



**An Integrated ARS Watershed Data System**

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# *Vision*

*Research and analyses that  
inform public debate and  
support stewardship goals of  
individuals  
organizations  
communities  
and the Nation*

# *Mission*

*To provide access to data and analytical tools to facilitate multidimensional watershed research and conduct analyses to support individual-, organization-, and policy-level decision making*



# Introduction

- USDA watershed research dates back to 1930's
  - Many research watersheds are still operational
  - Data have been managed and disseminated independently at each research location
  - Data are varied, including GIS maps; satellite images; climatic, runoff, sediment, streamflow, and water quality records; and land use and management.
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# Needs

- Make data more accessible
  - Make data more useful
  - Support CEAP research
  - Rescue historic data
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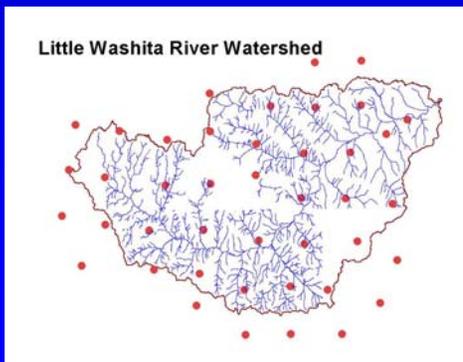
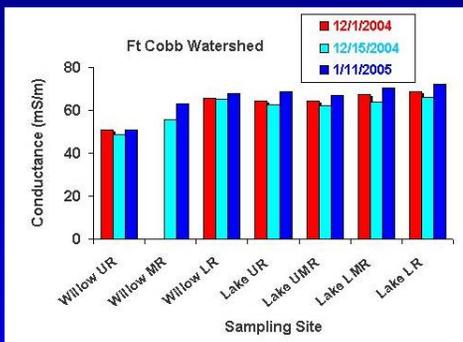
# Objective

- Develop and implement a data system to organize, document, manipulate, and compile climate, water, soil, management, and socio-economic data for assessment of conservation practices and other hydrologic analyses.
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# System Architecture

## Local Sites

- Create Metadata
- Create filter for data harvest
- Provide URL

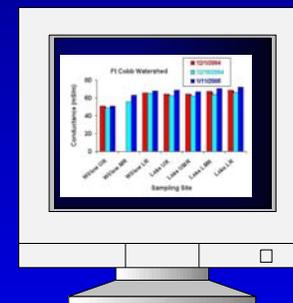
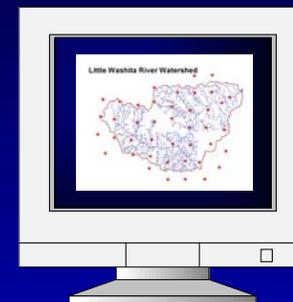


## Server

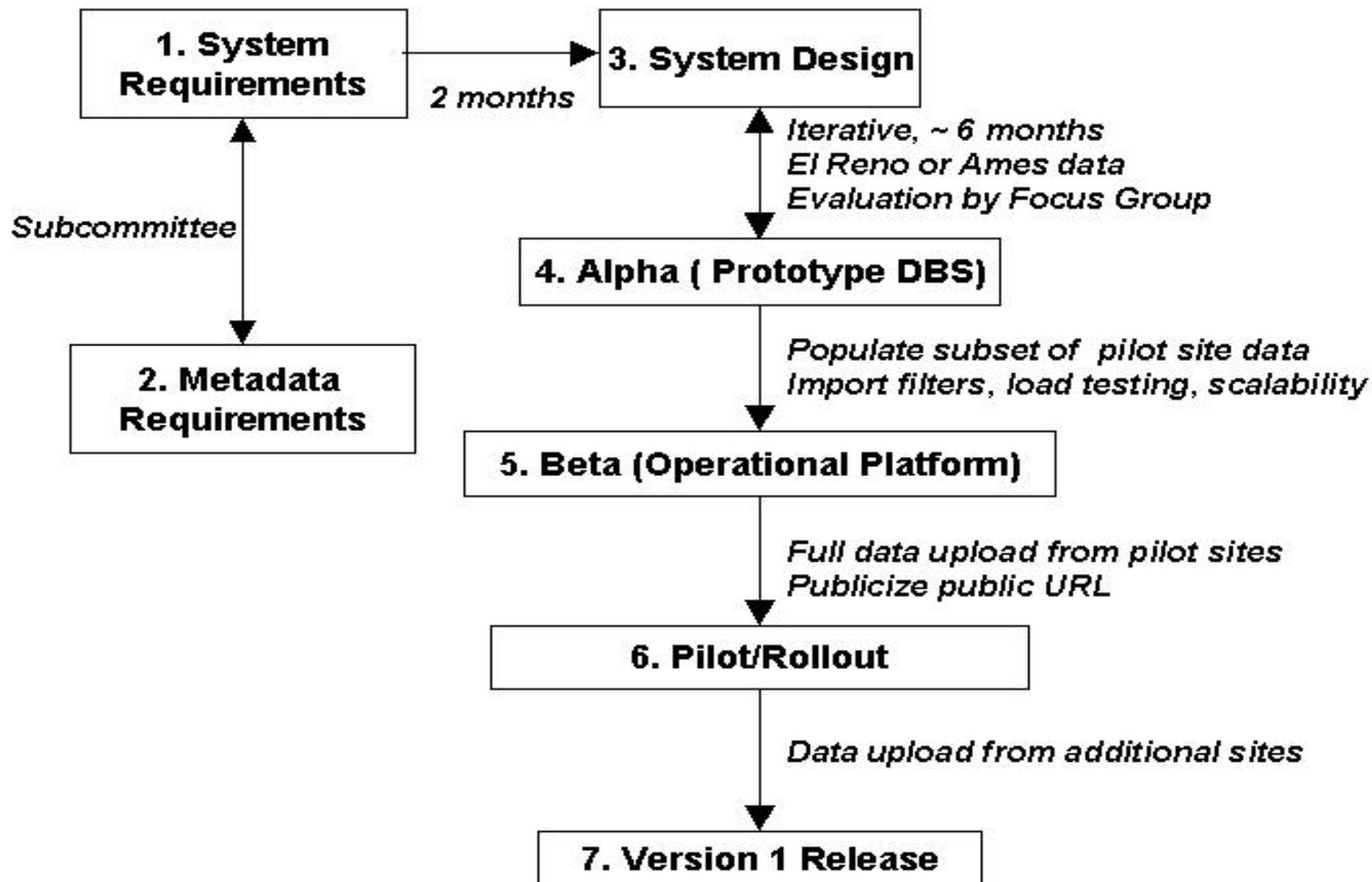
- Data Management System
- Metadata Search Engine
- Visualization & Analytical Tools



## Clients



# System Development Strategy



# System Requirements

- Web-based, server-client architecture
  - Meet stakeholder/user needs
  - Meet the industry standards
  - QA/QC procedures
  - Ease-to-maintain, scaleable
  - Data access: browser independent, speedy
  - “Any-place, any-time” access
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# Metadata Requirements

- Who, what, when, where, why, and how about every facet of the data
  - Document existing and future data to allow users to evaluate the nature and quality of the data
  - Metadata search engine for finding the needed datasets
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# Metadata Standards Considered

- U.S. Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM)
  - USDA's geospatial metadata standard
    1. FGDC **full compliance metadata**
    2. USDA-Service Center Initiative (SCI) **minimum compliance metadata**
  - National Biological Information Infrastructure (NBII)'s Biological Data Profile of the CSDGM for both geospatial and non-geospatial data
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# What does the FGDC standard include?

## Metadata

## Main Sections

## Supporting Sections

0. Metadata

1. Identification

2. Data Quality

3. Spatial Data Org.

4. Spatial Reference

5. Entity and Attrib.

6. Distribution

7. Metadata Ref.

8. Citation

9. Time Period

10. Contact



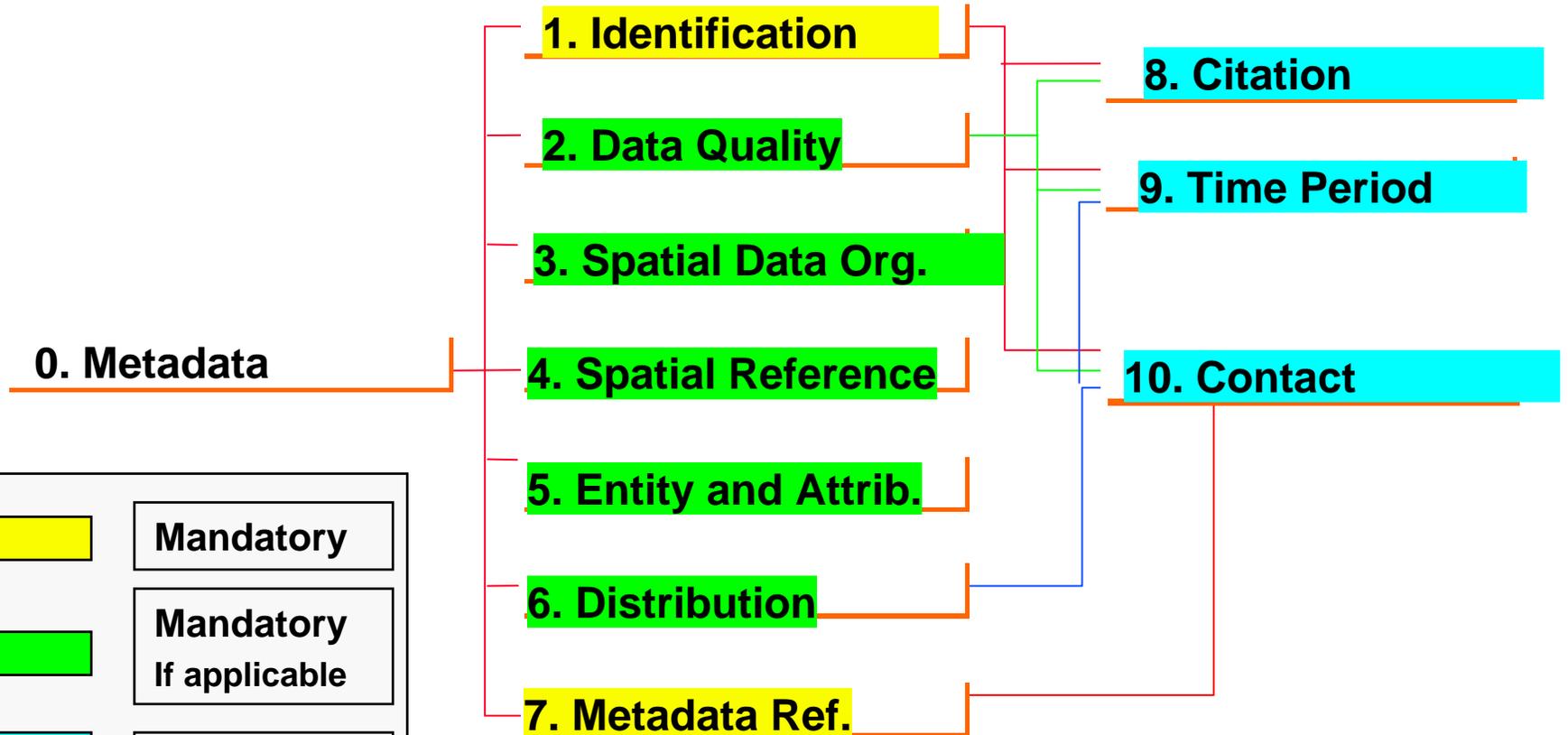
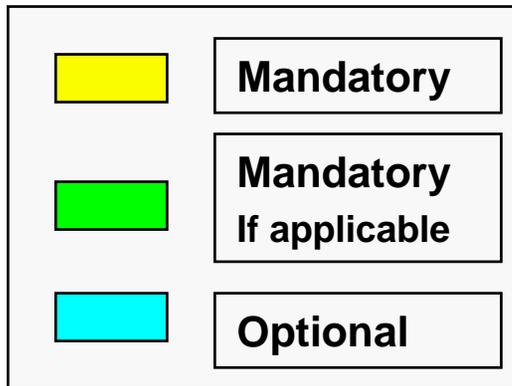
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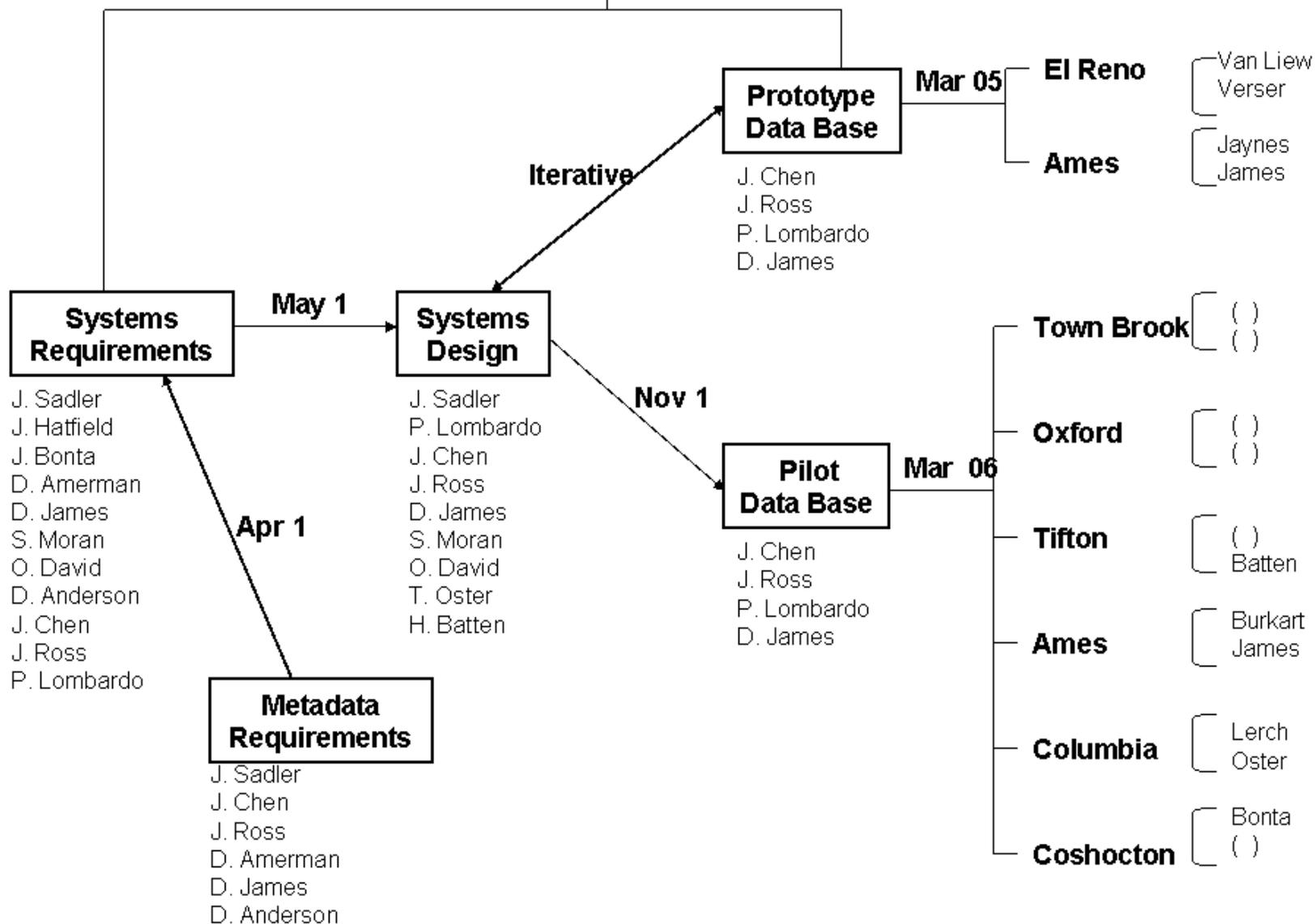
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If applicable



Optional



# Implementation Plan – Steiner/Sadler

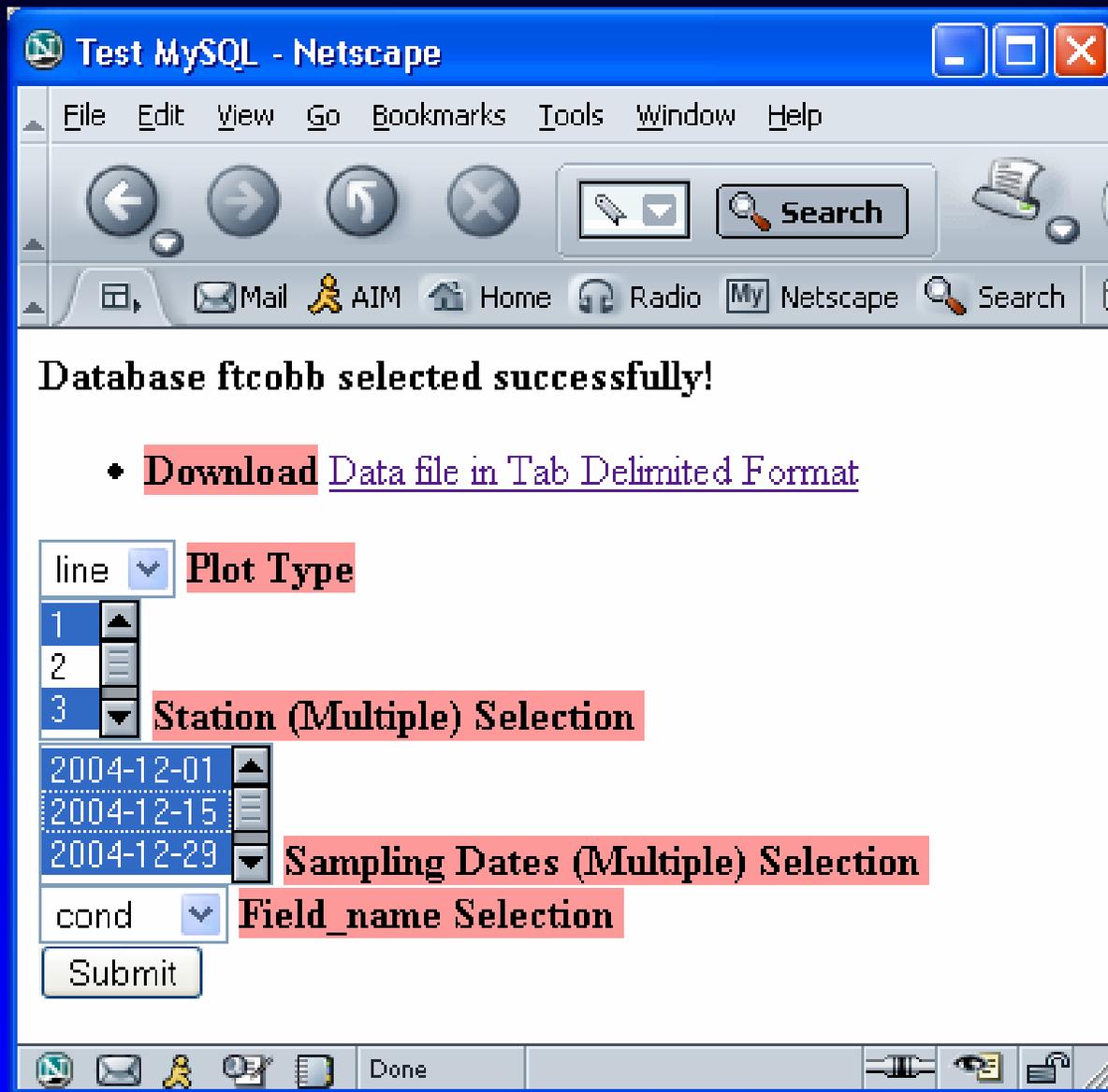


# Prototype in El Reno, OK

- Hardware: A dual Xeon processor (2.8GHz CPU), 1 GB of RAM, and a 60GB hard drive
  - Software: Mainly running Microsoft 2003 server with the Microsoft IIS and Apache coexisting web servers, and MS SQL/MySQL mixed servers. ASP.NET, PHP, and XHTML scripting languages are used.
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# System Tools

- Utility to create data files for model testing and analyses
  - Utility to display reports and create downloadable files from query results
  - Utility to generate statistics reports
  - Visualization tools – trends, time series, line/chart comparisons, outliers/abnormality identification
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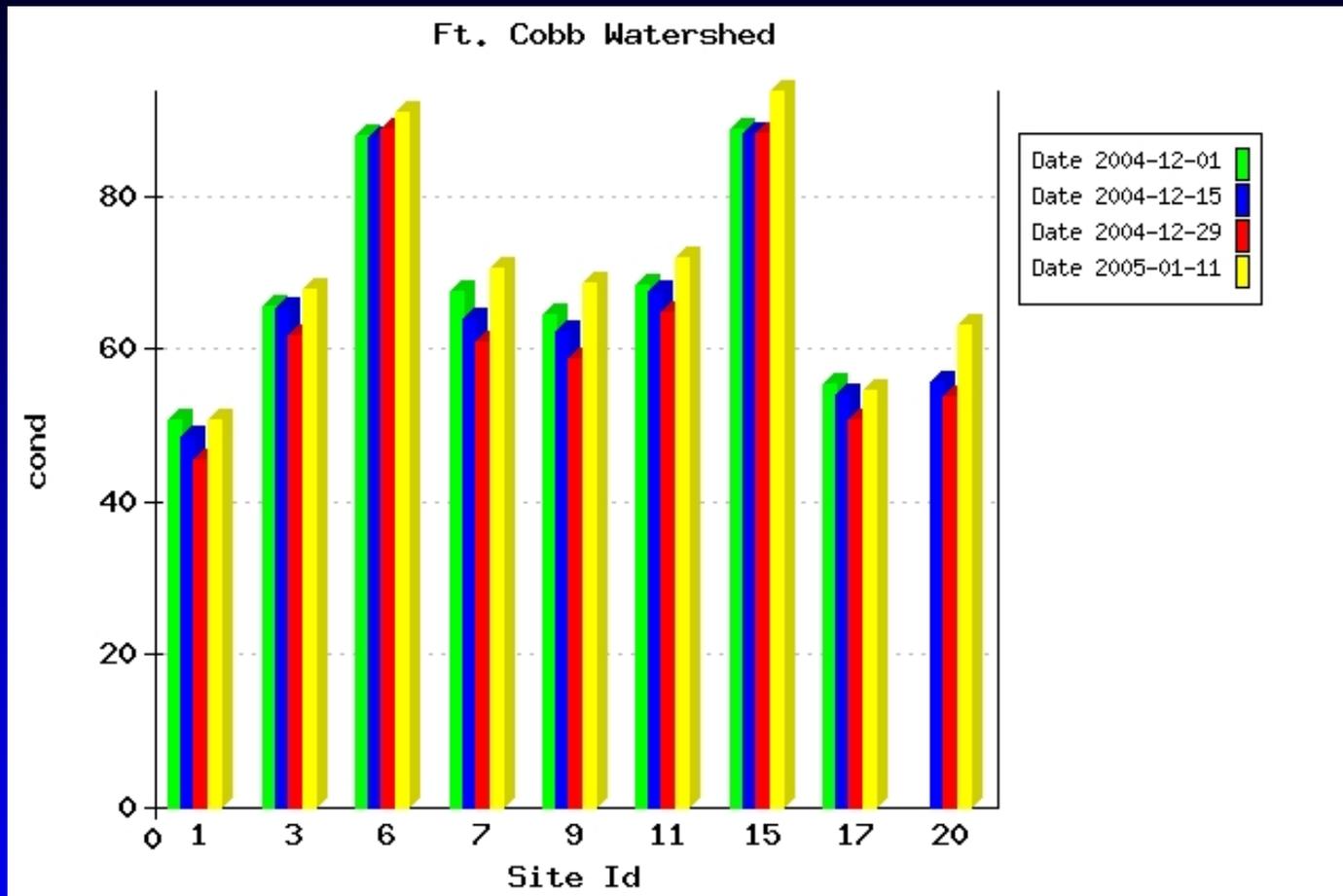
## Screen provides

- Selection for:
  - Plot type
  - Station
  - Time period
  - Parameter
- Data download

The screenshot shows a Netscape browser window displaying a data table. The table has six columns: siteid, stream, date, ph, cond, and turb. The data is organized into rows, with siteid values ranging from 1 to 7. The stream names include Willow, Cherry Dale, Cobb, and Lake. The dates range from 2004-12-01 to 2005-01-11. The ph values range from 6.4 to 9.4, cond values range from 43.1 to 88.8, and turb values range from 0 to 27.

siteid	stream	date	ph	cond	turb
1	Willow	2004-12-01	7.8	50.7	7
1	Willow	2004-12-15	6.4	48.6	27
1	Willow	2004-12-29	7.6	45.5	26
1	Willow	2005-01-11	7.6	50.8	20
2	Cherry Dale	2004-12-03	7.7	43.7	6
2	Cherry Dale	2004-12-15	7.8	41.7	12
2	Cherry Dale	2004-12-29	9.4	37.5	15
2	Cherry Dale	2005-01-11	8.9	43.1	22
3	Willow	2004-12-01	7.6	65.7	47
3	Willow	2004-12-15	7.1	65.4	27
3	Willow	2004-12-29	8.1	61.7	29
3	Willow	2005-01-11	8	67.9	15
6	Cobb	2004-12-01	7.7	88	14
6	Cobb	2004-12-15	7.1	87.5	13
6	Cobb	2004-12-29	8.2	88.8	25
6	Cobb	2005-01-11	8.1	9.1	14
7	Lake	2004-12-01	7.8	67.6	0

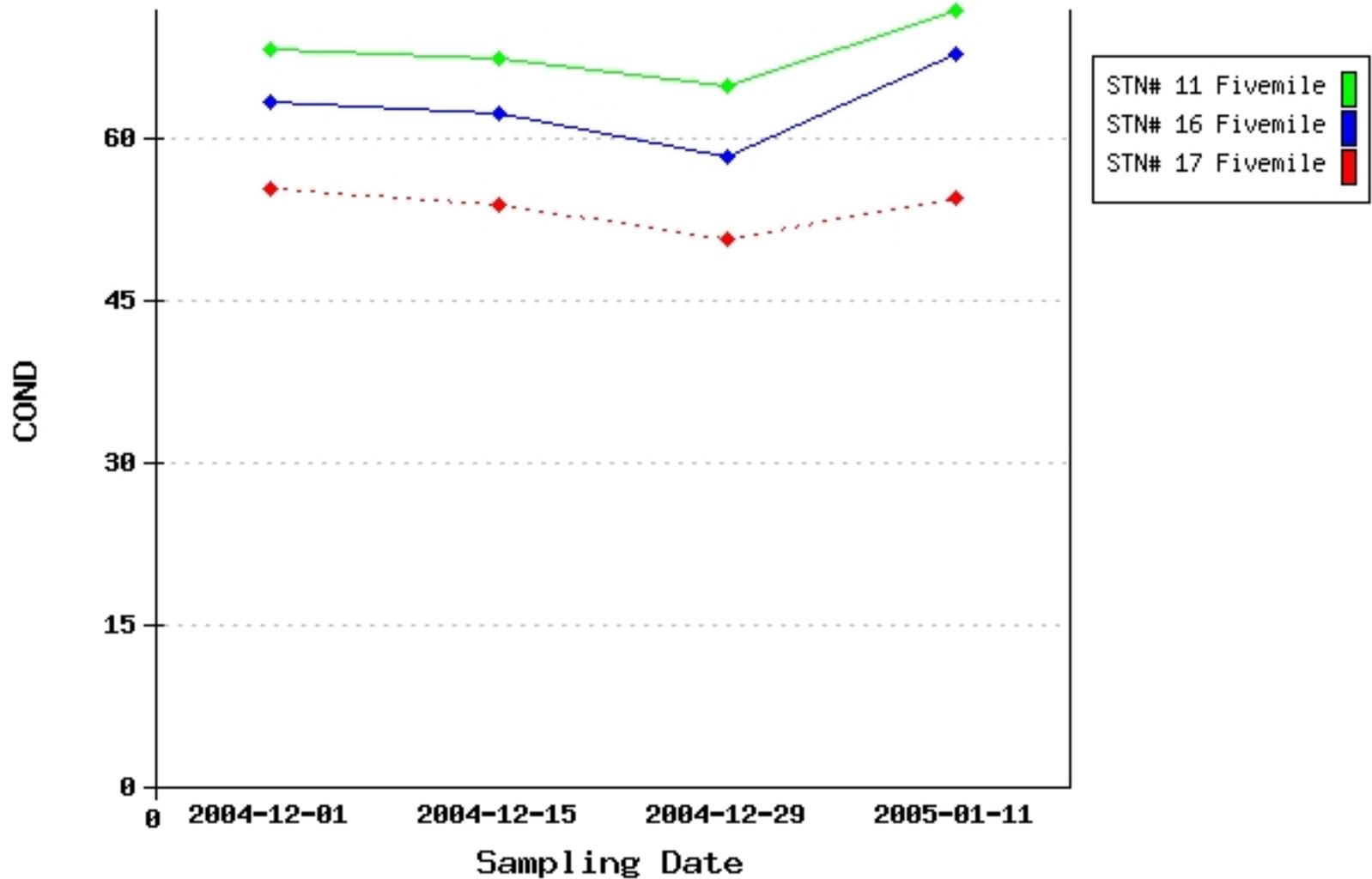
**Query Results: Data table for display (downloadable)**



**Bar Chart: Comparison of water quality (Conductance) among nine stations during four sampling periods**

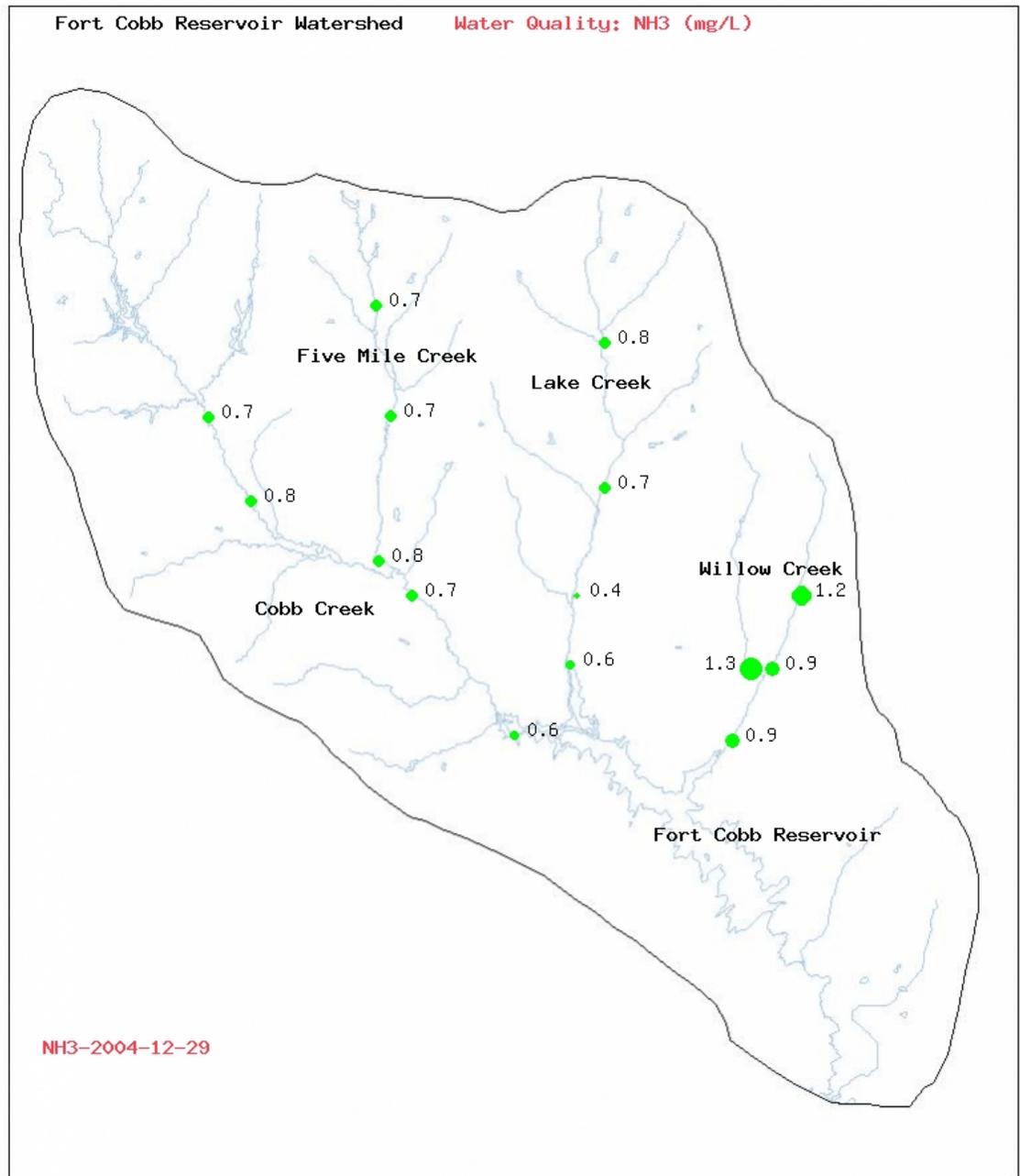
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### Ft. Cobb Watershed



Time series example

**Spatial distribution of ammonium (NH<sub>3</sub>) in stream  
(symbol sizes represent the relative magnitudes of precipitation)**





# Needed Interactions

	System Req.	System Design	Focus Groups	Metadata Wizard	Populate Data Base
CEAP-WAS Teams	X		X		
Benchmark Watersheds	X		X	X	X
Other watersheds	X		X	X	X
MSEA	X		X		
External	X	X	X		

# Interactions with Teams

- Development of a common data dictionary  
All Teams
  - Methodology inventory  
Team 6
  - File structure for input and test data  
Teams 3, 4, 5
  - Data to be collected  
Teams 2, 4
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# Summary

The ARS data system will provide

- One-stop access and data exploration for ARS scientists and the general public
  - Metadata that inform users about the data
  - A friendly environment
  - Ability to explore and access the data
  - Support to CEAP modeling and analyses
  - Increased accessibility, utility, and impact to ARS watershed data.
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*ARS's commitment - as researchers, staff, research teams, Program Leaders, line managers, and an Agency - to stewardship of data and information from research supported by American taxpayers*

# Acknowledgements

- E. John Sadler, Co-Chair of Data Team
  - Jin-Song Chen, Research Hydrologist
  - John Ross, IT Specialist
  - Data Team who are supporting this effort
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