



Streams Monitoring at Pecos National Historical Park

2014

Importance

Plants and animals tend to be more abundant and densely populated in riparian habitats than in any other habitat type, making streams and associated riparian areas critical to the ecological integrity of an area. Riparian corridors supply food, cover, and water for a variety of wildlife, and also serve as migration routes and habitat connectors. They also help control water pollution, reduce erosion, mitigate floods, and increase groundwater recharge. Riparian systems perform many ecosystem functions important to human populations, yet are one of the most endangered forest types in the United States.

Monitoring Objectives

The overall goal of the Southern Plains Network (SOPN) streams monitoring program is to detect broad-scale changes in aquatic and riparian ecological condition by observing selected ecological drivers, stressors, and processes. Specific, measurable objectives for streams monitoring on the Arkansas River at Pecos National Historical Park (NHP) are to determine the status of and detect long-term trends in:

- **Water quality** for daily, seasonal, and annual core water quality parameters (temperature, pH, dissolved oxygen, specific conductivity, turbidity), and seasonal nutrients, metals, inorganics, and bacteria,
- **Aquatic macroinvertebrates** for relative abundance of selected taxa and community structure and selected multimetric indicators of biotic integrity,
- **Surface water quantity** for seasonal and annual base flow conditions; frequency, magnitude, and duration of low flow and flood events; and extent of wet and dry areas,
- **Channel morphology** for cross-sectional area, sinuosity, channel slope, and sediment size distribution,
- **Riparian vegetation cover** for dominant and common (>10%) perennial species, and
- **Fish** for communities on local and regional scales.

Status of the Effort

During 2013, SOPN completed routine water quality monitoring during quarterly site visits, including water quality sampling and water quantity measurements. Aquatic macroinvertebrates were sampled in October and sent to the National Aquatic Monitoring Center (BugLab) at Utah State University for taxonomic identification and analysis. In April, SOPN improved stream monitoring efforts by installing a station mount to house a logging multiparameter water quality probe (see photo) that will be deployed for two weeks during the spring, summer, and fall sampling seasons. The probe will record core



Pecos River.

water quality parameters every 15 minutes. This new dataset will provide a baseline for daily fluctuations.

SOPN continued its collaboration with the U.S. Environmental Protection Agency (EPA) by sending water samples from fall and summer sampling to the EPA Region 8 Laboratory for analysis of emerging contaminants (e.g., pesticides, pharmaceuticals, personal care products, and wastewater indicators).

In late spring 2013, the Tres Lagunas and Jaroso fires affected 21,300 acres in the watershed upstream from the park. To monitor the short- and long-term effects of these fires, SOPN performed post-fire, pre-monsoon monitoring, focusing on channel morphology metrics in the active stream channel, as well as substrate size analysis.

SOPN produced four field summary reports, presenting provisional data collected during quarterly sampling periods.



Permanent mount for multiparameter logging probe. For two-week periods, the probe is deployed inside the mount, where it is protected from high-flow events and other potential disturbances.

Results indicated a mountainous, high-quality aquatic ecosystem. All water quality parameters measured in fall, winter, and spring met state water quality standards except for one. Measured at 8.9, pH exceeded the New Mexico standard for high-quality cold water aquatic life during the fall sampling season. The only other water quality exceedances were observed in the continuous water quality data during summer, when monsoon rain events carried ash and sediment through the Pecos River and exceedances were recorded for specific conductivity, dissolved oxygen, and pH.

Management Concern

Habitat degradation

Following the Tres Lagunas and Jaroso fires, monsoon rains washed ash and sediment into the Pecos River. The material was deposited throughout the stream channel, including in riffles, affecting the aquatic habitat monitored by SOPN. Increases in fine sediment and embeddedness decrease the interstitial spaces used by macroinvertebrate fauna as habitat. Observations of stream benthic habitat indicate that the sedimentation and increase in particle embeddedness will likely reduce numbers of benthic fauna; this, combined with highly turbid post-fire flows, may impact fish populations in this reach of the Pecos River. The speed at which the aquatic community rebounds will depend on high-flow events, especially winter/spring flooding that scours fine sediment and transports it downstream.

Exotic species

Preventing the spread and dominance of exotic species is an important goal at the park. The disturbance caused by the 2013 fires created the opportunity for expansion of non-native taxa. An increase in exotic and invasive taxa is possible in the riparian area, where high flows tend to deposit seeds from already-disturbed upstream locations and access to light and nutrients is plentiful.

Flooding and channel change

Reduced vegetation cover and soil damage from upstream fires have resulted in sediment-heavy flows. Following monsoon rain events, sediment built up along banks, islands, and in the channel substrate. On September 13, 2013, a flood event occurred with a peak discharge of 2,210 cfs (cubic feet per second). While this flow was largely driven by an intense, regionwide storm, fire effects likely contributed to the high flows. Following this flow event, general observations included bank erosion in isolated locations, widening of the channel in some areas, and a reduction in the depth of pools due to sedimentation.

Flooding has already damaged river crossings and management roads in the riparian area. Additional flooding events may further degrade these areas, resulting in inaccessibility or necessary repairs.

pH

Our monitoring indicates that pH only exceeded the state standard once in water year 2013. Exceedances of pH were also observed during water years 2011 and 2012, indicating that this is a consistent issue and may have natural causes. However, pH has not been observed above 9.00, and the exceedances are not considered severe. The aquatic community has likely adjusted to the frequent elevations of pH, but they may affect the survival of more sensitive aquatic species.

Conclusions

The Pecos River, within Pecos NHP, is a high-quality, mountainous stream. The monitored stream segment is a small section of a much larger aquatic system. Parameters are influenced by land-use activities upstream and in the stream watersheds. Runoff from residential areas, agricultural uses, climate, fires, and other influences beyond the control of park managers can all have significant impacts on park resources. The fires have resulted in a currently degraded aquatic habitat and an increased threat of flooding, erosion, and sedimentation. Continued monitoring and analysis of park resources will be necessary for park managers to make informed decisions about management, planning, and mitigation.

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Post-fire bank erosion, Pecos River.