

# Rio Nutrias Watershed Based Plan

+



5/20/2015

A Plan to Determine the Best Management Practices to Improve Water Quality on the Rio Nutrias

Table of Contents

**INTRODUCTION** ..... 3

**RIO NUTRIAS WATERSHED DESCRIPTION** ..... 4

**RIO NUTRIAS WATERSHED PLANNING HISTORY** ..... 6

**RIO NUTRIAS WATER QUALITY** ..... 9

**STAKEHOLDER DETERMINED PROBABLE CAUSES AND SOURCES FOR WATER QUALITY IMPAIRMENT**..... 10

**ESTIMATED LOAD CONTRIBUTIONS BROKEN DOWN BY PROBABLE CAUSES AND SOURCES, CATEGORIZED BY SUBWATERSHED** ..... 12

**LOAD REDUCTION ESTIMATES TO ACHIEVE WATER QUALITY**..... 14

**POTENTIAL DATA GAPS**..... 17

**SELECTED BEST MANAGEMENT PRACTICES TO SUPPORT LOAD REDUCTIONS** ..... 18

    Streambank Stabilization..... 18

    Headgate Repair ..... 20

    River Crossings ..... 21

    Arroyo/Headcut repair..... 22

    Brush control..... 23

    Reseeding..... 25

    Forest Thinning..... 26

    Fencing..... 27

    Water Development -dirt tanks, wells, drinkers and pipeline infrastructure ..... 28

**APPROXIMATE LOCATIONS FOR MANAGEMENT MEASURES** ..... 29

**SUMMARY OF COST ESTIMATES** ..... 30

**STAKEHOLDER OUTREACH AND PARTICIPATION**..... 31

**10 YEAR IMPLEMENTATION PLAN** ..... 34

**PROJECT MILESTONES** ..... 35

**CRITERIA** ..... 36

**PROJECT MONITORING**..... 38

**BIBLIOGRAPHY** ..... 39

**APPENDIX A. PSIAC MODEL**..... 41

**APPENDIX B. CONVERSION DATA**..... 49

*Figure 1. Topographical Map Rio Nutrias Watershed..... 4*

*Figure 2 Geology Map Rio Nutrias Watershed ..... 5*

*Figure 3 Land Ownership Map Rio Nutrias Watershed ..... 6*

*Figure 4 Estimated load contribution Upper Rio Nutrias ..... 12*

*Figure 5 Estimated load contirbution Middle Rio Nutrias ..... 12*

*Figure 6 Estimated load contribution Lower Rio Nutrias ..... 13*

*Figure 7 Estimated load contributions Rito de Los Ojas ..... 13*

*Figure 8 load estimates Upper Rio Nutrias ..... 15*

*Figure 9 load estimates Middle Rio Nutrias ..... 15*

*Figure 10 load estimates Lower Rio Nutrias..... 16*

*Figure 11 load estimates Rito de Los Ojas..... 16*

*Figure 12 Rio Nutrias unstable streambanks..... 18*

*Figure 13 Rio Nutrias channel downcutting ..... 19*

*Figure 14 Rio Nutrias headgate ..... 20*

*Figure 15 Rio Nutrias river crossing ..... 21*

*Figure 16 Rio Nutrias gully ..... 22*

*Figure 17 Rio Nutrias headcut..... 23*

*Figure 18 Rio Nutrias previously treated sagebrush ..... 24*

*Figure 19 Rio Nutrias area to be reseeded ..... 25*

*Figure 20 Rio Nutrias example of overgrown forests..... 26*

*Figure 21 Rio Nutrias fencing damaged by elk ..... 27*

*Figure 22 Rio Nutrias dirt tank ..... 28*

*Table 1 TMDL Rio Nutrias ..... 9*

*Table 2 PSAC SEDIMENT YIELD RESULTS..... 14*

# Rio Nutrias Watershed Based Plan

## A PLAN TO DETERMINE THE BEST MANAGEMENT PRACTICES TO IMPROVE WATER QUALITY ON THE RIO NUTRIAS

### INTRODUCTION

The Rio Nutrias is within the northern area of the Cebolla/Nutrias watershed, Rio Arriba County, NM. This area was originally part of a Spanish land grant that was converted later to public and private land. The watershed has been used as rangeland for almost two centuries. The soils in the area are highly erodible, coupled with encroaching brush communities, drought and an over population of migrating wildlife that compete for limited resources, this area faces many rangeland and riparian impairments. The current heirs to the lands along with public land agencies have long realized the need for a more comprehensive and cooperative planning effort to improve conditions of the watershed. Although many restoration projects have been put into place there was still an overarching need for a more comprehensive planning process to take place to address the greater watershed health. The Rio Nutrias Community actively engaged in this planning process to create this watershed based planning document, offering their time and knowledge of their landscape to create a clear picture and evaluation of the entire Rio Nutrias watershed and together, we have created a defined strategy to accomplish the larger goals of the restoration work. This plan was funded by EPA CWA 319 planning funds, administered through the New Mexico Environment Department, Surface Water Quality Bureau.

## RIO NUTRIAS WATERSHED DESCRIPTION

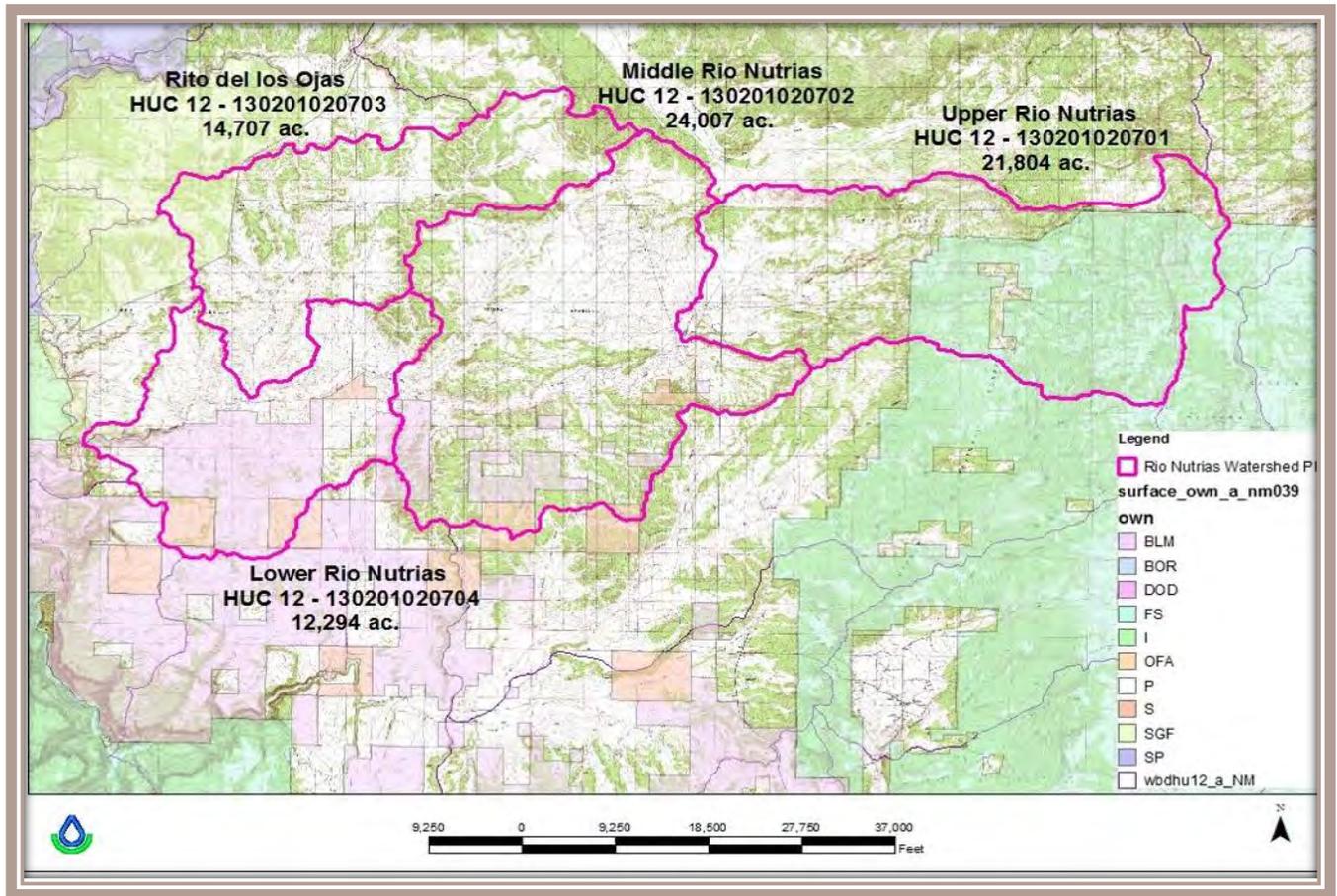


FIGURE 1. TOPGRAPHICAL MAP RIO NUTRIAS WATERSHED

The Rio Nutrias is located within the greater Rio Chama watershed (USGS Hydrologic Code 13020102), Rio Arriba County, New Mexico. The Rio Nutrias is part of the Cebolla/Nutrias watershed planning area. This watershed based planning approach is specific to the Rio Nutrias (Rio Chama to headwaters) (NM-2116.A\_060). The size of the Rio Nutrias watershed is 106 square miles and the miles of impaired stream reach is 34.63 miles. The Rio Nutrias watershed has four smaller watersheds including the Upper, Middle and Lower Rio Nutrias, and the Rito de los Ojas.

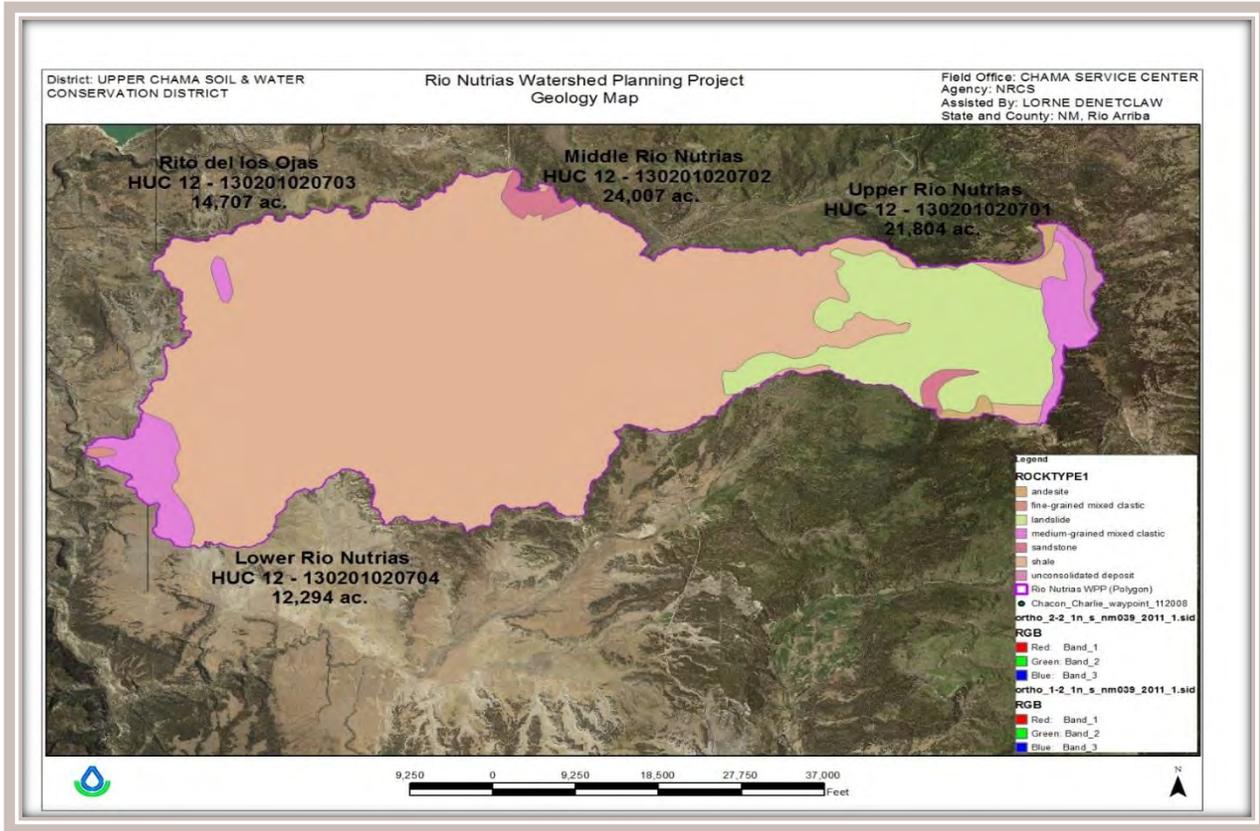


FIGURE 2 GEOLOGY MAP RIO NUTRIAS WATERSHED

The geology of the watershed consists of predominately shale rock formations. Watershed land ownership is 74% private, 12% US Forest Service, 10% Bureau of Land Management, 2% State of New Mexico and 2% State of New Mexico Game and Fish. Several small streams including the Terrero Creek, flow west into the Rio Nutrias, which eventually empties through deep canyons into the Rio Chama.

This section of the Rio Chama has been designated as a Wild and Scenic river. There are also several small lakes in the upper reaches of the watershed, famous for their excellent fishing. The watershed ranges in elevation from 6,700 ft. at the west boundary to 10,700 ft. at the east and includes diverse ecosystems primarily piñon, juniper and sagebrush at the lower elevations, aspen, mixed conifer and ponderosa woodlands at mid elevation and alpine meadows at the summits. Early conservation work in the 1950's cleared tens of thousands of acres of sagebrush, piñon and juniper woodlands and planted

crested wheatgrass. Many of the lands have returned to brush and native grasses in areas that were not continually managed. The watershed has a diverse wildlife population including elk, mule deer, bear, turkey, grouse and mountain lion. Elk are particularly abundant in these areas that are often in direct competition with livestock for water and forage.

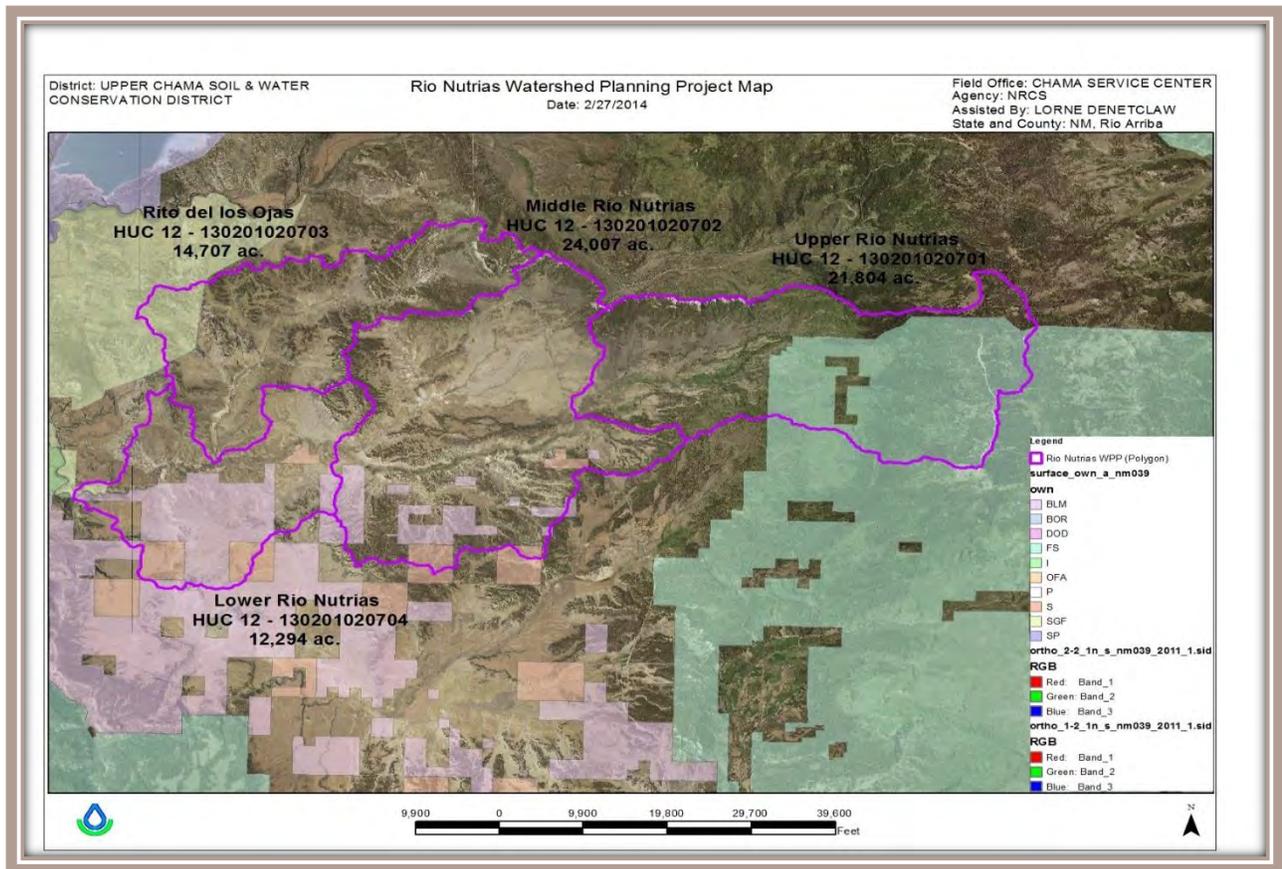


FIGURE 3 LAND OWNERSHIP MAP RIO NUTRIAS WATERSHED

## RIO NUTRIAS WATERSHED PLANNING HISTORY

In 1999, the Esperanza Grazing Association was awarded CWA 319(h) funds for an on the ground project. The project included the implementation of an extensive list of management measures including installation of earthen dams, pipeline, drinkers, water storage tanks, submersible electric water pumps, cattle guards, culverts and fencing. In addition, the cooperators built 50 earthen plugs to stop erosion,

planted 400 willow seedlings, graded and built turnouts on 10 miles of eroding roads, treated 4,163 acres of sagebrush, implemented a rest and rotation system and reduced stocking rates by utilizing alternative pasture. Numerous soil, range and riparian monitoring sites have been established and data has been collected since 2001.

In 2000, a Cebolla/Nutrias watershed improvement group was formed. Many of the stakeholders in the region were frustrated by a lack of communication and cooperative effort between Federal land management agencies, private land owners and grazing permit holders. The participants who have previously worked independently realized that the watershed would be better served by a planned and deliberative cooperative process. The watershed improvement group included; US Forest Service, Bureau of Land Management, New Mexico Game and Fish, State of New Mexico Lands, Natural Resource Conservation Service, Northern Rio Grande Resource Conservation and Development Council, Ranchers and interested community members. This group has been highly successful in leveraging funds to continue work on individual projects to improve watershed conditions, such as thinning contracts on private land, acquiring EQIP funds for private conservation work and working successfully to maintain relationships with Federal agencies to facilitate regulatory processes for conservation work to continue.

In 2003, the BLM performed an Environmental Assessment, an analysis of the management plan for grazing permit renewal on the Esperanza and Las Nutrias allotments to allow the conservation work under the 319 grant. The purpose of this plan was to identify needed range improvements with the objectives of maintaining the local natural resources especially improving water quality. This plan identified the need to implement various BMP's to reduce sediment loading into the Rio Nutrias and the Rio Cebolla. Management measures included livestock and wildlife water distribution systems, riparian protection and enhancement, brush control to enhance soil stabilizing grasses, road improvements to

reduce erosion and soil erosion control structures. The plan also included a monitoring plan to assess soil, vegetation and water quality, but it is understood that it has not been implemented at this time.

In 2005, the Meridian Institute created the Rio Chama Watershed Restoration Action Strategy.

This plan was created for the greater Rio Chama Watershed. The plan addressed the Rio Nutrias water quality impairment for turbidity. They listed the potential causes as natural causes (e.g. erosive soil type), increase in woody species (sage, juniper) and reduced riparian vegetation. The plan also states that the river channel has cut down exposing many steep unprotected streambanks. The proposed strategies to improve water quality include brush control, rangeland improvements that include upland water development and fencing to improve grazing management, streambank stabilization, riparian planting, fencing and channel stabilization projects.

In 2010, the Environmental Assessment for Canjilon Ranger District Range Improvements Project was completed by the USFS. Within the Canjilon Ranger district, the Jarosa, Nutrias and a small section of the Cebolla allotments are within the boundaries of the Rio Nutrias watershed. The EA document discusses proposed range improvements on these allotments including water development, fencing and rebuilding a corral.

In 2010, the BLM created the Environmental Assessment for 7 BLM Allotments Located in the Rio Chama Watershed. This EA was for grazing permit renewal and includes three BLM allotments Rio Nutrias, Chico and Esperanza, within the Rio Nutrias watershed. Proposed improvements for these allotments include possible vegetation manipulation by fire, herbicide, or mechanical means, but the document notes that the actions will be addressed in a subsequent NEPA document if and when funding is available.

In 2014, the BLM released the Rio Chama Wilderness Study Area Vegetation Treatment Project. This document proposes to use fire, herbicide and mechanical means to manipulate vegetation within the study area. The project boundary falls at the outermost western border of the watershed and includes only small slices of the Nutrias Canyon and Esperanza allotments.

## RIO NUTRIAS WATER QUALITY

The Rio Nutrias was listed on the NMED 2010-2012 Clean Water Act Integrated 303(d)/305(b) List of Assessed Surface Waters. The 303(d) list identified the Rio Nutrias as impaired by turbidity. The impairment was originally listed on the NMED 2002-2004 Clean Water Act Integrated 303(d)/305(b) List of Assessed Surface Waters. Supported designated uses include domestic water supply, fish culture, irrigation and wildlife habitat; unsupported uses are high quality coldwater aquatic life. According to the 2004 TMDL, for the lower Rio Chama, probable sources of impairment on the Rio Nutrias include agriculture, rangeland, removal of riparian vegetation, streambank modification/destabilization, and road maintenance (improperly placed culverts). The TMDL document has estimated the necessary load reductions for the waterbody to meet the designated uses, calculations are as follows:

<b>RIO NUTRIAS</b>	<b>Target Load Allocation (lbs/day)</b>	<b>Measured Load (lbs/day)</b>	<b>Load Reduction (lbs/day)</b>
<b>Turbidity</b>	8,167	17,788	9,621

TABLE 1 TMDL RIO NUTRIAS

## STAKEHOLDER DETERMINED PROBABLE CAUSES AND SOURCES FOR WATER QUALITY IMPAIRMENT



**Drought** -New Mexico has been in a drought for the last five years. The drought has had an effect on the amount of vegetation in the watershed



**Brush/Shrub Encroachment**-The watershed had massive brush removal in the 1950's. Some of the brush has returned, there has been an ongoing effort to return the area to grasslands.



**Arroyos and Gullies**-There are a few gullies actively eroding in the watershed.



**Geology/Natural Sources**- The underlying geology and soils found in the watershed are inherently erosive.



Forest Conditions -The forests in the upper watershed are overgrown. The dense stand of trees prevent grasses from growing.



Water Crossings- Culverts and unstabilized streamcrossings can exelerate erosion in a streamchannel.



Rangeland Grazing including Wildlife -Massive herds of wildlife are coming to the lower elevations to feed on the areas of previous restoration where grass communities are healthy and water is avaiable via drinkers, trick tanks and the river.



Streambank Destabilization/ Hydro modifications-Much of the watershed is experiencing some level of streambank destabilization including channel downcutting and actively eroding banks.

### ESTIMATED LOAD CONTRIBUTIONS BROKEN DOWN BY PROBABLE CAUSES AND SOURCES, CATEGORIZED BY SUBWATERSHED

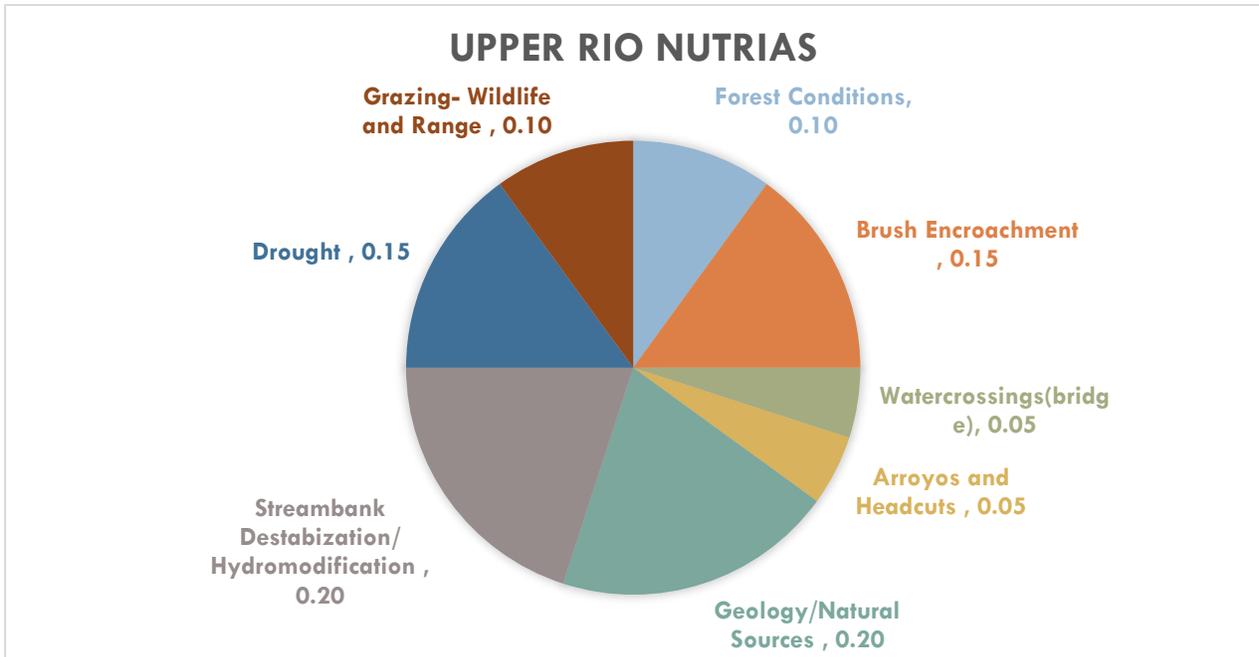


FIGURE 4 ESTIMATED LOAD CONTRIBUTION UPPER RIO NUTRIAS

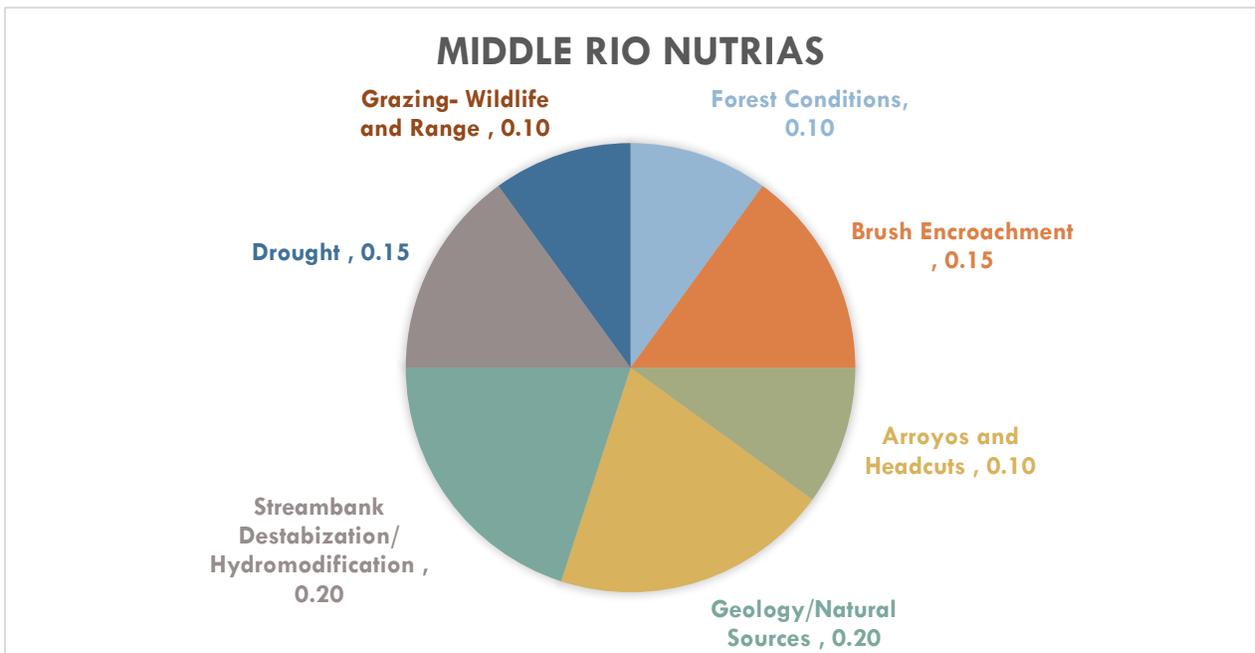


FIGURE 5 ESTIMATED LOAD CONTRIBUION MIDDLE RIO NUTRIAS

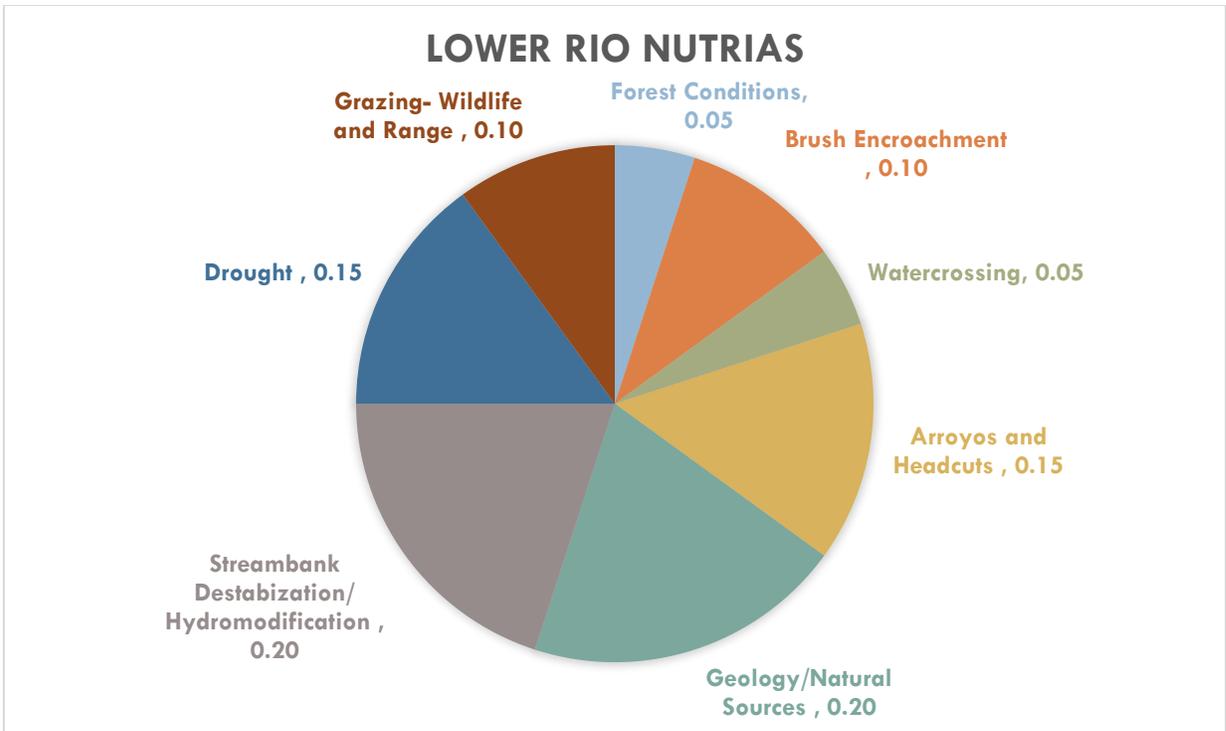


FIGURE 6 ESTIMATED LOAD CONTRIBUTION LOWER RIO NUTRIAS

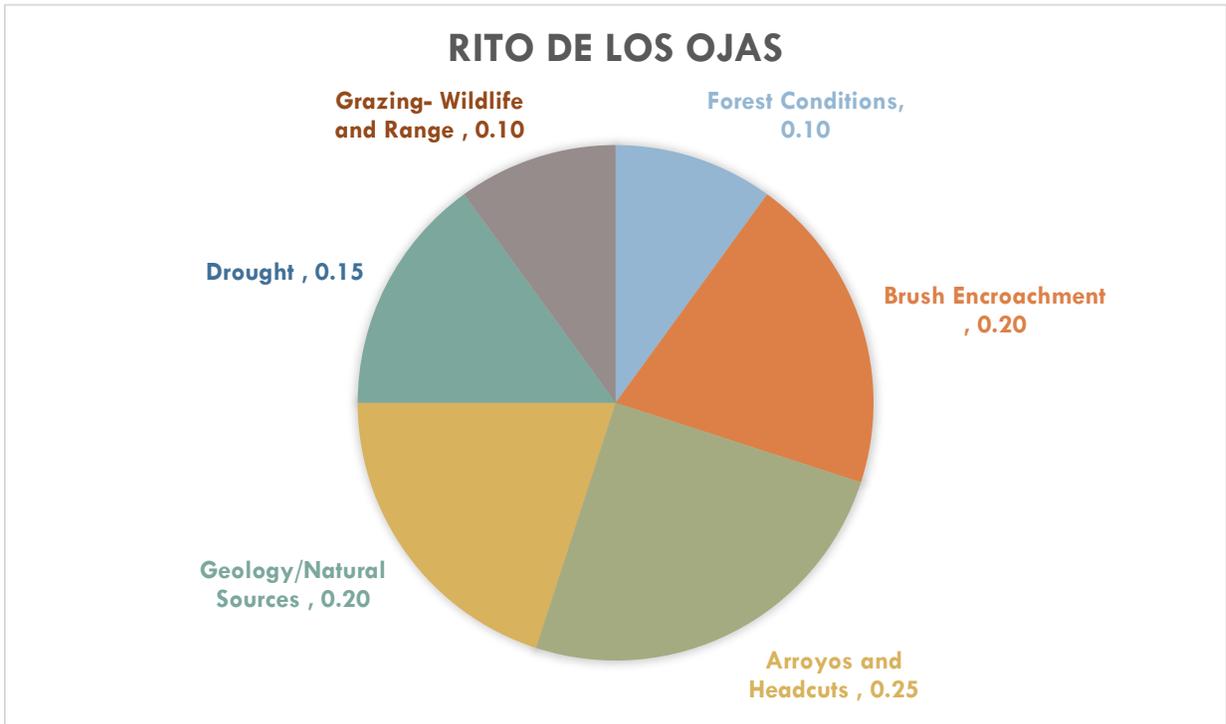


FIGURE 7 ESTIMATED LOAD CONTRIBUTIONS RITO DE LOS OJAS

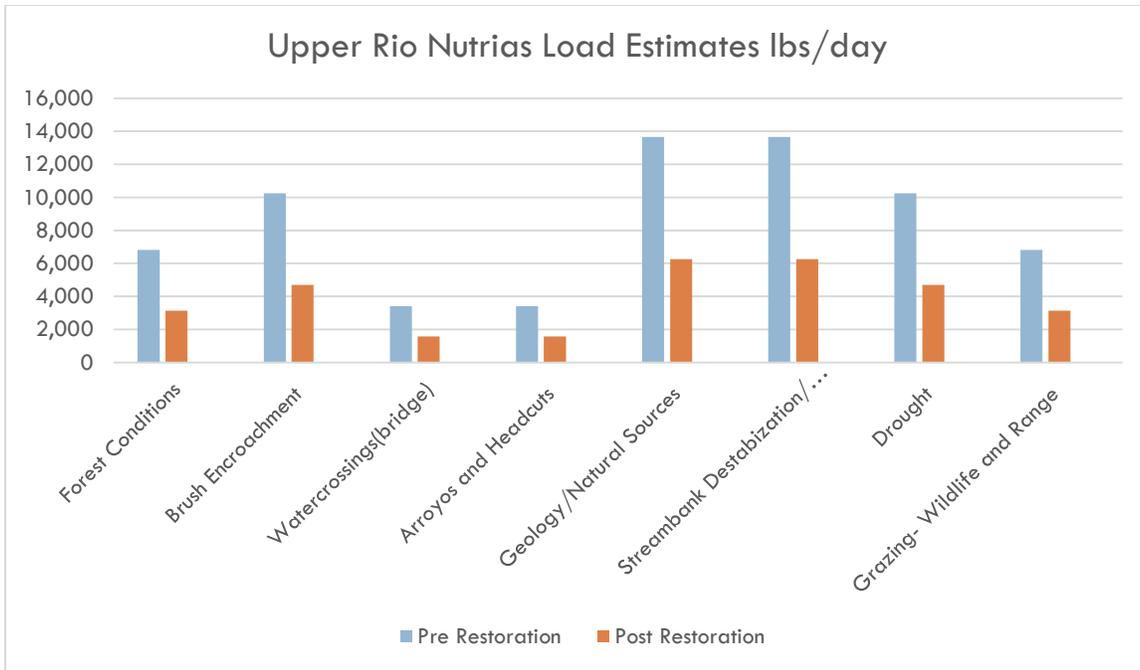
## LOAD REDUCTION ESTIMATES TO ACHIEVE WATER QUALITY

Detailed pollutant loading and reduction modeling for the Rio Nutrias watershed was done for this plan using the “Pacific Southwest Interagency Committee Report of the Water Management Subcommittee; *factors for affecting sediment yield and measures for reduction of erosion and sediment yields*” model.

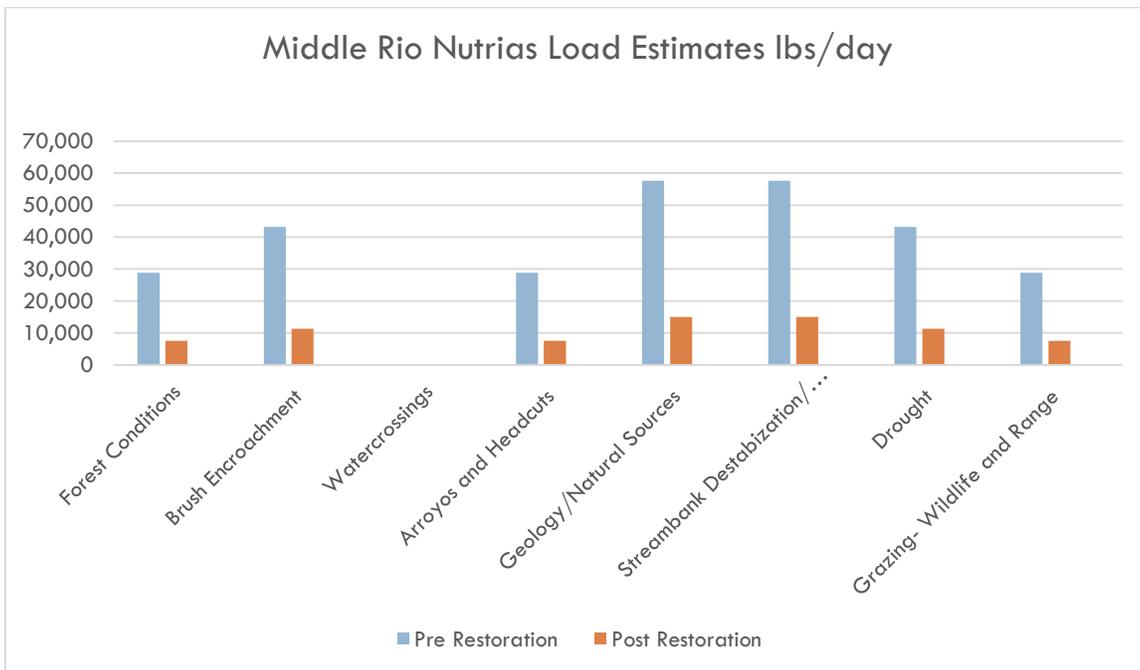
The Rio Nutrias watershed area was broken down into the smaller HUC- 12 sub watersheds to allow for more localized measurements. The PSIAC model was applied to each sub watershed to estimate current pollutant loading. The model was also used to estimate pollutant loading after Best Management Practices are implemented. The total result for each sub watershed was then broken down by the estimated contribution of each pollutant source. The results from the PSIAC modeling in ac ft. /year were converted to lbs. /day. The results from the modeling are found in the graphs below. Model data can be found in the appendices.

PSIAC MODEL	Upper Rio Nutrias	Middle Rio Nutrias	Lower Rio Nutrias	Rito De Los Ojas
Current Estimated Sediment Yields	68,262 lbs./day	288,092 lbs./day	219,592 lbs./day	262,825 lbs./day
Potential Estimated Sediment Yields with Implementation of Selected Management Measures	31,287 lbs./day	87,680 lbs./day	62,512 lbs./day	74,819 lbs./day

TABLE 2 PSIAC SEDIMENT YIELD RESULTS



**FIGURE 8 LOAD ESTIMATES UPPER RIO NUTRIAS**



**FIGURE 9 LOAD ESTIMATES MIDDLE RIO NUTRIAS**

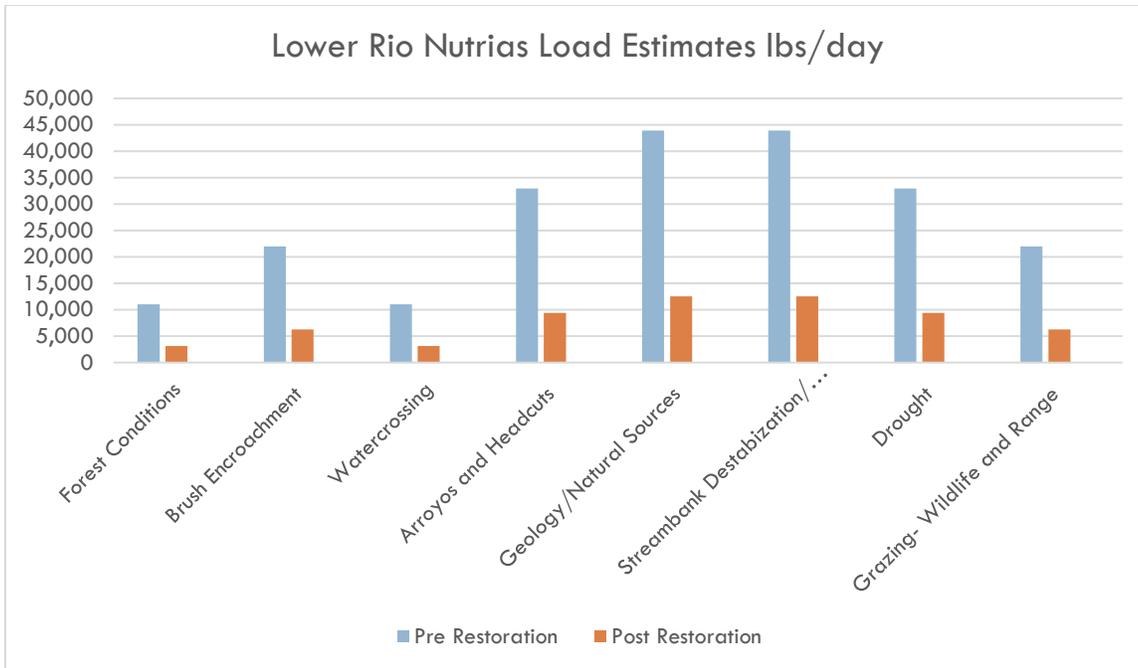


FIGURE 10 LOAD ESTIMATES LOWER RUI NUTRIAS

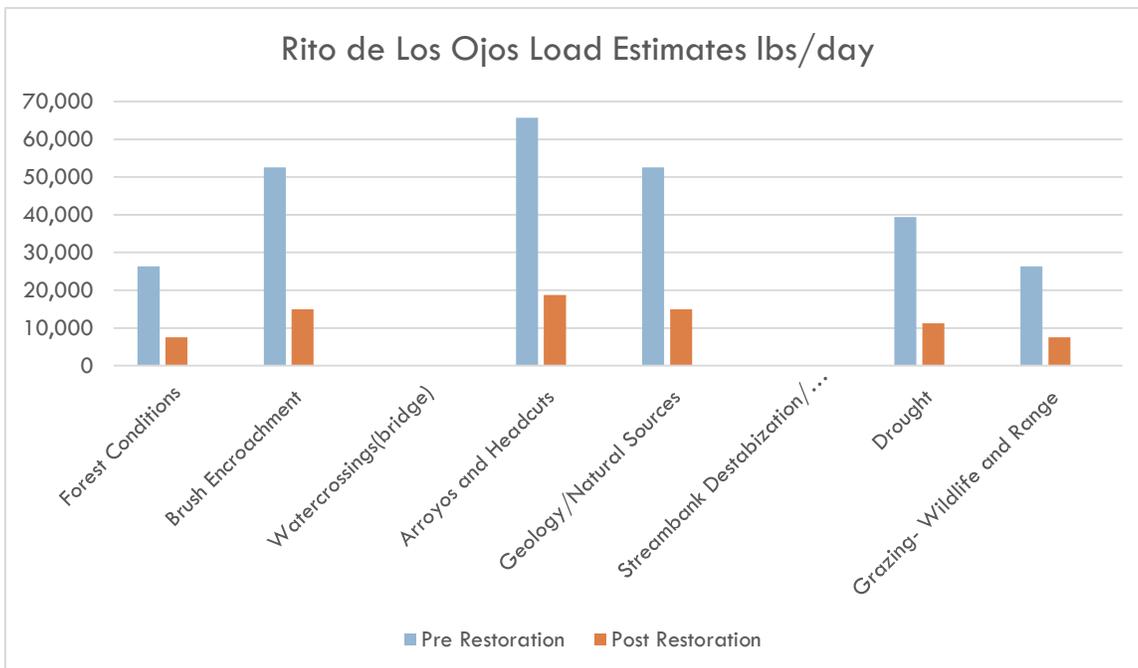


FIGURE 11 LOAD ESTIMATES RITO DE LOS OJAS

## POTENTIAL DATA GAPS

The TMDL created by the NMED in 2004 was based off of one sampling point at the lower end of the upper Rio Nutrias sub watershed. New water quality samples were taken in 2012 at locations within the upper, middle and lower Rio Nutrias sub watersheds. The results from these samples have not been published at this time. The plan may need to be revised in the future to include the results from the new data.

PSIAC modeling used for the plan is an easy to use model, but like most models it has a margin of error and should only be used as an estimate of current or future conditions. Also, the results of this model are not directly comparable to the TMDL created for the Rio Nutrias due to the fact that they are inherently measuring different aspects of an erosional process. The PSIAC calculates all potential mobilized erosion within the watershed, this erosion does not always deposit directly into the watercourse. The TMDL measures the amount of erosion that actually deposits into the watercourse. It is assumed that these two calculations can be compared within some order of magnitude to make simple estimations of effectiveness of best management practices over time. It may be determined in the future that the community or the regulators would prefer a more comparative modeling regime for purposes of implementing this plan.

## SELECTED BEST MANAGEMENT PRACTICES TO SUPPORT LOAD REDUCTIONS



FIGURE 12 RIO NUTRIAS UNSTABLE STREAMBANKS

### Streambank Stabilization

Streambank stabilization measures can be divided into two categories

Vegetative management prescription would be indicated if the river has marginally degraded streambanks that are unstable and are showing signs of actively eroding streambanks.

Vegetative management includes shaping the streambanks, using an erosion control fabric, if appropriate and planting the critical vegetation area. The purpose is to stabilize and protect against bank scour and erosion.

Streambank bioengineering would be prescribed for a moderately degraded streambanks that are unstable and are showing signs of actively eroding streambanks. Streambank bioengineering includes reshaping the streambanks and utilizing plant materials such as root wads, logs branches and brush mats as structural components, may also include terracing and revetment.



**FIGURE 13 RIO NUTRIAS CHANNEL DOWNCUTTING**

We estimate that approximately 2 miles of streambank engineering and approximately 5 miles of vegetative management prescriptions will be needed to be implemented to restore the river channel to a more stable state. It is not likely that any streambank stabilization project will be an entire mile in length, but rather smaller sections in the most severely eroded areas and where a willing landowner would like to participate. It is important to improve the upland conditions before engaging in a large scale streambank stabilization effort, as the stream channel is affected by the greater conditions within the watershed.

*Price per unit- Bioengineering techniques \$248,160 per mile, Vegetative management \$95,040 per mile*

*Potential Funding Sources- NRCS EQIP, EPA 319, USFWS, NMGF, NMED Wetlands*

*Technical Assistance- NRCS, NM State Engineer, NM Interstate Stream Commission, NM State Forestry Plant Center, NRCS Native Plant Center*

*Permits and Regulation - USACE permit required, BLM lands -NEPA required*

*Responsible party- Landowner*

## Headgate Repair



**FIGURE 14 RIO NUTRIAS HEADGATE**

Prescriptions include headgate repair or replacement with the addition of rock check dams or other erosion control practices to create a surface water profile and to stabilize surrounding streambanks. The failure of the headgates in the watershed are all related to land erosion created by degraded streambanks or hydro modification from the diversion structure. Some headgate structural components may be reusable, some may need to be upgraded or resized. All headgates will need some amount of erosion control work to keep the structure stable over time, suggestions would be rock check dams, streambank bioengineering and vegetation management. We approximate 10-15 headgates will need to be repaired or replaced.

*Price per Unit- Estimated cost of \$8,000 to include some erosion control practices*

*Potential Funding Sources- EPA 319, NRCS EQIP, Upper Chama SWCD, NM State Capital Outlay, NM Interstate Stream Commission, NM Infrastructure Capital Improvement, Bureau of Reclamation*

*Technical Assistance- USDA NRCS, NM State Engineer, NM Acequia Association, USACE*

*Permits and Regulation- USACE*

*Responsible Party- Landowner*

## River Crossings



**FIGURE 15 RIO NUTRIAS RIVER CROSSING**

We have identified two river crossings that could be repaired. Both are located on Rio Arriba County roads. The first is currently an oversized culvert that appears to be creating erosion due to hydro modifications, we suggest replacing it with a bridge so the river can travel underneath the road crossing without impediment.

The second is a road crossing the stream, we suggest upgrading to an armored low river crossing, this would include installing a stable surface at the river bottom and approaches. This could be accomplished using paver or blocks, this will reduce potential erosion from vehicular traffic.

*Price per Unit- We estimate the cost to be \$12,000 to create a bridge and \$4,000 to create an armored low river crossing*

*Potential Funding Sources- EPA 319, Rio Arriba County, NMDOT, Infrastructure Capital Improvement*

*Technical Assistance- Rio Arriba County*

*Permits and Regulation – Rio Arriba County*

*Responsible Party- Rio Arriba County*

### Arroyo/Headcut repair

There have been several actively eroding gullies, arroyos and headcuts identified. Many degraded arroyos have been remediated previously with some becoming a drainage to a trick tank. We estimate that there are approximately 10 arroyos or headcuts of various size and depths. Prescriptions include regrading the gully and installing rock check dams to encourage water and sediment retention, this will promote revegetation of the disturbed area. Some of the larger headcuts will require a more extensive engineering design to correct the erosion problem.



**FIGURE 16 RIO NUTRIAS GULLY**

*Price per Unit-\$5,000-\$20,000 per repair*

*Potential Funding Sources- NRCS EQIP (size restrictions), EPA 319, USPFW*

*Technical Assistance- NRCS*

*Permits and Regulation- USACE, FEMA floodplain, Rio Arriba County can consult*

*Responsible Party- Landowner or Lessee*



FIGURE 17 RIO NUTRIAS HEADCUT

### Brush control

The areas within the watershed that have had sagebrush eradication have significantly more grasses and groundcover. Removing the invasive brush creates better habitat conditions and inhibits sheet and rill erosion. We estimate that there are approximately 15,000 acres of invasive brush in the watershed that could be treated. Treatment could be mechanical using a brush hog or other equipment to manually remove the brush or could be a chemical application such as aerial spraying of an herbicide. Practice method would depend on size of treatment area and preference of the landowner. Some landowners who have previously completed a mechanical treatment were discouraged by how fast the brush has reoccurred. Treatment with an herbicide does not create the same soil disturbance and the skeletons of the dead brush stay intact for several years as they decompose, holding the soil structure in place and also providing a beneficial microclimate for the grasses as they grow back.



**FIGURE 18 RIO NUTRIAS PREVIOUSLY TREATED SAGEBRUSH**

*Price per Unit-\$35/ac for aerial chemical treatment, \$100/ac for mechanical treatment*

*Potential Funding Sources- NRCS EQIP, EPA 319, NMGF Habitat Stamp, US Partners for Fish and Wildlife, NM State Land Office*

*Technical Assistance- NRCS, BLM, USFS, NM State Lands*

*Permits and Regulation- Private Lands- Soil Disturbance Permit from Rio Arriba County, USFS Lands- NEPA Required, BLM Lands-NEPA required*

*Responsible Party- Landowner or Lessee*

## Reseeding

Prescriptions include range reseeding to improve forage conditions, wildlife habitat and erosion concerns, and pasture reseeding to improve forage condition and reduce erosion concerns. Many landowners have indicated that they would like to reseed with native grasses that may be more tolerant of the drought conditions that we have been experiencing. Reseeding range and pasture lands will improve ground cover and eliminate erosion conditions. We estimate that there are 2,000 acres of range and 200 acres of pasture that could be reseeded.



**FIGURE 19 RIO NUTRIAS AREA TO BE RESEDED**

*Price per Unit- \$82/ac nonnative seed and \$362/ac native seed for range planting  
\$90/ac for pasture planting*

*Potential Funding Sources- NRCS EQIP, EPA 319, NMGF Habitat Stamp, NMGF SWW*

*Technical Assistance- NRCS, UCSWCD has equipment to lend*

*Permits and Regulation- None needed unless using seed drill on BLM lands requires a NEPA. (Applicability to BLM Rio Chama Vegetation Plan)*

*Responsible Party- Landowner or Lessee*

## Forest Thinning

Forest stands have become very overgrown in parts of the watershed and have created a closed canopy condition where the groundcover cannot grow underneath the trees. This has created sheet and rill erosion, degraded habitat conditions and poses a fire hazard. Prescriptions include thinning trees to a desired density using tools, mastication and controlled burns where necessary to return forest structure and composition to a desired condition.



**FIGURE 20 RIO NUECES EXAMPLE OF OVERGROWN FORESTS**

*Price per Unit- \$1,850/ac for heavy thinning, \$1,030/ac for light thinning and \$1,000-\$800/ac for mastication.*

*Potential Funding Source- NRCS EQIP, ENMRD hazardous fuels nonfederal lands, USFS Secure Rural Schools title II, USFS CFRP, NMED River Stewardship*

*Technical Assistance- NRCS, NMSF, USFS, NM Watershed Institute*

*Permits and Regulation- Private lands- any harvest over 25 acres permit from Rio Arriba County, USFS lands- NEPA required, BLM lands NEPA required*

*Responsible Party- Landowner or Lessee*

## Fencing

Fencing is a best management practice to disburse grazing and could be helpful in establishing better groundcover conditions that will reduce soil erosion. Many of the fences in the watershed have been damaged by elk. We estimate the need for approximately 10 miles of fencing to be installed in the watershed.



**FIGURE 21 RIO NUTRIAS FENCING DAMAGED BY ELK**

*Price per unit- \$11,000 per mile*

*Potential Funding Sources- NRCS EQIP, EPA 319, NMGF, Rocky Mountain Elk Foundation*

*Technical Assistance- NRCS*

*Permits and Regulation- none known*

*Responsible Party- Landowner or Lessee*

## Water Development -dirt tanks, wells, drinkers and pipeline infrastructure



**FIGURE 22 RIO NUTRIAS DIRT TANK**

Water development is a range and wildlife management technique that can disburse the animals on the landscape, can also relieve the pressure on the river and riparian area. Many of the landowners rely on dirt tanks for providing water for their livestock. Most of the tanks have been installed at the end of an already existing gully or arroyo. These tanks have effectively served as sediment traps and most tanks have a vegetated and healed arroyo upstream from it. These tanks also provide a valuable habitat for wildlife and birds. Because they have been filled with sediments over the years many of the tanks need to be cleaned. Several landowners would like to install new dirt tanks and there is a lot of interest in wells, pipelines and drinkers because our most recent drought has made water collection undependable at best. We estimate that 7 wells with infrastructure and 10 Ponds could be installed or upgraded.

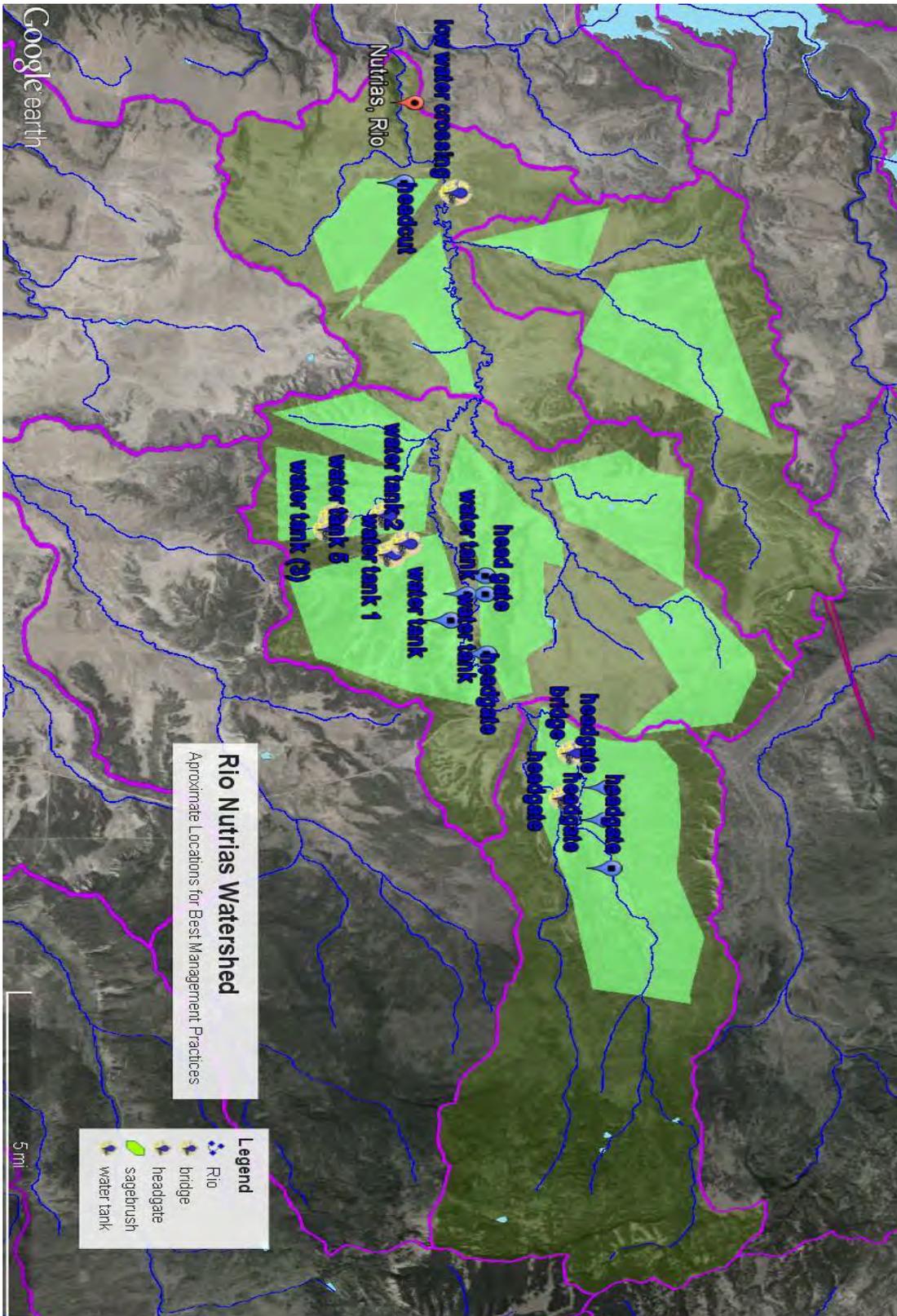
*Price per Unit-\$25,000 per well and approximately \$7,000 per pond*

*Potential Funding Sources- NRCS EQIP (limited scope), EPA 319, NMGF, UFSF Secure Rural Schools, USPFW*

*Technical Assistance- NRCS EQIP, special equipment needed*

*Permits and Regulation – If diversion is less than 10 ac/ft. NM State Engineer Permit will not be needed*

# APPROXIMATE LOCATIONS FOR MANAGEMENT MEASURES



SUMMARY OF COST ESTIMATES

Best Management Practices	Description and Approximate Number of Units	Estimated Costs per Unit	Total Estimated Costs
Headgate Repair/Replacement	10-15 Headgates and Associated Erosion Control Structures	\$8,000 per structure	\$80,000- \$120,000
Forest Thinning (USFS)	2,500 acres	\$1,200 per acre	\$3,000,000
Forest Thinning (Private Lands)	2,000 acres	\$1,200 per acre	\$2,400,000
Fencing	10 Miles	\$11,000 per mile	\$110,000
Invasive Brush Control	Chemical or Mechanical Treatment 15,000 acres	\$35-\$100 per acre	\$525,000- \$1,500,000
Water Development	7 Wells and Infrastructure 10 Ponds	\$25,000 per well \$7,000 per pond	\$175,000 \$70,000
Arroyo/ Headcut Repair	10 Arroyos or Headcuts Various size and depths	\$5,000-\$20,000 per repair	\$50,000- \$200,000
Reseeding (Range)	Native or Non-native Range Seeding 2,000 acres	\$82- \$362 per acre	\$164,000- \$724,000
Reseeding (Pasture)	Perennial Grass Pasture Seeding 200 acres	\$90 per acre	\$1,800
River Crossings	1 Hard Bottom River Crossing 1 Bridge Crossing	\$4,000 \$12,000	\$4,000 \$12,000
Streambank Stabilization	Bioengineering Methods 2 miles Critical Vegetation Area 5 miles	\$248,160 per mile \$95,040 per mile	\$496,320 \$475,200
Project Monitoring	Pre and Post Implementation Project Monitoring/Long Term Range Monitoring	\$15,000 per year	\$150,000

<b>Project Outreach and Project Administration</b>	Technical Assistance /Communications/Capacity Building/ Engaging Partnerships/ Financial Assistance/Fundraising/	\$40,000 per year	\$400,000
<b>TOTAL ESTIMATED COSTS</b>			\$8,113,320- \$9,383,320

## STAKEHOLDER OUTREACH AND PARTICIPATION

### Stakeholder Outreach

Outreach for this planning process included identifying the landowners within the watershed and requesting their mailing addresses to initiate communication. Postcards were mailed out to landowners to announce a project kick off meeting. In addition, we spoke directly with landowners to discuss the planning project and answer any questions people had. We scheduled site visits and held interviews with many of the families in the watershed, during these visits stakeholders we identified potential sources of erosion, discussed previously implemented best management practices and created ideas for future projects on their properties.

### Stakeholder Participation

The community of Las Nutrias gave up their free time to actively participate in this planning process. Stakeholders met with us on an individual level to discuss their concerns, objectives and hurdles they have had in long term restoration. Most landowners have been actively implementing restoration projects on their land over time. A questionnaire was developed to assess what BMP projects were a priority for them, what difficulties they have experienced in the past such as funding, maintenance, regulation, technical assistance need or BMP failure. The interview also gauged what stakeholders see as the bigger picture issues for the watershed, responses included streambank erosion, sagebrush encroachment, pinon juniper encroachment, water collection tanks full of sediment, condition of the range due to drought and

forage competition with the elk and wildlife knocking down fences. The results of the fieldwork were the basis of all planning exercises for the group and the foundation of this plan.

Many of the stakeholders have also attended bimonthly meetings and workshops to discuss land and water management issues and to engage in discussions about the most appropriate methods for approaching the needed restoration work. We used postcards and phone calls to announce meetings and workshops. We also have a limited email list serve.

The watershed group meetings were a chance for the community to learn about new best management practices, to discover funding sources and a chance for the group to make democratic decisions on the priorities for future actions within the watershed. The topics and presentations at the meetings included the following;

#### Watershed Best Management Practices

- NRCS EQIP BMP's (Lorne DeNetclaw, Chama NRCS)
- Innovative Ranching BMP's (Delbert Trujillo NMED)
- Large Scale River Restoration and Grazing Allotment Improvements ( David Manzanares, NMACD)

#### Federal and State Funding Programs

- USFWS- Partners for Fish and Wildlife
- NMGF- Habitat Stamp
- USFS- Collaborative Forest Restoration Program
- NMACD- Collaborative Restoration Management Planning Project
- NMSF- EMNRD Non Federal Lands Thinning Program

#### Group Planning Exercises

- Watershed group prioritized improvement projects
- Watershed group estimated costs, technical assistance and permits need to implement improvement projects
- Watershed group gave preferences for potential funding sources for implementation projects

## Future Stakeholder Outreach and Participation Activities

The future outreach and participation activities will include;

- Continue the watershed group meetings at least quarterly or as needed, meetings will continue to be advertised by mailings, phone calls and word of mouth.
- We will continue outreach with landowners who have not participated yet.
- Assist the private landowners with funding applications and implementation projects.
- Hold workshops for group funding applications.
- Hold workshops on monitoring to make it easier for landowners to complete project specific monitoring pre and post implementation.
- Have field days to learn about innovative BMP installations.
- Hold a workshops on BMP maintenance.
- Have field days to visit completed or ongoing restoration projects to share technical information amongst the stakeholders.
- Continue to host guest speakers as needed to learn about new topics such as innovative BMP's, funding sources, regulations and success stories from other restoration projects.
- Maintain current partnerships and create new partnerships to identify collaborative efforts and funding sources.
- Engage in efforts with the local agencies to pursue management options and encourage NEPA planning where appropriate.

### Stakeholders in the Rio Nueces Watershed

#### Private Landowners

Upper Chama Soil and Water Conservation District

New Mexico Association of Conservation Districts

New Mexico State Forestry

Upper Chama USDA NRCS

Bureau of Land Management Taos Field Office

USFS Canjilon Ranger District

New Mexico State Lands Office

Rio Arriba County

New Mexico Game and Fish

US Partners for Fish and Wildlife

## 10 YEAR IMPLEMENTATION PLAN

Project	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Establish a Non-Profit Organization	x									
Hire a Coordinator	x									
Continue Watershed Group Meetings	x	x	x	x	x	x	x	x	x	x
Apply for EPA 319 Grant	x			x			x			x
NRCS EQIP Funding for Private Landowners	x	x	x	x	x	x	x	x	x	x
USFS Forest Thinning			x	x	x	x	x	x	x	x
Private lands Forest Thinning	x	x	x	x	x	x	x	x	x	x
Water Development Projects	x	x	x	x	x	x	x	x	x	x
Headgate Repair or Replacement	x	x	x	x	x					
Reseeding Rangelands and Pastures	x	x	x	x	x	x	x	x	x	x
Brush Control Projects	x	x	x	x	x	x	x	x	x	x
Streambank Stabilization Projects			x	x	x	x	x	x	x	x
Arroyos and Headcuts Repair	x	x	x	x	x					
Fencing	x	x	x	x	x	x	x	x	x	x
Bridge		x								

Armored Low Water Crossing							x			
PSAIC Watershed Assessment		x		x		x		x		x
NMED Water Quality Assessment						x				
Restoration Pre and Post Project Monitoring	x	x	x	x	x	x	x	x	x	x

## PROJECT MILESTONES

The following list are project milestones for implementation of the Watershed Based Plan

Establish a Not for Profit organization that can assume the fiscal operations for the watershed.

Secure funding to hire a watershed coordinator/administrator.

Facilitate watershed group meetings at minimum on a quarterly basis.

Apply for EPA CWA 319 On the Ground Project Funding every 3 years or as needed.

Implement EPA CWA 319 projects.

Complete the NRCS Coordinated Resource Management Plan.

Apply for Coordinated Resource Management Funding.

Assist 5 landowners per year in applying for NRCS EQIP funding.

Assist 2 landowners per year to apply for Partners for Fish and Wildlife funding for private landowners in the watershed.

Assist 2 landowners per year to apply for NMSF thinning projects on Non Federal Lands.

Show our support for USFS NEPA development on Upper Rio Nutrias Watershed lands.

Identify an applicant for Collaborative Forest Restoration Program Funding to implement thinning on USFS lands

Identify eligible projects and partner with the USFS and BLM to apply for NMGF Habitat Stamp Funding.

Continue working with the NMGF to establish appropriate wildlife populations in the Rio Nutrias Watershed.

Assist Rio Arriba County to find funding and engineering designs for river crossings on County Roads.

Complete PSIAC Watershed Assessment every two years.

Implement a pre and post restoration monitoring program to track project successes.

Create an annual report every year to track metrics to provide for adaptive management.

Reevaluate restoration priorities upon next NMED water quality sampling results.

Continue to build the watershed community and assist in addressing their natural resource concerns.

## CRITERIA

The measurement of success for this watershed management plan will be attainment of water quality standards. The NMED will perform water quality sampling on the Rio Nutrias again in 2020. Once the data becomes available we can reevaluate our program and make course corrections if needed.

The most decisive criteria in determining the success of the Watershed Based Plan will be attainment of water quality standards, yet it is unlikely that the turbidity levels in the Rio Nutrias will change in a short time period, we may need to complete many watershed restoration projects to begin to see a change. Watershed restoration projects are subject to funding availability. We are also dependent on climatic

conditions to see a positive change, for example the drought is currently contributing to the conditions of the watershed if the drought does not end or gets worse it will continue to effect the water quality.

To have effective and timely adaptive management for this plan we will also define alternative criteria to measure interim success.

We will use the following interim qualitative criteria to continue to assess watershed condition; change in land use, change in erosion, change in vegetative cover and change in streambank/channel conditions.

We will use the data we collected for the current watershed assessment as a baseline. We will also use the PSIAC model to measure the sediment yields using our current data as a baseline. The PSIAC watershed assessment and measurement of sediment yields will be performed at 2 year intervals and can provide a measurement of progress towards the water quality goals and provide for more timely adaptive management if needed.

Interim success criteria can also include the following quantitative criteria to measure our success in meeting our project milestones;

- Number of meetings, project participation and outreach events
- Valuable partnerships created and maintained
- Amount of funding received per year to implement restoration projects
- Number of BMP's implemented as gauged by number of acres, or feet of restoration work in a percentile to our overall goal

An annual report will be produced at the end of each calendar year and will summarize all of the criteria indicators, problems encountered and project successes.

## PROJECT MONITORING

There will be two types of monitoring utilized in this implementation plan, a biannual watershed assessment and measurement of sediment yields, and pre/post individual restoration project monitoring.

Watershed monitoring and assessment will focus on the cause of water quality impairment and will utilize the methods we have established in this document. The PSIAC watershed assessment model will be applied to assess long term trends in watershed health and potential changes in land use, vegetation, upland erosion and channel stability. The model will also be used to estimate sediment yields. This assessment will be done by the watershed coordinator and will be done every two years always in the same month so ground conditions will be similar.

Restoration Project Specific Monitoring Program- A photo point monitoring protocol will be implemented for all restoration projects. We will assess the parameters of each project pre and post restoration to monitor the effectiveness of restoration projects over time. This will help provide for adaptive management strategies if implementation is not having the results we anticipated. This will also provide a catalog of completed restoration projects and will ensure maintenance is applied to all BMP's. The watershed coordinator will work with the project funder and the landowner to implement this protocol at each restoration site. The post restoration monitoring will also take place in the summer months to ensure similar ground cover and vegetation conditions.

The NMED SWQB will conduct water quality monitoring on the Rio Nutrias in 2020. We will work with the SWQB to ensure accurate data collection.

All monitoring data will be logged onto standardized forms and will be stored in an electronic file and a binder. Monitoring data will be published in the annual report. Proper training in an established

monitoring protocol will take place before any data is collected. A Quality Assurance Project Plan will also be developed before any monitoring will take place.

## BIBLIOGRAPHY

Total Maximum Daily Loads (TMDLs) for the Lower Rio Chama Watershed

(Below El Vado Reservoir to the Confluence with the Rio Grande), NMED, 2004.

Rio Chama Watershed Restoration Action Strategy (WRAS), Meridian Institute, 2005

Environmental Assessment for Canjillon Ranger District Range Improvements Project, United States

Department of Agriculture, Forest Service Southwestern Region, 2010

Environmental Assessment NM-020-03-017 for the Esperanza Allotment, # 561 and Rio Nutrias Allotment, # 579 Analysis of Allotment Management Plan for Grazing Permit Renewal, U.S. Department of the Interior, Bureau of Land Management, 2003

Rio Chama Wilderness Study Area Vegetation Treatment Project DOI-BLM-NM-F020-2012-0032-EA.

U.S. Department of the Interior, Bureau of Land Management, 2012

Final Environmental Impact Statement for Riparian and Aquatic Habitat Management in the Taos Field

Office – New Mexico Volume 2: Proposed Riparian and Aquatic Habitat Management Plan, U.S.

Department of the Interior, Bureau of Land Management, 1994

Environmental Assessment for 7 BLM Allotments Located In The Rio Chama Watershed DOI-BLM-NM-F020-2010-0031-EA, U.S. Department of the Interior, Bureau of Land Management, 2010

Handbook for Developing Watershed Plans to Restore and Protect Our Waters, EPA 841-B-08-002, US EPA, Office of Water, 2008

Rio Arriba Field Office Technical Guide, USDA Natural Resources Conservation Service, 2014

Monitoring Rangelands in New Mexico: Range, Riparian, Erosion, Water Quality and Wildlife, Report 53, NMSU, Range Improvement Task Force, 2002

Pacific Southwest Interagency Committee Report of the Water Management Subcommittee; *factors for affecting sediment yield and measures for reduction of erosion and sediment yields*", Pacific Southwest Interagency Committee, 1968

## APPENDIX A. PSIAC MODEL

*Rio Nutrias Watershed Current Sediment Loading Estimates and Potential Sediment Load Reduction Estimates Under Proposed Best Management Practices Using Pacific Southwest Interagency Committee Report Method.(2013)*

### Description of the Model Methodology

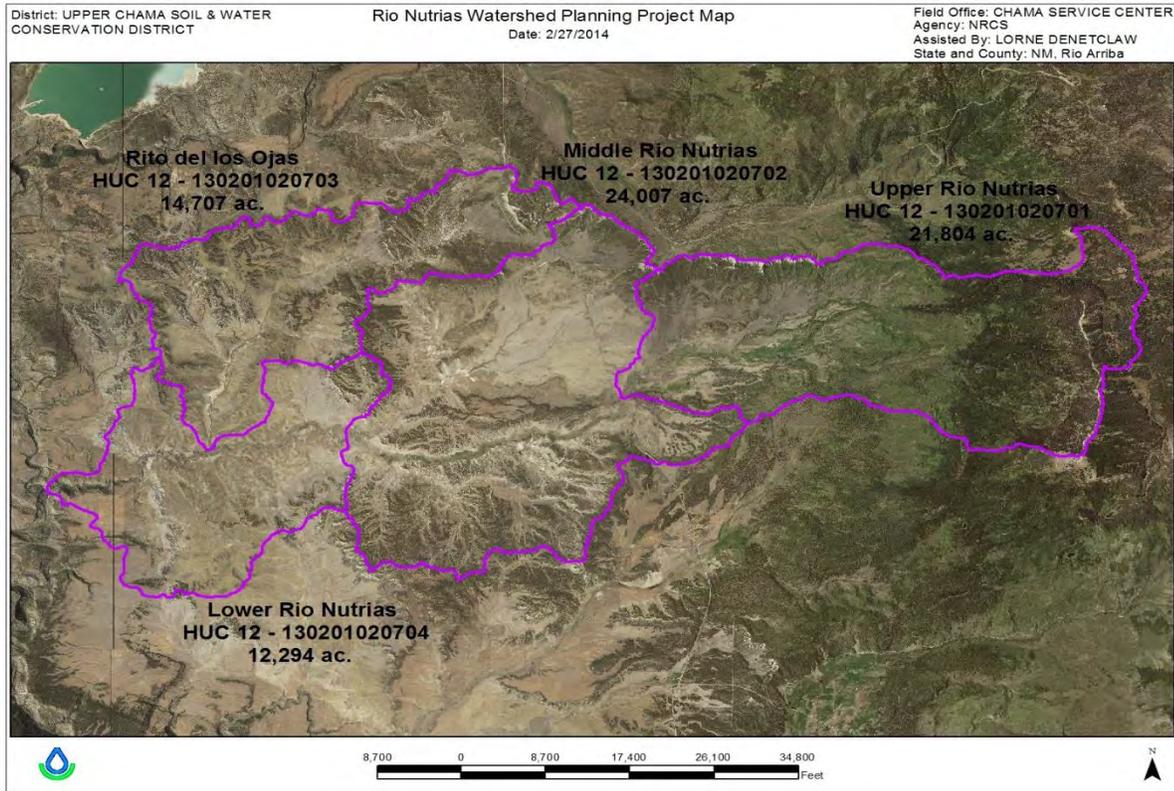
The pollutant loading and reduction modeling for the Rio Nutrias was done using the “Pacific Southwest Interagency Committee Report of the Water Management Subcommittee; *factors for affecting sediment yield and measures for reduction of erosion and sediment yields*” model. The model was created to provide estimations of sediment yield in variety of conditions found in the Pacific Southwest. The intent is to provide soil loss estimates for broad planning purposes. The use of this model can be an economic and non-technical method to evaluate small watersheds.

The PSIAC model assigns a numeric value for each of the following categories; surface geology, soils, climate, runoff, topography, ground cover, land use, upland erosion and channel erosion/sediment transport. This model is not an exact science but rather a rough estimate as the trained observer applies a value to each of these factors determining what a value might be when given a series of similar examples.

### Rio Nutrias Watershed

The watershed runs east to west starting in high elevation Alpine environment and terminates at the Rio Chama River canyon. The elevation, climate and vegetation changes drastically from the top to the bottom. The watershed was grouped into three areas for purposes of modeling. The upper section of the watershed, Upper Rio Nutrias, is a total of 21,804 acres in size. The middle section, Middle Rio Nutrias,

includes 24,007 acres and the lower section includes Rito de los Ojos (14,707 acres) and the Lower Rio Nutrias (12,294 acres) sections for a combined total of 27,001 acres.



### Upper Rio Nutrias

The upper section of the watershed includes USFS and private lands. The vegetation is primarily forested lands including Ponderosa pine, Aspen, Oak brush and open meadows that have a high percentage of grass cover, the topography is steep and the precipitation averages between 20 – 33 inches a year some in snow and other summer monsoon storms.

### *Middle Rio Nutrias*

The middle section of the watershed is mostly private lands with a small section of BLM and an even smaller section of state lands. The vegetation includes the transition to lower elevations, primarily piñon and juniper interspaced with sagebrush and grasses on the hillside, irrigated pasture and riparian areas in the valley. The precipitation averages 16-19 inches a year.

### *Lower Rio Nutrias*

The lower section of the watershed is managed by a combination of BLM, State of New Mexico and private individuals. The lower section is more arid open grasslands with sagebrush interspaced with piñon and juniper sections, the Rio Nutrias runs thru this section as well but lacks any substantial riparian area due to channel down cutting. This area is widely used for grazing periodically throughout the year. In the past large scale conservation projects cleared thousands of acres of sage and planted crested wheatgrass. More recently there has been ongoing efforts to continue to eradicate the sage brush. The most recent drought has had an effect on ground cover and pasture vitality. There is also a massive elk and deer population that forage on the pasture and range lands, this has created coupled damages to the groundcover. The precipitation for the lower section averages 14-15 inches per year.

### *Applying the Model*

To apply this model we visited the field and found a vantage point to assess the different factors in the model. For the upper section of the watershed we visited USFS lands and found a bluff to look out upon the watershed, for the middle section we visited a vista above irrigated fields, and for the lower section of the watershed we visited a site looking over the Rio Nutrias valley on BLM lands. We also included our experiences in the many site visits we have done in the Rio Nutrias watershed in our ratings



*The Upper Rio Nutrias*



*The Middle Rio Nutrias*



The Lower Rio Nutrias

PSIAC Calculations for Sediment Yield in Rio Nutrias Watershed

	<b>Upper Rio Nutrias</b>	<b>Reasoning</b>	<b>Middle Rio Nutrias</b>	<b>Reasoning</b>	<b>Lower Rio Nutrias</b>	<b>Reasoning</b>
<b>Surface Geology</b>	8	Shale and rock formations	8	Shale outcroppings and mudstone alluvial valley	7	Shale, sandstone and mudstone alluvial valley
<b>Soils</b>	2	High in organic matter	5	Combination of saline soils and organic matter	8	Saline, alkaline, easily dispersed, fine texture
<b>Climate</b>	5	Intense storms and snow	7	Short period intense storms, freeze thaw occurrence	7	Short period intense storms, freeze thaw occurrence

<b>Runoff</b>	6	Moderate peak flows note some overbank flooding	7	Moderate peak flows note incisions	8	Moderate to high peak flows evident by incision and wet banks
<b>Topography</b>	15	Steep to moderate %30 slope, wide floodplain development	14	%40 slope, some floodplain development	13	%50 upland slope, very little floodplain development
<b>Vegetation</b>	-8	@75-80% groundcover, healthy grasses	-5	@50 -60 % groundcover mostly in riparian areas, sage, piñon on slopes	0	@ 30-40% groundcover, sage, little grass, some litter and rock fragments
<b>Land Use</b>	-9	Low intensity grazing minimal roads	3	Moderate intensity grazing and cultivation	0	Moderate intensity grazing, many roads
<b>Upland Erosion</b>	1	None visible	5	Some gullies present	10	Gullies and rills
<b>Channel Erosion/Sediment Transport</b>	10	Banks in stable condition healthy riparian area	23	Continuous eroding banks some at large depths	25	Continuous eroding banks at large depths, headcuts and active degradation
<b>Total</b>	30 = .24 ac ft./mi <sup>2</sup> / yr.		67= .92 ac ft./mi <sup>2</sup> / yr.		78= 1.42 ac ft./ mi <sup>2</sup> /yr.	

PSIAC Calculations for Reductions of Sediment Yields

The model provides numeric values for using specific land treatments or structural prescriptions to abate the erosion and sediment loads. Specific land treatment prescriptions that have been indicated in the Rio Nutrias include; forest thinning, brush control, reseeding, fencing, water development and specific structural prescriptions indicated include; headgate repair, streambank bioengineering, sediment dams, arroyo mitigation and road crossing redevelopment. The model differentiates between extensive treatment and intensive treatments. Extensive treatments are only land treatments and intensive treatments are land and structural treatments coupled together. The model applies different numeric criteria depending on whether extensive or intensive treatment are applied.

Only factors that can be affected by treatment can change their numeric value, these factors include ground cover, land use, upland erosion and channel erosion.

<b>Sediment Contribution Factors</b>	<b>Upper Rio Nutrias</b>	<b>With treatment - assume extensive treatment because no structural prescriptions have been indicated</b>	<b>Middle Rio Nutrias</b>	<b>With treatment -assume intensive treatment, because structural prescriptions have been indicated</b>	<b>Lower Rio Nutrias</b>	<b>With treatment - assume intensive treatment, because structural prescriptions have been indicated</b>
<b>Surface Geology</b>	8	8	8	8	7	7
<b>Soils</b>	2	2	5	5	8	8
<b>Climate</b>	5	5	7	7	7	7
<b>Runoff</b>	6	6	7	7	8	8
<b>Topography</b>	15	15	14	14	13	13
<b>Vegetation</b>	-8	-13	-5	-12	0	-5
<b>Land Use</b>	-9	-14	3	-4	0	-5

<b>Upland Erosion</b>	1	0	5	5	10	5
<b>Channel Erosion/Sediment Transport</b>	10	0	23	0	25	5
<b>Total</b>	30 = .24 ac ft./mi <sup>2</sup> /yr.	9 = .11 ac ft./mi <sup>2</sup> /yr.	67 = .92 ac ft./mi <sup>2</sup> /yr.	30 = .24 ac ft./mi <sup>2</sup> /yr.	78 = 1.42 ac ft./mi <sup>2</sup> /yr.	43 = .39 ac ft./mi <sup>2</sup> /yr.

Conclusion of the PSIAC Modeling

If intensive treatment occurs in the Upper Rio Nutrias Watershed we can expect a small reduction in sediment yields of .13 ac ft. /mi.<sup>2</sup> /yr.

If intensive treatment occurs in the Middle Rio Nutrias we can expect a moderate reduction in sediment yields of .68 ac ft. /mi.<sup>2</sup> /yr.

If intensive treatment occurs in the Lower Rio Nutrias we can expect moderately high reduction in sediment yields of 1.03 ac ft. /mi.<sup>2</sup> /yr.

APPENDIX B. CONVERSION DATA

Sediment Loading from Individual Sources	% of area	Pre-treatment Load ac ft./mi2/yr	Predicted Post-treatment Load ac ft./mi2/yr	Pre-treatment Load lbs./sq. mi./yr	Predicted Post-treatment Load lbs./sq. mi./yr	Pre-treatment Load lbs./day/area	Predicted Post-treatment Load lbs./day/area	Estimated Load Reduction in lbs./day/area
Upper Rio Nutrias	34.07	0.24	0.11	731,808	335,412	68,262	31,287	36,975
Forest Conditions	0.10	0.024	0.011	73,181	33,541	6,826	3,129	3,698
Brush Encroachment	0.15	0.036	0.0165	109,771	50,312	10,239	4,693	5,546
Watercrossings(bridge)	0.05	0.012	0.0055	36,590	16,771	3,413	1,564	1,849
Arroyos and Headcuts	0.05	0.012	0.0055	36,590	16,771	3,413	1,564	1,849
Geology/Natural Sources	0.20	0.048	0.022	146,362	67,082	13,652	6,257	7,395
Streambank Destabization/ Hydromodification	0.20	0.048	0.022	146,362	67,082	13,652	6,257	7,395
Drought	0.15	0.036	0.0165	109,771	50,312	10,239	4,693	5,546
Grazing- Wildlife and Range	0.10	0.024	0.011	73,181	33,541	6,826	3,129	3,698

Sediment Loading from Individual Sources	% of area	Pre-treatment Load ac ft./mi2/yr	Predicted Post-treatment Load ac ft./mi2/yr	Pre-treatment Load lbs./sq. mi./yr	Predicted Post-treatment Load lbs./sq. mi./yr	Pre-treatment Load lbs./day/area	Predicted Post-treatment Load lbs./day/area	Estimated Load Reduction in lbs./day/area
Middle Rio Nutrias	37.51	0.92	0.24	2,805,264	731,808	288,092	75,154	212,937
Forest Conditions	0.10	0.092	0.024	280,526	73,181	28,809	7,515	21,294
Brush Encroachment	0.15	0.138	0.036	420,790	109,771	43,214	11,273	31,941
Watercrossings	0.00	0	0	0	0	0	0	0
Arroyos and Headcuts	0.10	0.092	0.024	280,526	73,181	28,809	7,515	21,294
Geology/Natural Sources	0.20	0.184	0.048	561,053	146,362	57,618	15,031	42,587
Streambank Destabization/ Hydromodification	0.20	0.184	0.048	561,053	146,362	57,618	15,031	42,587
Drought	0.15	0.138	0.036	420,790	109,771	43,214	11,273	31,941
Grazing- Wildlife and Range	0.10	0.092	0.024	280,526	73,181	28,809	7,515	21,294

Sediment Loading from Individual Sources	% of area	Pre-treatment Load ac ft./mi2/yr	Predicted Post-treatment Load ac ft./mi2/yr	Pre-treatment Load lbs./sq. mi./yr	Predicted Post-treatment Load lbs./sq. mi./yr	Pre-treatment Load lbs./day/area	Predicted Post-treatment Load lbs./day/area	Estimated Load Reduction in lbs./day/area
Lower Rio Nutrias	19.20	1.37	0.39	4,177,404	1,189,188	219,592	62,512	157,081
Forest Conditions	0.05	0.0685	0.0195	208,870	59,459	10,980	3,126	7,854
Brush Encroachment	0.10	0.137	0.039	417,740	118,919	21,959	6,251	15,708
Watercrossing	0.05	0.0685	0.0195	208,870	59,459	10,980	3,126	7,854
Arroyos and Headcuts	0.15	0.2055	0.0585	626,611	178,378	32,939	9,377	23,562
Geology/Natural Sources	0.20	0.274	0.078	835,481	237,838	43,918	12,502	31,416
Streambank Destabization/ Hydromodification	0.20	0.274	0.078	835,481	237,838	43,918	12,502	31,416
Drought	0.15	0.2055	0.0585	626,611	178,378	32,939	9,377	23,562
Grazing- Wildlife and Range	0.10	0.137	0.039	417,740	118,919	21,959	6,251	15,708

Sediment Loading from Individual Sources	% of area	Pre-treatment Load ac ft./mi2/yr	Predicted Post-treatment Load ac ft./mi2/yr	Pre-treatment Load lbs./sq. mi./yr	Predicted Post-treatment Load lbs./sq. mi./yr	Pre-treatment Load lbs./day/area	Predicted Post-treatment Load lbs./day/area	Estimated Load Reduction in lbs./day/area
Rito de los Ojas	22.98	1.37	0.39	4,177,404	1,189,188	262,825	74,819	188,006
Forest Conditions	0.10	0.137	0.039	417,740	118,919	26,282	7,482	18,801
Brush Encroachments	0.20	0.274	0.078	835,481	237,838	52,565	14,964	37,601
Watercrossings	0.00	0	0	0	0	0	0	0
Arroyos and Headcuts	0.25	0.3425	0.0975	1,044,351	297,297	65,706	18,705	47,002
Geology/Natural Sources	0.20	0.274	0.078	835,481	237,838	52,565	14,964	37,601
Streambank Destabization/ Hydromodification	0.00	0	0	0	0	0	0	0
Drought	0.15	0.2055	0.0585	626,611	178,378	39,424	11,223	28,201
Grazing- Wildlife and Range	0.10	0.137	0.039	417,740	118,919	26,282	7,482	18,801