

# State of the Watershed Reporting

## Methods and Application in the Oldman Watershed Studies

**J. Bennett, D. Hart, S. Palechek, D. Reid, S. Touchinski**

CWRA Alberta Branch Annual Conference  
28-30 March, 2010  
Edmonton, AB

## OWC Goals

1. To understand our watershed
2. To keep residents are well informed and engaged
3. To follow the desired outcomes of Basin stakeholders
4. To adopt practices that are beneficial to the health and function of the watershed

## Intentions and Objectives

- Adopt a watershed approach.
- Share and report data in a format that is well understood by the general public
- Apply methods scientifically rigorous enough to use in planning.
- Form the basis for developing effective management strategies.

## Intentions and Objectives

- Conduct an overall assessment of the watershed.
- Document and interpret the findings.
- Identify the factors that are contributing to the current conditions.
- Increase social awareness of local conditions.



## Indicators

- Performance Measures for Environmental Change
  - measures of environmental quality
  - show trends in environmental conditions
  - show how well a system is functioning over time

## RREST

- **R**elevant – able to show you something about the system that you need to know
- **R**eliable – the information is trustworthy
- **E**asy – understandable
- **S**traightforward
- **T**imely – the information is available while there is still time to act

## Choosing Indicators

- Workshop Approach
  - Management objectives
  
- Consensus Approach
  - Terrestrial & riparian indicators
  - Water quantity indicators
  - Water quality indicators

## Terrestrial and Riparian Ecology Indicators:

- Potential
  - Riparian health
  - Linear development
  - Land use inventory
  - Livestock density
  - Wetland inventory
  - Fragmentation
  - Biodiversity
  - Fish
  - Aquatic macrophytes
  - Vegetation types
  - Benthic invertebrates
- Selected:
  - Land cover
  - Soil erosion
  - Riparian health
  - Human footprint

## Water Quantity Potential Indicators

- Trends in natural flow
- License allocation (volume) vs median natural flow
- Current use vs median natural flow
- % of time IO not met at current level of water use
- % of time WCO not met
- % of time IFN not met
- Irrigation district water use efficiency
- Municipal water use efficiency

## Water Quantity Selected Indicators

- Trends in natural flow (1912 -2001)
- Licence allocation (volume) and current use vs. median natural flow
- % of time IO and WCO not met at current level of water use
- Irrigation district and urban municipal water use efficiencies

## Water Quantity Indicator Thresholds

- Difficult to establish thresholds for water quantity
  - Impact of storage development
  - Tolerances for deficits are different for various water use purposes
  
- A comparative ranking of performance.
- Professional judgment was use to rank performance as good, fair or poor.

## Water Quality Potential Indicators

- TSS
- Nutrients (N&P)
- DO
- Temperature
- Fecal coliforms
- benthic invertebrate community structure
- flow
- landuse (non-point source)
- TDS
- Pesticides
- invasive species (e.g., algae, fish)
- groundwater
- manganese
- iron
- pharmaceuticals
- point source contaminants

## Water Quality Selected Indicators and Thresholds

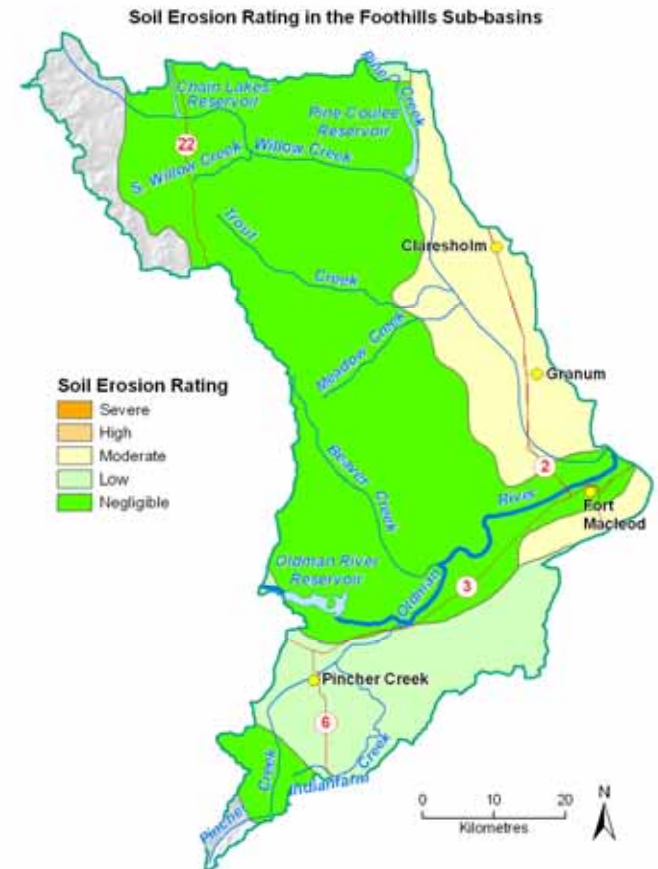
- Nutrients
  - Nitrogen
  - Phosphorus
- Total Suspended Solids (TSS)
- Fecal Coliforms
- Water Quality Guidelines
- Natural variability

# Terrestrial and Riparian Ecology Analysis and Presentation



Sources: AMEC, ESRI, GeoBase®, Oldman Watershed Council.

S:\GIS\Projects\CWA2061\_Oldman\_Watershed\ArcGIS Projects\DraftReport\Fig 2.3 Foothills Landcover.mxd



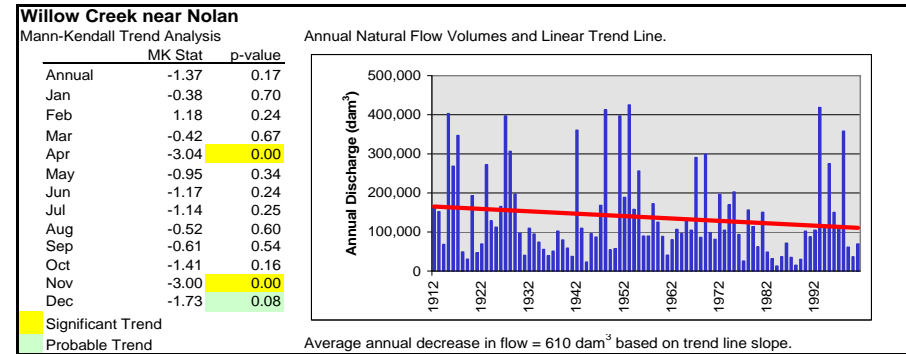
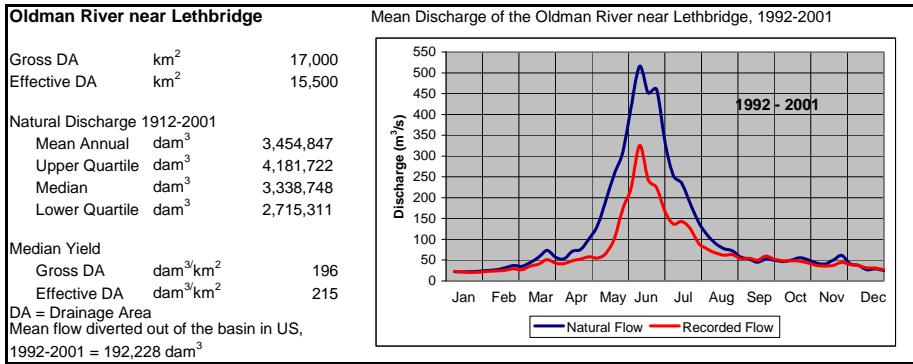
Sources: AMEC, ESRI, GeoBase®, AB Agriculture, Food and Rural Development, Agriculture and Agri-Food Canada.

S:\GIS\Projects\CWA2061\_Oldman\_Watershed\ArcGIS Projects\DraftReport\Fig2.5 Foothills Soil Erosion.mxd

# Water Quantity Analysis and Presentation

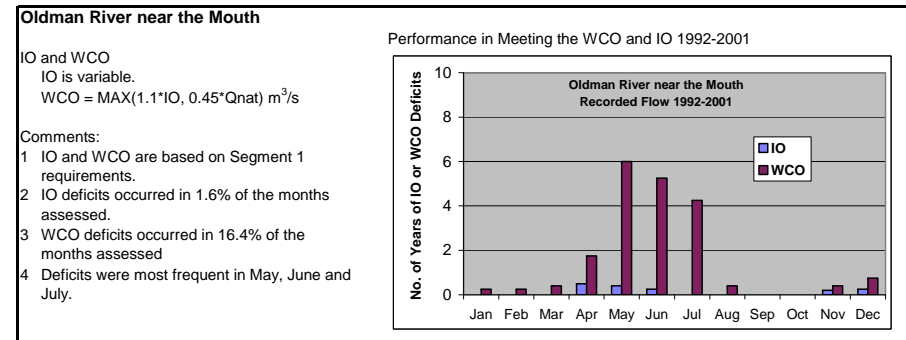
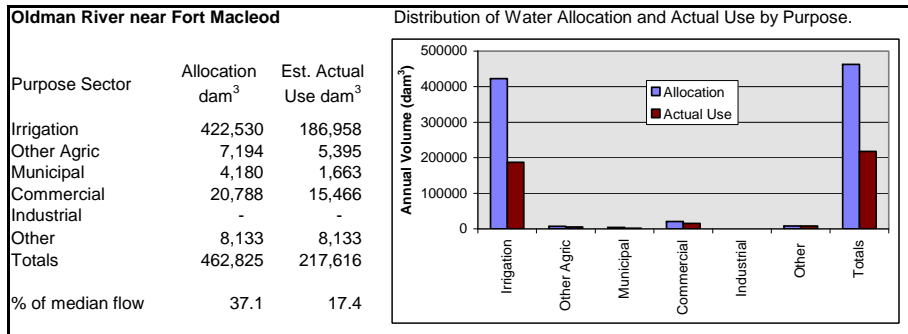
## Hydrologic characteristics

## Analysis of streamflow trends



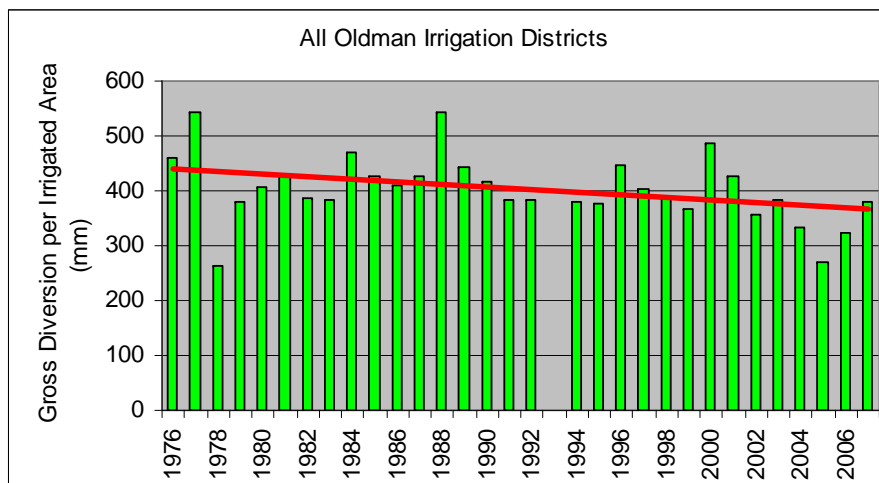
## Current licensed allocation and actual use

## Performance in meeting IO and WCO



# Water Quantity Analysis and Presentation

## Irrigation district water use efficiency



## Municipal water use efficiency

Community	Population		Water Use			
	2001	2006	2001		2006	
			m3	L/c-d	m3	L/c-d
Town of Coaldale	6008	6177	1,116,715	509	839,394	373

# Water Quality Analysis and Presentation

## Example Showing Annual Median Indicator Guideline Adherence by Site

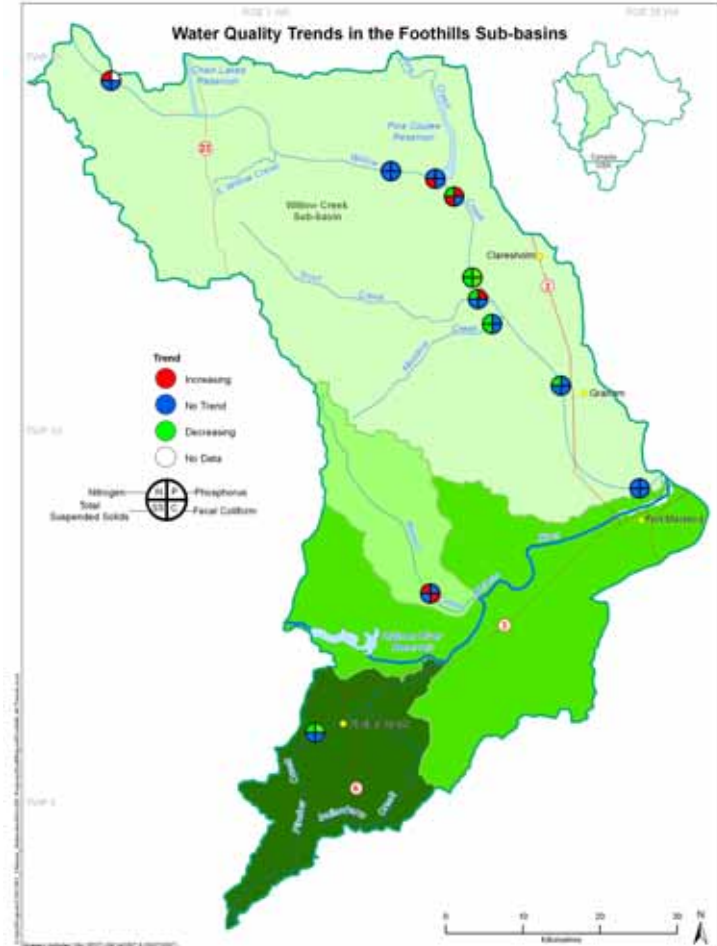
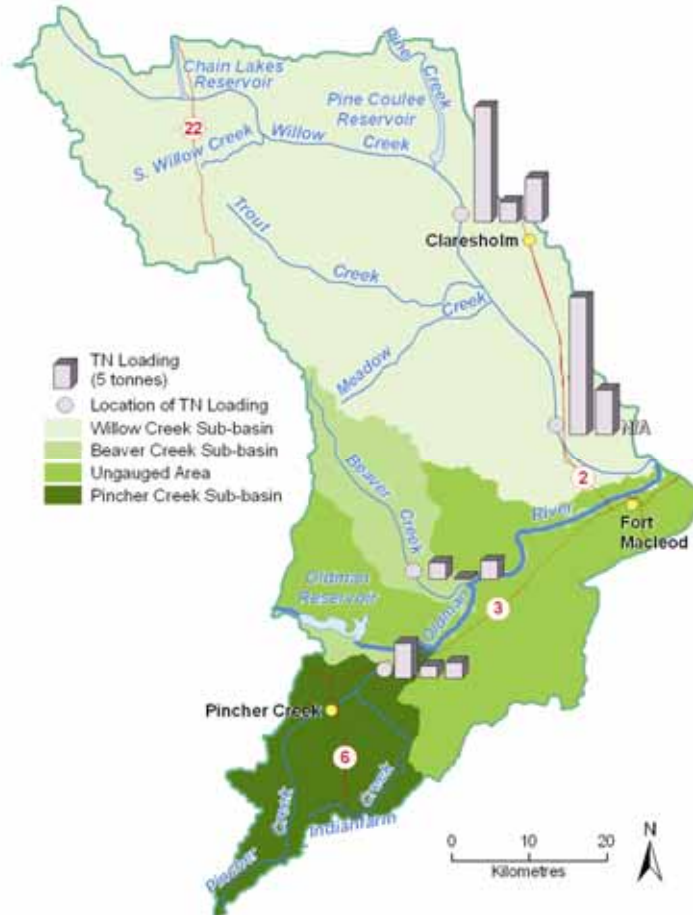
Monitoring Sites / Years	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
AB05AB0170-WILLOW CREEK D/S OF CHAIN LAKES																													
AB05AB0180-SOUTH WILLOW CREEK NEAR THE MOUTH																													
AB05AB0190-WILLOW CREEK BELOW LANE CREEK																													
AB05AB0200-WILLOW CREEK ABOVE HWY 527																													
AB05AB0265-WILLOW CREEK WEST OF HWY 22 ON HWY 532																													
AB05AB0770-WILLOW CREEK U/S OF PINE COULEE DIVERSION																													
AB05AB0780-WILLOW CREEK D/S OF PINE COULEE RESERVIOR OUTLET																													
AB05AB0790-WILLOW CREEK AT WILLOW CREEK PROVINCIAL PARK																													
AB05AB0220-WILLOW CREEK ABOVE CLARESHOLM WATER INTAKE																													
AB05AB0250-WILLOW CREEK AT SEC HWY 519																													
AB05AB0260-WILLOW CREEK AT SEC HWY 811																													
TROUT CREEK																													
MEADOW CREEK																													
BEAVER CREEK																													
PINCHER CREEK																													
INDIAN FARM CREEK																													

\* median not calculated, results shown are based on less than 3 samples

	No Data
	< 0.05 mg/L (below guideline)
	0.05 - 1.00 mg/L
	> 1.00 mg/L

# Water Quality Analysis and Presentation

Total Nitrogen Loadings in the Foothills Sub-basins (1991, 2000, 2004)



Sources: AMEC, ESRI, GeoBase®.

# Terrestrial and Riparian Ecology Evaluation

- Basis for ranking:
  - Scientific information
  - Comparative analysis
  - Professional judgment

## **Land Cover: % of area vegetated**

- Good >50 %
- Fair 25 to 50%
- Poor <25%

## **Soil Erosion: % of area at risk of erosion**

- Good < 25%
- Fair 25 to 50%
- Poor - >50%

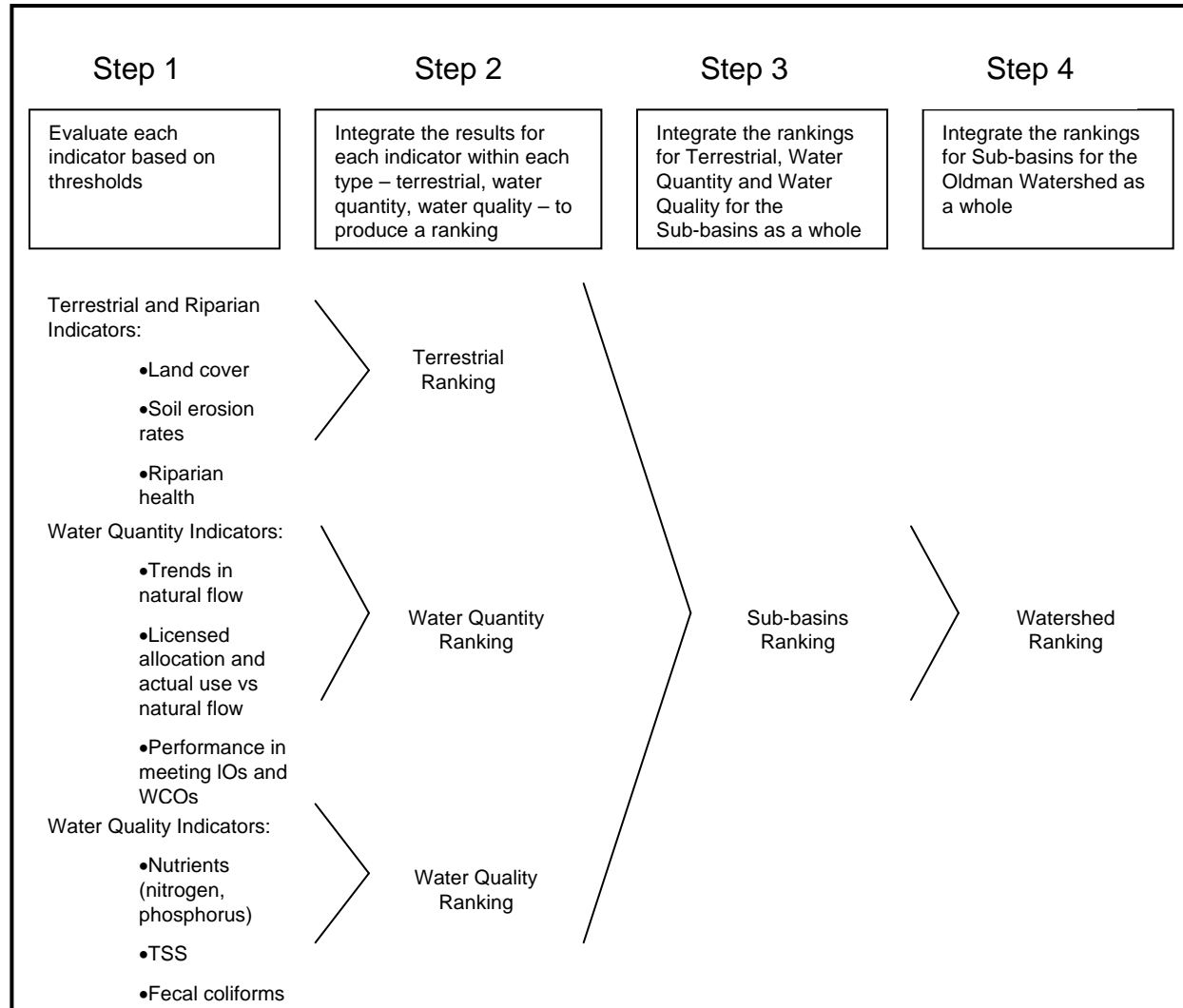
## Water Quality Evaluation

The overall water quality was ranked as follows:

- **Good**
  - no or less than 10% cases with exceedances
  - neutral or decreasing trend particularly over the last decade
- **Fair**
  - not more than 50% exceedances
  - increasing trends for one or two indicators
- **Poor**
  - more than 50% exceedances
  - increasing trend in more than two indicators

# Integration of Information

## Process of Evaluating Sub-basins and Watershed Health



## Next Steps

- A primer to Integrated Watershed Management planning.
- Lead to action and be used to support future decision-making processes.
- Support a larger watershed management effort.
- Develop educational programs, formulate revision of policy, provide direction to stakeholders.
- A living document.

**Thank You !**