers*

Only 10 Razorback Suckers were captured in 2014. This is significantly less Razorback Sucker than were captured in 2013 (n=39) and 2012 (n=26). The majority of Razorback Suckers were captured during April and May. Adults in spawning condition were observed for the third straight years. Both milt and eggs were observed in April and May.

*Colorado Pikeminnow*

The number of Colorado Pikeminnow captured in 2014 was also lower than past years. Only 40 total individuals were captured as opposed to 80 in 2013. Captured Colorado Pikeminnow ranged in size from 77-610 mm. Of those 40 captures, 7 were previously tagged.

The majority of Colorado Pikeminnow captures occurred in July and August. This was consistent with past years.

*Fish Passage PIT Tag Antenna*

A total of 636 unique fish were detected by the antenna during the 2014 operating season. Razorback Suckers were by far the most abundant fish detected on the passage antenna with a total of 559 detected. Of those 303 were fish that were stocked during the 2014 augmentation season near the PIT antenna. Twenty seven Colorado Pikeminnow also detected along with 43 Flannelmouth Suckers, 4 Bluehead Suckers, and 4 Channel Catfish.

Using the passage capture data and the data collected by the stationary PIT tag antenna we were able to determine how well the passage facility is able to successfully move fish around the PNM Weir (Table 2). Only 9 of the 256 Razorbacks stocked prior to 2014 were captured at the passage (3.51%). The percentage of Colorado Pikeminnow detected was higher with 7 captures and 27 detections (25.9%). The low number of fish that successfully passed through the facility is likely due to the lack of water passing through the facility. This is caused by the obstruction created when trash screens fill with debris.

Table 2. Number of unique PIT tag detections, captures, and percentage passed by species from the PNM Fish Passage Facility and the PNM Fish Passage PIT Tag Antenna in 2014.

<b>Species</b>	<b>Unique Detections</b>	<b>Captures</b>	<b>Percentage Passed</b>
Razorback Sucker	256	9	3.51%
2014 Razorback Sucker	303	1	0.33%
Colorado Pikeminnow	27	7	25.9%
Flannelmouth Sucker	43	Unknown	Unknown
Bluehead Sucker	4	Unknown	Unknown

Channel Catfish	4	Unknown	Unknown
<b>Total</b>	<b>636</b>		

*Detections and Flow*

As with the number of captures at the fish passage, the number of unique detections on the passage antenna seems to correspond with river flow. The number of fish captured at the facility is highest on the descending side of a peak in the hydrograph. Alternatively, the number of unique fish detected at the antenna seems to correspond with the ascending side of the hydrograph peak (Figure 2).

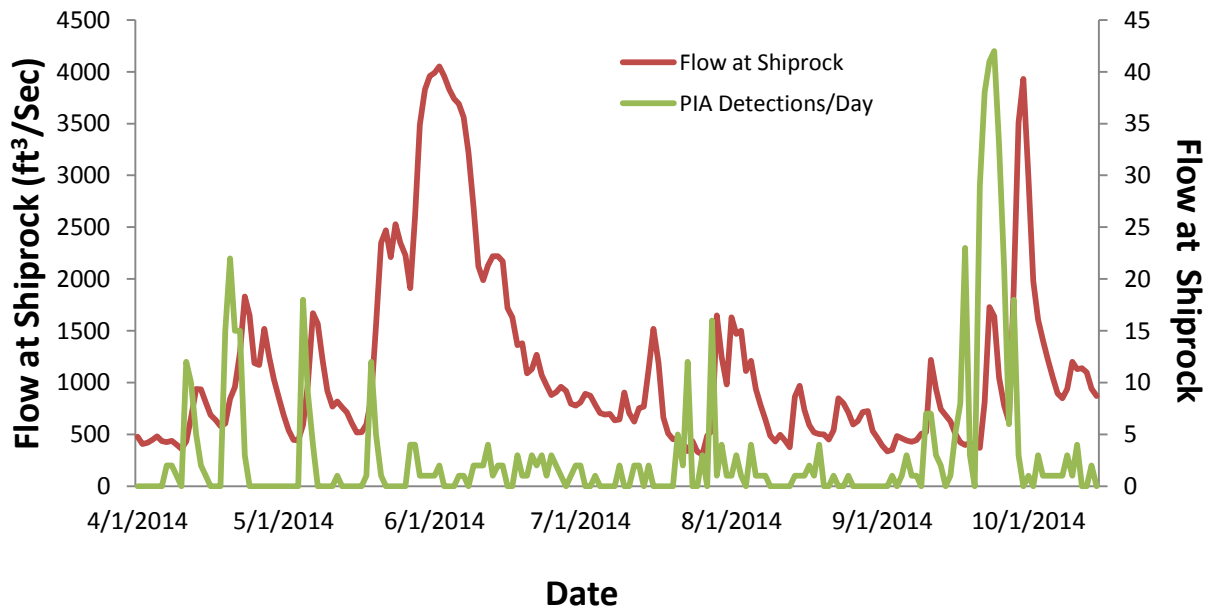


Figure 2. Number of unique fish detections per day in 2014 at the PNM Fish Passage Antenna with San Juan River flow at Shiprock, NM.

### *Temporal Detections*

The timing of detections for Razorback Sucker and Colorado Pikeminnow show a similar pattern to the captures at the facility with most of the Razorback detections centered in April and May and the majority of Colorado Pikeminnow detections in June and July (Figure 3). Although the majority of detections for Razorback Suckers were during April and May, they were detected almost continuously throughout the season. There is also a large pulse of detections of Razorback Suckers in September and August. This is the result of stocking events that occurred just downstream of the antenna.

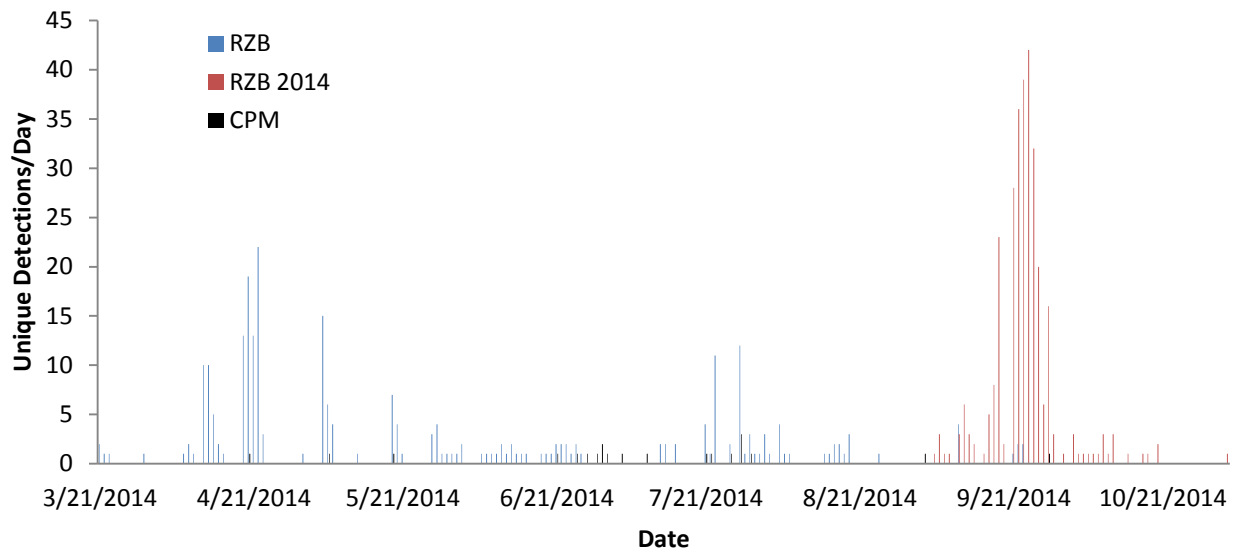


Figure 3. Number of unique detections of Razorback Suckers and Colorado Pikeminnow per day at the PNM Fish Passage Antenna in 2014. Razorbacks stocked in 2014 near the fish passage are indicated by the red bars.

The timing of Razorback Sucker activity can also be assessed using data from the PIT tag antenna. We were unable to assess activity timing for other species due to the lack of detections.

To assess the timing of activity, we examined the total number of detections (not just unique detections) for each hour of the day. We assumed that detections meant that fish were active and moving. This analysis shows that Razorback Suckers were most active at night with the greatest activity between 10:00 pm and 1:00am (Figure 4).

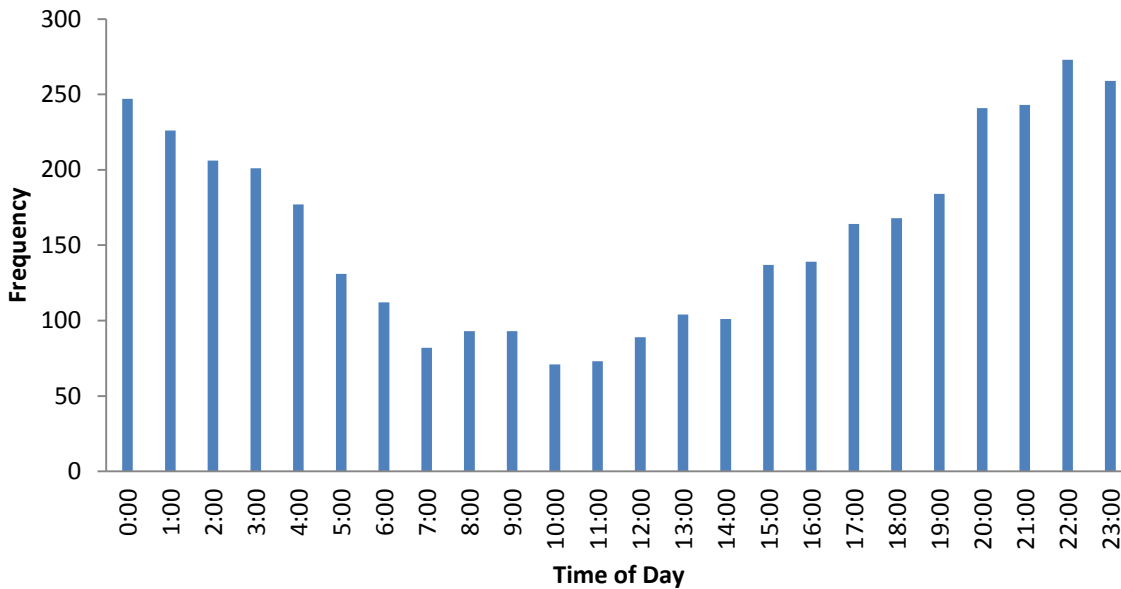


Figure 4. Frequency of total (not unique) Razorback Sucker tag detections by hour of day at the PNM Fish Passage Antenna in 2014.

## DISCUSSION

During its operation in 2014 the fish passage was successful in allowing upstream movement of native fishes, although improvements can be made to increase the number of fish that are captured and passed through the facility. From the antenna data collected in 2014, it is obvious that significantly more fish are attempting to move upstream through the facility than are successfully being passed. This may be caused by the obstruction of flow through the passage canal due to the clogging of trash screens.

Funding was acquired in 2014 from the Bureau of Indian Affairs and the SJRIP to design and install an automated trash rake that will automatically remove debris from the existing trash screens. Once installed, this should help provide continuous flow through the passage canal. The automated trash rake will also help to sluice sediment through the facility preventing sediment from depositing at the inflow. With consistent flow it is likely that the number of fish successfully passed through the facility will increase. The trash rakes should be installed and operating by June 2015. The PIT antenna will continue to operate throughout the 2015 season and will allow for evaluation of the impact of the trash rake on passage efficiency.

Overall the 2014 season showed some encouraging signs of success for the recovery efforts. In the future the Navajo Nation will work to aid in recovery efforts through operation of the fish passage and will continue to improve our operating procedures. In the 2014 season we will make the following adjustments:

1. Evaluate operation period and efficiency of the PNM fish passage with stationary PIT tag antennae
2. Explore other types of data that can be collected at the passage that will aid in recovery efforts.

#### **LITERATURE CITED**

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