Managing ARS Natural Resource Data

WHAT: Measurement Data

WHERE: Spatial Data

HOW: Metadata

Managing ARS Natural Resource Data

- ARS research data collection efforts vary geographically, thematically, temporally, and methodologically

- ARS research data collection efforts are research driven -- they are not designed for regulatory purposes or large-scale monitoring

- Field data collection and analytical laboratory methods are Scientist-chosen, based upon research requirements -- ***No Agency standards***

- Providing access to ARS research data requires fine-grained *metadata* to enable intelligent scientific evaluation and utilization

ARS Data Management

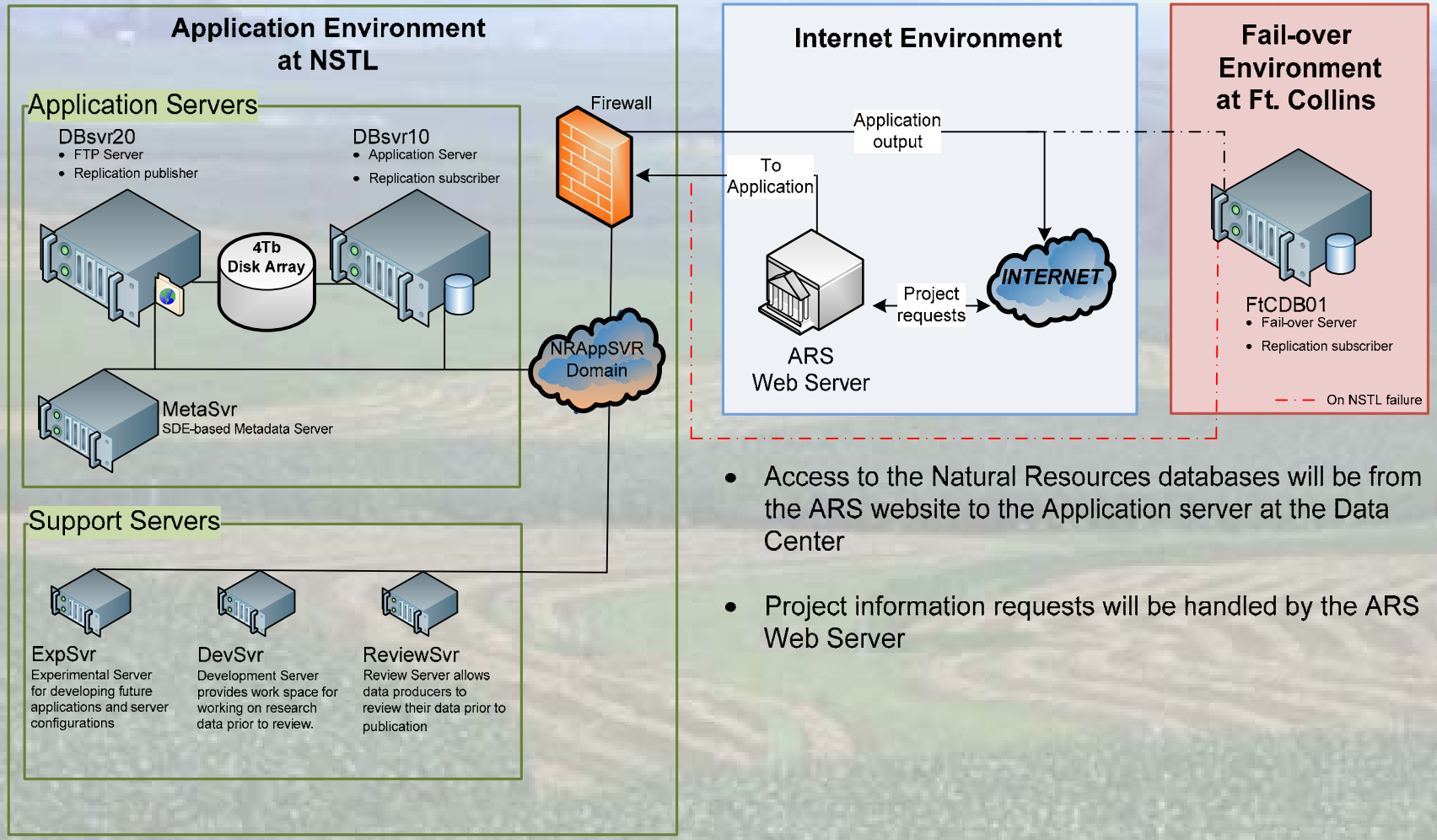
The unique field-data collection techniques and analytical laboratory methods requires a database structure capable of managing detailed measurement, spatial, and metadata on an individual data-set basis

☑ **Measurement Data**
- Data table – the actual measurements
- Data table definition file – bridge between the data and metadata

☑ **Spatial Data**
- Measurement GIS data
  - GIS shape file or raster dataset

☑ **Metadata**
- Measurement Data
  - Methods Catalog
  - Parameter Descriptions
- Spatial Data
  - FGDC-compliant metadata file
- Site Descriptions
  - Detailed description of sampling locations and instruments

Natural Resource Data Retrieval Environment



- Access to the Natural Resources databases will be from the ARS website to the Application server at the Data Center
- Project information requests will be handled by the ARS Web Server

☑ **Measurement Data**

Building Research Databases

➢ Research measurement data will be managed as a collection of locations or ***sites*** with a common theme derived from individual measurements:

- South Fork Meteorology
  - Air temperature, Rainfall, Atmospheric pressure, Wind speed
- Walnut Creek Water Quality
  - NO3_N, Phosphorus, Atrazine, Alachlor

➢ Site data will be managed by unique SiteID/Date-Time pairs with measurements as additional columns using generic column names mapped to support information in a definition table. A single measurement table will be split into two tables:

- Data table – the actual measurements
- Data table definition file – bridge between the data and support Information

☑ **Measurement Data**

Typical Watershed Measurement Data

Hydrology
- Stream discharge
- Stream stage

Water Quality
- Nutrient
- Herbicide/Pesticide

Weather
- Minimum temperature
- Maximum temperature
- Precipitation

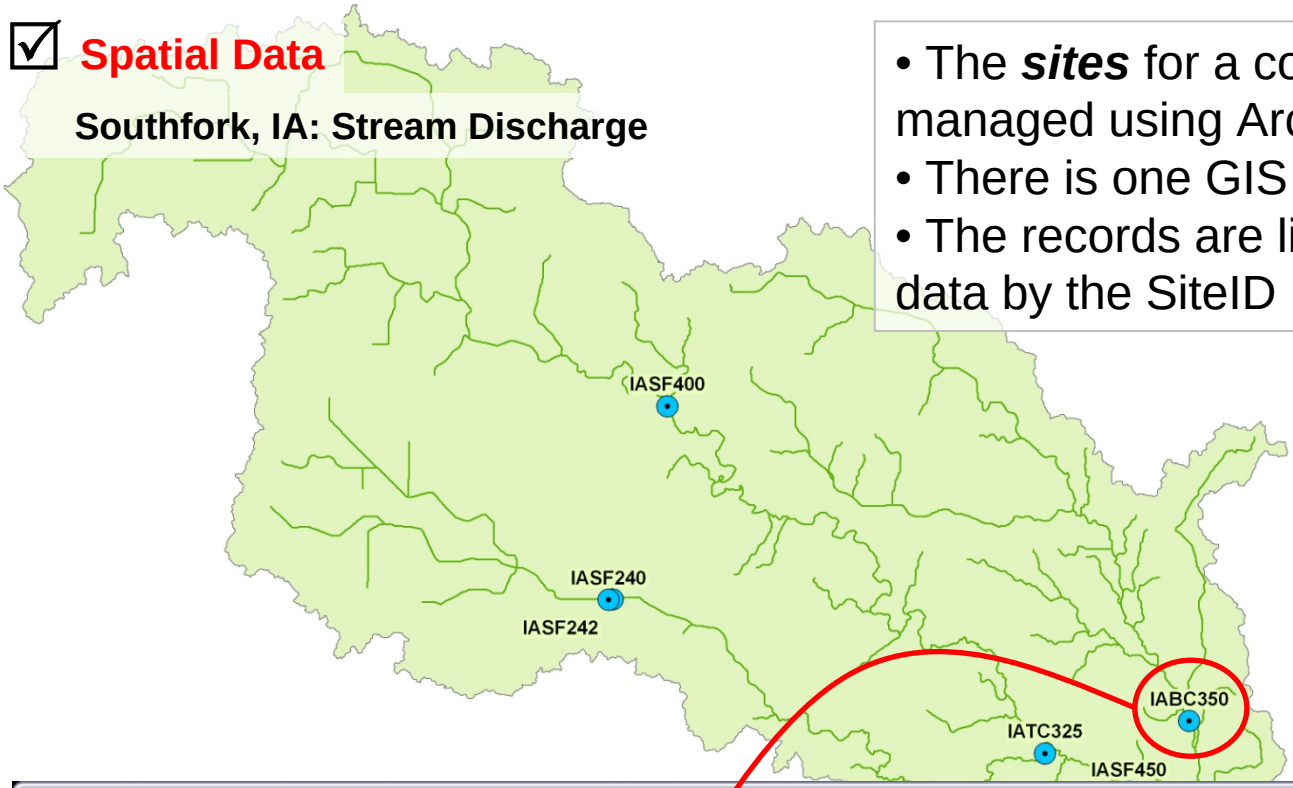
Land Use
- Agricultural management information that may be used as model input

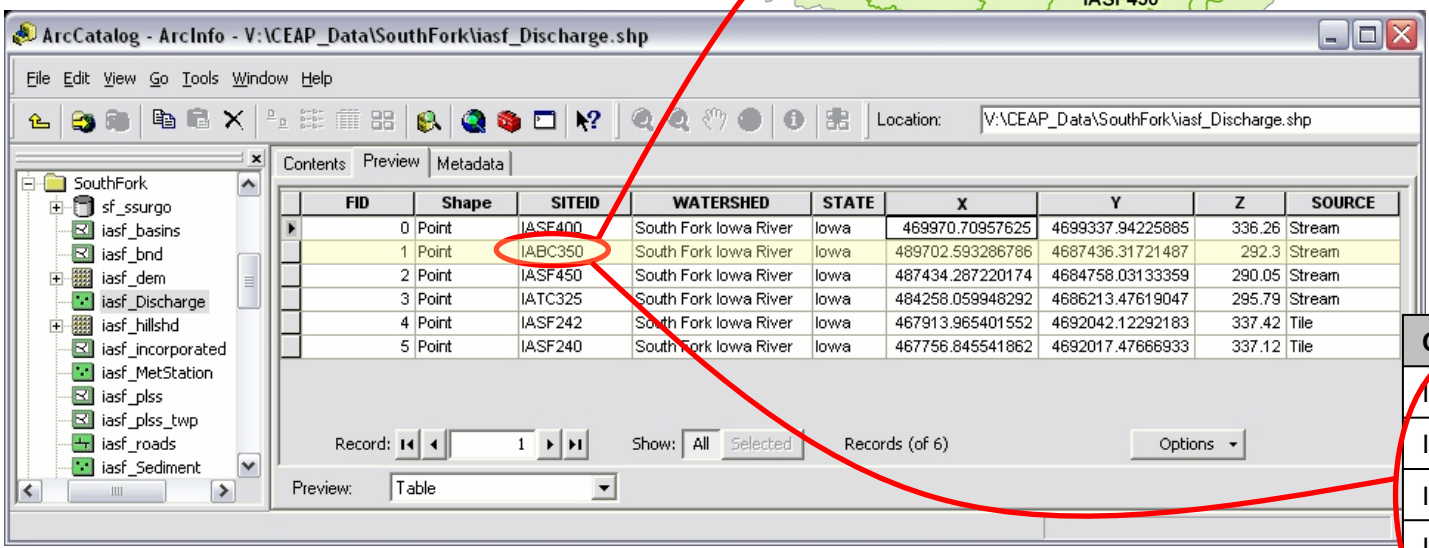
- Daily resolution for time-series data are most common
- Sub-daily resolution data are acceptable and may be more desirable
- Data Table Definition files will include Parameter Description, Lab Methods, and Field Methods for each measurement field

☑ Spatial Data

Southfork, IA: Stream Discharge

- The ***sites*** for a common theme will be managed using ArcGIS software
- There is one GIS shape file record per site
- The records are linked to the measurement data by the SiteID



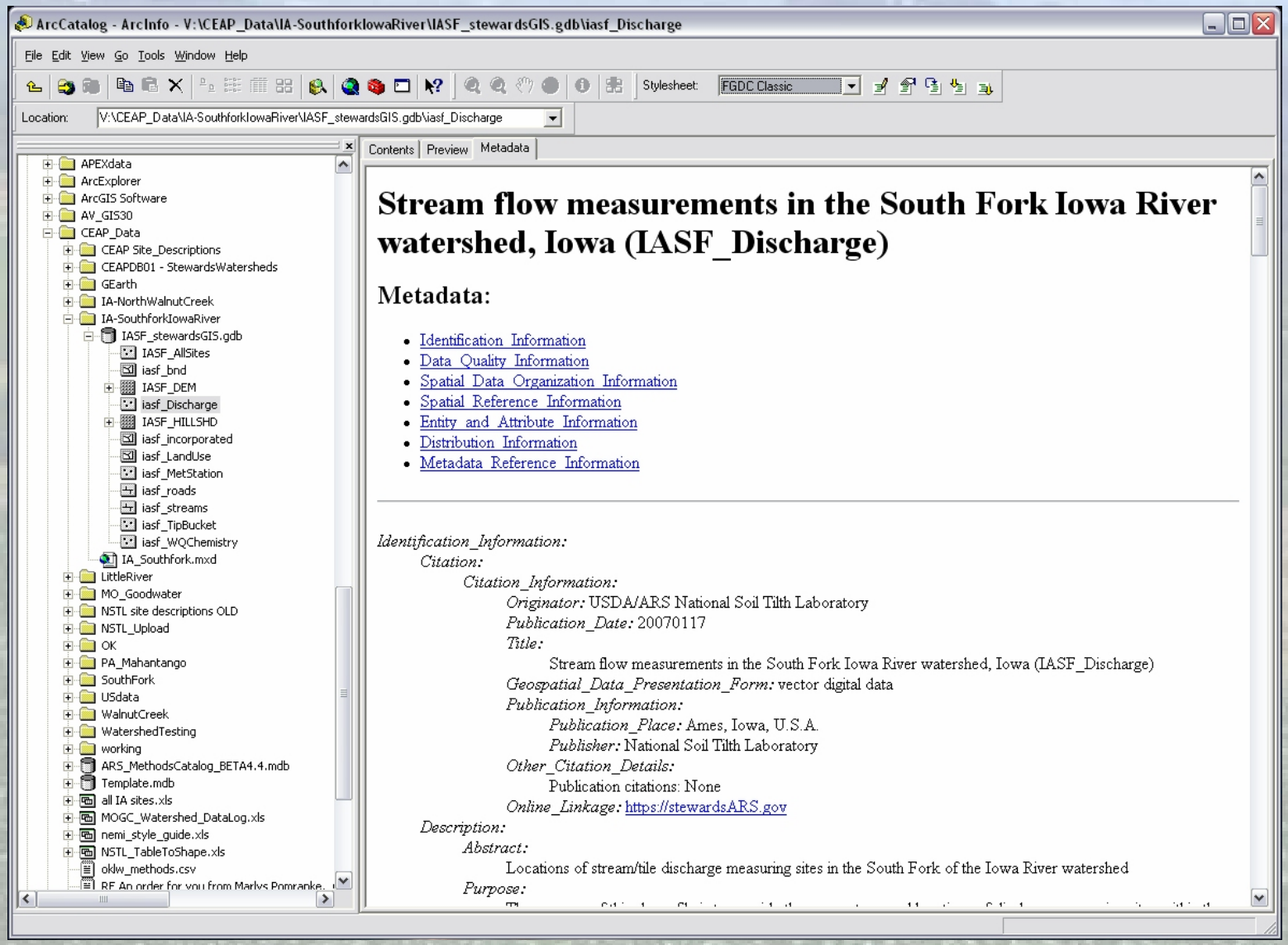


IASF_DischgDaily
Data Table

COL 1	COL2	COL3
IABC350	2/12/2001	6.07
IABC350	2/13/2001	5.21
IABC350	2/14/2001	5.39
IABC350	2/15/2001	5.02
IABC350	2/16/2001	5.18

Preparing FGDC-compliant metadata

- Using ArcCatalog see *Spatial Metadata Guidance Using ArcCatalog document*



☑ Metadata

Individual Site Description

HTML format

Watershed: Southfork Iowa River, IA
Site: IABC264

This site is a river monitoring site where water quality grab samples have been taken. This site is a drainage ditch located on 195th Street, at the bridge 1 mile east of county road S-45.

Location – SE ¼ sec. 21, T88N, R20W, in Hardin County, IA
UTM Zone 15N, NAD83: Easting 485148.77 Northing 4696334.84
Latitude: 42 25 9.04 Longitude: -93 10 49.85
Elevation: 320m

Establishment – June 15, 2001, by the National Soil Tilth Laboratory, USDA/ARS, Ames, Iowa.

Drainage area –

Instruments – None.

History – No previous instruments at this site.

Theme/Table/Topics:
IASF_SedDaily: siteid; datetime; sediment
IASF_swWQChem: siteid; datetime; bottle; no3_n; total_p

Keywords – Sediment Yield, Suspended Sediment, Water Quality, Nitrate Nitrogen, Nitrate Nitrite, Nutrients, Pesticides, Phosphorous

☑ Metadata ➔ARS Methods Catalog

The **ARS Methods Catalog** is a database of the field and laboratory methods used to produce scientific measurements that are made by ARS researchers.

- The ARS Methods Catalog is patterned after the National Environmental Methods Index (NEMI), a USGS/USEPA collaborative clearinghouse of methods and procedures for water, sediment, air and tissues.

- A Microsoft Access database application has been developed to assist data producers in managing their methods information.

- A link to the methods information will be carried in the Data Table Definition file to enable detailed methods information to be included with data at download.

- A Parameter Description will be assembled for each measurement field by the watershed. The Parameter Description is a descriptive term for the watershed measurements and is the primary search field for the NATURAL RES interface.

- A more detailed description of the Methods Catalog and its components can be found in the *Notes on the ARS Methods Catalog* document and the *ARS Methods Catalog Database Description* document.

☑ Metadata ➔ARS Methods Catalog

Methods Report

MethodID	Analyte	Detection Level	Detection Units
NSTL_SQ6	Nitrogen	0.01	%

Accuracy	Accuracy Units	Precision	Precision Units	Precision/Accuracy Concentration Used
103.5	%	3.47	RSD	0.19%

Media	Instrument
soil	Elemental Analyzer

Offical Method Name
Elemental Analysis of Nitrogen in soil

Method Type	Method Subcategory	Method Source
Laboratory	Inorganic	Soil Science Society of America

Source Citation

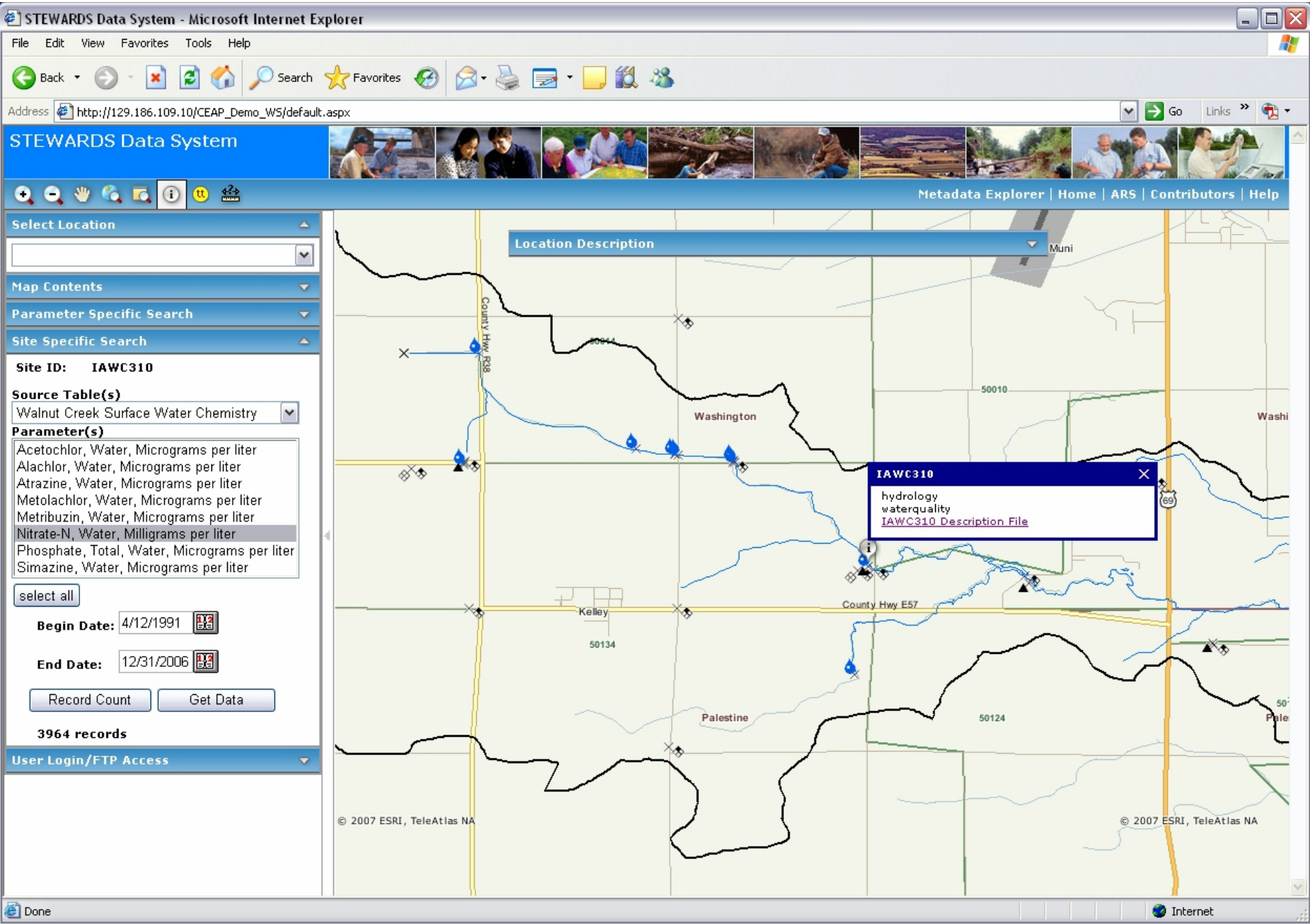
Nelson, D.W.; Sommers, L.E.; Total Carbon, Organic Carbon, and Organic Matter (973-974); Methods of Soil Analysis, Part 3- Chemical Methods, 1996, Sparks, D.L. (ed)

Brief Method Summary

Finely dried and ground soil is flash combusted in an oxidative environment. Nitrogen is ocnverted into nitrogen ioxides. The gas passes through a reductive column, which converts the nitrogen oxides into nitrogen gas prior to separation on a GC column. Nitrogen is analyzed using a thermal conductivity detector.

Method Page 1

☑ Metadata ➔ARS Methods Catalog>Parameter Description



☑ Metadata ➔ARS Methods Catalog>Parameter Description

Parameter Description
Acetochlor, water, micrograms per liter
Alachlor, water, filtered, milliliters per liter
Alachlor, water, micrograms per liter
Ammonia, water, milligrams per liter
Atrazine, water, micrograms per liter
Barometric pressure, air, daily, mean, millbars
Barometric pressure, air, daily, maximum, millibars
Cyanazine amide, water, micrograms per liter
Cyanazine, water, micrograms per liter
Deethylatrazine, water, micrograms per liter
Deisoatrazine, water, micrograms per liter
Discharge, drainage tile, water, daily, mean, cubic meters per second
Discharge, water, daily, mean, cubic meters per second
Discharge, water, daily, total, cubic meters per day
Discharge, water, instantaneous, cubic meters per second
Evaporation, pan, water, daily, millimeters
Evaporation, pan, water, daily, millimeters per day
Humidity, actual vapor pressure, air, mean, hourly, kilopascals
Humidity, relative, air, daily, maximum, percent
Humidity, relative, air, daily, mean, percent
Humidity, relative, air, daily, minimum, percent
Humidity, relative, air, percent

Parameter Description
Metolachlor, water, micrograms per liter
Metribuzin, water, micrograms per liter
Nitrate-N, water, milligrams per liter
Nitrogen, total, water, milligrams per liter
Orthophosphate, water, milligrams per liter
Phosphate, total, water, micrograms per liter
Rainfall, breakpoint, no media, millimeters since last data point
Rainfall, breakpoint, no media, volume since last data point, millimeters
Rainfall, no media, daily, millimeters per day
Rainfall, no media, daily, volume, millimeters
Rainfall, no media, hourly, millimeters per hour
Rainfall, no media, hourly, volume, millimeters
Sediment, water, suspended, grams per liter
Simazine, water, micrograms per liter
Solar Irradiance, no media, hourly, megajoules per square meter per hour
Stage, water, instantaneous, meters
Temperature, air, daily, maximum, degrees Celsius
Temperature, air, daily, minimum, degrees Celsius
Temperature, air, hourly, mean, degrees Celsius
Temperature, soil, daily, maximum, 10cm, degrees Celsius
Temperature, soil, daily, maximum, 15cm, degrees Celsius

Advantages of the Database

- Repository for data archives
- Allows multiple site analysis
- Provides researchers with a quality screened data base for their use to meet project objectives
- Allows for cross-location interactions without a *forced* common data structure

CEAP GrazingLand

- Same structure as the CEAP Cropland database

Soil Quality (CEAP)

- Survey of the soils of each CEAP watershed
- Methods catalog for soil quality assessment parameters
- Observations
- Georeferenced samples from each watershed

GRACENet

- Management Systems
- Site Locations (Spatially referenced)
- Meteorological data
- Soil data
- GHG Observations
- Crop performance data

REAP

- Assessment of Biofuel production
- Site locations
- Experimental design and location differences
- Observations
- Capability of cross-location analyses and comparison to other data

Air Quality

- Site Specific Studies
- Methods catalog
- Observations
  - Production system dynamics
  - Meteorology and micrometeorology
  - Air quality parameters
    - VOC's
    - Particulates
    - Ammonia
    - GHG
    - Pesticide Volatilization

WHAT DATA DO YOU WANT TO SHARE

Photo courtesy of USDA NRCS