

Using AGWA to Assist with Rapid Watershed Assessments

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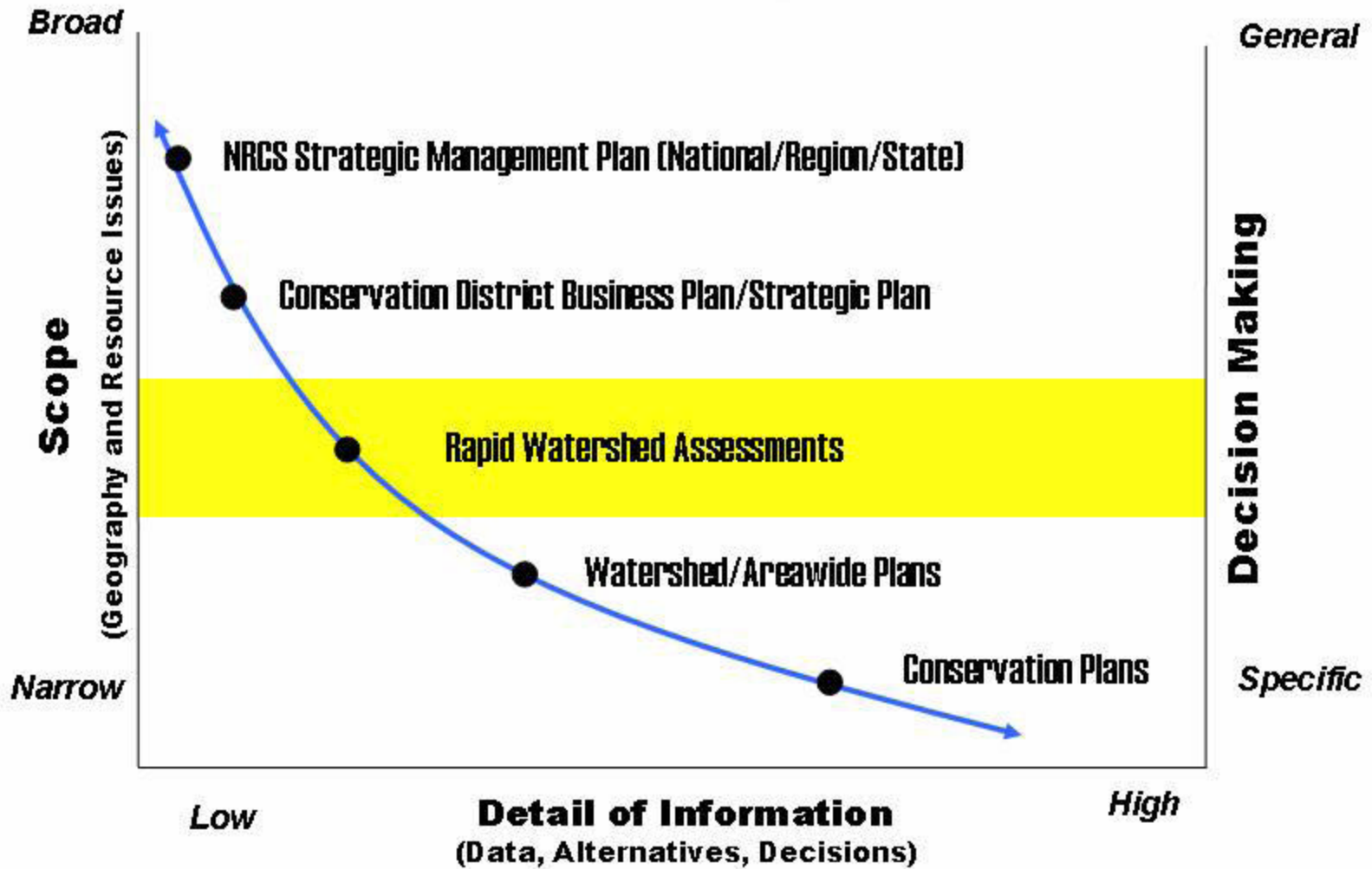
NRCS Wyoming



Overview

- Overview of Rapid Watershed Assessment
- AGWA tool
 - Background and capabilities
 - Use in RWA & beyond
- Application in Watershed Assessment in Wyoming
- Linking RWA and Watershed planning

NRCS Planning Continuum



Watershed Approach

Rapid Watershed Assessment

- An evaluation of watershed resources to determine the size, scope, and value of natural resource needs.

Watershed Resource Profile

- A descriptive set of data portraying the significant natural resource features of the watershed.

Rapid Watershed Assessment

- Rapid
- Flexible
- Provides a platform for delivery of Farm Bill programs
- Planning intensity based on resource need
- Follows routine Environmental Evaluation procedures, provides a platform for Environmental Assessment

AGWA

Automated Geospatial Watershed Assessment

A GIS-Based Hydrologic Modeling Tool

■ Interdisciplinary

- Watershed hydrology and management
- Landscape ecology
- Remote sensing
- GIS

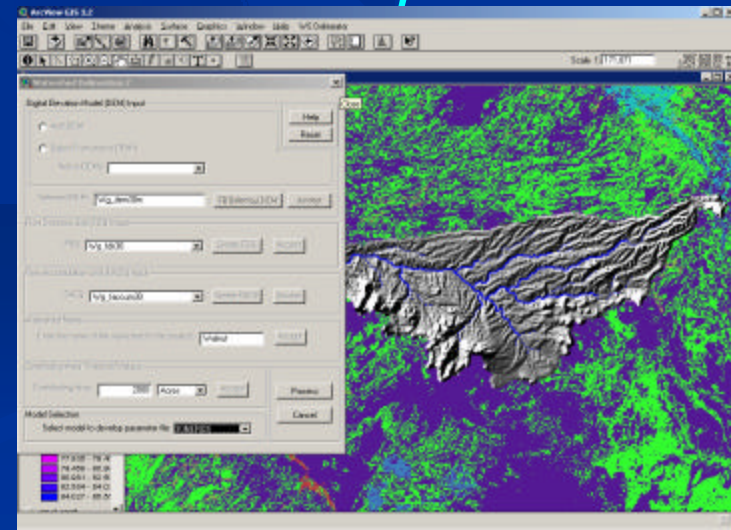
■ Multi-Agency Project

- USDA – ARS
- US – EPA (Landscape Ecology Branch & Office of Water)
- University of Arizona
- University of Wyoming

**** 2000 CSREES Grant provided genesis for Internet Version of AGWA**

Objectives of the AGWA tool

- PC-based GIS tool for watershed modeling
 - Can accommodate multiple hydrological models (*modular*)
- Investigate the impacts of land cover change, and management practices, on runoff, erosion, water quality
- Targeted for use by research scientists, management specialists
 - Ease of use
 - Widely applicable



Objectives of the AGWA tool

- Simple, direct method for model parameterization
- Provide accurate, repeatable results
- Require basic, attainable GIS data
 - 30m USGS DEM (free, US coverage)
 - STATSGO, SURRGO, FAO soil data (US and global coverage)
 - US-EPA NALC, MRLC, and GAP landscape data
- Useful for scenario development, alternative futures simulation work, and watershed assessments
 - Provide relative change when validation data are insufficient

Modeling the Impacts of Land Cover Change and Best Management Practices

- Two models utilized to account for a range of space and time scales

- KINEROS2 (smaller basins, events – design storms)

Distributed: physically-based model with dynamic routing

Hydrology, erosion, sediment transport

- SWAT (Large basins – daily/annual)

Distributed: empirical and physically-based model

Hydrology, sediment, nutrient, and pesticide yields

- Has been applied across a range of landscape, precipitation regimes



Assessment of BMPs

- KINEROS stream buffer strip tool
- 2 new land-cover modification options
 - examine the effects of different management practices on water quantity and quality at the watershed scale
- BMP land Cover modification using NRCS state and transition models
- Post-fire watershed assessment

AGWA 1.4 ArcView Interface - in BASINS 3.1

Automated Geospatial Watershed Assessment (AGWA) tool BETA v1.31

File Edit View Theme Analysis Surface Grid Graphics Tools Window Help

AGWA Tools

- Delineate Watershed
- Run Landcover and Soils Parameterization
- KINEROS
 - Write KINEROS Precipitation File
 - Write Output File and Run KINEROS
 - View KINEROS Results
- SWAT
 - Write SWAT Precipitation File
 - Write Output and Run SWAT
 - View SWAT Results

Scale 1: 148,610 582,117.87 3,520,385.71

Walnut Gulch Experimental Watershed, AZ

sw_g1_2

wwg1_2

- 11 - 95
- 96 - 180
- 181 - 265
- 266 - 349
- 350 - 434
- 435 - 519
- 520 - 603
- 604 - 688
- 689 - 773
- No Data

Nalc_1997

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- No Data

Wg_hill

- 60 - 80
- 81 - 101
- 102 - 122
- 123 - 143
- 144 - 163
- 164 - 184
- 185 - 205
- 206 - 226
- 227 - 247
- No Data

Hillshade of Dem 10m

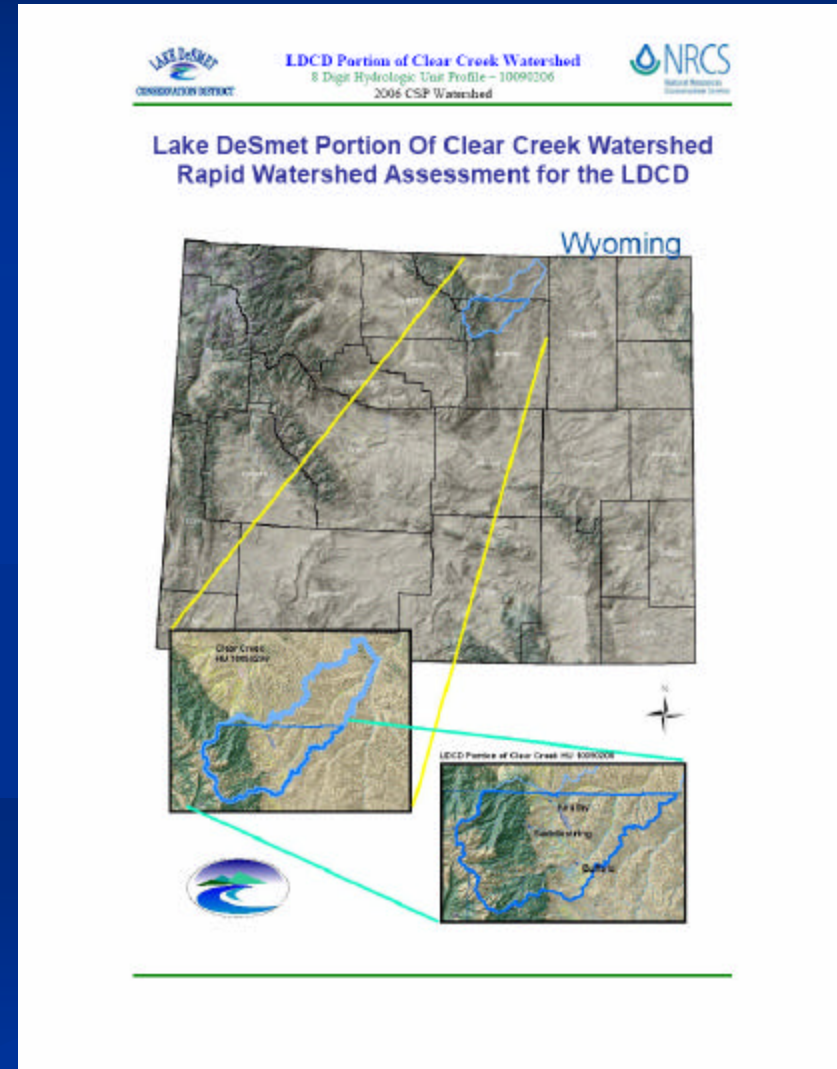
Wyoming Watershed Assessment

Clear Creek Watershed

8 Digit HUC - 10090206
2006 CSP Watershed
Total area: 738,312 acres
439,661 acres (Johnson Co.)
298,651 acres (Sheridan Co.)

Buffalo (pop. 3,900 in 2000).

Ranching/Farming
Irrigated Agriculture
CBM development



Wyoming Watershed Assessment

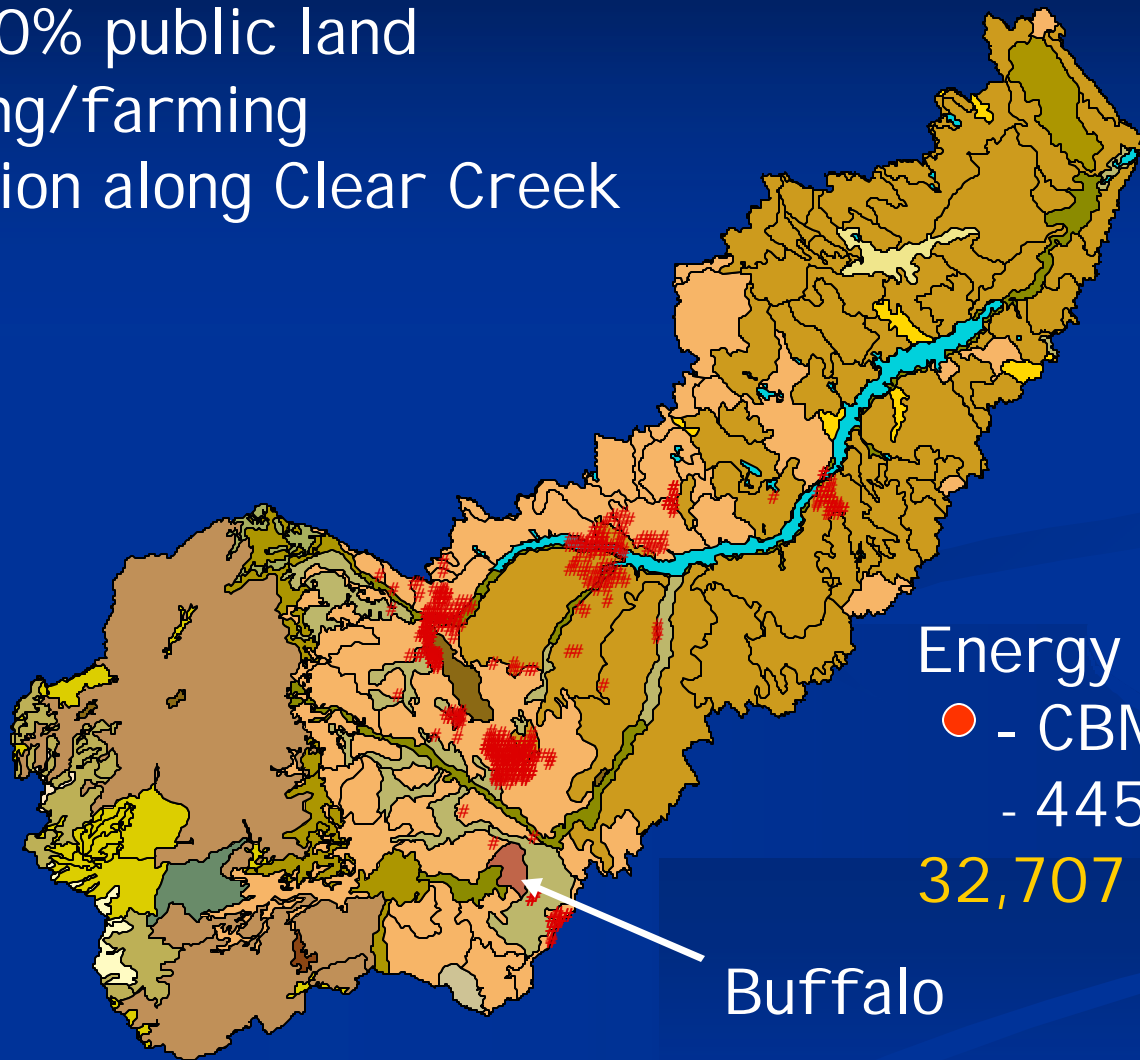
Clear Creek Watershed

Spatial Data Sets:

- Hydrologic Units
- Ownership
- Landuse
- Topography
- Land Cover
- Soils- Statsgo
- Hydrography
- USGS Gauges (16 - 50-60 year records)
- Common Resource Areas

Clear Creek Watershed

Over 50% public land
Ranching/farming
Irrigation along Clear Creek



Energy Development
● - CBM wells
- 445 wells (2001)
32,707 BBLs per well

Buffalo

Clear Creek Watershed

Survey Results

CLEAR CREEK

Natural Resource Issues	Public Meeting										WGT AVG	Mail-in Responses										WGT AVG	TOT	weight %		
	10	9	8	7	6	5	4	3	2	1		10	9	8	7	6	5	4	3	2	1					
air quality								2	1		3									10	43	2.4%				
animal waste	1	1	2								15							1	1		19	1.1%				
biological diversity								1	1		3							1	1		17	0.9%				
flooding	2		1	1		2					45									5	50	2.8%				
agricultural land conversion	1	1	4		1	1	1	1		2	71	3	1		1				1	1	55	126	7.0%			
agricultural productivity			2	1	3	1	1	1		3	63							1	1		21	84	4.7%			
forestry			1					1			12										0	12	0.7%			
grazing lands			2	3		2	1	1	1		51									1	28	89	5.0%			
irrigation water management systems	2	3	1	2	2	1	1	3	1	1	88		2	1	1	1	1			1	44	132	7.4%			
integrated pest management plans			1			1	2	1		3	21									1	19	40	2.2%			
noxious/invasive weeds	1		2	1		1	1	3	3		57	1		1	1	1	2	1			41	98	5.5%			
food & fiber production			1	1					1	1	18										1	19	1.1%			
urban land use						2				4	26				1	1			2		16	42	2.3%			
soil erosion	1	1	2	1	4	1	1	1			78	1			1	1	2	1			27	105	5.9%			
soil quality / soil health					1	2	2		2		36		2							1	29	67	3.7%			
riparian corridors	1	1	1	1		2	1		1	3	53				1			1			18	69	3.9%			
water quality / quantity	8	3	1	4		2	1	1	1		160	2	4	1			1	1	1		70	230	12.8%			
threatened / endangered species								1			5										0	5	0.3%			
urban water pollution	1		1		2		1				34									1	9	43	2.4%			
water availability / conservation	6	6		2	2	1	1	1			140	1	1	2						1	37	177	9.9%			
wetlands			1	1	2	1				2	34									1	12	46	2.6%			
wildlife / habitat enhancement			2	1	2	2	2			2	54	1		1	2	1	1		1	1	37	89	5.0%			
recreation	2		2	1		2		1		2	43										14	57	3.2%			
rural land use	2		2	1		1	1	2	3		64				2				1	2	20	84	4.7%			
industrial development / reclamation			1		1	1	1			1	24										16	40	2.2%			
other				1							7										3	7	0.4%			
Customer Group	10	9	8	7	6	5	4	3	2	1		10	9	8	7	6	5	4	3	2	1	1790	100.0%			
agribusiness						1	2	2	3	2	19							1	1			9	28	6.0%		
business community								2	6	1	25									1		3	28	6.0%		
part-time farmers / ranchers						2	5	1	3	1	40								4	3	1	27	67	14.3%		
full-time farmers / ranchers						12			3	2	68											22	90	19.2%		
developers						1	4	4	2	1	38										1	27	65	13.9%		
environmental groups						2	1	4	1	1	27								1	1	1	10	37	7.9%		
federal and state agencies							1	2	1	4	16										2	8	24	5.1%		
hobby farmers							1	3	1		15										1	14	29	6.2%		
planners						2	1	2	2	4	28										1	11	39	8.3%		
recreational users						1	1	2	3		15											2	17	3.6%		
urban / suburban citizens						1	5	2	1	1	32											1	33	7.0%		
minority farmers / ranchers								1	1		5										1	2	7	1.5%		
leader (other)											0											5	5	1.1%		
Producers, Programs, Services	10	9	8	7	6	5	4	3	2	1		10	9	8	7	6	5	4	3	2	1	469	100.0%			
agricultural waste management						1	1	2			15												0	15	3.1%	
cost-share programs						6	3	2			48								1	1	1	1	2	16	64	13.1%
conservation planning						8	1	3	2	3	60									4	1	2	23	83	16.9%	
educational programs						1	2	1	3	1	23									1	2		14	37	7.6%	
engineering design							4	1	3	1	26												15	41	8.4%	
erosion & sediment control						3	3	3		1	37											2	5	42	8.6%	
flood prevention						1	1			1	13												0	13	2.7%	
forestry programs										1	6												0	6	1.2%	
land use planning						3	3	1		2	32								3	1	2		25	57	11.6%	
resource inventories								2	3	1	13											3	16	29	5.9%	
soil survey & soil information						1	4	2	2		23											1	22	45	9.2%	
recreation opportunities						1		2	2	2	17												0	17	3.5%	
rural development assistance								2	3	2	14												0	14	2.9%	
wildlife management						2	1		1	1	17											1	4	21	4.3%	
other								1			3											1	3	6	1.2%	
Community Representation																								490	100.0%	
City	9																							11	33.3%	
Rural Subdivision	3																							5	15.2%	
Rural Agriculture	8																							15	45.5%	
Other - U.S. Forest Service, Big Horn N.F.,																								1	3.0%	
Other - Ag Business	1																							1	3.0%	
TOTAL	21											12											33			

Clear Creek Watershed

Priority Issues

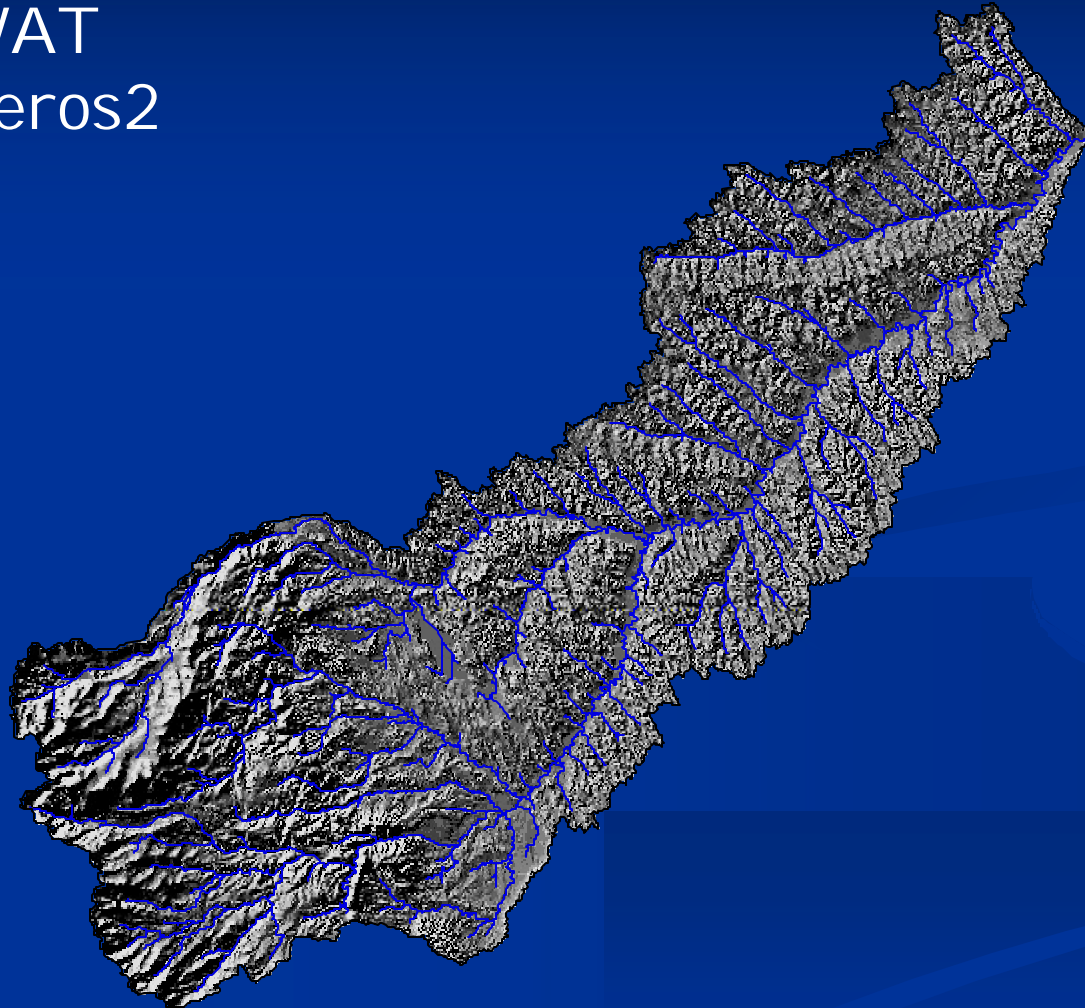
- Natural Resource Issues:
 - Water quality/quantity
 - Water Availability /Conservation
 - Irrigation Water Management
- Respondents:
 - Farmers/Ranchers (full and part-time)
 - Developers
- Program Services:
 - Conservation planning
 - Cost- share program
 - Land-use planning

Clear Creek

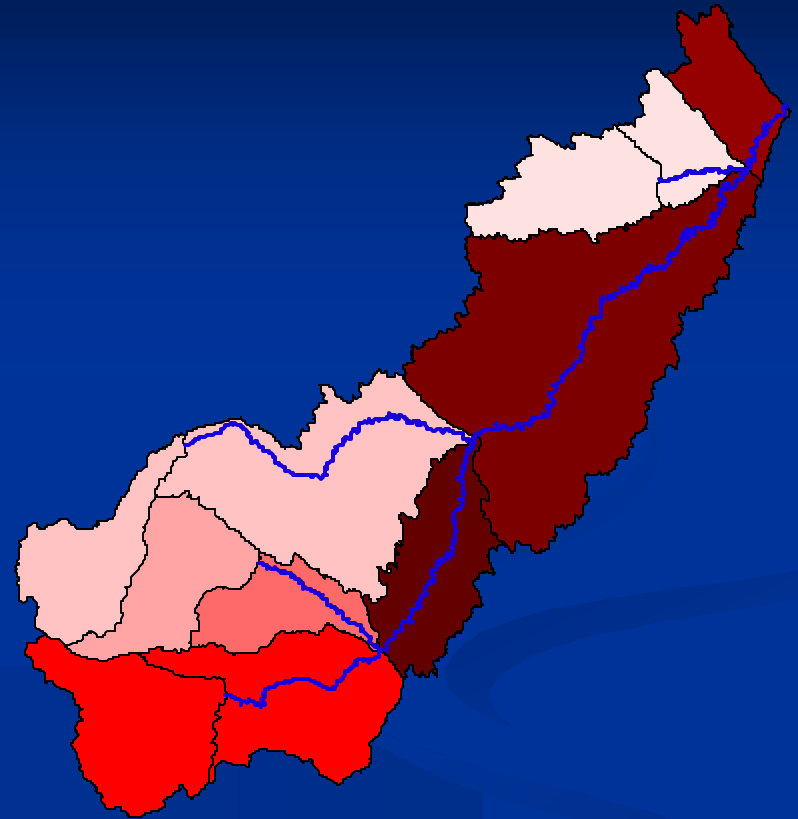
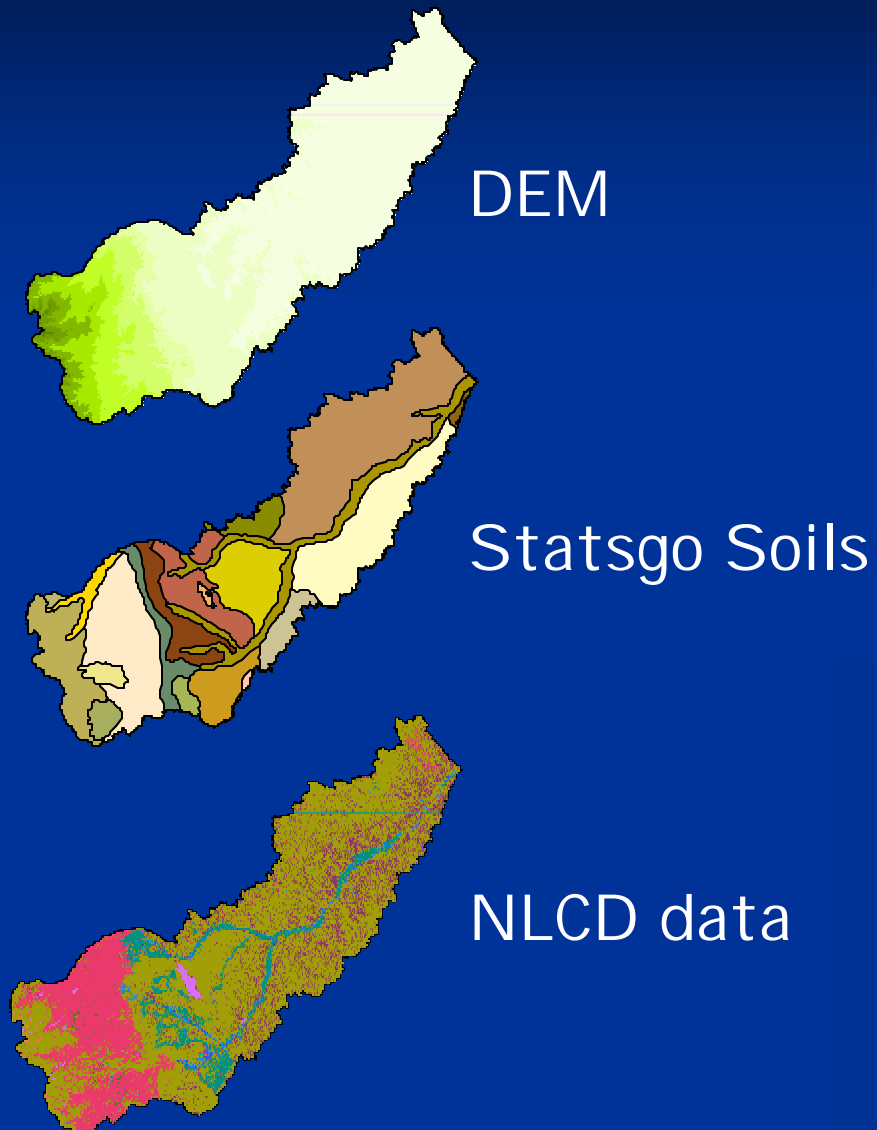
Watershed Modeling Assessments:

SWAT

Kineros2

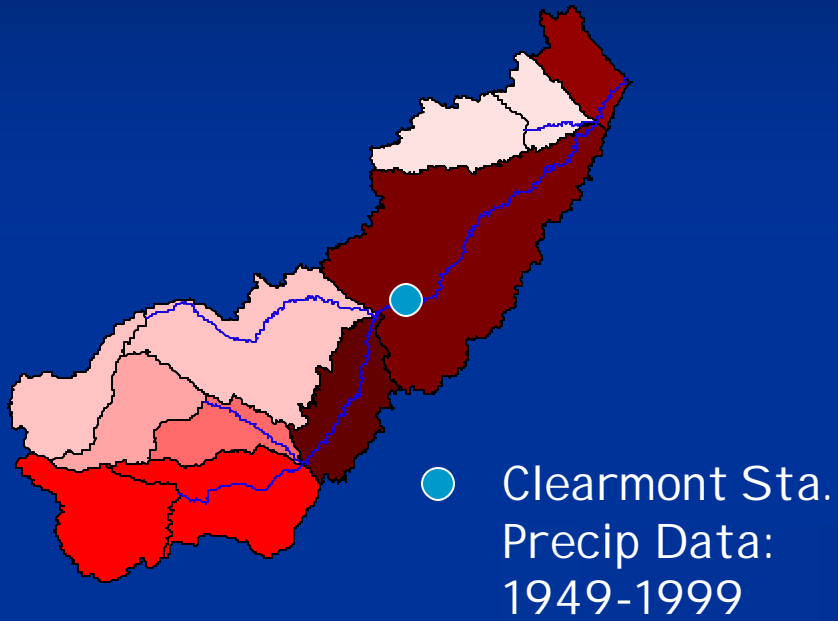


Clear Creek



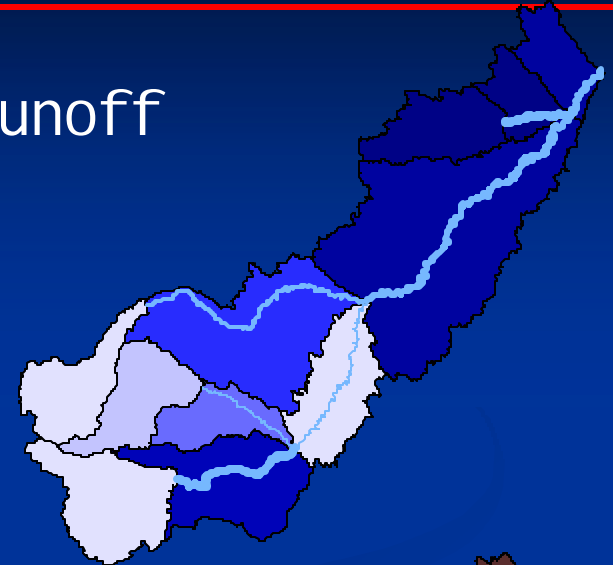
Discretized Watershed
Input parameters for SWAT

SWAT - Clear Creek

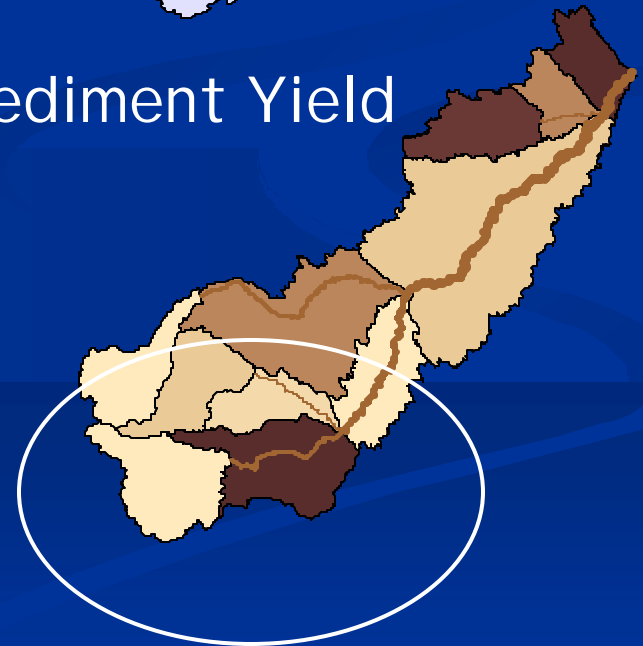


Discretized Watershed
Input parameters for SWAT

Runoff

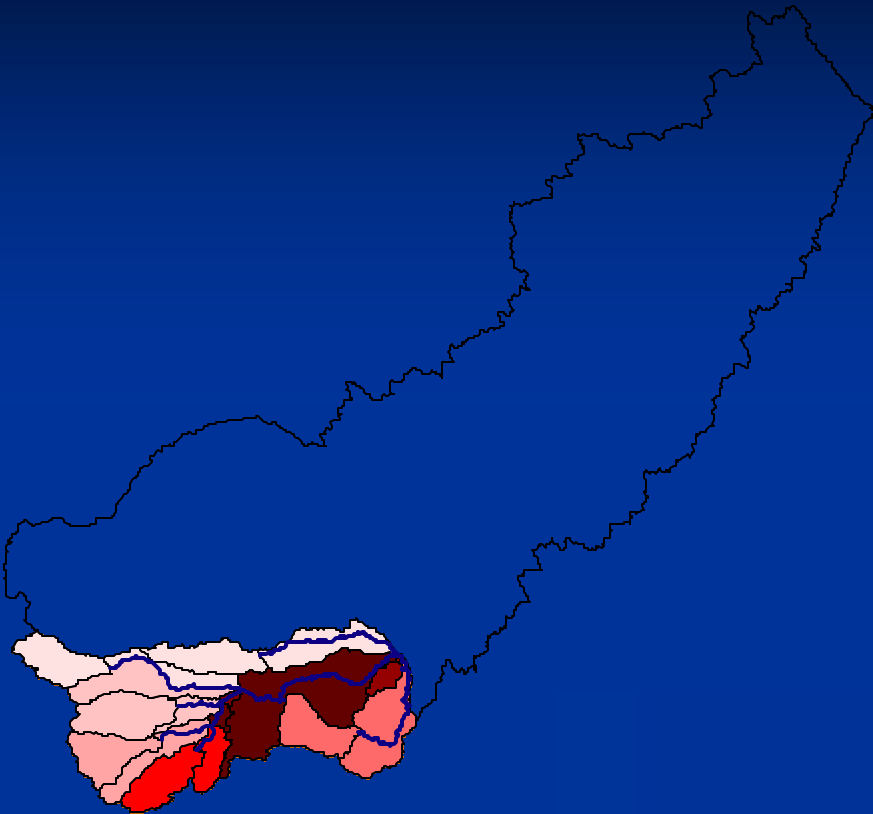


Sediment Yield

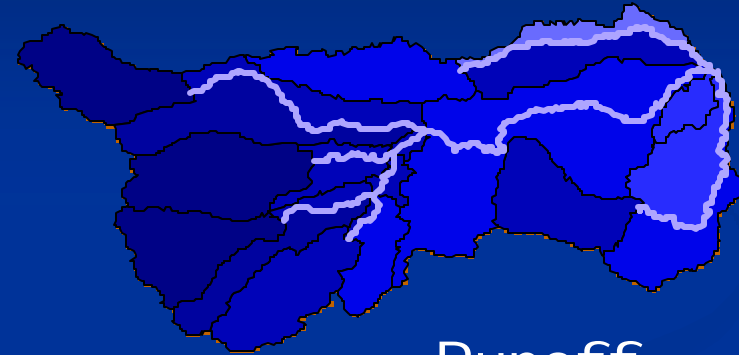


Multi-scale Application

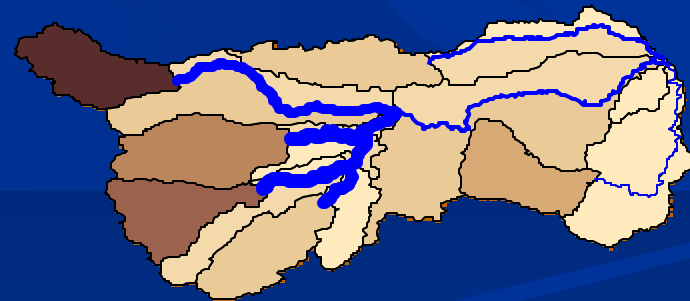
Results From Kineros2



Sub-watershed Analysis
Discretized watershed
Input parameters
for Kineros2



Runoff



Sediment Yield

Application Levels

- Quick assessment: using readily available data.
 - Relative differences
 - Highlight potential areas for in depth assessment
- Detailed assessment:
 - More detailed datasets
 - Calibrated model parameters
 - Evaluation of BMPS/scenarios
- Link AGWA results back to watershed characteristics/uses.

Summary

- RWA is designed to evaluate watershed resources to determine the size, scope, and value of natural resource needs
- Ongoing process:
 - Complete the Assessment & Matrix
 - Integrate AGWA simulations
 - Links between AGWA results and current watershed characteristics and use.

Next Steps

- Integrate information from RWA process and AGWA into Watershed Planning.
- Watershed planning:
 - AGWA will be used to evaluate potential management scenarios.
 - Promotes a link between the RWA process and the next steps in the NRCS planning continuum.

Issues

- Beginning the process....
- Define differences among
 - Watershed Characterization
 - Watershed Assessment
 - Watershed Planning
- Geospatial watershed assessment tools (e.g. AGWA) can be used to integrate these three parts of the process.

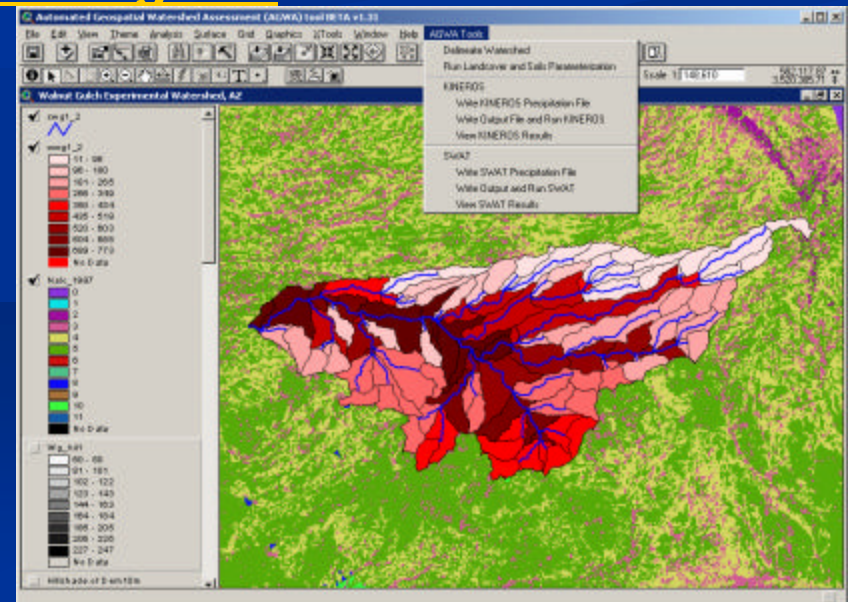
AGWA Information

- Google: AGWA ARS
- EPA Basins
- AGWA Web Pages:

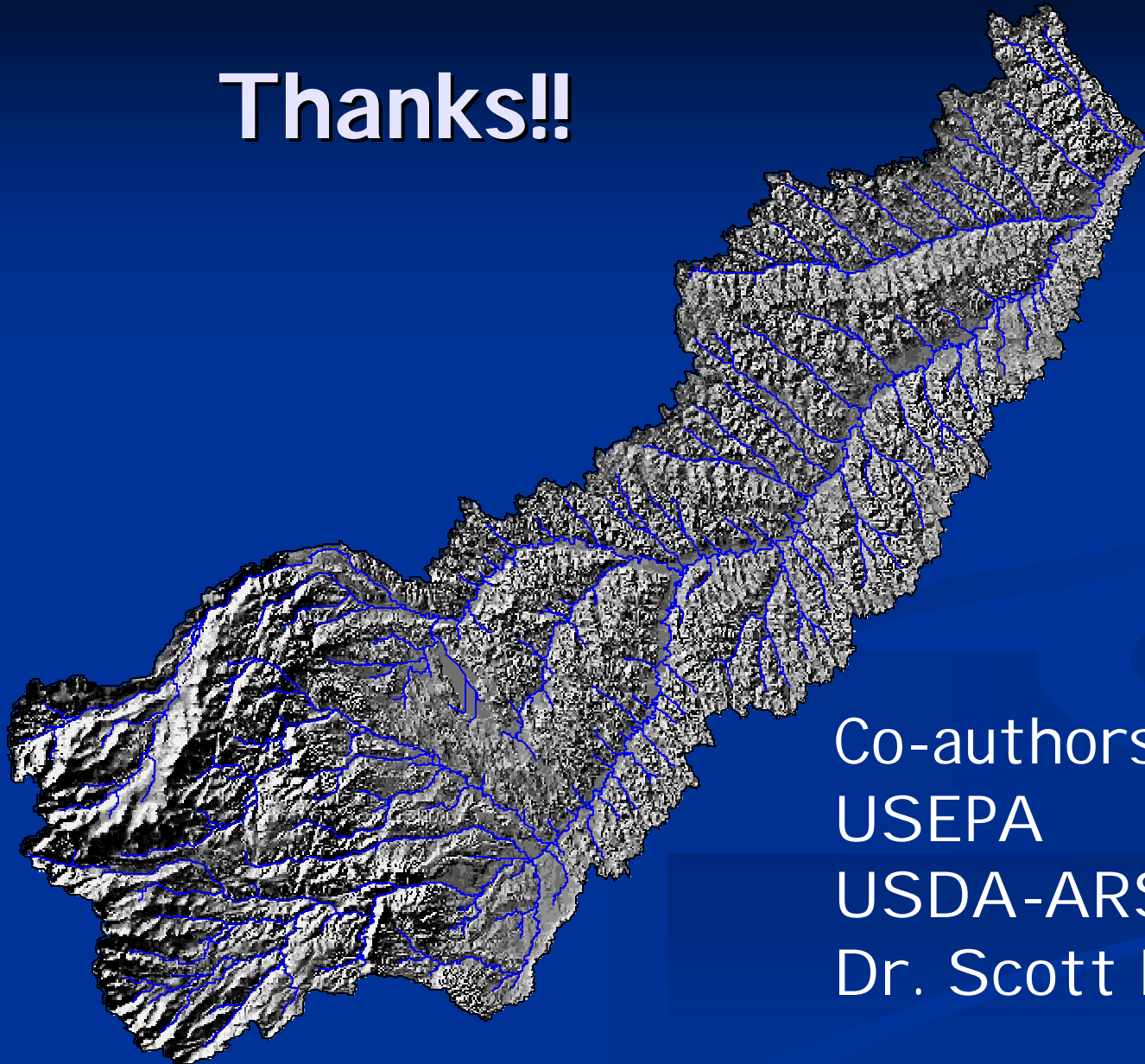
<http://www.epa.gov/nerlesd1/land-sci/agwa/>

<http://www.tucson.ars.ag.gov/agwa/>

(includes documentation,
software, and related
publications)



Thanks!!



Co-authors

USEPA

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