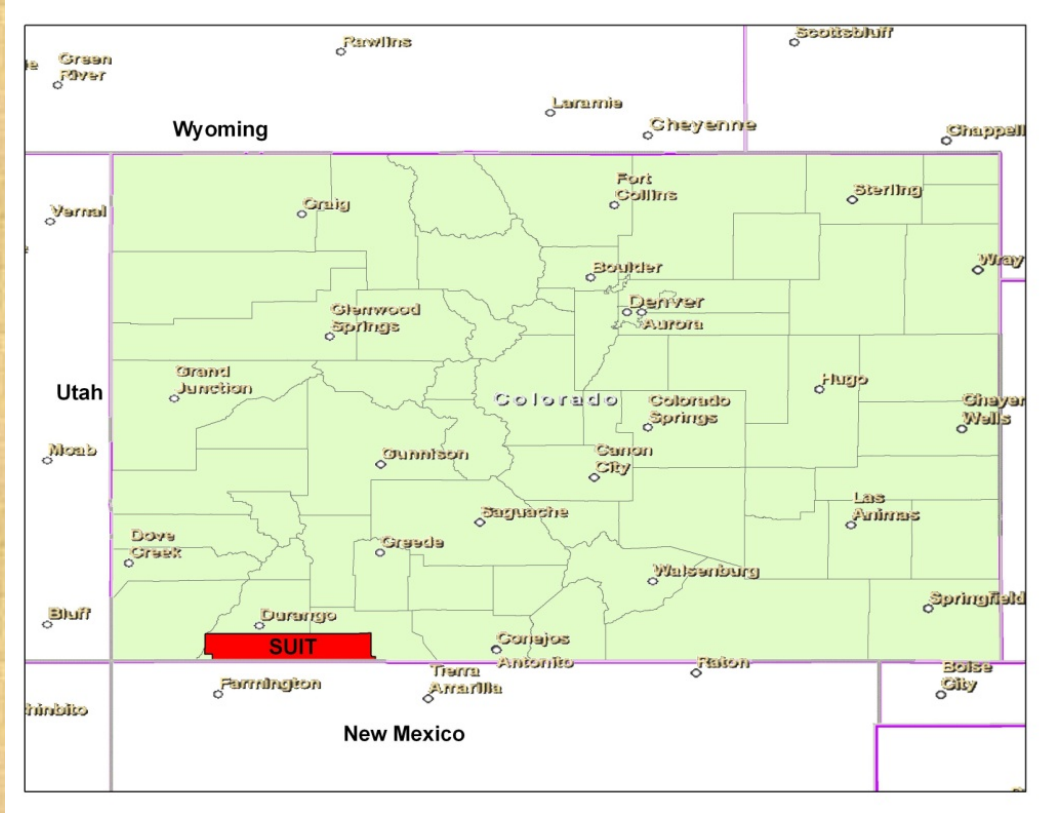
Implementing Agricultural Best Management Practices Through The Clean Water Act- §319

BACKGROUND INFORMATION

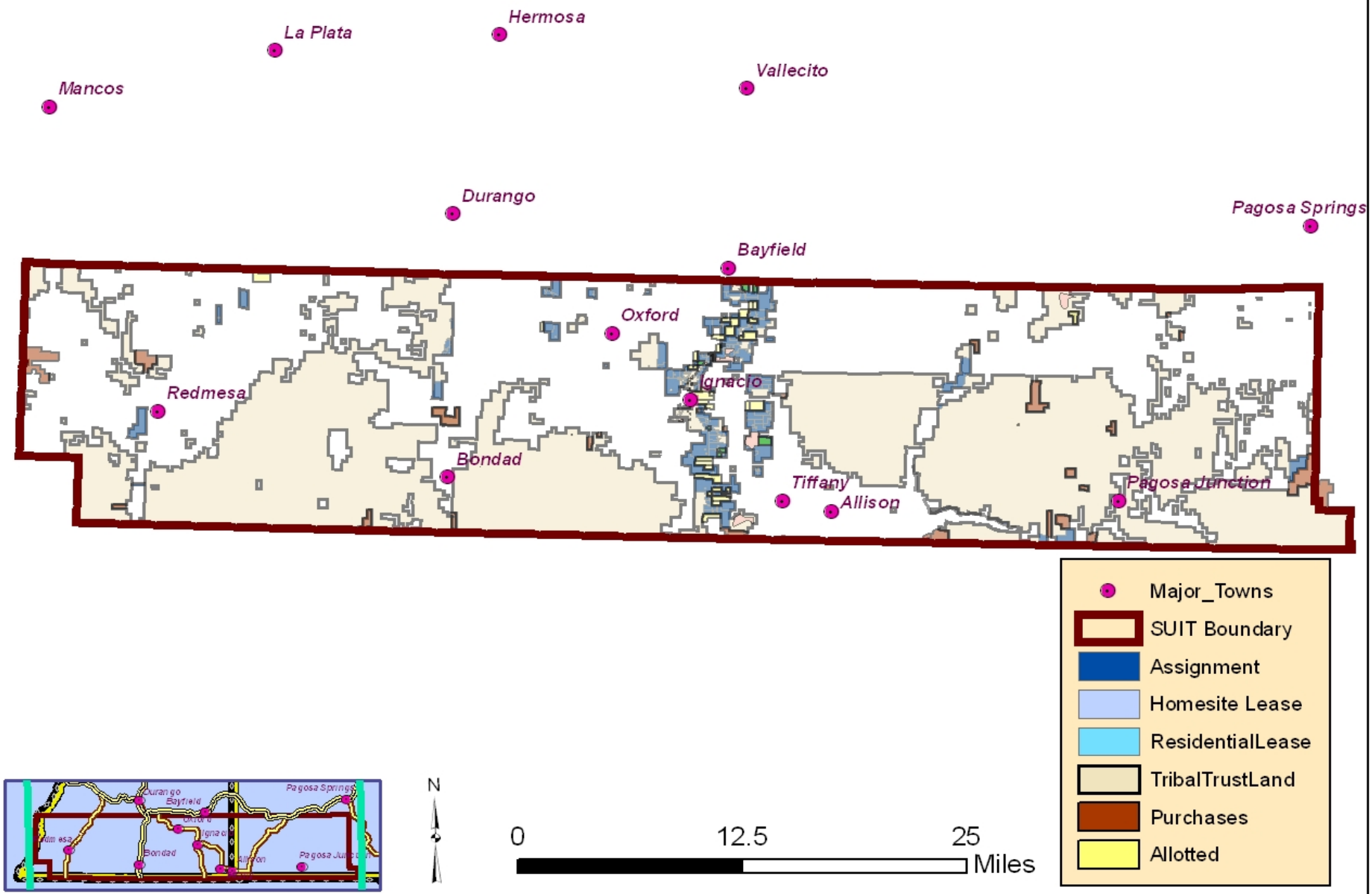
- The Southern Ute Indian Tribe (SUIT) is located in Southwestern Colorado
- SUIT shares it's southern border with New Mexico
- It's exterior boundaries encompasses approximately 710,000 acres



SUIT INFORMATION

- The Reservation is a checkerboard of Tribal Trust Lands and Fee Land (Private Land)
- 308,000 acres of Tribal Trust Lands
- 7 major rivers flow through the Reservation
- The Los Piños flows through Ignacio, CO, the Tribal headquarters for the Southern Ute Indian Tribe
- There are about 1,400 SUIT Tribal members, of which, about 900 live on the Reservation

Southern Ute Indian Reservation



SUIT 319 Program Background

- The SUIT 319 program received TAS in 1996
  - Non-regulatory program that works towards reducing non-point source pollution
  - Began Implementing education and outreach opportunities in 1996
  - Began Implementing Stream Restorations in 1999
  - Began Implementing Agricultural BMP's in 2004

WQ Issues On The SUIT Reservation

- Identified In The NPS Assessment Report
  - Agricultural Impacts
  - Land Disturbance Impacts
  - Degraded Streams and Eroding Stream Banks
- Los Pinos River Watersheds Initially Identified as Highest Priority
- In 2007 Draft Assessment Report other Watersheds such as Spring Creek, Animas River Identified as Priorities

Cost Share Program Background

- Began in 2004
- Funded through CWA §319 competitive funds
  - Annual budget is typically around $30,000
- Designed to assist local land managers with:
  - Irrigation improvement
  - Riparian Fencing
  - Field buffers/filter strips
  - Off-stream watering sources
- Has equipped 31 projects with 28 land managers
- Currently 27 active participants
- Equips both Tribal and non Tribal land managers
- 17 Tribal Member land managers
- 10 Non-native land managers

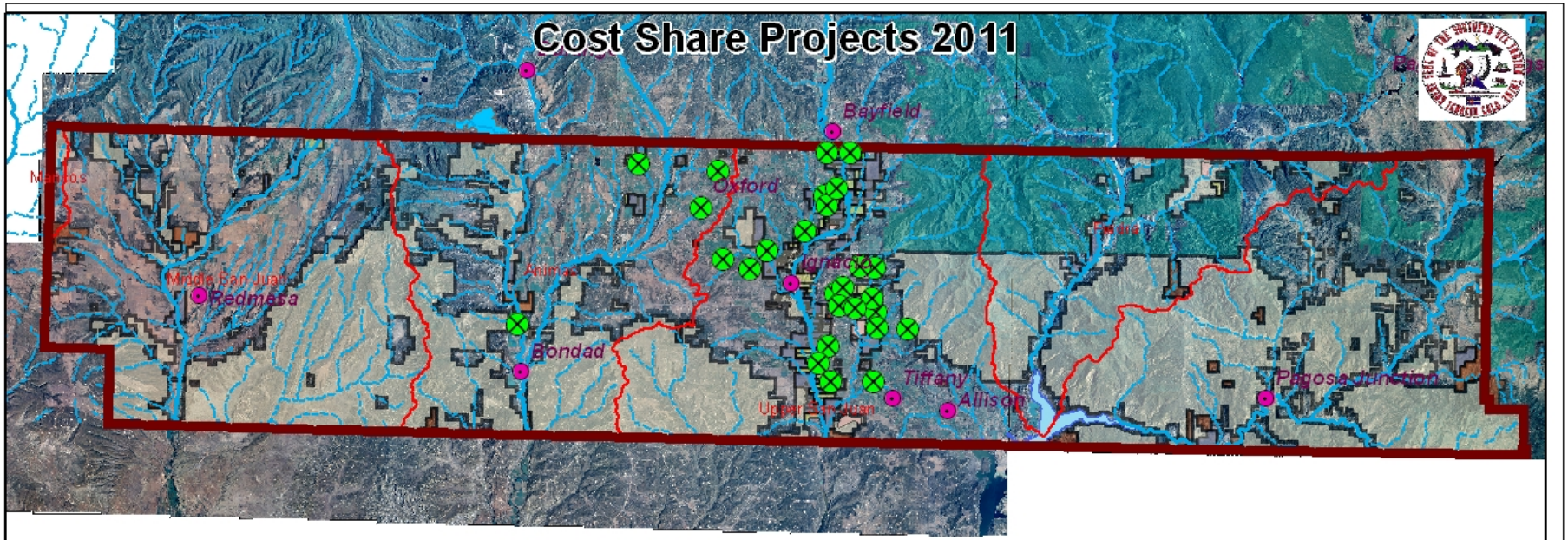
Cost Share Program Background

- 95% costs covered by program
  - 5% required match (actual or in-kind)
- Similar to the NRCS EQUIP program
- Participants enter in 5 year conservation agreements
- Equipment life estimated to be 15 years
- Gated pipe most supplied equipment

Cost Share Program Partners

- Natural Resource Conservation Service (NRCS) Southern Ute Office
  - Provides technical assistance with irrigation systems
- Southern Ute Agriculture Division
  - Provides assistance with equipment and technical assistance
- Southern Ute Water Resources Division
  - Provides assistance with equipment and technical assistance
- Southern Ute Water Quality §106 Program
  - Provides supplemental data that is valuable to the §319 and Cost Share Program (e.g. Pine River Nutrient Study)

Cost Share Projects 2011



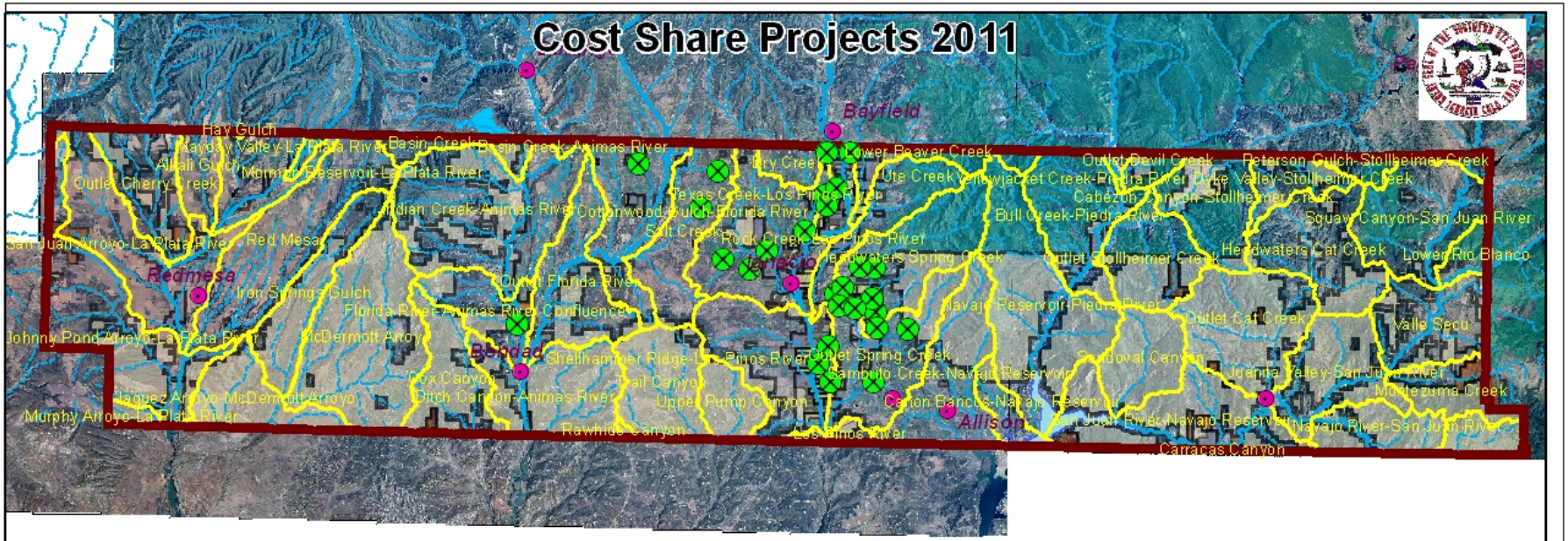
Project	Acres Served	BMP	Approx linear footage	Approx Cost	Watershed 8 digit HUC	Watershed 12 digit HUC	12 Digit HUC
1	12.0	Gated Pipe and associated parts	2190	8260.25	Animas	Cottonwood Gulch- Florida River	140801040803
2	22.0	Gated Pipe and associated parts / Field filter strip	2640	8967.4	Animas	Florida River- Animas River Confluence	140801040904
3	18.0	Gated Pipe and associated parts	2910	5312	Upper San Juan	Headwaters Spring Creek	140801011504
4	44.0	Undeground pipe, Diesel Pump, associated sideroll parts	500	13142	Upper San Juan	Headwaters Spring Creek	140801011504
5	22.0	Underground pipe / Inlet Structure	600	2292.01	Upper San Juan	Headwaters Spring Creek	140801011504
6	13.3	Gated Pipe and associated parts	2010	6983.41	Upper San Juan	Headwaters Spring Creek	140801011504
7	50.2	Underground pipe / Inlet Structure / stilling basin	440	4491.42	Upper San Juan	Headwaters Spring Creek	140801011504
8	30.0	Gated Pipe and associated parts	1860	8000	Upper San Juan	Headwaters Spring Creek	140801011504
9	33.3	Gated Pipe and associated parts	4600	11493.75	Upper San Juan	Outlet Spring Creek	140801011505
10	22.0	Gated Pipe and associated parts	1830	6301.14	Upper San Juan	Outlet Spring Creek	140801011505
11	88.4	Gated Pipe and associated parts	2250	6714.68	Upper San Juan	Outlet Spring Creek	140801011505
12	15.3	Gated Pipe and associated parts	2250	6236	Upper San Juan	Outlet Spring Creek	140801011505
13	25.0	Gated Pipe and associated parts	2430	7416.59	Upper San Juan	Outlet Spring Creek	140801011505
14	15.0	Gated Pipe and associated parts	1610	4276.86	Upper San Juan	Rock Creek- Los Pinos	140801011502
15	29.0	Gated Pipe and associated parts / Exclusion fencing	2310	15353.87	Upper San Juan	Rock Creek- Los Pinos	140801011502
16	40.0	Gated Pipe and associated parts	2370	7282.86	Upper San Juan	Rock Creek- Los Pinos	140801011502
17	7.0	Gated Pipe and associated parts	1020	3219.13	Upper San Juan	Rock Creek- Los Pinos	140801011502
18	14.0	Gated Pipe and associated parts	1650	7000	Upper San Juan	Rock Creek- Los Pinos	140801011502
19	15.0	Gated Pipe and associated parts	1380	6000	Animas	Salt Creek	140801040802
20	20.0	Gated Pipe and associated parts	1350	6000	Animas	Salt Creek	140801040802
21	28.0	Gated Pipe and associated parts	3520	9533.8	Upper San Juan	Shellhammer Ridge- Los Pinos	140801011506
22	30.0	Gated Pipe and associated parts	2680	6030.76	Upper San Juan	Shellhammer Ridge- Los Pinos	140801011506
23	6.5	Gated Pipe and associated parts	1860	8163.64	Upper San Juan	Shellhammer Ridge- Los Pinos	140801011506
24	29.0	Gated Pipe and associated parts	2380	6335.18	Upper San Juan	Texas Creek- Los Pinos	140801011403
25	38.0	Gated Pipe and associated parts	8090	20495.01	Upper San Juan	Texas Creek- Los Pinos	140801011403
26	13.0	Gated Pipe and associated parts	1910	9162.51	Upper San Juan	Texas Creek- Los Pinos	140801011403
27	21.0	Gated Pipe and associated parts	2670	12500	Upper San Juan	Texas Creek- Los Pinos	140801011403

Major Towns
SUIT Boundary
Purchases
TribalTrustLand
Allotted
Cost Share Participants
8 Digit Huc Watersheds

N

0 12.5 25 Miles

Cost Share Projects 2011



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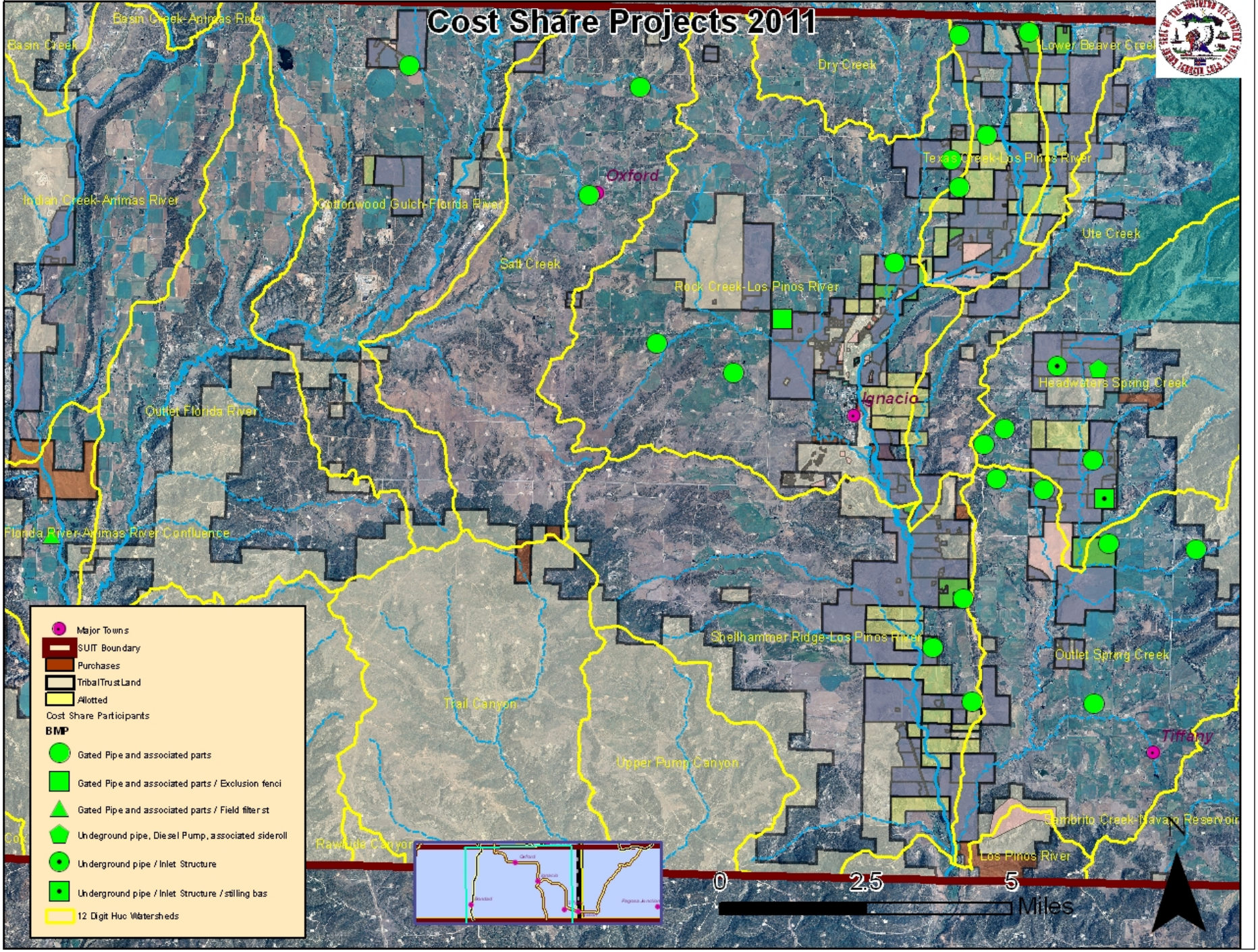
Cost Share Projects 2011
Basin Creek-Animas River
Basin Creek
Lower Beaver Creek
Dry Creek
Texas Creek-Los Pinos River
Oxford
Indian Creek-Animas River
Cottonwood Gulch-Florida River
Ute Creek
Salt Creek
Rock Creek-Los Pinos River
Headwaters Spring Creek
Ignacio
Outlet Florida River
Florida River-Animas River Confluence
Shellhammer Ridge-Los Pinos River
Outlet Spring Creek
Trail Canyon
Tiffany
Upper Pump Canyon
Rawhide Canyon
Los Pinos River
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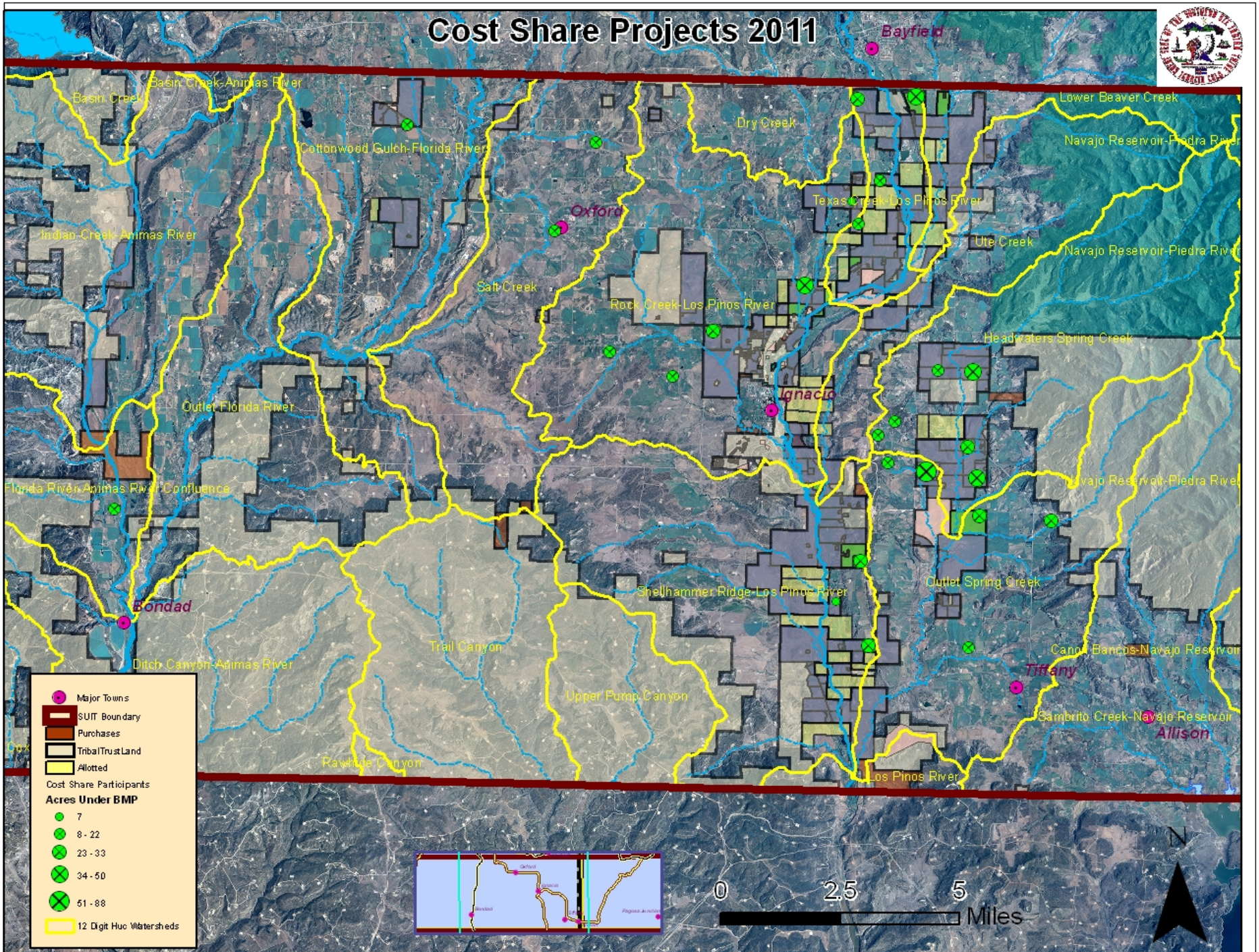

Cost Share Projects 2011
Bayfield
Basin Creek
Basin Creek-Animas River
Cottonwood Gulch-Florida River
Dry Creek
Lower Beaver Creek
Navajo Reservoir-Piedra River
Oxford
Texas Creek-Los Pinos River
Indian Creek-Animas River
Ute Creek
Salt Creek
Rock Creek-Los Pinos River
Headwaters Spring Creek
Ignacio
Outlet Florida River
Florida River-Animas River Confluence
Shellhammer Ridge-Los Pinos River
Outlet Spring Creek
Bondad
Trail Canyon
Ditch Canyon-Animas River
Canon Bancos-Navajo Reservoir
Tiffany
Upper Pump Canyon
Sambrito Creek-Navajo Reservoir
Allison
Rawhide Canyon
Los Pinos River
Major Towns
SUIT Boundary
Purchases
TribalTrustLand
Allotted
Cost Share Participants
Acres Under BMP
7
8 - 22
23 - 33
34 - 50
51 - 88
12 Digit Huc Watersheds
N
0
2.5
5
Miles

Cost Share Summary Stats

Outlet Spring Creek	5
Rock Creek- Los Pinos	5
Headwaters Spring Creek	6
Texas Creek- Los Pinos	4
Shellhammer Ridge- Los Pinos	3
Cottonwood Gulch- Florida River	1
Salt Creek	2
Florida River- Animas River Confluence	1
TOTAL	**27**

Outlet Spring Creek	184
Rock Creek- Los Pinos	105
Headwaters Spring Creek	177.5
Texas Creek- Los Pinos	101
Shellhammer Ridge- Los Pinos	64.5
Cottonwood Gulch- Florida River	12
Salt Creek	35
Florida River- Animas River Confluence	22
TOTAL	**701**

Acres Under BMP			
Watershed	**Riparian Exclusion Fencing**	**Gated Pipe**	**Field Filter Strip**
Outlet Spring Creek	0	184	0
Rock Creek- Los Pinos	29	105	0
Headwaters Spring Creek	0	177.5	0
Texas Creek- Los Pinos	0	101	0
Shellhammer Ridge- Los Pinos	0	64.5	0
Cottonwood Gulch- Florida River	0	12	0
Salt Creek	0	35	0
Florida River- Animas River Confluence	0	22	22
TOTAL	**29**	**701**	**22**

Cost of installed Equipment	**Total Participant Match (in kind and actual)**
$216,964.27	$10,848.21
95%	5%


Field Filter Strip

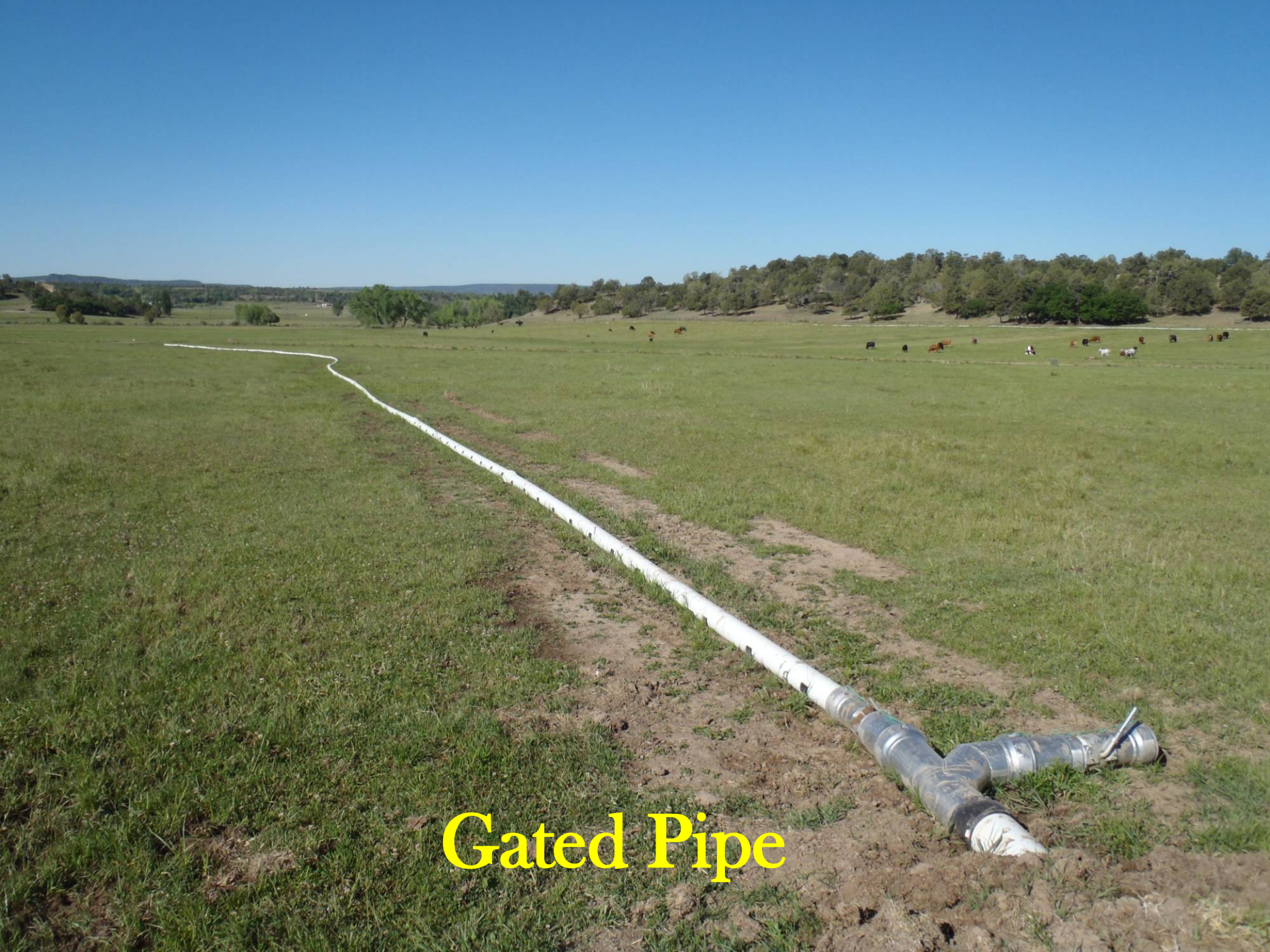

Field Filter Strip


Stream Bank Erosion Associated With
Unmanaged Grazing

Grazing To Waters Edge

Riparian Exclusion Fencing

Riparian Exclusion Fencing


Gated Pipe


Inlet structure

Benefits to Land Managers

- Expedites irrigation time
- Makes control of irrigation easier
- Increases production

Issues

- BMP's are only effective when used and maintained properly

- It is important to clearly outline the programs goals and the responsibilities of the participant.

- It is important to provide technical assistance and support to participants who may not be meeting the expectations or requirements of the conservation agreement

- If a participant is continually deficient with the stipulations outlined in the conservation agreement, then participation in the program may need to be terminated

Quantifying pollutant Reductions

- Quantifying pollutant reductions from small scale irrigation projects very difficult
- Tried to find appropriate model to give a general idea about what reductions may be
- Spreadsheet Tool for the Estimation of Pollutant Load (STEPL)
  - USEPA Region 5 model developed by Tetra Tech
  - **http://it.tetratech-ffx.com/steplweb/default.htm**

STEPL INPUTS

- Precipitation data
- Land use data
- Livestock data
- Soils data
- Septic system/treatment plant data
- Gully, rill, and eroding bank data
- BMP data (for certain BMP's)
- Evaluated by 12 digit HUC's
- Input data can be found on STEPL data server
  - Input data should be refined when data available.
- Derives reduction numbers based on inputted data and BMP's

Limitations for STEPL

- Only certain BMP's are included in the model
- Gated pipe not included in the model
- User defined BMP input available
  - Will have to make assumptions about gated pipe to generate reduction numbers
- STEPL is a model and is not field data
  - Provides estimation and not definitive data

General Irrigation Efficiencies

Table 1: Typical application efficiencies of irrigation systems.

Type	Percent
Micro sprinklers and drip	85-95
Low pressure center pivots	80-90
High pressure center pivots	75-85
Side roll/hand move sprinklers	60-70
Flood irrigation	20-50
Border irrigation	40-60
Furrow no cutback	40-60
Furrow with cutback	60-80
Furrow with surge	70-90

Table from Colorado State University Extension Office Fact Sheet 0.514
"Nitrogen and Irrigation Management"

Assumptions For STEPL

- No definitive data about N, P, BOD, and sediment reductions from gated pipe
  - Flood irrigation through earthen ditches and furrows about 20% efficient
  - Flood irrigation with the use of gated pipe and furrows about 50% efficient (at best)
  - Gated pipe achieves a 30% improvement in efficiency
    - 30% efficiency improvement translates to 30% reduction in N, P, BOD, and sediment

Cost Share Summary Stats

Participants (by 12 digit HUC)	
Outlet Spring Creek	5
Rock Creek- Los Pinos	5
Headwaters Spring Creek	6
Texas Creek- Los Pinos	4
Shellhammer Ridge- Los Pinos	3
Cottonwood Gulch- Florida River	1
Salt Creek	2
Florida River- Animas River Confluence	1
TOTAL	**27**

Acres Served (by 12 digit HUC)	
Outlet Spring Creek	184
Rock Creek- Los Pinos	105
Headwaters Spring Creek	177.5
Texas Creek- Los Pinos	101
Shellhammer Ridge- Los Pinos	64.5
Cottonwood Gulch- Florida River	12
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TOTAL	**701**

Acres Under BMP			
Watershed	**Riparian Exclusion Fencing**	**Gated Pipe**	**Field Filter Strip**
Outlet Spring Creek	0	184	0
Rock Creek- Los Pinos	29	105	0
Headwaters Spring Creek	0	177.5	0
Texas Creek- Los Pinos	0	101	0
Shellhammer Ridge- Los Pinos	0	64.5	0
Cottonwood Gulch- Florida River	0	12	0
Salt Creek	0	35	0
Florida River- Animas River Confluence	0	22	22
TOTAL	**29**	**701**	**22**

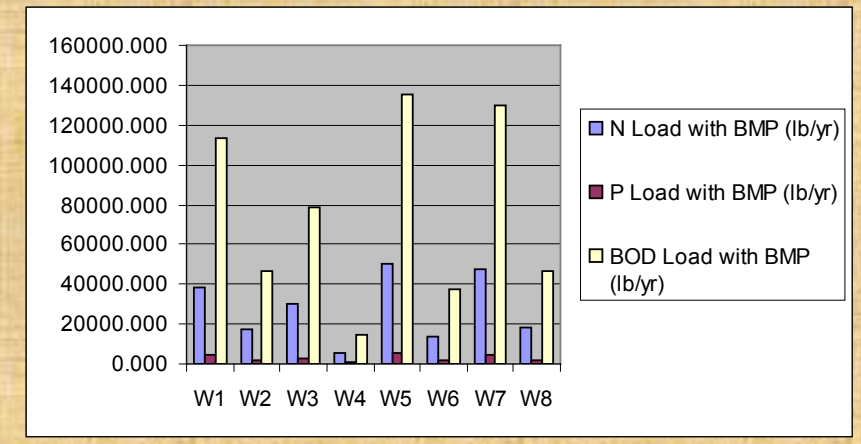
Cost of installed Equipment	Total Participant Match (in kind and actual)
$216,964.27	$10,848.21
95%	5%

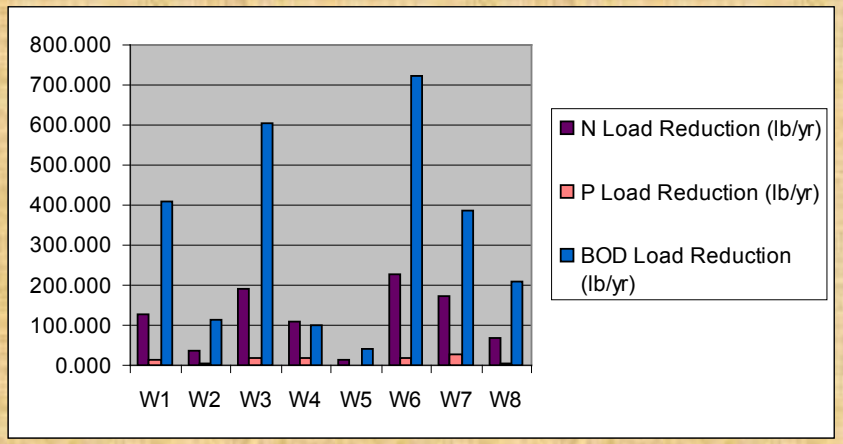
STEPL Results

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year	%	%	%	%
Texas Creek-Los Pinos River	38673.6	4742.7	114096.5	613.6	128.9	11.6	411.3	1.9	38544.7	4731.1	113685.3	611.7	0.3	0.2	0.4	0.3
Salt Creek	17510.0	1983.7	46771.6	318.1	35.8	3.3	113.9	0.7	17474.2	1980.3	46657.7	317.4	0.2	0.2	0.2	0.2
Outlet Spring Creek	30146.1	3148.3	79396.8	590.2	190.0	17.7	603.4	3.5	29956.2	3130.6	78793.4	586.7	0.6	0.6	0.8	0.6
Florida River-Animas River Confluence	5606.6	835.3	14369.8	107.2	109.4	16.5	101.0	4.9	5497.2	818.8	14268.7	102.2	2.0	2.0	0.7	4.6
Cottonwood Gulch-Florida River	50046.3	5219.3	135057.7	934.5	12.4	1.2	39.3	0.2	50034.0	5218.2	135018.4	934.2	0.0	0.0	0.0	0.0
Headwaters Spring Creek	13523.1	1838.5	38622.1	215.9	227.1	20.4	724.6	3.4	13295.9	1818.2	37897.4	212.5	1.7	1.1	1.9	1.6
Rock Creek-Los Pinos River	48114.0	4730.3	129843.7	873.6	174.3	25.5	388.0	8.9	47939.7	4704.8	129455.7	864.7	0.4	0.5	0.3	1.0
Shellhammer Ridge-Los Pinos River	18030.9	2219.3	46772.6	376.4	66.4	6.2	211.0	1.2	17964.5	2213.1	46561.6	375.2	0.4	0.3	0.5	0.3
Total	**221650.7**	**24717.5**	**604930.8**	**4029.5**	**944.4**	**102.4**	**2592.6**	**24.7**	**220706.4**	**24615.1**	**602338.2**	**4004.8**	**0.4**	**0.4**	**0.4**	**0.6**

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	14557.87	2254.74	56954.30	334.25
Cropland	6834.19	1468.00	14405.36	618.93
Pastureland	158877.02	14680.91	505200.58	2787.43
Forest	8675.13	4240.35	21265.14	264.17
Feedlots	2786.53	557.31	3715.37	0.00
User Defined	0.00	0.00	0.00	0.00
Septic	195.30	76.49	797.46	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	28780.33	1337.30	0.00	0.00
Total	220706.36	24615.09	602338.22	4004.79

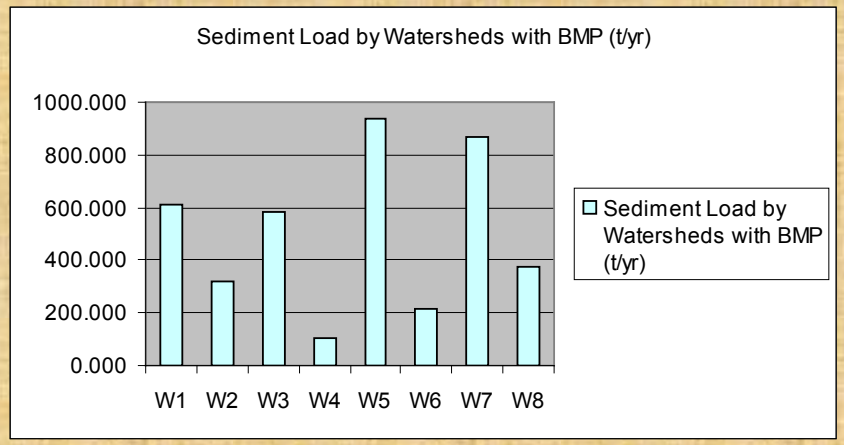
STEPL Results

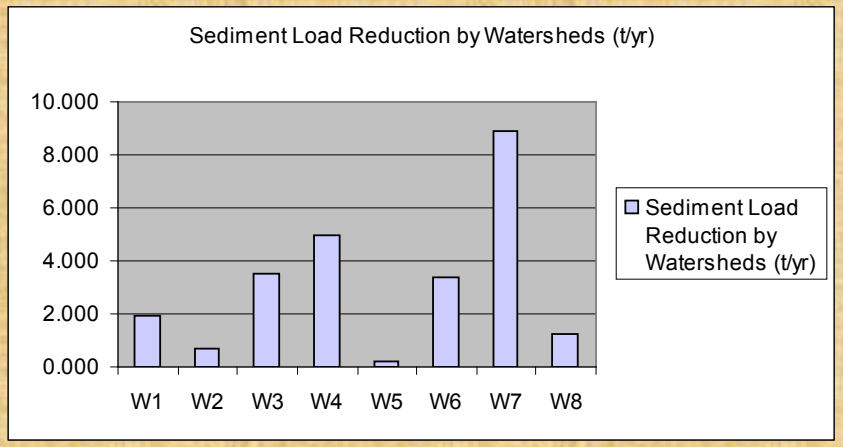




Watershed Key	
W1	Texas Creek-Los Pinos River
W2	Salt Creek
W3	Outlet Spring Creek
W4	Florida River-Animas River Confluence
W5	Cottonwood Gulch-Florida River
W6	Headwaters Spring Creek
W7	Rock Creek-Los Pinos River
W8	Shellhammer Ridge-Los Pinos River

STEPL Results





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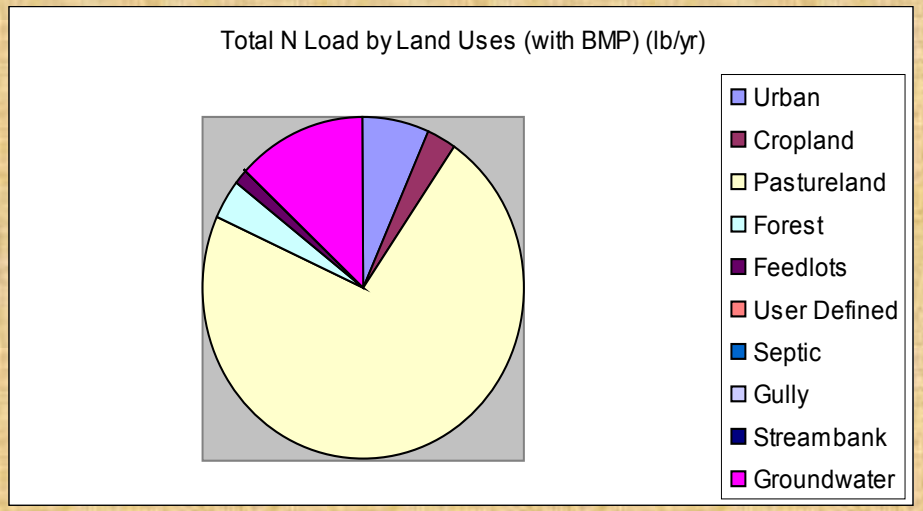

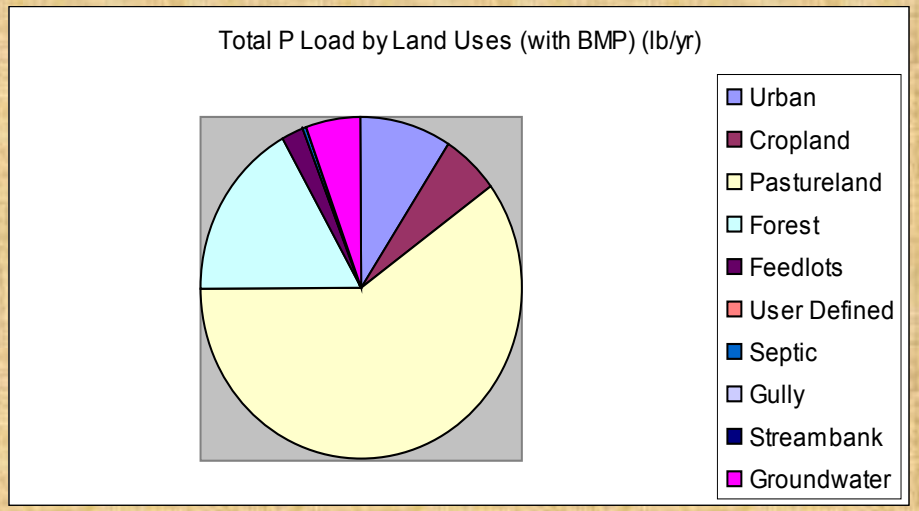

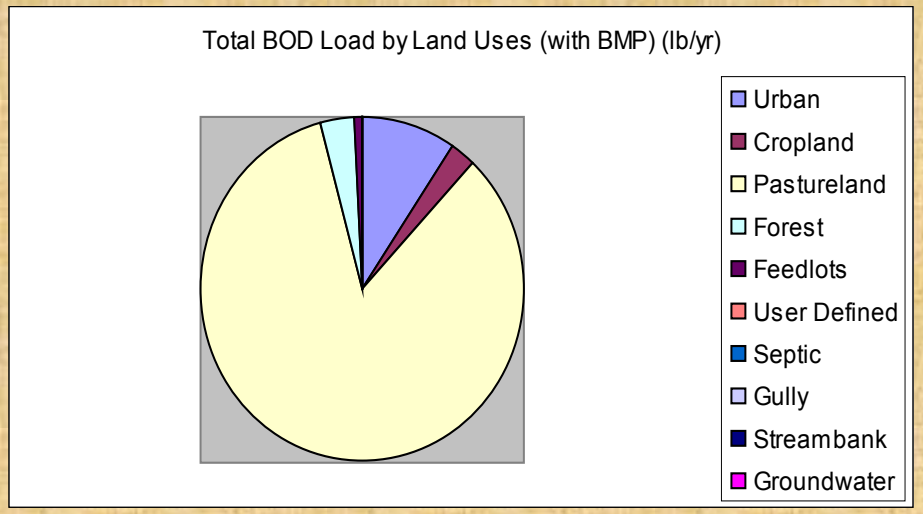

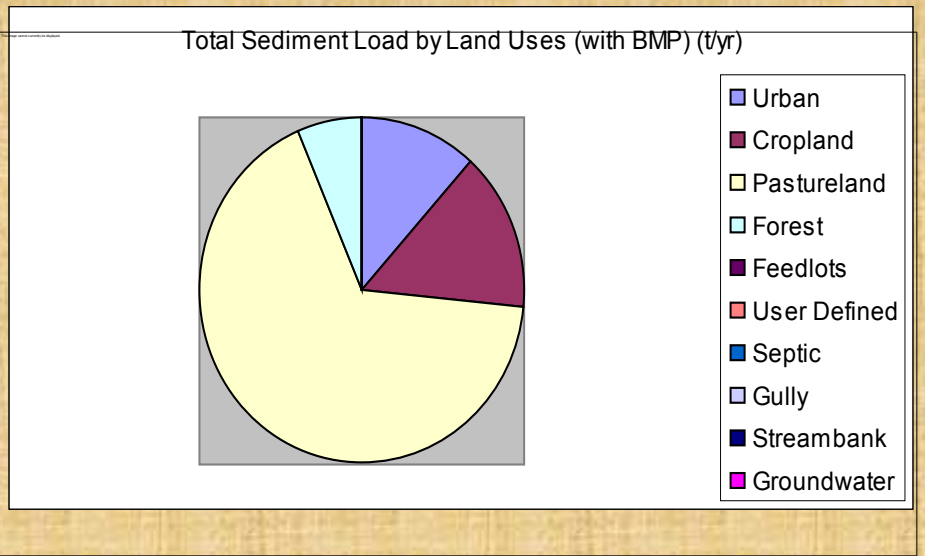

STEPL Results

Total Reduction and Cost of Reductions (Total cost = $216,964.27)				
	N Reduction lb/year	**P Reduction lb/year**	**BOD Reduction lb/year**	**Sediment Reduction t/year**
Total Annual Reduction	944	102	2593	25
Cost per lb	$229.74	$2,119.66	$83.69	$4.39
Reduction after 5 years	4722	512	12963	124
Cost per lb after 5 years	$45.95	$423.93	$16.74	$0.88
Reduction after 10 years	9444	1024	25926	247
Cost per lb after 10 years	$22.97	$211.96634	$8.37	$0.44
Reduction after 15 years	14166	1535	38889	371
Cost per lb after 15 years	$15.32	$141.31	$5.58	$0.29

Alternatives to STEPL

- Dynamic Watershed Simulation Model (DSWM)
- Erosion Productivity Impact Calculator (EPIC)
- GIS-Based Phosphorus Loading Model (GISPLM)
- Loading Simulation Program in C++ (LSPC)
- Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds—Urban Catchment Model (P8-UCM)
- Riparian Ecosystem Management Model (REMM)
- Kinematic Runoff and Erosion Model, v2 (KINEROS2)
- Automated Geospatial Watershed Assessment (AGWA)
- SPAtially Referenced Regression On Watershed Attributes (SPARROW)
- The Precipitation-Runoff Modeling System (PRMS)
- The Root Zone Water Quality Model (RZWQM)
- Better Assessment Science Integrating Point and Nonpoint Sources (BASINS)
- TMDL Modeling Toolbox

Lessons Learned

- Quantification of Agricultural improvement projects is difficult and not cut and dry
  - It is important to understand the limitations of models used to estimate reductions
- Agricultural BMP's only work if properly installed, used, and maintained.
- Watershed Scale improvements may not be seen in the field until the implementation of many projects over many years

Lessons Learned

- Gated pipe can be used as an incentive to implement other less popular BMP's
- Some participants need more support and supervision than others
- It is important to try and determine the level of commitment from the participant
- Annual inspections of implemented projects is key
- Supplying Agricultural BMP's to Tribal and Non-Tribal Land Managers has helped with SUIT Public Relations

Next Steps

- Find data on reduction numbers from gated pipe
- Try and indentify models that could be better suited to quantify reductions from irrigation improvements
- The §319 program would like to start implementing more non-gated pipe agricultural improvements.
  - Off Stream Watering Sources
  - Riparian Exclusion Fencing
  - Field Filter Strips/Buffers
- Implement more Agricultural BMP's

Questions/Comments ?

SOUTHERN UTE INDIAN TRIBE

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