Watershed Assessment and Non-Point Source Management Plan Pine Ridge Indian Reservation

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2011 National Tribal Water Quality Conference
November 14-17, 2011

Overview

- Background on Watershed Characteristics
- Previous Monitoring efforts (NPS and Biological Assessments)
- Current Assessment Wounded Knee and Porcupine Creek
- Future direction

Pine Ridge Indian Reservation

Southwestern South Dakota

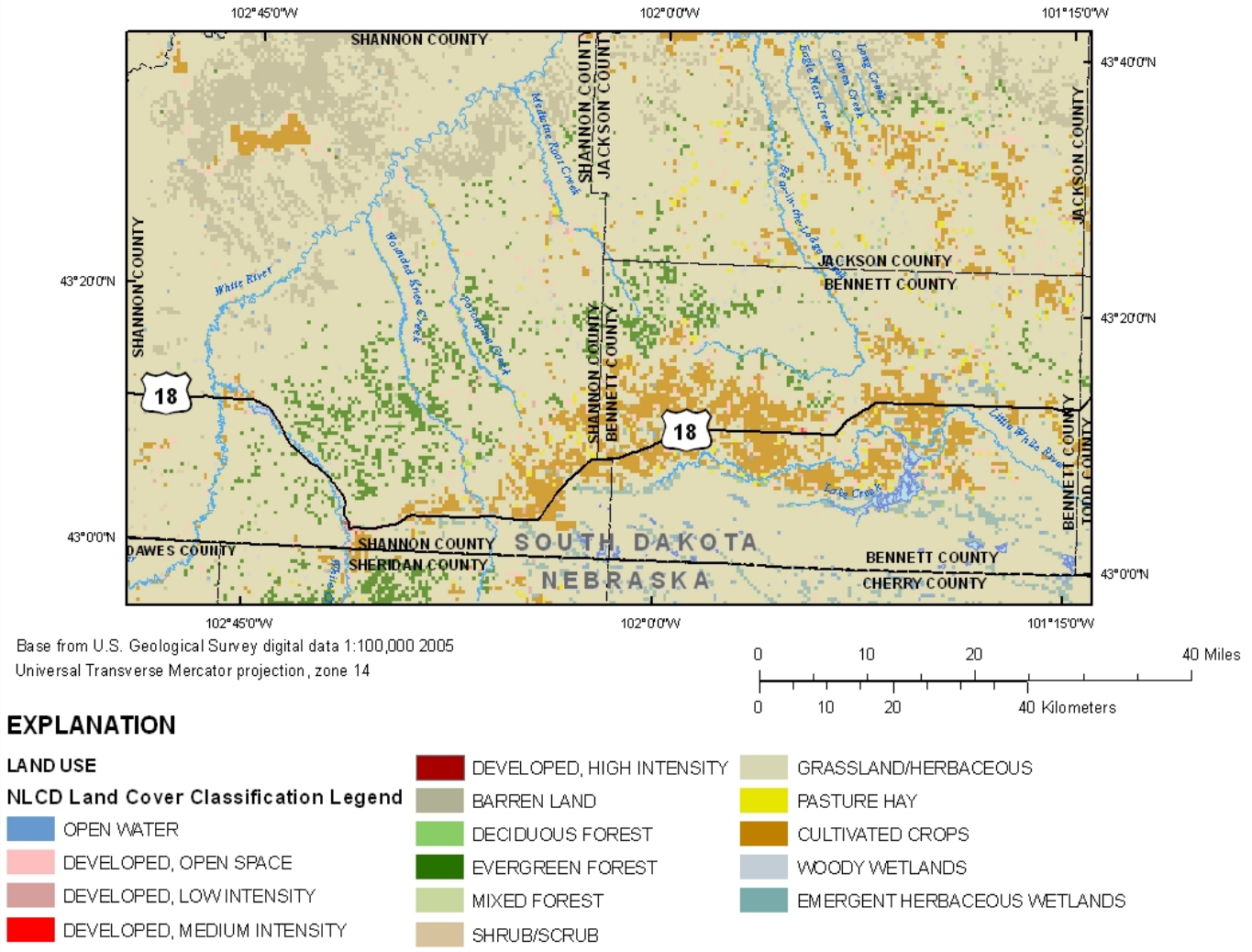
Second Largest in the United States

208 million acres

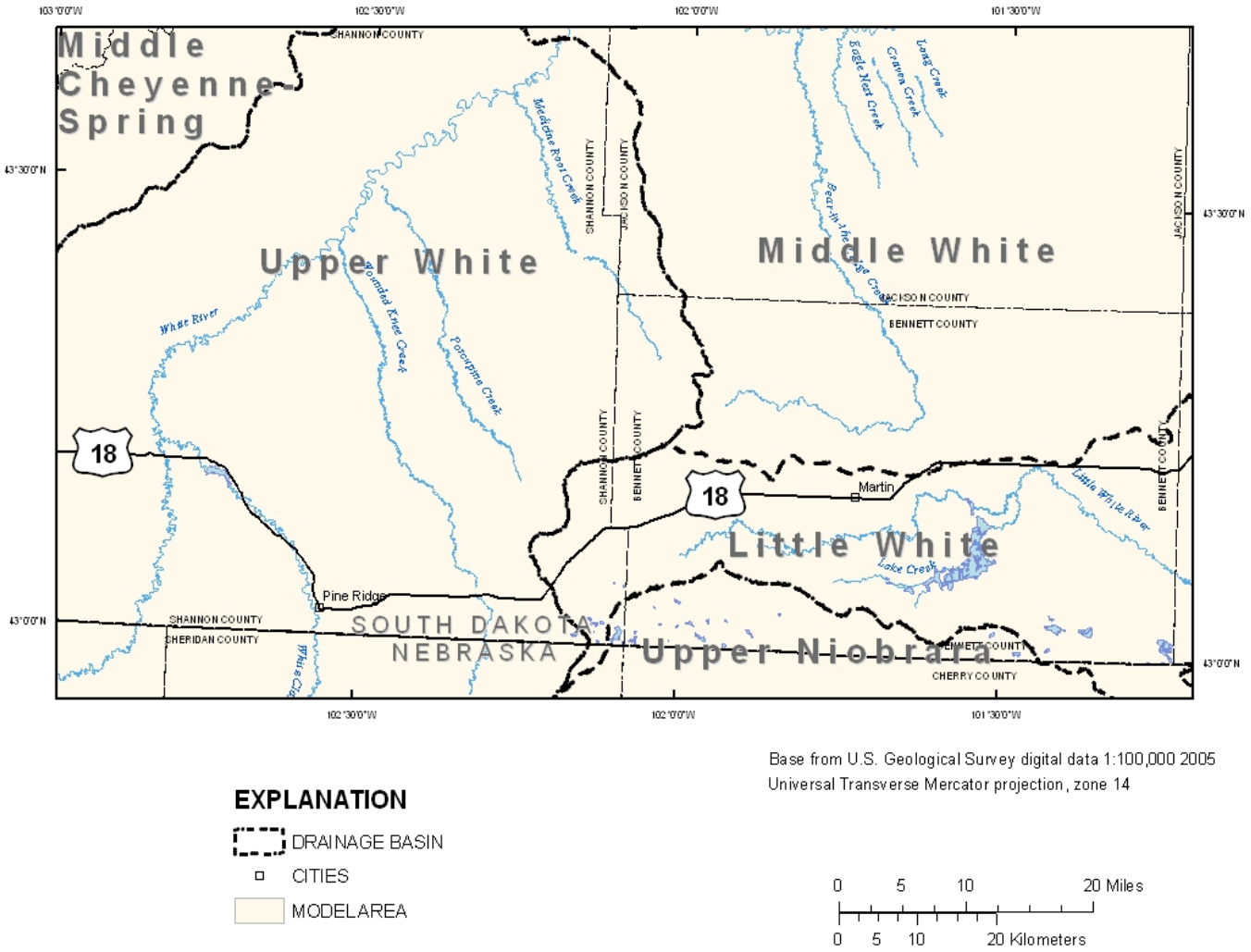
Figure 1. Location of the Pine Ridge Reservation

Land Use/Land Cover

Grasslands	74.1 %
Pasture/Hay	8.1 %
Row crops	5.4 %
Bare soil/rock	5.0 %
Small Grains	2.2 %



Hydrologic Units

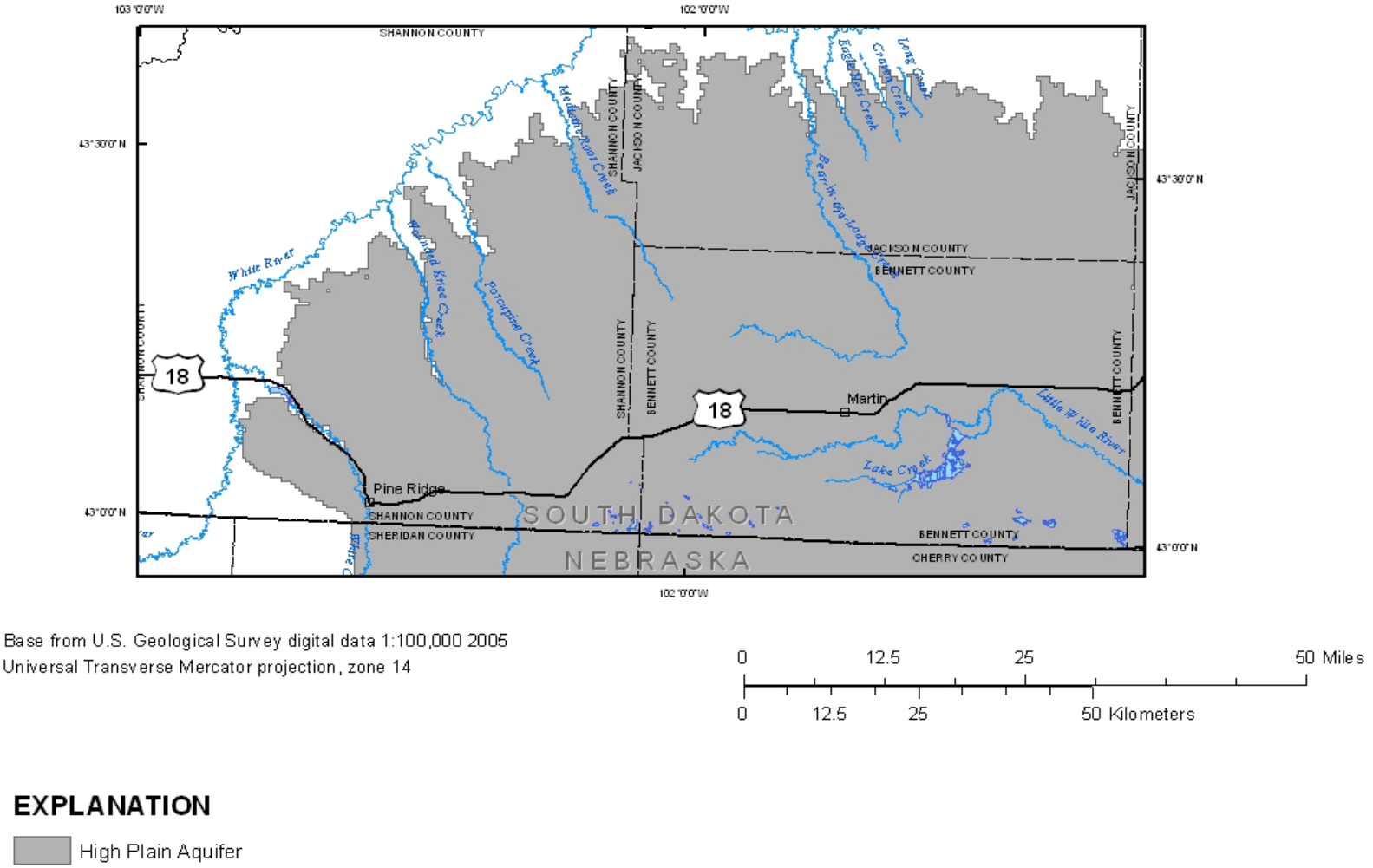


Three Major Watersheds

Cheyenne River Watershed (218 square miles)

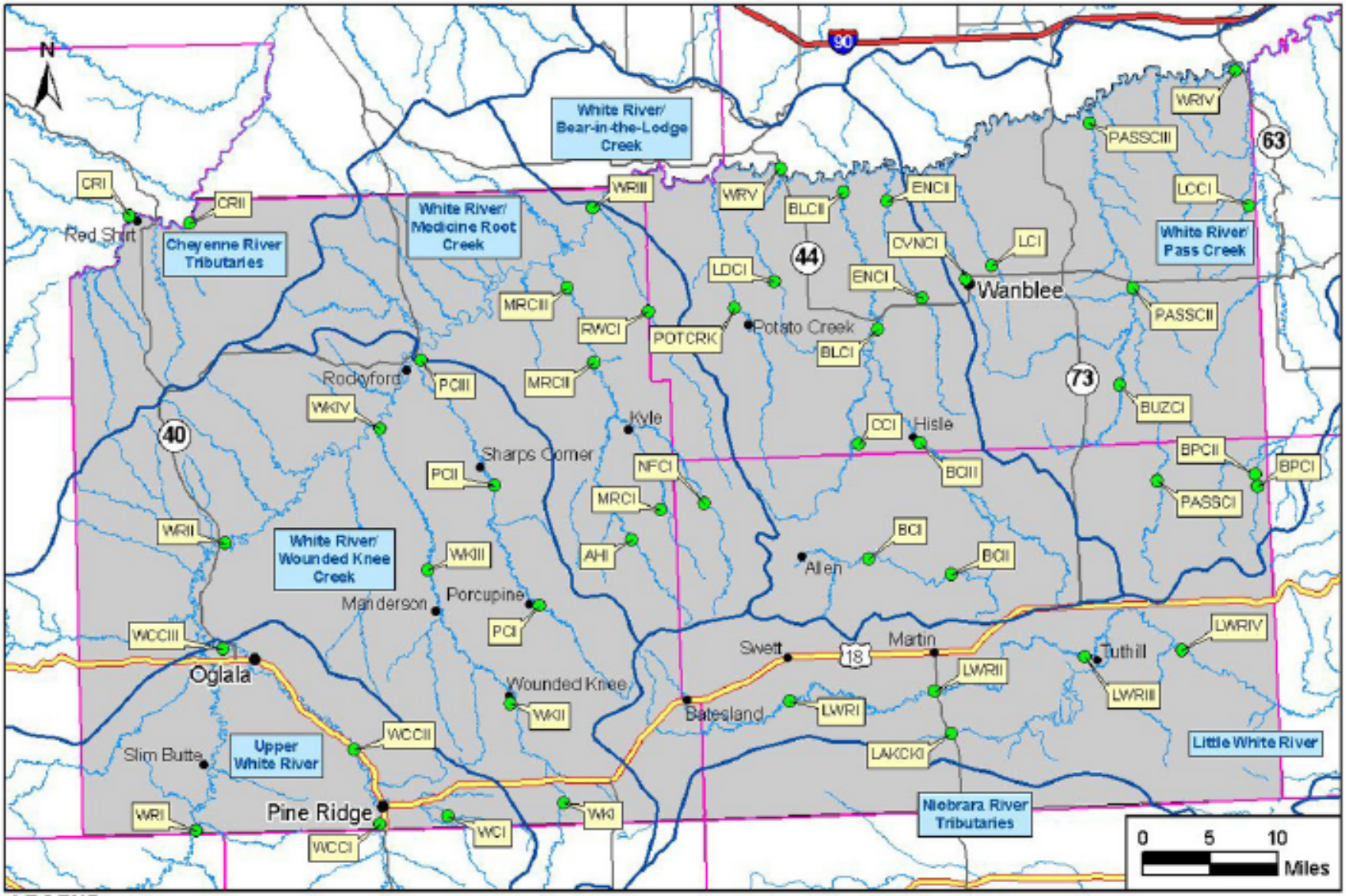
White River Watershed (4,010 square miles)

Niobrara River Watershed (216 square miles)



Groundwater

High Plains Aquifer consisting of the Ogallala and Arikaree formations



LEGEND

- Surface Water Monitoring Site
- Watershed Boundary
- Pine Ridge (Oglala Sioux) Reservation Boundary
- County Boundary

Sources: Oglala Sioux Tribe, 2005; USGS, 2005.

Figure 2. Subwatersheds and Surface Water Monitoring Sites

Monitoring Program: 1992 to 2004

- 44 fixed locations covering an area 100 miles by 70 miles
- Frequency and rotation, sampled twice per year
  - Low flow(late summer, fall)
  - High Flow (spring, early summer)
  - No event samples were taken during this time period
- Parameters included heavy metals, minerals and nutrients (29 physical and chemical parameters)
- Benthic macroinvertebrate sampling

2005 NPS Assessment

- Parameters of Concern
  - phosphorus, iron, arsenic, and manganese
  - moderately high levels of mercury and lead, high temperatures, low dissolved oxygen, and turbidity
- Shift Monitoring to focus on
  - Agricultural runoff
  - Septic Systems
  - Storm water Runoff
  - Illegal dumping
  - Roads and Construction

Monitoring Program: 2005 - Current

- Revisions based on 2005 NPS Assessment Report
- Parameters were changed from metals and toxins to bacteria, nutrients and inorganics
- Frequency and rotation
  - Once per month May to Oct every year
  - No event sampling
- macroinvertebrate sampling spring every year, analysis is ongoing.

Current period Assessment:
Wounded Knee and Porcupine Creeks

- Provide an analysis of the data collected by the Water Quality Program from 2005-2009 to assess the Porcupine Creek and Wounded Knee subwatershed

- Review *Non-Point Source (NPS) Assessment and Management Plan* to develop recommendations for future monitoring and implementation of best management practices (BMPs).

Beneficial Uses

Waterbody	Site #	Beneficial Use
Wounded Knee Creek	WKI WKII	• Coldwater marginal fish life propagation* • Warmwater permanent fish life propagation • Immersion recreation • Fish and wildlife propagation, recreation, and stock water • Spiritual • Boundary
	WKIII WKIV	• Warmwater permanent fish life propagation • Immersion recreation • Fish and wildlife propagation, recreation, and stock water • Spiritual
Porcupine Creek	PCI	• Warmwater semipermanent fish life propagation • Fish and wildlife propagation, recreation, an stock watering
	PCII PCIII	• Warmwater permanent fish life propagation

*the Tribe has indicated that this is an potential beneficial use, more sampling is required.

Current SD DENR

Porcupine Creek & Wounded Knee Creek - Beneficial Uses (6 and 8)

- 6-Warmwater marginal fish life pro
- 8-Limited contact recreational

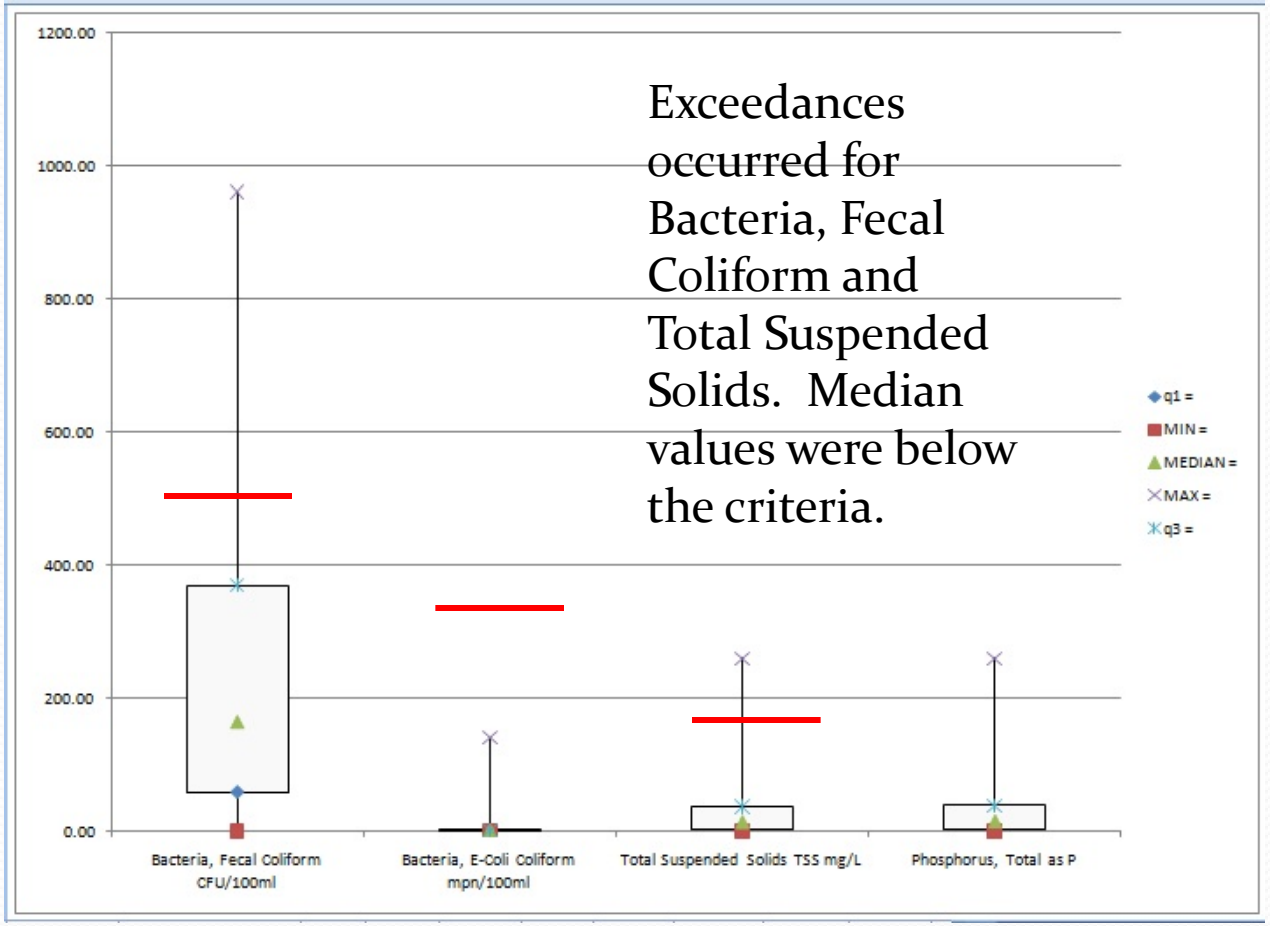
Biological and Physical Sampling Data

- 1999 Report
  - 39 sites sampled from April – November 1998.
  - Benthic data collected and metric/scoring developed.
  - Biological condition value assigned: non-impaired; moderately impaired; severely impaired.
  - Habitat assessment conducted and scored using 12 parameters. Categories were assigned based on score: optimal; sub-optimal and marginal.

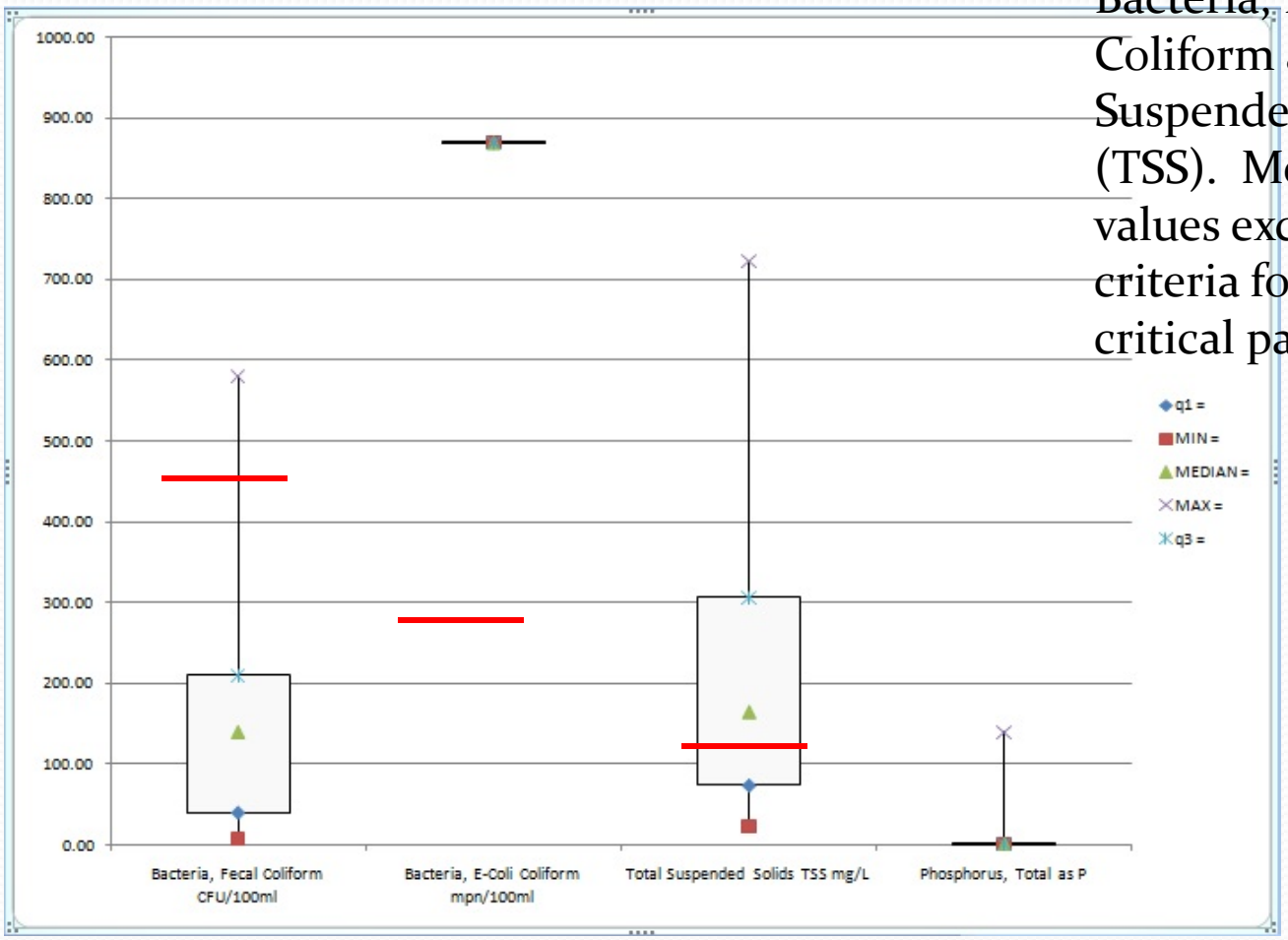
- Findings: Wounded Knee Creek segments were moderately to severely impaired. Porcupine Creek segments were moderately to non-impaired. Nutrient enrichment suggested.

- Samples were collected in 2009/2010; however, analysis has not been completed.

Summary Statistics- Key Parameters Wounded Knee Box Plot (2005-2009 data)



Summary Statistics- Key Parameters Porcupine Box Plot (2005-2009 data)



Exceedances occurred for Bacteria, Fecal Coliform and Total Suspended Solids (TSS). Median values exceeded the criteria for TSS, a critical parameter.

Exceedances

Key Parameter	# of Exceedences	% Samples with Exceedences
TSS	4	11%
Bacteria- Fecal Coliform E-Coli	 4 13	 17% 43%
Phosphorus	0	0%

- Due to sampling frequency, the collected data will not indicate a large number of exceedances.
- Sampling during events is needed to accurately represent the surface water conditions.
- Flow measurements and load calculations are necessary to determine the reduction of pollutant load necessary to achieve water quality standards.

Findings and Recommendations:

- **Frequency of sampling** and the fact that run-off events have not been sampled, does not provide a full representation of the flow regime. To do a full flow regime analysis, requires monthly sampling in addition to four to six event samples.

- Although sampling strategy has covered low flow and high flow seasons, # of samples during those seasons may be too few to fully characterize those seasons. Data represents base-flow conditions for the seasons, but not of "run-off" events.

  Recommend monthly sampling in addition to 4 to 6 events for a minimum of a one year period, two years recommended.

Findings and Recommendations:

- **Flow** was not measured and load was not calculated in conjunction with water quality sampling.
- For Example: In the Porcupine Creek, samples of the PCI site, of the 6 samples, only 1 flow measurement was available to calculate load.
- To fully evaluate level of load reduction necessary to meet water quality standards, flow needs to be measured and load calculated.

Recommend at least one flow monitoring station be established per watershed.

Pollutants Sources to be addressed

- Sediment
  - Agriculture – Livestock production
  - Agriculture – Crop production
  - Urban runoff from roads
  - Construction
  - Urban runoff from towns and villages
  - Natural sources

Pollutants Sources to be addressed

- Nutrients
  - Agriculture – Livestock production
  - Agriculture – Crop production
  - Septic systems
  - Urban runoff from towns and villages
  - Natural sources

Findings and Recommendations:

- The **parameter priorities** (sediment and nutrients) established in previous reports are still appropriate and relative to the level of impairment and importance of watershed.
- The BMPs identified in previous study are still appropriate.

Major evaluation of land management practices needs to be completed.

Recommend preparation of grant proposal for implementation of recommended BMPS to EPA.

Prioritization of Watersheds

Current Water Program Schedule (Ranked Value)

- 2008 Wounded Knee/Porcupine Creeks (3.73)
- 2009 Medicine Root/Red Water Creeks (3.72)
- 2010 American Horse/No Flesh Creeks (3.40)
- 2011 Potato/Lost Dog Creeks (4.03)
- 2012 Bear In The Lodge/Eagle Nest/Craven/Long Creeks (4.0)
- 2013 Pass/Blackpipe/Buzzard Creeks (3.86)
- 2014 Bear Creek/Little White River (4.26)
- 2015 White Clay/Wolf Creeks (3.10)
- 2016 Cheyenne/White Rivers (3.24)

Next Steps

- Prioritize the Watersheds taking into consideration Tribal values
- Implement new sampling strategy (frequency, flow, event sampling)
  - Training
  - Equipment
- Evaluation of land management practices within each watershed
  - Implement BMPs
  - Urban, Agriculture (land and livestock), Riparian Buffer Zones (Conservation Districts), Mining Practices
- Complete next Watershed Assessment
- Prepare EPA Grant Application for BMP Implementation