

4.5 Ranking of Nonpoint Sources

The 2011 evaluation of NPS pollution differs from the 1994 Plan in a number of ways. It is perceived that the recipient waterbody, Pyramid Lake, has a cumulative effect of upstream and shoreline sources, where 21 of the 28 categories affect it. While the river remains apparently the greatest contributor of TDS to the lake, the perception about how this occurs has changed. Agricultural activities continue to be significant sources of NPS, but upstream contributions and eroding streambanks are a major factor. The instability of the Truckee River channel is due to the hydrological flow changes from diversions and deliveries, and physical streambed changes from channelization and vegetation shifts.

Perennial streams were introduced to the waterbodies studied in this ranking. Feral horses and unpaved roads/OHVs are considered the greatest contributors to NPS, while hydromodification (channelized upland meadows) and off-reservation sources are also considered important concerns. Perennial streams are important contributors to the ecosystem in the basin, and maintaining their water quality is useful in numerous ways. Reducing NPS concerns by stream restoration is an excellent side benefit to other water bodies on the reservation.

Agriculture remains an important concern in this assessment of NPS pollution. Nutrients, sediment, rangeland sources and pesticides are categorized as important to significant concerns for the reservation waters. It also should be noted that great progress has been made in the intervening years between these plan documents, and much of the river has been fenced, grazing has been increasingly managed to benefit pastureland, and watering areas have been established away from streams. Yet, more remains to be done.

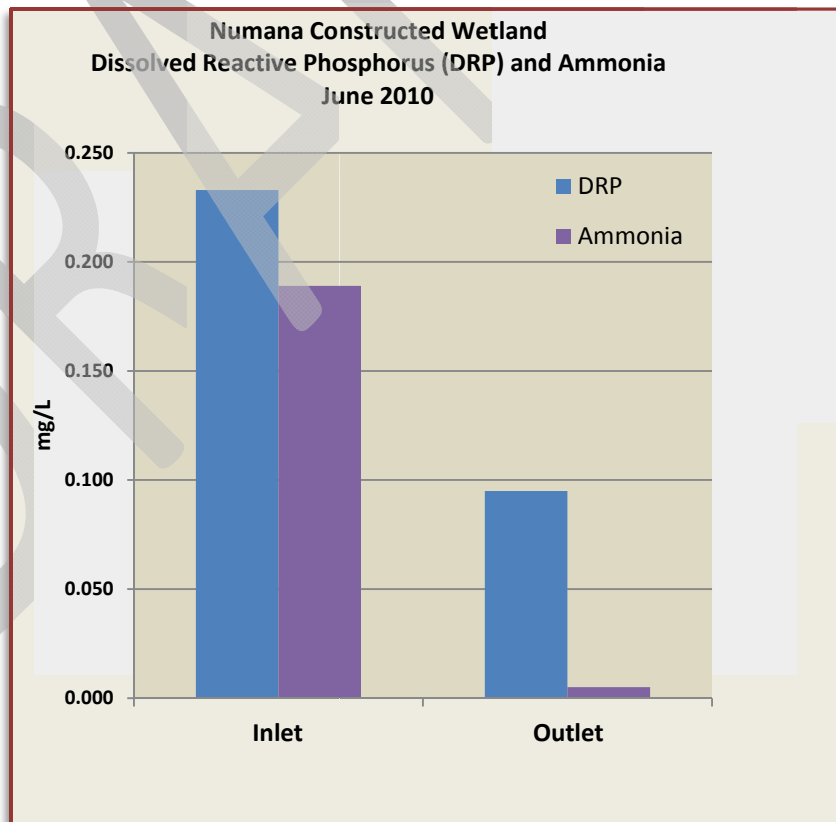
Urban impacts have become more of a concern since 1994 - from town landscapes, to sewage systems, to roadway improvements, and to upstream sources. In part, this is because more knowledge is available, such as the character of nutrient transport in groundwater, and also because of increases in pavement, buildings, and populations. They still rank fairly low on the NPS concern ranking. It is hoped that good planning and coordination with other agencies will help prevent or mitigate NPS sources from urban areas.

5.0 Proposed Nonpoint Source Management Implementation Program

This section provides a more detailed discussion of the broader category recommended actions to address NPS concerns on the reservation. These recommendations include both structural and non-structural measures intended to the most significant issues identified within each NPS category. Management measures and BMPs as described within EPA and NRCS guidance manuals and documents will be implemented for each recommendation as is appropriate for each NPS concern and abatement activity. A schedule for implementation of NPS abatement activity recommendations is provided at the end of this section in Table 4.

Wetlands Enhancement/Creation

The original natural riparian wetland area of the Lower Truckee River has been significantly reduced, as is the case with the majority of rivers in the western states. Causes for wetland loss include channel modifications, such as the Army Corps straightening of the channel in the 1960's, and conversion of riparian areas to agricultural land. A number of opportunities exist within the reservation for large scale restoration projects to restore wetlands in abandoned river meanders or adjoining floodplain areas. These types of treatments are effective in re-creating riverine wetlands that are representative of what existed in a more natural state. A number of large scale river restorations have recently been implemented by the Nature Conservancy and partnering entities on reaches upstream of the reservation. The Lockwood, Mustang,



and 102 Ranch restoration projects are effectively demonstrating how to restore a river to a more natural state, with its wetland conditions. As a result, the river

attains a proper functioning condition (PFC), in which floodplain and wetland areas are accessed in higher flows, allowing water to slow and excess nutrients or other potential pollutants to settle out and be processed more efficiently. Proper functioning rivers, adjacent floodplains and wetlands are highly effective filters for NPS pollution (Swanson, 2006).

Experimental constructed wetlands in cold Sierra climate regions have shown that constructed wetlands are effective in removal of suspended solids, turbidity, and excess nutrients from agricultural and stormwater runoff (Reuter, et. al., 1992). As mentioned earlier, the Numana Fish Hatchery was upgraded with a constructed wetland below the hatchery water outlet in September of 1994. The wetland area was constructed to provide nutrient removal from hatchery water before discharging into the Truckee River.

A 1995 study by Professor John J. Warwick of University Nevada Reno and graduate student Daniel Spinogatti Jr. sought to determine the efficacy of this type of system in removing excess nutrients, targeting nitrogen and phosphorus (Warwick, 1995). The study indicated that the constructed wetland is effective in reducing nutrient levels of hatchery effluent, demonstrating a 41% reduction in total nitrogen and a 19% reduction in total phosphorus. Subsequent water quality monitoring by the PLPT Environmental Department Water Quality Program demonstrates that the Numana constructed wetland continues to be effective in lowering nutrient levels of hatchery effluent (Figure 20).

Opportunities for enhancement of existing wetland areas and for construction of new wetlands in appropriate areas should be planned for and implemented along the Lower Truckee, with consideration of which areas might provide the most benefits in mitigating sources of NPS pollution, such as agricultural irrigation return flow areas. Proper Functioning Condition assessments (Swanson, 2006), should be conducted to help determine the most appropriate areas for wetland restoration. The Truckee River Flood Project, in its "Living River Plan" (TRFP, 2011) prepared plans for a number of restoration sites along the lower Truckee River within the reservation. These sites have had preliminary restoration plans prepared and should be considered for funding, more extensive plans and implementation. Overall, this voluntary restoration and protection work falls within a core element of the *Wetland Program Plan for the Pyramid Lake Paiute Tribe*, which was approved by the Tribal Council on March 18, 2011. (PLPT, 2011-B)

NPS Categories and Concerns Addressed:

- Forestry
 - riparian area deforestation (historic and current)
 - Hydromodification and Habitat Alteration
 - channelization and channel modification (historic USACE)
-

- dams (on and off reservation)
- streambank and shoreline erosion
- Wetland & Riparian Management
 - historic loss of wetland from agricultural development, channelization, riparian area deforestation

Management Action:

- Evaluate Truckee River sites for PFC deficiency and potential wetland restoration
- Determine locations with significant stormwater flows or agricultural run-off
- Prepare wetland construction drawings and acquire requisite permitting
- Enhance existing wetlands with planting, weed management, and other actions
- Construct new riparian habitat wetlands
- Construct new water quality mitigation wetlands

Streambank Restoration/Floodplain Enhancement

Historic straightening of the Lower Truckee River channel, deforestation of riparian forest, diversion of river flows resulting in lowering the elevation of Pyramid Lake water surface, and construction of Marble Bluff Dam have all contributed to degraded conditions on the Lower Truckee. Downcutting has led to incised conditions with unstable and actively eroding stream banks (Figure 21). The river has lost connection with its historic floodplain in most reaches. Vertical, unstable cut banks do not allow the opportunity for riparian vegetation to reestablish and stabilize banks. There are many opportunities for both small and large scale projects to restore river banks, river meanders, and floodplains on the reservation.



Figure 24. Eroding Bank, Lower Truckee River

Channel reconstruction has proven effective in recreating river/wetland conditions that are representative of what existed in a more natural state. As mentioned earlier, Truckee river restoration projects at the Lockwood, Mustang, McCarran Ranch and 102 Ranch sites have brought the river alignment back to a more natural status (Figure 22).

The Tribe has been implementing riparian area plantings for several consecutive years, and has also begun implementation of bank stabilizing restorations that include recontouring steep banks to milder slopes that will allow vegetation to establish as river flow levels drop. The tribal restoration projects have also attenuated scour velocities using rock revetment treatments. These efforts have provided important positive results and should continue. A number of the larger ephemeral tributaries to the Lower Truckee on the reservation may also be contributing excess sediment to the river during runoff events. Ephemeral tributaries should be inventoried and assessed for conditions that are contributing to NPS pollution. Improvements to channel function on tributaries in need of restoration should be planned and implemented. Proper Functioning Condition assessments (Swanson, 2006), should be conducted to help determine the most appropriate areas for streambank and floodplain restorations.

NPS Categories and Concerns Addressed:

- Forestry
 - riparian area deforestation (historic and current)
- Hydromodification and Habitat Alteration
 - channelization and channel modification (historic USACE)
 - dams (on and off reservation)
 - streambank and shoreline erosion
- Wetland & Riparian Management
 - historic loss of wetland from agricultural development, channelization, riparian area deforestation

Agricultural Crop Conversions/Alternative Irrigation Practices

Roughly 1000 acres of reservation land adjacent to the river is dedicated for the use of irrigated crop land (Figure 23). The primary irrigated crop grown on the reservation is alfalfa, which requires large amounts of irrigation water. Crop conversions or rotations to less water demanding crops could help to mitigate NPS pollution contributions from irrigation ditches, overland return flows, and subsurface return flows. The 1994 Plan determined subsurface agricultural return flows to be a significant source of TDS to the river below Wadsworth.

Since 2002, University of Nevada Cooperative Extension Crop Specialist Jay Davison has partnered with several farmers in western Nevada to demonstrate that the grain teff can be grown with 1/3 less water and sold for higher profit compared to alfalfa. Teff grain is used to produce a bread flour that is a staple in many diets of the world. In addition, it is gluten free and is also used as a thickener in baby foods because of its nutritional value, so it has potential to become a very popular grain for commercial use. The fibrous stalk is also nutrient rich and is excellent fodder for livestock (Sloan, 2010).

Teff grain is in high demand and provides an excellent opportunity for alfalfa farmers to realize greater profits and simultaneously become less dependent on water deliveries. Opportunities to educate local farmers and develop a demonstration project area should be pursued and implemented.

Reducing return flows by increasing efficiency of water uptake by plants can be accomplished through several means. Gravity flow is more efficient in fields that have been laser-leveled, and this is one option which has been utilized by tribal farmers. Another option worthy of testing is producing specialty crops with drip-tube systems. This would require investments in infrastructure, but dry-land farming in areas such as Israel has been quite successful with this method. In the U.S. there are several commercial suppliers of in-line drip tubing for agricultural purposes.

NPS Categories and Concerns Addressed:

- Agriculture
 - return flows

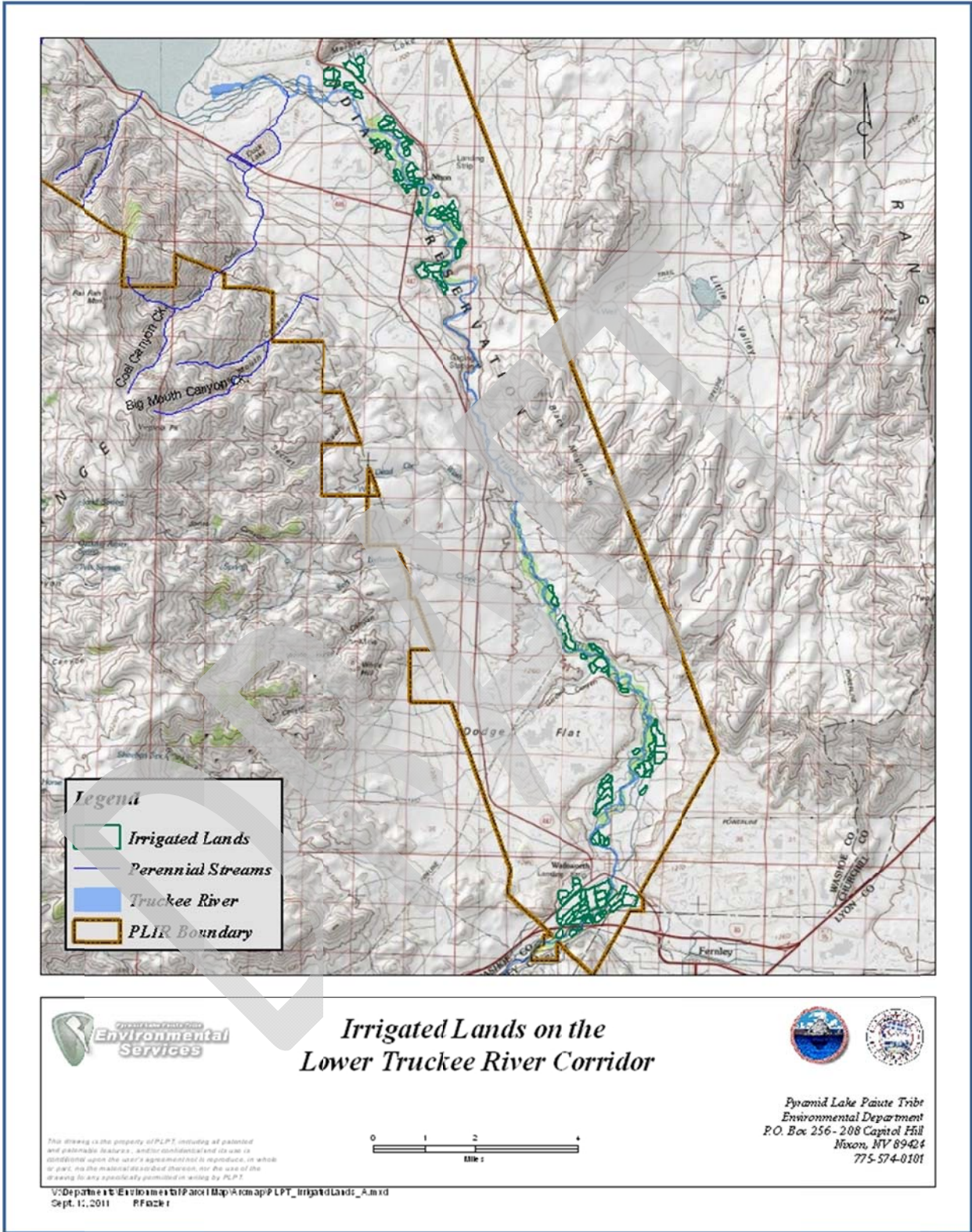


Figure 25. Irrigated Lands on the Lower Truckee River Corridor

Removal and Control of Invasive Plant Species/Reestablishment of Native Plant Communities

Over the past two decades various exotic invasive plant species (invasives) have greatly expanded their numbers and land coverage within reservation boundaries. Invasives that become established within riparian areas can negatively impact these zones in a variety of ways. Some of these adverse impacts can contribute to NPS pollution. The Tribe has been actively battling these infestations for several consecutive years and continues to do so. For some invasive species, such as tamarisk, manual removal of vast thick stands is required to thwart a complete takeover and transformation of the naturally diverse riparian vegetation to monotypic stands of an invasive species. Section 4.2 of this report includes a more in-depth discussion of the problem on the reservation, the species present, and the impacts. Removal of invasive plant species by the most appropriate method should continue and be accompanied by a replanting component to reestablish native vegetation in areas where invasives have been removed.

NPS Categories and Concerns Addressed:

- Hydromodification and Habitat Alteration
- Wetland & Riparian Management

Range Rehabilitation: Brush Management, Reseeding

The Pyramid Lake Tribe Comprehensive Resource Management Plan (CRMP) identifies 27,600 acres of land suitable for reseeded with higher forage value plant materials. An additional 33,000 acres are identified that could be treated with mechanical or chemical brush removal to open up understory and allow for regeneration of perennial grass and forb plants. Both of these practices would provide not only higher quality range forage, but in the long term will help to stabilize soils in grazing areas, reducing sediment runoff and NPS pollution to Pyramid Lake and the Lower Truckee River. Mapped areas and strategies for implementing these BMPs are provided in the CRMP, and these activities should be included in future work plans.

NPS Categories and Concerns Addressed:

- Agriculture
 - rangeland and riparian area grazing (cattle and horses)

Fencing and Rangeland Water Development

The Tribe has installed livestock/horse exclusion fencing on several perennial streams in the mountain rangeland of Pyramid Lake. These structures are effective in

rehabilitating riparian areas that have been overgrazed. Many more such opportunities exist for enclosure fencing installations, and should be planned for and implemented. The Lower Truckee River on reservation land has also been fenced to keep cattle out of the riparian areas. Fencing along the Truckee River and perennial streams requires ongoing inspection and maintenance, and should be conducted by a range rider. Stock watering structures should be installed before or during fence construction; there are several opportunities for well locations and spring developments throughout much of the Reservation (NRCS, 2005). Riparian and wetland areas near springs should be protected from over-use with fencing and piping of water to troughs away from the source.

NPS Categories and Concerns Addressed:

- Agriculture
 - rangeland and riparian area grazing (cattle and horses)
- Wetland & Riparian Management
 - Grazing destruction of riparian and wetland areas

Feral horse Population Reductions

Efforts to reduce the number of feral horses on PLPT reservation rangelands have been instituted on a number of occasions over the past ten years. The most recent roundup of horses on the reservation was conducted by BIA and PLPT staff in December 2010, and resulted in more than 900 animals captured and transported to auction or were adopted. A follow-up helicopter survey was conducted in May 2011. A total of 890 horses were counted and still remaining on reservation rangelands. In contrast, only 154 antelope and 39 mule deer were counted. Numbers of colts and fillies within remaining horse herds indicates a reproduction rate of roughly 15%. These numbers suggest that within 7 years the feral horse population will triple to approximately 2,700 animals (Mosley, 2011). Rangeland impacts from oversized horse populations and the resulting overgrazing of sensitive areas is described in section 4.2. Efforts to maintain populations at more sustainable levels are required and should continue. The Tribe should also research alternative methods of population control, such as the sterilization programs proposed by Interior Secretary Ken Salazar in 2009 to address “out of control populations” of feral horses on public lands in the West (Lyndsey, 2009).

NPS Categories and Concerns Addressed:

- Agriculture
 - rangeland and riparian area grazing (cattle and horses)

Beaver Population Control

As described in section 4.2, beavers are present and active along the Lower Truckee riparian zone. Observations have verified that beaver activity can produce both desirable (wetland creation) and undesirable (loss of riparian trees) results and conditions when considering NPS concerns. Further research on beaver populations on the reservation should be conducted to determine current numbers and a suitable population size based on habitat requirements and potential damage to riparian areas. The Tribe currently has open season beaver trapping for tribal members, and tails are rewarded. Numbers for bounty rewarded tails for years 2007 – 2009 are:

- 2007 - 50
- 2008 - 47
- 2009 - 42

Following research to determine population numbers and distribution, a more comprehensive plan for beaver population management should be developed.

NPS Categories and Concerns Addressed:

- Forestry
 - riparian area deforestation (historic and current)
- Wetland & Riparian Management
 - channelization and channel modification (historic USACE)
 - streambank and shoreline erosion
- Hydromodification and Habitat Alteration

Update/Revise Range Management Plan

Approximately 303,360 acres of the Pyramid Lake Indian Reservation are designated as grazing land for livestock and wildlife use (NRCS, 2005). The Tribe's CRMP describes in detail grazing areas in terms of available Acres per Annual Unit Month (AUM) and appropriate seasonal rotations. However, the Tribe does not have a recent or updated Range Management Plan to reflect findings and conclusions as presented in the CRMP. The content of the CRMP can guide the development of a Range Management Plan, and the Tribe should collaborate with the Cattleman's Association to develop one.

NPS Categories and Concerns Addressed:

- Agriculture
 - rangeland and riparian area grazing (cattle and horses)

Development of a Watershed Based Plan

Completion of this updated NPS Assessment and Management Plan will facilitate development of a Watershed Based Plan (WBP) for the Lower Truckee River on reservation land. A NPS Assessment and Management Plan serves as a cornerstone in a more comprehensive watershed based plan. The Tribe should apply for funding through the EPA and other sources and use the EPA guidance document ***Handbook for Developing Watershed Plans to Restore and Protect Our Waters*** to develop the watershed based plan. Development of such a plan could encompass a 2-3 year timeframe, and personnel resources, outside contractors, and funding considerations should be planned for accordingly. Proper Functioning Condition assessments (Swanson, 2006), should be conducted to help determine the most appropriate areas for restoration recommendations to be included in the WBP.

NPS Categories and Concerns Addressed:

- Abandoned Mine Drainage
- Agriculture
 - return flows
 - rangeland and riparian area grazing (cattle and horses)
- Forestry
 - riparian area deforestation (historic and current)
- Hydromodification and Habitat Alteration
 - channelization and channel modification (historic USACE)
 - dams (on and off reservation)
 - streambank and shoreline erosion
- Marinas and Boating
 - lakeshore RV grey water issues
- Wetland & Riparian Management
 - historic loss of wetland from agricultural development, channelization, riparian area deforestation
- Urban Runoff
- Atmospheric Deposition

Continued Involvement in Upstream Watershed Management Workgroups

For many years the Tribe has invested consistent and ongoing time and resources into collaborating and working with upstream agencies and organizations involved with watershed planning for the Lower Truckee River. These efforts remain vital to the

Tribe's goal of protecting water quality of reservation waters. It is important that this involvement is planned for and staff are delegated to specific workgroups and meetings. The Environmental Director, Manager, and Water Quality Manager should remain responsible for delegating staff and ensuring that important meetings and processes involve departmental participation, to the extent practicable.

NPS Categories and Concerns Addressed:

- Abandoned Mine Drainage
- Agriculture
 - return flows
 - rangeland and riparian area grazing (cattle and horses)
- Forestry
 - riparian area deforestation (historic and current)
- Hydromodification and Habitat Alteration
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- Atmospheric Deposition

Ordinance Reviews/Updates

The Tribe's Water Quality Ordinance adopted by tribal council in 2005, serves as the primary tribal regulatory tool for protection of water quality on the reservation. The ordinance establishes support for the Tribe's Water Quality Standards and 401 Water Quality Certification programs, which were approved by the EPA in December 2008. Effective watershed planning and management requires a component of adaptive management. Changes in land use and activities, as well as new information obtained from ongoing water quality monitoring programs and other studies, dictate that planning and implementations are adapted to reflect the changing conditions. The adaptive management component for this plan is discussed in further detail in section 5.1. Similarly, the ordinance should undergo periodic review and language updates to reflect changing conditions, in order to insure that it remains fully protective of water quality. A

practical timeframe for this process should mirror that of the Triennial Review of the Tribe's water quality standards.

NPS Categories and Concerns Addressed:

- Abandoned Mine Drainage
- Agriculture
 - return flows
 - rangeland and riparian area grazing (cattle and horses)
- Forestry
 - riparian area deforestation (historic and current)
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 - dams (on and off reservation)
 - streambank and shoreline erosion
- Marinas and Boating
 - lakeshore RV grey water issues
- Wetland & Riparian Management
 - historic loss of wetland from agricultural development, channelization, riparian area deforestation
- Urban Runoff
- Atmospheric Deposition

Table 4: Proposed NPS Pollution Management Activities

Abatement Activity	Proposed Schedule
Wetlands Enhancement/Creation	2012-2016 As Projects are Identified and Funding is Obtained
Truckee River Floodplain and Riparian Restoration	2012-2016 As Projects are Identified and Funding is Obtained
Agricultural Crop Conversions/Alternative Irrigation Practices	2012-Develop Educational Materials 2013-2014 Develop Demonstration Site
Stream Fencing Enclosures on San Emidio Canyon Creek	2012
Numana Wetlands Enhancement Restoration	2012
Development of a Watershed Based Plan	2012-2013
Ordinance Reviews/Updates	Three-Year Cycles, including 2012
Paiute Pit Wetlands, CEMEX Reclamation	Planning 2012-2014, Implementation through 2018
Conservation Planning for Range Areas	2013
Range Rehabilitation: Brush Management, Reseeding	Post-Fire Actions as well as Ongoing, 2014-2016
Rotational Fencing Units and Rangeland Water Development	2014-2016
Update/Revise Range Management Plan	Ten-year Cycles, including 2015
Removal and Control of Invasive Tamarisk	Ongoing to 2019
Removal and Control of Invasive Whitetop	Ongoing
Feral Horse Population Reductions	Ongoing, As Needed
Beaver Population Control	Ongoing, As Needed
Continued Involvement in Upstream Watershed Management Workgroups	Ongoing
Laser Leveling of Agricultural Fields	Ongoing
Grazing Management	Ongoing

5.1 Adaptive Management

EPA recommends updating NPS Assessment and Management Plans at least once each five years. This timeframe for reevaluation ensures that any changes in sources and/or severity of NPS pollution are acknowledged, and the effectiveness of abatement activities for treatment are assessed and adjusted as needed. This process provides a functional form of adaptive management for NPS pollution at a maximum time interval of each five years.

However, potential changes in climate may dictate the need for more regular assessment and evaluation of conditions within each five year review period. Climate changes in arid western mountain regions hold the potential for dramatic impacts to water availability, storage, and flow regimes. The possibility exists for lower flow conditions in warmer dryer months, punctuated by flashier high flows during heavy high elevation precipitation events and/or rapid snowmelt. Both of these scenarios could significantly alter the currently observed patterns of NPS pollution deposition and transport. Management measures and abatement activities in these circumstances need to evolve rapidly to adapt to new conditions, and do so on an as needed basis, rather than via a timetable defined review process. For the purposes of this plan, detection of climate change driven changes in NPS pollution concerns will be accomplished by utilization of the following mechanisms:

- 1) Monitoring and observation of significant changes in normal seasonal weather patterns.
- 2) Monitoring and observation of significant changes in normal seasonal flow regimes.
- 3) Monitoring and observation of significant landscape alterations resulting from changes in normal seasonal weather patterns and/or flow regimes.
- 4) Continuing annual analysis of water quality monitoring data for support of water quality standards criteria and beneficial uses.
- 5) Water quality monitoring driven by the occurrence of extreme weather or flow events.

5.2 Funding Sources

The Tribe has used a variety of funding sources over the years to accomplish NPS planning and abatement activities. Diversifying NPS funding sources enables broad coverage for a multitude of activities and methodologies in the management and treatment of NPS pollution issues. To date the Tribe has conducted project work with funding provided by the EPA, the NRCS, BIA, USFWS, the Truckee River Fund, and the internally-sourced Pyramid Lake License Plate funds. As construction for various improvement projects increase, funds will be contributed to the Tribe's Environmental

Fund as a result of Water Quality 401 Certification Regulation. A number of the Tribal Environmental Department staff actively research and write grants for NPS activities on an ongoing basis.

Future funding opportunities will be pursued through the above listed previous funding entities, as well as a number of previously untapped potential resources. Funding resources and project partnerships that have not yet been utilized include the Truckee River Flood Project, The U.S. Army Corps of Engineers, Bureau of Reclamation, Indian Health Service, Nevada Department of Environmental Protection, Nevada Department of Transportation, Bureau of Land Management, Nevada Land Conservancy, the Burning Man Community and the Americorps program. Internal resources may also become available and should be pursued through tribal council and finance on the occasion. Known tribal sources of revenue which may be suitable for nonpoint source mitigation projects include certain lease incomes, lake and river user fees, environmentally-related fines, taxes, and the PLPT Water Resources Acquisition Program (WRAP). Any such use of funds will be contingent upon current interests in the tribal leadership, and applied for best benefit of the community as a whole. Creative funding may become available through private sources, in the form of trade-offs such as wetlands mitigation banking, carbon trading, and other public-private partnerships and cost sharing such as those promoted by the Sierra Business Council.

6.0 Summary

Progress has been made in understanding and addressing nonpoint source pollutants on the Pyramid Lake Indian Reservation, however it is clear that the tribe's waterbodies remain affected by NPS. These pollutants are contributed from upstream sources, groundwater sources, and from a variety of landscape disturbances within the reservation. Since the Nonpoint Source Assessment and Management Plan was developed in 1994, a number of activities have successfully abated or reduced the impact of several NPS sources. Meanwhile, further review and study of water quality has occurred in the river and lake, and also in the reservations perennial and ephemeral streams. It is reassuring to see that, in terms of phosphorous, the water quality of the lower Truckee River region has shown signs of gradual improvement. Yet, at current levels it and other nonpoint sources still cause significant impacts to the river. This study about NPS concerns has expanded to include additional sources. It is hoped that greater use of best management practices (BMPs) and other actions, such as rangeland management and coordination with other agencies, can be used to address these sources. The tribe plans to develop and implement a more rigorous permitting process for projects that are conducted on the reservation that require a 401 water

quality certification, which gives the tribe latitude to exert its authority and sovereignty, while taking a proactive control on stormwater discharges within its exterior boundaries.

One of the more promising actions which can be undertaken to address NPS pollution are ecosystem restoration projects. Restoration can bring the riparian areas within the reservation to proper functioning conditions. Restoration technology has been applied successfully in large-scale projects in nearby areas upstream. With the review and priorities set in this updated NPS Assessment and Management Plan, nonpoint source pollution mitigation projects can continue to be made for the benefit of the Pyramid Lake tribal community and its precious fishery.

DRAFT

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